

Environment & Climate Regulation

Contributing editors

Carlos de Miguel Perales, Uría Menéndez

Per Hemmer, Bech-Bruun



2018

GETTING THE
DEAL THROUGH

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Main climate regulations, policies and authorities

1 International agreements

Do any international agreements or regulations on climate matters apply in your country?

After increasing its focus on climate change regulation during 2008 to 2016, the United States, under the new Trump administration, has indicated that it intends to roll back federal climate change regulations and withdraw from certain international agreements. On 31 March 2015, the US announced its commitment to reduce GHG emissions to 26 to 28 per cent below 2005 levels by 2025 as the basis for its 'Intended Nationally Determined Contribution' at the United Nations Climate Change Conference (COP21). In April 2016, the US signed the 'Paris Agreement' arising from COP21, and later ratified it. However, in June of 2017, President Trump announced that the United States would pull out of the Paris Agreement. Following that announcement, at least 14 states formed a group called the US Climate Alliance and announced that they will uphold commitments to the Paris Agreement. The US Climate Alliance's member states encompass about 36 per cent of the US population, over US\$7 trillion in GDP, and were responsible for nearly 20 per cent of US carbon dioxide emissions in 2014. Additional states may join the US Climate Alliance, which is exploring methods for reducing emissions to 26 per cent to 28 per cent below 2005 levels by 2025 and taking further action to reduce GHG emissions in the United States.

On 11 November 2014, the US struck a bilateral agreement with China under which both nations will seek to significantly reduce greenhouse gas (GHG) emissions. Under the agreement, the US pledged to reduce GHG emissions to 26 per cent to 28 per cent below 2005 levels by 2025. Similarly, in June 2016, the US, Mexico, and Canada announced a joint goal of achieving 50 per cent 'clean power' generation by 2025, across all three countries. This goal may lead to increased trans-border transmission and energy infrastructure projects. The three nations also agreed to reduce methane emissions from the oil and gas sector by 40 per cent to 45 per cent by 2025. While both of these agreements remain in effect, it is unclear what action, if any, the Trump administration may take to rescind or modify US commitments.

The US previously ratified the United Nations (UN) Framework Convention on Climate Change on 15 October 1992, which became effective on 21 March 1994. The US signed the Kyoto Protocol on 11 December 1998, but it does not apply to the US as the US Congress did not ratify it. The US also is a party to the Vienna Convention for the Protection of the Ozone Layer and a protocol to that treaty, the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol), since the Protocol's finalisation in 1987. The Montreal Protocol and related US implementing legislation places certain restrictions on the production and use of ozone-depleting substances (ODS), including chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), many of which are potent GHGs. Under the Montreal Protocol, CFCs have now been phased out, except for the continued production and consumption of a small quantity of CFCs for uses agreed upon as 'essential' by the Parties. HCFCs are currently being phased down through incremental decreases in HCFC consumption and production, with a complete HCFC phaseout in the US by 2030. On 15 October 2016, at the 28th Meeting of the Parties (MOP28) in Kigali, Rwanda, the Parties agreed after nearly seven years

of negotiation to amend the Montreal Protocol to expand its scope beyond the original focus on ODSs to include certain hydrofluorocarbons (HFCs) (the Kigali Amendment). While HFCs are not ozone depleting substances, they have high global warming potential (GWP) and are widely used as substitutes for ODSs, which is the key linkage for including HFCs in the Montreal Protocol. At the time of writing it is unclear whether the US will ratify the Kigali Amendment and, if so, whether the US Environmental Protection Agency (EPA) would be required to seek additional statutory authority under the Clean Air Act (CAA) to implement HFC controls in line with the Kigali Amendment.

2 International regulations and national regulatory policies

How are the regulatory policies of your country affected by international regulations on climate matters?

The US lacks a comprehensive policy to regulate GHG emissions at the national level. In the absence of a national change programme, individual US states and federal regulatory agencies have taken numerous sector-based actions to reduce GHG emissions and often look to international standards and data when designing domestic GHG programmes. For example, EPA has historically cited GHG emissions data and climate change research created by the UN's Intergovernmental Panel on Climate Change (IPCC). Similarly, EPA and the Federal Aviation Administration (FAA) traditionally have worked with the International Civil Aviation Organization (ICAO) to establish aircraft emissions standards. EPA recently completed a multi-year rulemaking process to align US GHG emissions standards for aircraft with those created by ICAO.

3 Main national regulatory policies

Outline recent government policy on climate matters.

Federal developments

The Trump administration has signalled that it intends to rescind or modify many prior federal regulatory actions, including the Clean Power Plan (CPP), motor vehicle standards and carbon accounting rules. At the same time, states and other groups have initiated legal action to block the administration's efforts and preserve existing GHG rules.

In the absence of legislation, federal agencies have historically regulated GHGs under pre-existing regulatory authority, primarily under the federal Clean Air Act (CAA). The recent centrepiece of these federal initiatives is the Clean Power Plan.

In March 2016, the US Supreme Court halted the implementation of the Clean Power Plan until the resolution of legal challenges in the US Court of Appeals for the DC Circuit. In March 2017, President Trump ordered EPA to take steps to review the Clean Power Plan. Following that announcement, the DC Circuit granted a request by the Trump administration to stay its review of the law pending further regulatory actions. The Clean Power Plan remains stayed and is undergoing review by EPA and is discussed in greater detail below.

The Trump administration is also taking steps to rescind or modify other GHG programmes, including those related to mining, the power sector, oil and gas extraction, federal permitting and energy efficiency. These are discussed in greater detail below.

Federal climate change regulation

A series of regulatory actions and related court decisions has created a regulatory framework under which EPA regulates GHG emissions from various sectors. In 2007, the US Supreme Court issued its seminal opinion in *Massachusetts v EPA*, finding that GHGs met the definition of 'air pollutant' under the CAA. The Court further held that EPA had authority to regulate GHG emissions from new motor vehicles, and was obligated to do so if the Agency determined that motor vehicle GHG emissions endangered public health and welfare. In 2009 EPA issued its 'Endangerment Finding,' determining that the six primary GHGs recognised by the UN reasonably may be anticipated to endanger public health and welfare. Concurrently, EPA determined that GHG emissions from motor vehicles contribute to pollution that endangers public health and welfare.

Transport sector: vehicles

The Endangerment Finding triggered a series of GHG regulatory efforts, beginning with EPA's 2010 issuance of GHG emission and fuel economy standards for new light-duty vehicles and engines starting with Model Year 2012 (the Tailpipe Rule). In September 2011, in coordination with the National Highway Traffic Safety Administration (NHTSA), EPA established fuel economy standards for light-duty cars and trucks in model years 2012 to 2016 (first phase) and 2017 to 2025 (second phase). Together, these standards are projected to result in an average industry fleet-wide level of 163 grams per mile of carbon dioxide (CO₂) in model year 2025, which is equivalent to 54.5 miles per gallon (mpg).

In September 2011, EPA and NHTSA, in collaboration with the California Air Resources Board (CARB), also established GHG emissions and fuel economy standards for medium and heavy-duty trucks. Phase one of this programme covers vehicles built for the 2014 to 2018 model years and is estimated to reduce CO₂ emissions by about 270 million metric tons (MMT) over the life of those vehicles. In August 2016, EPA and NHTSA finalised Phase 2 of this programme, covering model years 2018 to 2027 for certain trailers and model years 2021 to 2027 for semi-trucks, large pickup trucks, vans and all types and sizes of buses and work trucks. EPA expects these standards to reduce GHG emissions by about 1.1 billion MMT.

In January 2017, the EPA administrator signed a determination maintaining the current GHG emissions standards for model year 2022 to 2025 vehicles. The administrator found that the GHG standards currently in place for model year 2022 to 2025 vehicles were appropriate under section 202(a)(1) and (2) of the Clean Air Act. In support of the determination, the administrator reasoned that the record established that, in light of technologies available today and improvements projected to occur between now and model years 2022 to 2025, it will be practical and feasible for automakers to meet such standards at reasonable cost that will achieve the significant GHG emissions reduction goals of the programme.

In March 2017, EPA announced its intention to reconsider the administrator's determination to maintain the current GHG emissions standards for model year 2022 to 2025 vehicles. EPA stated that it will coordinate its reconsideration with a parallel rulemaking process to be undertaken by the NHTSA regarding Corporate Average Fuel Economy (CAFE) standards for cars and light trucks for model year 2022 to 2025 vehicles. In August 2017, EPA announced its intention to reconsider whether the light-duty vehicle GHG standards previously established for model years 2022 to 2025 were appropriate under section 202(a) of the Clean Air Act. EPA is required to determine by no later than 1 April 2018, whether the standards for model years 2022 to 2025 are appropriate. One option mentioned is a proposal that would freeze fuel economy standards at 2021 levels (a fleet average of 41 miles per gallon), instead of increasing them every year through 2025. Thirteen states and several NGOs have announced that they will sue EPA and the Trump administration over any attempt to roll back vehicle emissions standards.

Transport sector: aircraft

On 15 August 2016, EPA promulgated an endangerment finding under Section 231(a)(2)(A) of the CAA for aircraft (the Aircraft Endangerment Finding). The Aircraft Endangerment Finding determined that GHG emissions from certain classes of aircraft engines, including those used by most large commercial aircraft, contribute to the air pollution that causes climate change and endangers public health and welfare. EPA

has not yet proposed aircraft engine GHG emission standards, but the Aircraft Endangerment Finding represents a step in that direction, much as the 2009 Endangerment Finding was the first step towards regulating GHG emissions from motor vehicles. EPA is working to align any eventual standards with those issued by ICAO. According to EPA, GHG emissions from aircraft represent 12 per cent of transport-related GHG emissions in the US, and 3 per cent of total US GHG emissions.

In October 2016, ICAO endorsed the Carbon Offsetting and Reductions Scheme for International Aviation (CORSIA) to prevent increases in international civil aviation carbon emissions above 2020 baseline levels. To accomplish this goal, CORSIA allows aircraft operators to purchase carbon offsets to mitigate emissions in excess of their baseline. Airlines can procure offsets through mechanisms such as the UNFCCC's Clean Development Mechanism, REDD+, or other projects. Signatories will be required to establish a robust monitoring, reporting, and verification system, which ICAO is currently developing guidance materials to address, along with other programme elements. ICAO formally adopted CORSIA in March 2017, and the agreement entered into force in July 2017. The first two phases of the programme are voluntary and include the pilot phase from 2021 to 2023, and the first phase from 2024 to 2026. The second phase, from 2027 to 2035, is mandatory. CORSIA takes effect in 2021 for all signatories, and as of 31 May 2017, 70 countries have pledged to participate in the voluntary stages. The US has previously pledged to participate in CORSIA, but continued US participation in CORSIA is currently under review by the Trump administration.

Electric power sector

When the Tailpipe Rule took effect in January 2011, GHGs became a 'regulated pollutant' under the CAA. Accordingly, EPA undertook various rulemaking processes to incorporate GHG emissions into programmes applicable to stationary sources, which include the Title V operating permit programme and the Prevention of Significant Deterioration (PSD) programme. These permitting programmes are discussed further in question 10. EPA also established New Source Performance Standards (NSPS) for both existing and new electric generating units (EGUs), which further regulate GHG emissions and are discussed below.

GHG performance standards for existing EGUs: the CPP

The CPP is the most significant attempted US action on climate change at the national level to date. The rule has yet to take effect, having been stayed pending review by the DC Circuit Court of Appeals. The CPP also is undergoing review by EPA.

Relying on section 111(d) of the CAA, the CPP would establish GHG emissions standards for existing fossil fuel-fired power plants. These emissions standards are based on the Best System of Emission Reduction (BSER) as determined by EPA. Under the CPP, EPA has defined BSER as consisting of three 'building blocks':

- improving operating efficiency at affected power plants;
- substituting generation from lower-emitting EGUs for generation from higher-emitting EGUs; and
- increasing renewable energy generating capacity to displace power generated by fossil fuel-fired power plants.

These building blocks are applied to each state's unique energy mix to calculate a state-specific GHG emissions rate target. To encourage and enable cap-and-trade programmes as a compliance mechanism, EPA also issued statewide mass-based standards that are extrapolated from the rate-based standards and reflect baseline generation in each state.

In its current form the CPP would require states to develop State Implementation Plans (SIPs) to achieve their respective GHG emission reduction goals at either the individual power plant level or on a state-wide basis. States have considerable flexibility to design compliance measures, which may include cap-and-trade programmes, renewable power programmes, individual plant emissions limitations, energy efficiency measures and other mechanisms to reduce overall GHG emissions from the power sector. States are permitted to propose plans that allow for interstate trading without formally entering into multi-state plans. This reduces the logistical barriers for states that generally wish to participate in trading but do not want to develop or participate in a formal multi-state plan. States that fail to submit an approvable plan will be subject to a federal implementation plan issued by EPA, which,

as currently proposed, would require those states to participate in a GHG emissions trading programme.

As noted above, the Trump administration is currently reviewing the CPP and is likely to modify or rescind the rule. However, at the time of writing, EPA has yet to act. It appears likely that EPA will either rescind the CPP or promulgate a new, narrower version of the CPP that eliminates many of the more aggressive measures in the original rule and focuses primarily on thermal and operating efficiency improvements. This so-called 'inside the fence' approach may eliminate certain legal objections to the CPP but also will result in a lesser reduction in GHG emissions.

GHG performance standards for new, modified and reconstructed EGUs

Concurrent with its release of the CPP, EPA released a final rule to limit GHG emissions from new, modified, and reconstructed EGUs. EPA's final rule for new EGUs not only serves as a stand-alone regulation, but also provides the legal underpinning for issuance of the CPP. Under EPA's interpretation of the CAA, a 111(b) rule for EGUs is necessary to trigger the authority to issue the 111(d) rule.

EPA's final NSPS rule limits GHG emissions from new, modified, and reconstructed EGUs. The new-source rule is also based on the concept of BSER, and establishes separate GHG performance standards for coal and natural gas-fired power plants. New coal-fired EGUs must emit no more than 1,400lbs CO₂/megawatt hour (MWh), while almost all new natural gas-fired EGUs must emit no more than 1,000lbs CO₂/MWh. The coal-fired EGU standard will almost certainly require the use of at least partial carbon capture and storage (CCS) technology, since even the most advanced type of coal plants achieve a CO₂ emission rate of around 1,700–1,800lbs/MWh. The standard applicable to natural gas-fired power plants is achievable using advanced natural gas combined cycle (NGCC) technology. EPA forecasts that its new-source standards will have limited cost and GHG impacts through 2022, given the low price of natural gas and limited interest in constructing new coal-fired power plants in the US.

The NSPS for new, modified, and reconstructed EGUs was challenged in the DC Circuit in 2015 in *North Dakota v EPA*. Pursuant to the Executive Order, EPA is currently reviewing the rule and likely will modify or rescind it to align with the Trump administration's deregulatory agenda. The case is being held in abeyance indefinitely while EPA reconsiders the rule.

Biomass

Biomass industries and energy producers have asked EPA to exempt biomass from GHG permitting, but EPA has yet to take concrete action. In the interim, biomass issues are being handled individually during the Title V and PSD permitting processes.

EPA also is in the midst of a process to evaluate the impact of biogenic CO₂ emissions from stationary sources. In November 2014, EPA released its 'Revised Framework for Assessing Biogenic CO₂ Emissions from Stationary Sources', which incorporates information from the scientific community and other stakeholders. EPA plans to continue refining this assessment through a second round of peer review with the Science Advisory Board (SAB). EPA's work on this continues, and in April, 2016, EPA held a workshop entitled 'Fostering Constructive Dialogue on the Role of Biomass in Stationary Source Carbon Strategies'. There is a current difference of opinion across various stakeholders on how to calculate biogenic CO₂ emissions and the carbon benefits associated with the use of different forms of biomass.

The CPP did little to clarify the role of biomass. The CPP generally provides that states may rely on 'qualifying biomass' to meet their state goals, but that such use will require demonstrations by the state that the biomass feedstocks contribute to net reductions in CO₂ emissions. EPA did not provide robust standards for assessing biomass emissions and instead left it to the states to assess the CO₂ emissions benefits of different biomass feedstocks. The CPP also references sustainable forestry and agriculture as tools for reducing dependence on fossil fuels, but does not incorporate a specific role for biomass in state implementation plans. As a result, the precise role of biomass in the US remains uncertain, at least until EPA develops a broader biomass rule or a comprehensive biogenic CO₂ emissions accounting mechanism.

Oil and gas sector

In 2012, EPA promulgated NSPSs for the Crude Oil and Natural Gas Production source category that regulate volatile organic compound emissions from gas wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, storage vessels and leaking components at natural gas processing plants, and sulphur dioxide emissions from natural gas processing plants. EPA revised these standards in 2013, 2014 and early 2015. EPA also enacted revisions to the National Emission Standards for Hazardous Air Pollutants for Oil and Natural Gas Production Facilities. While not directly regulating GHGs, EPA predicted that these regulations would result in significant climate co-benefits owing to anticipated methane reductions.

In the spring of 2014, President Obama released a 'Strategy to Reduce Methane Emissions' that identified key sources of methane emissions (landfills, coal mines, agriculture, and the oil and gas sector) and set forth a plan to reduce GHG emissions from those sources. In January 2015, the Obama administration announced a new goal to cut methane emissions from the oil and gas sector by 40 per cent to 45 per cent over the next decade.

In June 2016, EPA published two final rules in support of President Obama's methane reduction initiative. First, EPA adopted the Final Source Determination Rule to clarify what onshore oil and natural gas facilities collectively constitute the 'stationary source' for purposes of New Source Review and Title V permitting. The rule excludes facilities located beyond a quarter of a mile from the stationary source and allows case-by-case evaluation of whether facilities located within a quarter of a mile are part of the stationary source based on the common-sense notion of a plant. Higher levels of emissions from the aggregation of multiple sources can trigger applicability of more burdensome and costly air permit requirements.

Second, in amendments to the NSPS for the oil and gas sector EPA established first-ever methane emissions limits for certain new, reconstructed, and modified facilities, including hydraulic fracturing wells. An important component of the rule requires operators to employ a leak detection programme to control fugitive emissions from leaking equipment. EPA estimates the final NSPS will reduce 510,000 short tons of methane by 2025, equivalent of reducing 11 million metric tons of carbon dioxide. EPA initially attempted to stay the rule by 90 days, but that action was blocked by a court. However, in June 2017, EPA proposed a more formal two-year stay of portions of the rule while the agency reconsiders those requirements. Specifically, EPA proposed to stay the rule's fugitive emissions requirements, well site pneumatic pump standards, and the requirement that closed vent systems be certified by a professional engineer. That proposal currently is pending finalisation. In March 2017, EPA also withdrew a November 2016 Information Collection Request (ICR) that had been issued to gather information in support of future methane regulations for existing oil and gas sources. EPA stated that it withdrew the ICR to reassess the need for the requested information and to reduce burdens on business.

Energy efficiency

To date, national-level energy efficiency policies have relied more on voluntary and cooperative measures than legislative mandates, although there are a few exceptions. On 30 April 2015, President Obama signed a bill designed to improve building efficiency standards. Reflecting more modest aspirations than previously proposed energy efficiency bills, this recent legislation may nonetheless indicate a growing bipartisan consensus on energy efficiency. Despite the lack of significant national mandates, energy efficiency has gained significant traction in the US as a mechanism for avoiding increased energy consumption and reducing GHG emissions.

Although President Obama undertook a series of executive actions designed to raise awareness and increase energy efficiency, President Trump has taken a different approach. For example, President Trump's proposed budget would eliminate all funding for the popular 'Energy Star' programme. It also would cut funding for the Energy Efficiency and Renewable Energy (EERE) programme, which supports research into energy-saving technologies for deployment across the residential, manufacturing and building sectors. The Trump administration also has declined to finalise rules that would establish the first-ever national energy standards for air compressors, portable air conditioners, and uninterruptible power supplies, along with rules that would update standards for walk-in coolers and freezers and commercial packaged

boilers (which are used to heat commercial space). Eleven states have sued the Trump administration over its decision to not finalise these standards. At the same time, the Trump administration has finalised new energy efficiency standards for ceiling fans, which will take effect in September 2017.

The US Department of Energy (DOE) runs the Federal Energy Management Program, which focuses on reducing energy consumption and increasing the proportion of renewable energy utilised at federal agencies. The DOE also runs a 'Better Buildings' programme, with a goal of increasing building energy efficiency by 20 per cent over the next decade across the commercial, public, industrial, and residential sectors. This cooperative programme focuses on outreach, knowledge transfer, and market-driven energy efficiency solutions. Through these and other programmes, the federal government continues to create limited incentives and provides some support for energy efficiency and related technologies. Certain of these programmes are popular with various stakeholders and the US Congress, which may continue to fund them irrespective of what action is taken by the Trump administration.

Regional climate change programmes

The Regional Greenhouse Gas Initiative (RGGI) encompasses the eastern states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Collectively, RGGI states account for about 20 per cent of the US gross domestic product. RGGI was the first market-based GHG reduction scheme in the US and operates a cap-and-trade programme covering the power sector. RGGI lowered its GHG emissions cap beginning in 2014, to 91 million short tons, with annual follow-on decreases of 2.5 per cent from 2015 to 2020. In August 2017, RGGI members approved measures to extend RGGI through 2030, with a further 30 per cent reduction in GHG emissions during that time. By 2030, RGGI will reduce power plant emissions in member states to levels 65 per cent lower than they were 2009 when RGGI began. Membership in RGGI is voluntary and subject to change. New Jersey withdrew from RGGI in 2011, while Pennsylvania's current governor supports joining RGGI; similarly, Virginia's Governor recently took executive action intended to create a pathway for Virginia to join RGGI in the future. RGGI and related issues are discussed further in questions 12 to 15.

The Western Climate Initiative (WCI) launched in 2007, but after many years of work by certain states in the US and provinces in Canada it has yet to develop into a functioning programme and appears unlikely to do so. It did lead to the development of WCI, Inc, a non-profit corporation that provides administrative and technical services to the GHG emission allowance trading schemes of California and Quebec. California's Cap-and-Trade programme, discussed further below, currently allows for other jurisdictions to 'link' with it provided that certain criteria are met, and such a linkage exists between California and Quebec. The Canadian province of Ontario is poised to join this programme, with both California and Ontario undertaking significant regulatory processes to enable this to occur beginning in 2018. California's regulatory amendments process for the Cap-and-Trade programme was completed in July 2017 (although at the time of writing, these amendments have not yet been approved by California's Office of Administrative Law), includes proposed amendments that would facilitate more diverse linkage options.

State climate change programmes

California's Global Warming Solutions Act, also known as AB 32, was signed into law on 27 September 2006. AB 32 established a mandate to reduce GHG emissions to 1990 levels by 2020 and granted broad authority to CARB to develop and implement a broad strategy to achieve that goal. On 8 September 2016, Governor Brown signed into law a pair of bills, SB 32 and AB 197, that amended AB 32 in several ways. Importantly, SB 32 extended and expanded the state's commitment to reducing GHG emissions, establishing a new reduction target of 40 per cent below 1990 levels by 2030. CARB's strategy to achieve these emission reduction goals is set forth in its Scoping Plan, which summarises the state's diverse set of GHG emission reduction programmes (several of which are administered by state agencies other than CARB). These include programmes in nearly every sector of the economy, including energy (eg, regional balancing markets, efficiency), transportation (eg, zero emissions vehicles, low-carbon fuel standard, high-speed rail system), agriculture (eg, methane capture standard),

water (eg, conservation programmes), waste management (eg, eliminate disposal of organic material at landfills), and natural lands (eg, forest carbon plan). In CARB's 2014 updated Scoping Plan, the 2020 limit on annual GHG emissions was set at 431 million metric tons, which CARB calculates as an emission reduction goal of 78 million metric tons below predicted 2020 'business as usual' emissions (509 million metric tons). In 2017 CARB was working on another update to its Scoping Plan to account for an emissions target of 40 per cent below 1990 levels by 2030 (which had been established by Executive Order prior to the passage of SB 32). CARB's latest draft of the Scoping Plan seeks a 2030 target of 260 million metric tons and envisions an 80 per cent reduction in greenhouse gas emission by 2050. Amendments to California's cap and trade programme, adopted in July 2017, seek to cap emissions in 2030 at 200.5 million metric tons.

Although it accounts for only about 30 per cent of the emission reductions under the current Scoping Plan (23 of the 78 million), the central feature is a multi-sector cap-and-trade GHG emissions programme, which was first implemented in 2013. The programme creates the second-largest carbon market in the world, after the European Union's, and covers 85 per cent of all GHG emissions in California. The programme began with the power and industrial sectors, and in 2015 expanded to cover transportation and heating fuels (see below). AB 32 mandates GHG emission reductions by 2020 only, but as noted above, SB 32 was enacted in 2016, extending the emission reduction mandate to 2030. Executive orders establish a further GHG emission reduction goal of 80 per cent below 1990 levels by 2050. As noted above, in 2016 CARB undertook a regulatory amendments process for its cap-and-trade regulation and its accompanying GHG emissions monitoring regulation; CARB continues to revise its Scoping Plan to address legislative developments. These amendments will assist CARB in implementing the programme through 2030 and prepare California to comply with the CPP. A legal challenge recently contended that the allowance auctions that are a central part of the cap-and-trade programme constitute an illegal tax. The case, known as *California Chamber of Commerce v CARB*, was decided by the California Court of Appeal for the Third District, resulting in a victory for CARB and a ruling that the allowance auctions do not constitute a tax. The California Supreme Court declined to review the case so the Court of Appeal's decision will be the last say on the matter, for now. The California legislature has further protected the programme from similar legal challenges by adopting legislation that is strong enough to authorise a tax within the programme, AB 398.

In July 2017, California passed AB 398, which extended CARB's cap-and-trade programme for 10 years from 2021 to 2030. AB 398 is called the 'California Global Warming Solutions Act' and amends previous version of that legislation. The bill was signed into law on 25 July 2017 and took effect immediately. Under AB 398, CARB is authorised to extend the cap-and-trade programme from 1 January 2021 to 31 December 2030. CARB must update the scoping plan for the programme no later than 1 January 2018. The new law pre-empts control of carbon dioxide emissions from stationary sources 'subject to a market-based compliance mechanism' by air pollution control districts. However, air districts may still regulate other GHG emissions. The law expressly does not limit CARB's ability to implement the Low Carbon Fuel Standard regulation, regulations of short-lived climate pollutants, or the sustainable freight action plan, all of which are policies that CARB will depend on based on its latest draft of the scoping plan. AB 398 also modifies the cap-and-trade programme in a few key ways, including the addition of cost control measures and new restrictions on the use of carbon offsets.

AB 398 implements several mechanisms to attempt to control costs, in part because required emission reductions for the period from 2021 to 2030 are more substantial than for the first three compliance periods from 2012 to 2020. CARB will establish a 'price ceiling.' The amount of the price ceiling will be based on consideration of six factors. The price ceiling mechanism will consist of allowances remaining in the 'allowance price containment reserve' as of 31 December 2020. If those allowances are exhausted, the CARB will allow additional emissions at the cost or metric ton at the price ceiling. Second, CARB will establish 'two price containment points' below the price ceiling. Allowances obtained through this mechanism cannot be traded. They will also be made up of a portion of allowances in the 'allowance price containment reserve' as of 31 December 2017 and subsequent unsold allowances that remain unsold for at least 24 months. CARB must also 'evaluate and address concerns related to over allocation' of allowances. This mandate may

lead CARB to take actions that work like a price floor. And CARB must create 'banking rules' that minimise market volatility.

The new law restricts both the percentage of emissions reductions that can be supplied by offset credits and where those offset credits can be generated. Currently, the cap-and-trade programme permits an entity to meet up to 8 per cent of its compliance obligation with offsets. Under AB 398, between 2021 and 2025 that is reduced to 4 per cent; in 2025 to 2030, the limit increases to 6 per cent. However, beginning in 2021 at least half of all offset credits used for compliance must be derived from projects that 'provide direct environmental benefits in state,' which are projects expected to be located in the state.

AB 398 requires industry allowance factors (which help to determine the number of 'free' allowances issued to a given industry each year) to be set 'at the levels applicable in the compliance period of 2015 to 2017' for the allowance allocation starting in 2021. In later years, these will be subject to a declining overall emissions cap adjustment factor. The law makes several adjustments to how revenue from the cap-and-trade programme may be used, specifying priorities that must be considered (but are not binding). The law also includes tax exemptions for certain 'personal property' purchases related to certain manufacturing, processing, refining, fabricating and recycling activities.

In addition to the cap-and-trade programme, the Clean Energy and Pollution Reduction Act of 2015, also known as SB 350, established state-wide goals in California for 2030 of 50 per cent electricity generation from renewable resources (ie, a renewable portfolio standard of 50 per cent) and doubling energy efficiency in electricity and natural gas usage (in effect, a 'green buildings' initiative).

In addition to regional the programmes discussed above, including RGGI, several other states have enacted significant GHG emission reduction legislation.

The Massachusetts Global Warming Solutions Act, enacted in 2008, targets a reduction in statewide GHG emissions of 25 per cent from 1990 levels by 2020 and an 80 per cent reduction from 1990 levels by 2050. The legislation is not self-implementing, but instead creates a framework for reducing GHG emissions from various sectors, such as electricity, transportation and buildings. In 2016, the Massachusetts Supreme Judicial Court ruled that current efforts were insufficient to achieve the goals of the Global Warming Solutions Act and ordered the state to set firm limits on GHG emissions for various sectors. In 2017, Massachusetts finalised a suite of six measures to collectively reduce GHG emissions. The centrepiece of these efforts is a new 'Clean Energy Standard' that requires utilities to deliver electricity purchased from 'clean' energy sources, starting at 16 per cent in 2018 and increasing 2 per cent annually to 80 per cent in 2050. 'Clean energy' is defined to include traditional renewables such as wind and solar, as well as lower-GHG emitting power generation that emits at least 50 per cent less GHGs than the most efficient natural gas generator (meaning that hydro power, nuclear and other sources may qualify). Massachusetts also adopted a hard cap on in-state GHG emissions from power plants that declines annually from 8.96 million metric tons of CO₂ in 2018 down to 1.8 million metric tons in 2050. These efforts compliment and overlap with Massachusetts' participation in RGGI.

Connecticut's Global Warming Solutions Act, also adopted in 2008, targets a reduction of statewide GHG emissions of 10 per cent from 1990 levels by 2020, with an 80 per cent reduction from 2001 levels required by 2050. These laws are driving increased action in Massachusetts and Connecticut in a variety of areas, including a focus on renewable energy development, energy efficiency, and reduction of fossil fuel use.

In September 2016, Washington finalised a multi-sector GHG emissions reduction scheme, called the Clean Air Rule, which requires annual reductions of 1.7 per cent in GHG emissions from each covered facility. Covered facilities have annual baseline or projected GHG emission of at least 70,000 metric tons of CO₂e. Facilities with the highest emissions have compliance dates starting in 2017, while facilities with lower emissions must comply in subsequent years. Parties that are in energy-intensive, trade-exposed industries may be entitled to less stringent requirements, depending on their performance relative to industry norms. The programme has some cap-and-trade elements, allowing compliance obligations to be met through a declining percentage of emissions allowances obtained from other programmes and through offset credits from emission reductions in Washington. Washington is evaluating other multi-sector GHG emission reduction programmes

from which covered entities may obtain allowances. The Clean Air Rule has been challenged in federal and state courts by business and environmental interests. The federal litigation has been stayed, pending resolution of the claims in state court. The state courts have not yet ruled on whether the Clean Air Rule is lawful. Washington voters defeated a carbon tax measure at the ballot box in November 2016. Proponents of GHG emission reductions indicated that they would pursue legislative options this year, but a carbon tax bill and a bill updating Washington's GHG reduction targets were stalled during the 2017 state legislative session. The legislature did provide funding for implementation of the Clean Air Rule, which may affect the outcomes of related lawsuits. At least one environmental coalition is exploring options for additional Washington ballot measures to address GHG emissions.

Oregon has set GHG reduction targets and in 2016 adopted the Clean Electricity and Coal Transition Act, which requires elimination of coal-fired generation in the state by 2035 and requires half of all electricity to come from renewable sources. Oregon is considering establishing a broader cap-and-trade programme, potentially with linkages to California, Washington, and other states.

Additional states have implemented programmes aimed at reducing GHG emissions, primarily related to the power sector. For example, Montana, New York, Illinois and Minnesota all have enacted some form of requirements related to GHG emissions from new electric generating facilities. Some states are beginning to broaden their GHG reduction efforts beyond the electric power sector, and at least 20 US states have adopted some form of GHG emissions target. Two factors have increased state-level activity over the past several years: greater public support for GHG regulation and a growing frustration with the lack of a comprehensive national GHG reduction programme. GHG reduction efforts are expanding across the US, but unevenly, with coastal states generally more receptive to GHG reduction programmes than inland states. With the election of Donald Trump, the expansion of state-level programmes is expected to continue as states and cities across the US increase their focus on climate change regulation in the absence of any real action at the federal level.

Ozone depleting substances

Ozone depleting substances are regulated under Title VI of the CAA, which contains provisions to protect the stratospheric ozone layer and mandates that EPA develop and implement regulations for managing ODSs consistent with the Montreal Protocol, discussed in section 1. Title VI requires the phase-out, through incremental, or 'stepped', decreases, of domestic production and import of ODSs, which are classified into Class I and II substances. Class I substances include CFCs, halons, carbon tetrachloride, methyl chloroform, methyl bromide, hydrobromofluorocarbons, and chlorobromomethane and have mostly been phased out. Class II substances are all HCFCs and are in the process of being phased out in the US. EPA has established a number of regulatory programmes to control ODSs, covering ODS phaseout, exemptions, imports and exports, labelling, destruction, and other specialised programmes.

Much of the current focus in the US surrounds HFC regulation. EPA has begun to regulate HFCs (which are not ODSs but are frequently used as ODS substitutes) through two Title VI programmes: the refrigerant management programme under section 608 of the CAA and the Significant New Alternatives Policy (SNAP) programme under section 612 of the CAA. In 2016, EPA updated its refrigerant management regulations to increase the stringency of the leak protection and repair requirements, as well as the record-keeping and reporting obligations. EPA also, for the first time, extended these requirements to include HFCs used as refrigerants. Two industry coalitions petitioned for review of the final rule in the DC Circuit, arguing, among other things, that EPA does not have the authority under the CAA to regulate non-ODS substitutes such as HFCs. The case, *National Environmental Development Association's Clean Air Project v EPA*, No. 17-1016, is currently being held in abeyance. One of the coalitions also petitioned EPA to reconsider aspects of the final rule and on 10 August 2017, EPA issued a letter to the petitioners stating that it plans to issue a new rule revisiting the 2016 rule's extension to non-ODS substitutes, such as HFCs.

EPA also started to regulate HFCs in certain end-uses through its SNAP programme, which is charged with evaluating substitutes for ODSs. Under CAA Section 612, EPA may prohibit or restrict the use of substances where alternatives with less adverse environmental effects,

such as lower GWP, are available. In 2015, EPA issued a SNAP rule that prohibited certain HFCs or HFC-blends in various end-uses in four industrial sectors. That rule was challenged and in August 2017, the DC Circuit issued an opinion vacating part of the rule to the extent it required manufacturers to replace HFCs with a substitute substance and remanding to EPA to determine whether it has the authority to conclude that a manufacturer's past decision to replace an ODS with an HFC is no longer lawful. *Mexichem Fluor, Inc v EPA*, No. 15-1328 (DC Cir 8 August 2017). At the time of writing, this decision has been appealed for rehearing. Under the court's opinion, EPA may still prohibit replacing an ODS for the first time with an HFC. As indicated by the recent regulatory and judicial activity surrounding HFCs, an HFC regulatory regime is still evolving in the US. As noted in section 1, this landscape will be affected by the US's decision on whether to ratify the Kigali Amendment.

4 Main national legislation

Identify the main national laws and regulations on climate matters.

As discussed in question 3, the US lacks any national climate change legislation. See question 3 for a discussion of US regulatory activities. See question 19 for a discussion of renewable energy policies and programmes.

5 National regulatory authorities

Identify the national regulatory authorities responsible for climate regulation and its implementation and administration. Outline their areas of competence.

EPA is the primary national regulatory authority with responsibility for climate regulation. EPA's authority includes promulgation and enforcement of CAA standards for GHG emissions for both mobile and stationary sources; GHG reporting programmes; adaptation to a changing climate; and protection of drinking water aquifers under the federal Safe Drinking Water Act with regard to CCS underground injection technologies.

NEPA requires federal agencies to consider potential environmental impacts associated with major federal actions that may significantly affect the environment. The Council on Environmental Quality (CEQ) is charged with ensuring federal agencies comply with NEPA. On 2 August 2016, the CEQ released its final guidance on how federal agencies should consider the impacts of their actions on climate change. However, on 28 March 2017, President Trump ordered the CEQ to rescind that guidance and the CEQ subsequently did so. At the same time, consideration of GHGs in federal permitting actions continues under NEPA and is often mandated by the courts. In August 2017, US Court of Appeals for the District of Columbia Circuit, in *Sierra Club v FERC*, ruled that federal agencies must quantitatively consider greenhouse gas impacts when issuing permits for natural gas pipelines, including those related to the ultimate combustion of the fuel. This decision affirmed that NEPA requires federal agencies to consider GHG emissions, a conclusion that will likely extend to other types of projects in addition to pipelines.

In July 2015, the US Government Interagency Working Group on the Social Cost of Carbon revised the social cost of carbon (SCC) estimates to reflect updates to the underlying models. As an example, using 2015 emissions and a 3 per cent discount factor, the SCC is US\$36. That cost will rise to US\$50 a metric ton in 2030 and US\$69 a metric ton in 2050. The SCC, which was designed for federal agencies to utilise in cost-benefit analyses of regulatory actions that impact cumulative global emissions, sets the incremental cost to society of each metric ton of CO₂ emitted and varies by emissions year and assumed discount rate. This SCC has been widely criticised by industry as having been increased without appropriate public process or analysis; at the same time, many environmental advocacy groups believe the figure is too low. In August 2016, the 7th US Circuit Court of Appeals upheld the Department of Energy's use of the Social Cost of Carbon metric in an energy efficiency rulemaking action. Further litigation over this metric may occur as its regulatory use expands.

On 28 March 2017, President Trump ordered the CEQ to rescind its guidance for accounting for GHG and climate impacts in NEPA reviews. CEQ implemented the order of 5 April by formally rescinding the guide.

The executive order also withdrew several technical guidance documents for the SCC, the Obama-era metric for estimating the costs and benefits of GHG reductions, and ordered agencies not to use the tool. The rescission of the CEQ guidance has created considerable uncertainty regarding how federal agencies should consider the impacts of their actions on climate change. Most recently, in August 2017, a federal court in Montana blocked approval of a coal mine expansion after finding that the Interior Department failed to adequately consider the GHG effects of the coal's transport and use in an environmental review of the project. Along with *Sierra Club v FERC*, discussed above, the decision underscores that agencies likely will have to address GHG issues in NEPA evaluations despite the lack of CEQ guidance. Expect future litigation over how climate change impacts are considered in projects subject to the requirements of NEPA.

General national climate matters

6 National emissions and limits

What are the main sources of emissions of greenhouse gases (GHG) (or other regulated emissions) in your country and the quantities of emissions from those sources? Describe any limitation or reduction obligations. Do they apply to private parties in your country?

The most recent comprehensive GHG emissions data for the US is EPA's 2017 'Inventory of US Greenhouse Gas Emissions and Sinks', which covers the period from 1990 through 2015. Mandatory GHG reporting began in 2011 for certain industries and in 2012 for others. As a result, EPA's 2017 report includes robust GHG emissions data from various sectors of the US economy. According to EPA's 2017 report, total US GHG emissions were 6,586.7MMT of CO₂ equivalent (CO₂e) in 2015, representing a decline of about 2.3 per cent from 2014 levels. That decline is attributable largely to warm winter conditions and substitution of natural gas for coal to produce electricity. Leading sector-based emissions (in MMT CO₂e) are as follows:

- electricity generation, 1,820.8;
- transport, 1,493.8;
- industrial, 842.5;
- residential, 338.3; and
- commercial, 217.4.

Other sectors were less significant. While CO₂ emissions are the largest source of total GHG emissions in the US, in 2015 methane emissions across various sectors accounted for 780.8MMT CO₂e, nitrous oxide accounted for 359.5MMT CO₂e, and hydrofluorocarbons accounted for 46.6MMT CO₂e. Other types of GHG emissions were less significant.

The US remains a large contributor to global GHG emissions. Globally, EPA estimates that 33,733MMT CO₂ were added to the atmosphere through fossil fuel combustion in 2014, with the US contributing about 16 per cent.

GHG emissions standards apply to private commercial entities to the extent that entity is subject to regulation by the relevant national or state authority. See question 3 for a discussion of GHG emission limitations.

7 National GHG emission projects

Describe any major GHG emission reduction projects implemented or to be implemented in your country. Describe any similar projects in other countries involving the participation of government authorities or private parties from your country.

At the federal level, GHG emission reductions are primarily driven by CAA regulation, which does not currently contemplate emissions reduction projects or carbon offsets as compliance mechanisms. See question 3 for a discussion of GHG regulations, permitting requirements, and related GHG emission reductions. RGGI and California's AB 32 both establish a system for GHG emission reductions. Carbon offsets are one component of complying with California's GHG reduction scheme and are generated through several approved methodologies. See questions 3 and 12 to 15 for a broader discussion of RGGI and California's programme. See question 19 for a discussion of renewable energy policies.

Domestic climate sector

8 Domestic climate sector

Describe the main commercial aspects of the climate sector in your country, including any related government policies.

Commercial climate business in the US is fragmented, largely due to the lack of comprehensive national climate change regulation. The CPP, discussed in question 3, may help to consolidate and increase the commercial climate sector. At present, the main drivers of the US climate sector are:

- emissions credit trading under RGGI;
- emissions credit and offset trading under California's AB 32; and
- biofuel requirements and related credit trading.

Carbon offset project development accelerated in 2016/17, with numerous projects developed in the continental US and Alaska. In particular, the generation of forest offset credits has increased dramatically as entities generate and sell offsets for use in compliance with California's cap-and-trade programme and in voluntary markets. Emissions trading and commercial aspects of RGGI and California's AB 32 are further discussed in questions 3 and 12 to 15; biofuels are discussed in question 24. See question 19 for a discussion of the renewable power sector.

General GHG emissions regulation

9 Regulation of emissions

Do any obligations for GHG emission limitation, reduction or removal apply to your country and private parties in your country? If so, describe the main obligations.

Various national, regional and state programmes exist in the US to regulate GHG emissions. See question 3 for a comprehensive discussion of US GHG emissions regulations.

10 GHG emission permits or approvals

Are there any requirements for obtaining GHG emission permits or approvals? If so, describe the main requirements.

Certain stationary sources are required to obtain Title V operating permits and PSD permits for GHG emissions. These CAA programmes are overseen and enforced by EPA. Under the CAA's 'cooperative federalism' approach, most states manage GHG permitting in conjunction with any applicable state laws or programmes. Typically, any applicable NSPS GHG emissions limits (such as those imposed by the CPP or new source NSPS programme) will be incorporated into a facility's Title V operating permit.

The CAA's permitting thresholds of 100 or 250 short tons per year are so low that, when applied to GHGs, they would sweep hundreds of thousands of very small sources into the GHG permitting programme. Recognising that this result would be contrary to Congressional intent and unnecessarily burdensome, EPA issued a Tailoring Rule in 2010 that attempted to rationalise permitting thresholds in the GHG context by setting the PSD and Title V applicability thresholds at 100,000 short tons per year for new and existing sources. Various groups challenged the Tailoring Rule and on 23 June 2014 the Supreme Court partially vacated the rule, holding that EPA had exceeded its statutory authority in adjusting the permitting thresholds for GHG purposes. As a result of this decision, stationary sources are now subject to GHG permitting requirements only if they would have been subject to CAA permitting requirements 'anyway', based on emissions of other pollutants. These 'anyway' sources account for the vast majority of stationary source GHG emissions in the US. EPA and state air agencies are adjusting their GHG permitting programmes to comply with the Court's decision. The current permitting threshold for GHG 'anyway' sources under Title V and PSD permitting is 75,000 short tons of CO₂e per year for new and existing sources, and for modifications resulting in a net GHG emissions increase equal to or greater than 75,000 short tons per year. EPA is continuing to develop its GHG permitting programme and strengthen the underlying legal basis.

When obtaining permits under the PSD programme, including new source review (NSR) permits, sources must evaluate available emissions reductions options to determine the 'best available control technology' (BACT) for that facility. BACT determinations are

made on a case-by-case basis considering energy, environmental and economic impacts, and other costs. Over time, technological advancements increase the degree of attainable emissions reductions. EPA has issued guidance as to relevant BACT considerations for various industry sectors and maintains a database of BACT determinations for GHG emissions and other pollutants.

11 Oversight of GHG emissions

How are GHG emissions monitored, reported and verified?

EPA's mandatory Greenhouse Gas Reporting Rule requires reporting of GHG data and other relevant information for facilities in 41 source categories. Among other sectors, the GHG reporting programme applies to power plants, petroleum and natural gas systems, refineries, and the chemicals, waste, metals, minerals, and pulp and paper industries. In general, the rule covers US sources that emit 25,000 short tons or more CO₂e per year. Data is submitted electronically and EPA has processes for identifying potential errors and verifying data. EPA compiles reported GHG to create its annual GHG inventory for the US. Compliance for covered sources is mandatory and administrative, civil or criminal penalties may apply for violations.

Several states also have implemented GHG reporting rules, and the reporting thresholds differ by state. For example, Massachusetts' GHG reporting rule is triggered for any facility that emits more than 5,000 short tons of CO₂e per year. California's regulation requires GHG reporting for certain industrial facilities, fuel suppliers, and electricity importers that emit 10,000 short tons of CO₂e per year. (Entities that emit more than 25,000 short tons of CO₂e per year are also covered by the state's cap-and-trade programme.) Entities must comply with both federal and state GHG reporting requirements, if applicable.

Climate change risk disclosure

Companies are increasingly facing significant pressure to disclose a great deal of Environmental Social and Governance (ESG) information, especially related to risks the company may face from climate change; including risks from the physical impacts of climate change, the impacts of new laws and policies and the long-term effect on the company of a shift to a low-carbon economy. In 2010 the Securities and Exchange Commission (SEC) issued interpretive guidance regarding required disclosures by companies of their climate change related risks. Although the 'materiality' standard still provides the threshold for required disclosures in the US, in 2016 the SEC issued a 'Concept Release,' a general request for comments regarding whether changes are needed to its disclosure rules. The Release included a specific request for comments as to whether investors were being adequately informed of climate change risk under the current disclosure regime. The SEC is reviewing comments and although major changes to the reporting requirements are not likely in the near term, many believe those changes will eventually come.

In the absence of federal action on climate change risk reporting, states, environmental groups, investors and shareholders are increasingly driving changes to climate risk reporting by companies. The New York State Attorney General has taken a leading and aggressive role, using state anti-fraud laws and the power of the subpoena to investigate what companies have said internally and publicly about the risks that climate change may pose to the company. Shareholder resolutions aimed at increasing corporate disclosure of climate risk information are increasing in numbers, are garnering more support, and some have been adopted with wide majorities and management's support, or even despite management's recommendations, to vote against the proposals. Major investment firms are recommending that companies do more to disclose climate change risks. There are now many organisations working to issue voluntary climate risk disclosure 'standards' that they argue will allow investors to make better comparisons of climate related risks and opportunities among companies. Companies are increasingly facing dozens or even hundreds of requests for data and information on how they assess and disclose climate-related risks. Most recently, in June 2017, the Task Force on Climate-Related Financial Disclosures, an industry-led task force established by the Financial Stability Board at the request of the G20, issued its final report recommending standards for how companies identify, manage, and disclose climate related risks. Although voluntary, some predict that such standards are likely to become mandatory, albeit this is not likely to occur in the US in the current administration.

GHG emission allowances (or similar emission instruments)**12 Regime****Is there a GHG emission allowance regime (or similar regime) in your country? How does it operate?**

There is no GHG allowance regime at the federal level. RGGI and California operate cap-and-trade programmes with associated emissions allowance regimes.

RGGI is limited to the power sector and uses an allowance system for compliance; electric power generators subject to RGGI are required to hold CO₂ allowances equal to the amount of CO₂ they emit in a given compliance year. Each RGGI state issues allowances in an amount defined by each state's applicable law or regulation implementing RGGI. Collectively, these allowances comprise the annual RGGI cap. One unique feature of RGGI is that allowances are distributed primarily through quarterly auctions. During 2016, the auction clearing prices ranged from US\$3.55 to US\$5.25; the latest auction cleared at a price of US\$2.53, due to a temporary over-supply and uncertainty over the RGGI programme review. That review subsequently lowered the RGGI cap by 30 per cent from years 2021 to 2030. Secondary market prices were consistent with auction prices. Through mid-2017, RGGI had conducted 36 successful allowance auctions; at the latest RGGI auction for which data is available, RGGI states sold all available allowances: 14,597,470, for total proceeds of US\$37 million. That revenue is allocated to member states and typically used for energy efficiency and other programmes. To date, the programme has raised and allocated to its member states nearly US\$3 billion. RGGI also utilises a cost containment reserve system to allocate and auction additional allowances when needed to limit price volatility. That cost containment system, combined with periodic over-supply, has kept prices low but also has frustrated efforts to create a market for carbon offsets in RGGI states. A new an Emissions Containment Reserve, which allows states to withhold allowances from auction if reduction costs are lower than projected will allow more dynamic response to market conditions and may have the effect of stabilising or raising slightly the cost of RGGI allowances.

California's cap-and-trade programme is administered by CARB as a central feature of its GHG emission reduction plan under AB 32 and subsequent amendments. Under this programme, which began in 2013, CARB sets an annual cap on GHGs and issues a limited number of emission allowances, each of which authorises its holder to emit one MT CO₂e. The number of available allowances is limited by the cap, and declines by approximately 3 per cent each year. In 2013, when the programme was limited to the power and large industrial sectors, the cap was set at 162.8MMT; in 2015, with the addition of transportation and heating fuels, the cap was set at 394.5MMT; in 2020 the cap will be ratcheted down to 334.2MMT. The latest amendments to the regulations governing this programme seek a 200.5MMT cap. Entities that emit 25,000MT CO₂e annually are obliged to surrender a certain number of compliance instruments to CARB, consistent with each entity's reported emissions. Compliance instruments consist primarily of allowances, which can be purchased from CARB at quarterly auctions. In addition, up to 8 per cent of a covered entity's obligation can be met with CARB-certified offsets. Both allowances and offsets also may be bought and sold on the secondary market, subject to certain restrictions. However, AB 398 reduces the percentage of offsets that may be used by an entity for compliance starting in 2021, as discussed in section 3.

CARB exercises broad oversight over this market, much as the federal Securities and Exchange Commission supervises markets for financial instruments in the United States. Covered entities are required to disclose substantial information to CARB, including information about corporate ownership and affiliates, directors and officers, high-level employees, and legal and market-strategy advisers.

In 2016, California's cap-and-trade programme remains linked with that of the Canadian province of Quebec, meaning that allowances issued by either jurisdiction may be used by entities in both. California conducted eight quarterly allowance auctions before linking with Quebec and the two jurisdictions have held eight joint quarterly auctions since the first one in November 2014. The Canadian province of Ontario began developing a cap-and-trade programme in 2015 and it is anticipated that it will link with California in 2018. Should other states develop cap-and-trade programmes, they also may link with

the California-Quebec programme or RGGI. See question 3 above on regional climate change programmes for more detailed information.

13 Registration**Are there any GHG emission allowance registries in your country? How are they administered?**

There is no GHG allowance regime at the federal level. The registry for RGGI allowances is called the 'CO₂ Allowance Tracking System' (RGGI-COATS). Each RGGI allowance has a unique serial number, and is registered in RGGI-COATS, which then tracks initial ownership, transfer and retirement of allowances. California and other linked jurisdictions utilise the Compliance Instrument Tracking System Service (CITSS) as an allowance registry. CITSS tracks the issuance, initial ownership, transfer and retirement of allowances and offsets.

14 Obtaining, possessing and using GHG emission allowances**What are the requirements for obtaining GHG emission allowances? How are allowances held, cancelled, surrendered and transferred? Can rights in favour of third parties (eg, a pledge) be created on allowances?**

There is no GHG allowance regime at the federal level. See questions 12 and 13 for a description of state and regional emissions allowances. California's cap-and-trade programme establishes holding limits that restrict the volume of allowances an entity may hold. It also prohibits acquiring and holding in a CITSS account any allowances in which another entity has an ownership interest or over which another entity can exert control over their disposition. However, entities may pledge compliance instruments (allowances or offsets) privately in over-the-counter transactions. Forward contracts such as futures and options also are allowed. Contractual arrangements must be reported to CARB only when the contract results in physical delivery of the compliance instruments to a new owner (eg, through a transfer in the CITSS system).

Trading of GHG emission allowances (or similar emission instruments)**15 Emission allowances trading****What GHG emission trading systems or schemes are applied in your country?**

There is no national GHG allowance regime or national-level emission trading system.

Any qualified party can participate in RGGI allowance auctions; auction rules limit the number of allowances that associated entities may purchase in a single auction to 25 per cent of the total allowances offered for auction. RGGI allowances also are traded on a secondary market, along with associated futures and options contracts. The RGGI-COATS registry facilitates this market by providing for allowance transfers.

California (jointly with Quebec since 2014) conducts quarterly auctions of GHG emission allowances. Both entities that are covered by California's cap-and-trade programme, and as others opting into the programme can participate in the auctions. In addition, a certain number of allowances are allocated directly by CARB to certain entities (principally in-state manufacturers and electric utilities), with free allocation decreasing over time. Following California's initial auction, allowance prices stabilised and trading volume increased, and a robust secondary market for California carbon allowances and offsets developed. Options and futures are also traded in the secondary marketplace, with 2017 prices in the range of US\$11 to US\$15 per allowance. Prices for both allowances and offsets have increased following the passage of AB 398 and the affirmation of the cap-and-trade programme by the Court of Appeal, both of which removed much uncertainty.

CARB's cap-and-trade programme also includes numerous features intended to provide flexibility to regulated entities and to prevent excessive volatility. In addition to offsets, these include floor and ceiling prices for the allowance auctions, a cost containment reserve and banking and borrowing provisions.

16 Trading agreements

Are any standard agreements on GHG emissions trading used in your country? If so, describe their main features and provisions.

In October 2013, the International Emissions Trading Association released a trade agreement template for California allowances and offsets. Its provisions address offset invalidation, holding limits and buyer liability provisions. As of September 2016, there is no standard emissions trading agreement used for RGGI allowances.

Sectoral regulation**17 Energy sector**

Give details of (non-renewable) energy production and consumption in your country. Describe any regulations on GHG emissions. Describe any obligations on the state and private persons for minimising energy consumption and improving energy efficiency. Describe the main features of any scheme for registration of energy savings and for trade of related accounting units or credits.

The US Energy Information Administration (EIA) compiles data and statistics on renewable and non-renewable energy production in the US (see www.eia.gov). See question 3 for a discussion of emissions regulations and energy efficiency.

Crude oil

In 2016, the US produced 3,239,114 thousand barrels of crude oil, imported 2,883,117 thousand barrels of crude oil and 798,278 thousand barrels of petroleum products and consumed 7,190,000 thousand barrels of crude oil and petroleum products.

Natural gas

In 2016, there were 32,647,385 million cubic feet of gross withdrawals of natural gas in the US and the US consumed 27,490,647 million cubic feet of natural gas.

Coal

In 2016, the US produced 728,232 thousand short tons of coal and exported 60,271 thousand short tons. In 2016, total US coal consumption was about 729,602 thousand short tons of coal, divided among the following sectors:

- electric power: 677,275;
- commercial and institutional: 1,182;
- coke plants: 16,485; and
- other industrial: 34,661.

Nuclear

In 2016, the US produced 2,916,558 pounds of uranium concentrate (U₃O₈) and nuclear power plants generated 805.3 billion kilowatt-hours of electricity.

In 2010, the DOE announced a series of loan guarantees to support construction of two advanced nuclear reactors at the Alvin W Vogtle Electric Generating Plant in Georgia; the final US\$1.8 billion loan closed on 24 June 2015. Significantly, the Vogtle project is the first new nuclear power plant to be licensed and begin construction in the US in over three decades. However, swelling construction costs and delays in 2017 have threatened the completion of the project.

Emissions

According to EPA, total US GHG emissions in the US in 2015 were 6,587.7 MMT CO₂e, representing a 2.3 per cent decrease from 2014. See question 6 for additional GHG emissions information. See question 11 for a discussion of EPA's GHG reporting programme. As discussed above, the electric generating sector is subject to GHG emissions limits through EPA permitting processes. In addition, the CPP will impose sector-wide GHG emissions limits on electric generators, if it survives pending litigation.

Energy efficiency

Many US states also are pursuing energy efficiency strategies. Twenty-six states have enacted long-term (three or more years) Energy Efficiency Resource Standards (EERS) or other binding energy savings

targets. Several other states have non-binding programmes, or aspirational programmes with very low efficiency targets. State programmes take a variety of approaches, but often mandate or incentivise demand-side energy efficiency programmes run by state and local electric utility companies. EERS vary widely, but generally target incremental energy efficiency gains of 0.5 to 2.5 per cent annually. EERS and other similar programmes are driving significant investment in energy efficiency technologies, software and services in many US states. There is no standard methodology for registering and trading instruments based on energy efficiency, and each state takes a different approach in tracking and assuring compliance, typically at the utility level. At the same time, the CPP encourages states to select energy efficiency as a compliance path, which may spur innovation and broader markets related to energy efficiency.

18 Other sectors

Describe, in general terms, any regulation on GHG emissions in connection with other sectors.

Climate regulation in the US has focused primarily on the power and transport sectors, although certain industrial sectors are subject to GHG reporting and permitting requirements. Permitting requirements may also apply to stationary sources in other source categories including, among others:

- large industrial, commercial or institutional boilers;
- pulp and paper;
- cement;
- iron and steel industry;
- refineries;
- nitric acid plants; and
- landfills.

See section 3 for a discussion of applicable regulations; see section 10 for a discussion of related GHG permitting requirements. California's climate change programme is economy-wide; see section 3 for a further discussion of AB 32.

Renewable energy and carbon capture**19 Renewable energy consumption, policy and general regulation**

Give details of the production and consumption of renewable energy in your country. What is the policy on renewable energy? Describe any obligations on the state and private parties for renewable energy production or use. Describe the main provisions of any scheme for registration of renewable energy production and use and for trade of related accounting units or credits.

The US does not have a comprehensive national policy on renewable energy production or use. Instead, a patchwork of federal and state programmes and incentives drive the renewable power sector in the US.

Twenty-nine states, plus Washington DC, have enacted binding renewable portfolio standards (RPS). Eight other states have non-binding RPS programmes or renewable energy goals. State RPS programmes operate by setting renewable energy targets for each year and requiring electric utility companies to achieve that level of renewable power. As a result, RPS programmes are the primary drivers for renewable energy investment in the US and are spurring significant investment in renewable energy infrastructure in many states. Renewable energy targets vary widely by state, but typically are in the range of 10 per cent to 30 per cent. Several states have much higher targets: Washington DC, New York, California and Oregon all have targets of 50 per cent; Vermont targets 75 per cent; and Hawaii has established a 100 per cent target by 2045. During 2016 and 2017, multiple states increased renewable energy targets established by their RPS programmes or initiated efforts to do so. Collectively, these programmes are expected to dramatically increase the demand for wind power while also driving the expansion of solar and hydrokinetic power. About 16 states also have separate, smaller targets for solar energy, often referred to as a 'solar carveout', which usually operate in tandem with a net metering or feed-in-tariff programme. As solar energy becomes more price competitive, solar carveouts have experienced less support and lower expansion in recent years.

RPS compliance is usually managed through a system of tradeable renewable energy credits (RECs), with one REC representing one MWh of renewable power. In general, RECs are registered by state agencies and are tradeable instruments. Most state programmes require compliance through use of RECs or renewable power generated in-state, with limited exceptions and eligible renewable resources and definitions can vary widely by state. This results in fragmented REC markets with prices varying widely by state and resource type. According to the DOE's Green Power Network, REC prices range from about US\$1 (in Texas and Washington DC) to about US\$50 (in Massachusetts and several other states). Solar RECs (SRECs) range from about US\$50 to a high of over US\$400.

In addition to mandatory RPS programmes, 'green power' programmes allow US energy consumers (typically residential and commercial) to purchase renewable or 'green' power from their utility company or independent power supplier. Energy suppliers purchase RECs on the voluntary market to meet green power demand. Voluntary REC supply is dominated by wind, though solar is increasing its market share. Prices for voluntary RECs hover around US\$1/MWh, significantly lower than most RECs purchased for compliance purposes. It is estimated that more than 50 per cent of retail customers in the US now have an option to purchasing 'green' or low-carbon power from their utility.

Thirty-eight states plus Washington DC have implemented net metering programmes, which allow grid-connected customers with renewable energy systems installed on their property to offset their electrical usage and sell excess electricity to their utility. Several states have also implemented feed-in-tariff programmes that provide a higher price to consumers generating certain types of renewable energy (typically solar). Net metering and feed-in-tariff programmes have aided the expansion of residential and commercial solar projects in the US, but are currently experiencing a period of uncertainty. As rooftop solar begins to provide a more significant volume of power, and as solar panel prices continue to decline, several states have moved to roll back or eliminate their net metering programmes, while others are seeking new ways to properly value solar power. Some states, such as Maine, have recently enacted legislation to eliminate or gradually phase out their net metering programmes, although in many instances there is also an ongoing effort to reinstate net metering. The debate over net metering is driven in part by utility companies who are concerned about the rapid expansion of distributed generation and by consumer groups concerned about societal cost allocation and potential increases in energy prices. As this debate continues, numerous states have expanded their net metering programmes and are developing pricing mechanisms to reward solar power based on its value to the grid, factoring in time-of-service, displacement of new fossil-fuel generation and infrastructure, and environmental benefits, including GHG reduction.

At the federal level, the DOE's loan guarantee programme backs investment in renewable power, energy efficiency and commercial climate technologies. Loans backed by the DOE have supported investment in solar, wind, geothermal, nuclear and energy storage technologies, among others. In 2013, the DOE announced the availability of US\$8 billion in loan guarantees for advanced energy projects that substantially reduce GHGs and other air pollution. More recently, in 2014, the DOE announced availability of US\$4.5 billion in loan guarantees available for innovative renewable energy and energy efficiency projects in the US that reduce GHG emissions. On 23 June 2015, the DOE released a 'Supplement to Loan Guarantee Solicitation Announcement' that clarifies the scope of eligible projects; applications under this programme have continued through 2017, under various solicitations issued by the DOE. The DOE also runs parallel loan programmes for nuclear energy projects and 'advanced fossil energy' projects, each with its own solicitations and funding caps.

Two federal tax credits also provide financial support for renewable energy facilities. The production tax credit (PTC) provides a tax credit for each kilowatt-hour (kWh) produced by eligible renewable power facilities. For eligible wind, geothermal and 'closed-loop' bioenergy projects, the PTC currently provides a 2.3 cent per kWh incentive for the first 10 years of the facility's operation. The PTC also currently provides a lower tax credit of 1.1 cents per kWh for certain other eligible facilities, such as 'open loop' biomass (which utilise farm and forest wastes rather than dedicated energy crops), efficiency upgrades and capacity additions at existing hydroelectric facilities, landfill gas and

municipal solid waste energy projects. Combined with state RPS programmes, the PTC has been a major driver of wind power development in the United States: between 2007 and 2014, US wind capacity nearly quadrupled. In late 2015, the US Congress extended the PTC for facilities that begin construction before 31 December 2019. The business energy investment tax credit (ITC) was significantly expanded in 2008. The ITC currently provides tax credits for capital investments in solar energy facilities (30 per cent of expenditures), fuel cells (30 per cent of expenditures), small wind turbines (30 per cent of expenditures), geothermal systems (10 per cent of expenditures), microturbines (10 per cent of expenditures) and CHP (10 per cent of expenditures). Credits are available for eligible energy systems placed in service on or before 31 December 2016, although some credits have caps or other restrictions. The ITC also was extended in late 2015, and now extends to the end of 2019, with a gradual step-down in credits between 2019 and 2022. More information on DOE's loan guarantee programme, the PTC and the ITC is available at www.energy.gov.

The federal government is also working to facilitate renewable power generation on public lands through a variety of programmes that are designed to streamline permitting and leasing. These programmes include, but are not limited to:

- The solar energy programme established by the Department of the Interior (DOI) and the Bureau of Land Management (BLM) facilitates approval and development of solar energy generation and transmission facilities on BLM-administered lands in six western states.
- The DOI's Renewable Energy Coordination Offices in four western states (Arizona California, Nevada and Wyoming) and smaller renewable energy teams in five other states (Colorado, Idaho, New Mexico, Oregon and Utah) expedite processing of applications for new renewable energy projects on public lands.
- The Bureau of Ocean Energy Management (BOEM) is working to identify and lease offshore wind energy areas for commercial wind energy development. On 31 July 2013, BOEM auctioned a wind energy area off the coasts of Rhode Island and Massachusetts, the first competitive lease sale in the US for an offshore wind project. An initial small-scale project was completed in 2016, while others are in the planning and solicitation stages.
- President Obama issued a memorandum on 7 June 2013 that directs federal agencies to review and likely expand existing energy transmission corridors. The memorandum seeks to reduce overall regulatory burden by creating a framework for collaboration between agencies.

As a result of these and other measures, along with declining prices for renewable technologies, the US renewable power sector set new records in 2017 and is expanding rapidly. In 2017, the US produced 549,527 thousand MWh of renewable power at Utility Scale Facilities, as follows:

- conventional hydroelectric: 263.77 billion kWh;
- wind: 238.59 billion kWh;
- off shore wind: 100,000 MWh;
- geothermal: 17.01 billion kWh;
- wood and other biomass: 28.78 billion kWh;
- solar: 71.52 billion kWh.

20 Wind energy

Describe, in general terms, any regulation of wind energy.

Wind energy projects are subject to a range of federal, state and local environmental, land use and natural resources laws and regulations. Access to transmission also remains a significant constraint for many wind projects, since wind energy resources in the US are not always located near demand. Developing new or expanded transmission lines can increase the complexity of the above regulatory requirements. A utility-scale wind facility and related transmission facilities may require approvals under the following laws, depending on the scope and impact of the project:

- the National Environmental Policy Act;
- the Federal Lands Policy and Management Act;
- the Clean Water Act;
- the Clean Air Act;
- the Coastal Zone Management Act;

- the National Historic Preservation Act;
- the Endangered Species Act;
- the Bald and Golden Eagle Protection Act;
- the Migratory Bird Treaty Act;
- the Marine Mammals Protection Act;
- requirements imposed by the FAA and the Federal Communication Commission (FCC) pertaining to lighting, aircraft safety, signal interference, and other matters; and
- various state and local siting, land use and environmental laws and regulations.

For projects located on federal land (notably in the west), federal land management agencies such as BLM or the United States Forest Service may act as the primary permitting authority. In some states, one or more state agencies may have permitting authority. In other cases, the primary permitting authority for a wind facility is the local planning commission, zoning board, city council or county board. Offshore wind projects also must coordinate with the US Coast Guard during construction and to address any navigational hazards. The Bureau of Ocean Energy Management (BOEM) administers the offshore wind leasing process through a competitive bidding process. BOEM has held several auctions, resulting in the sale of various leases to develop offshore wind projects, primarily on the east coast. There is increasing interest in development on the west coast as well: in August 2016, BOEM issued a request for interest for a lease area off the California coast, on which a developer has expressed interest in building a 765MW floating wind energy project.

Renewable energy projects have seen significant litigation over environmental impacts and other issues. Litigation may involve local issues, such as noise, siting and site-specific impacts, or may implicate broader state or national policies. With respect to wind energy, impacts on birds are a frequent focus of litigation. For example, in 2013, the US Fish and Wildlife Service (FWS) issued a rule that provided for programmatic permits of 30 years in duration under the Bald and Golden Eagle Protection Act, allowing 'take' of bald or golden eagles incident to otherwise lawful activities. Under the Bald and Golden Eagle Protection Act, 'take' means, among other things, to wound, kill, molest or disturb protected birds. Wind turbines have the potential to take bald eagles and other birds by direct action (ie, death or injury owing to a collision) or indirect action (ie, disturbing nesting, migration, or other behaviour). Environmentalists challenged the FWS rule and on 11 August 2015, the US District Court for the Northern District of California issued an order invalidating the 30-year rule. As a result, for now, 30-year incidental take permits are no longer available to wind energy and other projects under the Eagle Act. Similar litigation has taken place under the Endangered Species Act and other laws.

The first offshore wind project in the US, the Block Island Wind Farm, began operating in December 2016 with a nameplate capacity of 30 MW. In June, 2017, Massachusetts utilities issued a solicitation to purchase up to 800 MW of additional offshore wind capacity. Additional projects are in the planning stages in North Carolina, Maryland, Virginia, and elsewhere. Offshore wind energy projects face environmental issues arising under the Marine Mammal Protection Act, fisheries laws, and other laws aimed at the protection and development of marine resources. However, it is anticipated that new projects will go forward in coming years notwithstanding these challenges and numerous leases have been issued to potential developers, primarily along the east coast.

Subsidies and incentive programmes for wind energy are discussed in question 19.

21 Solar energy

Describe, in general terms, any regulation of solar energy.

Solar has grown rapidly in the US over the past two years, with the US nearly doubling its solar capacity in 2016 alone. Both rooftop solar and larger commercial- or utility-scale projects have gained significant traction, especially in states with favourable solar incentives and net metering programmes. Even in states with weak solar incentives, solar has experienced significant growth and rooftop solar power is now price competitive with traditional grid-supplied power in much of the US. Utility-scale solar is also becoming more price competitive, with prices falling in 2017 to below US\$1 per watt.

Large, utility-scale solar power projects face many of the same regulatory challenges that arise in the context of wind energy development. Depending on the size, location and technology, large solar energy projects may implicate a wide range of federal, state and local laws and be subject to litigation. Smaller commercial or residential solar systems, such as those commonly installed on rooftops, typically do not require major regulatory approvals. These projects must nonetheless comply with local building, zoning, land use and development regulations and obtain any required permits. In some states, additional authorisation may be required for interconnection to the grid. Further authorisation may be required for feed-in tariff or net metering eligibility, or to qualify under a state's RPS programme. Subsidies and incentive programmes for solar energy are discussed in question 19.

22 Hydropower, geothermal, wave and tidal energy

Describe, in general terms, any regulation of hydropower, geothermal, wave or tidal energy.

The Federal Energy Regulatory Commission (FERC) issues licences for construction of new hydropower projects. During the permitting process, FERC and the applicant must assure compliance with NEPA. In many cases, permittees also must obtain authorisations under various state and federal laws, including but not limited to the Clean Water Act, the Endangered Species Act, and other laws. In some states, additional authorisation may be required for hydropower resources to qualify for RPS or net metering programmes. With climate change an increasing concern, some states have increased focus on hydropower as a source of energy; in particular, states in the northeast are exploring ways to import more hydro power from Canada and increase capacity and production at existing hydro power facilities.

The first commercial, grid-connected tidal energy project in the US was deployed off the coast of Eastport, Maine in July 2012. Several other wave and tidal energy projects are in developmental stages. FERC and the US Army Corps of Engineers may be involved in the permitting process for these hydrokinetic technologies, depending on location. Projects may implicate a range of laws, including but not limited to:

- the National Environmental Policy Act;
- the Clean Water Act;
- the Coastal Zone Management Act;
- the Endangered Species Act;
- the Marine Mammals Protection Act; and
- various other federal, state and local laws.

The Energy Policy Act of 2005 authorised BOEM to issue leases, easements and rights of way to allow for renewable energy development on the Outer Continental Shelf, including those for wave, tidal and other hydrokinetic projects. Because these projects may cause navigational hazards, coordination with the US Coast Guard is often required.

Geothermal projects are regulated by a mix of federal and state agencies, with requirements varying by state and whether the project is located on state, federal or private land. The Geothermal Steam Act of 1970 requires the DOI to establish rules and regulations for the leasing of geothermal resources on lands managed by federal agencies. These regulations are issued by the Bureau of Land Management. Existing EPA Underground Injection Control Regulations under the federal Safe Drinking Water Act define Class V injection wells to include injection wells associated with the recovery of geothermal energy.

23 Waste-to-energy

Describe, in general terms, any regulation of production of energy based on waste.

By the end of 2015, the US had 71 waste-to-energy facilities that combust municipal solid waste. No new waste-to-energy plants have been built in the US since 1995, but some plants have expanded. Collectively, these facilities have the capacity to produce 2,720 megawatts of power per year and supply only about 0.4 per cent of electrical generation in the US. As combustion units, waste-to-energy systems are subject to regulatory requirements that are similar to fossil-fuel fired power plants, but often significantly more stringent. The CAA imposes numerous requirements on waste-to-energy facilities, which also must comply with the Clean Water Act, the Resource Conservation and Recovery Act and other federal, state and local laws. Waste-to-energy facilities

Update and trends

The election of Donald Trump as President has significant ramifications for climate regulation in the US. While the previous administration under President Obama had taken numerous actions on climate change, including ratification of the historic Paris Agreement, the Trump administration has signalled that it intends to reverse course on many of those measures. In particular, it is likely that the federal Clean Power Plan will be severely downsized or eliminated altogether, along with other power plant GHG standards. GHG standards for motor vehicles and trucks also may experience a significant setback. Energy efficiency standards for appliances and industrial equipment may also suffer, although these have support from many quarters. Finally, it is likely that the US will withdraw from the Paris Agreement and may also revisit its commitment to other international agreements related to climate and environmental issues.

At the same time, many states have announced plans to continue

or increase climate regulation at the state level and through regional programmes such as RGGI and the United States Climate Alliance. Eighty cities have also expressed a willingness to increase their focus on GHG emissions, improve resiliency to climate change impacts and expand clean energy efforts. Market forces also continue to drive the rapid expansion of wind and solar energy, and offshore wind power is poised to become a commercial reality in the US within the next five years. Collectively, these sub-national measures, as well as private-sector initiatives taken in response to consumer demand, are significant but likely inadequate to reduce US emissions to levels previously committed to under the Paris Agreement. It is likely that the focus on climate change and renewable energy will persist or increase in some states, but that the US will not take significant action at the international or national level, under the current administration, to reduce GHG emissions.

and related ash landfills have come under increased legal and regulatory scrutiny in recent years and are at times the subject of lawsuits brought under environmental laws. In addition, permitting actions, facility expansions and new projects may implicate many of the laws listed in question 20.

24 Biofuels and biomass

Describe, in general terms, any regulation of biofuel for transport uses and any regulation of biomass for generation of heat and power.

In 2007, EPA established a national Renewable Fuel Standard (RFS) programme that requires transportation fuel refiners to displace certain amounts of petrol and diesel with renewable fuels such as cellulosic biofuel, biomass-based diesel and advanced biofuel. The programme established the annual renewable fuel standards, responsibilities of refiners and other fuel producers, a trading system, compliance mechanisms and record-keeping and reporting requirements. Companies that refine, import or blend fossil fuels are obligated to meet certain individual RFS quotas based on the volume of fuel they introduce into the market. Compliance with these volume-based biofuels requirements are managed through a system that employs Renewable Identification Numbers (or RINs), which are serial numbers assigned to each batch of biofuel for the purpose of tracking its production, use, and trading by EPA. RINs may be and traded separately from the underlying biofuel, which has led to some fraud in RIN markets. The production of biofuels is also subject to regulation under the federal Clean Air Act and other environmental laws.

EPA has recently scaled back biofuel requirements to account for declining petrol use and technical limitations related to ethanol blending and biofuel production. In November 2015, EPA finalised a goal of 18 billion gallons of renewable fuels for 2016. This was a modest increase from the agency's June 2015 proposal, but it is still short of the 22.25 required by Congress. Still, the 18 billion gallons goal exceeds 10 per cent of the projected petrol production for 2016, which some US car makers advised could negatively affect the performance of cars and may violate certain warranties.

EPA took various regulatory actions in 2016 and 2017 as it explored a path forward for the renewable fuels programme. In June 2017, EPA issued proposed volume requirements under the Renewable Fuel Standard programme for cellulosic biofuel, biomass-based diesel, advanced biofuel and total renewable fuel for 2018. The proposal would require a total of 19.24 billion gallons of total renewable fuel in 2018. EPA also proposed an additional biomass-based diesel volume standard for 2019. EPA held a public listening session on 1 August 2017, and was expected to act on the proposal in late 2017. Farming interests are pressing for an increase in biofuel requirements, in particular for increased cellulosic ethanol targets, while petroleum companies and some vehicle manufacturers advocate lower requirements. President Trump has expressed support for biofuel requirements and it is likely that EPA will continue its path of modest, year-over-year, increases in biofuels requirements.

Some individual states have implemented their own regulations, such as acquisition or fuel use standards, taxes, fuel production or quality regulations and air quality or emissions regulations. For

example, California is in the process of implementing its Low Carbon Fuel Standard (LCFS). By 2020, the LCFS mandates a 10 per cent reduction in the carbon intensity of transportation fuels that are sold, supplied or offered for sale in California. Beginning 1 January 2011, transportation fuel producers and importers had to meet specified average carbon intensity requirements for fuel in each calendar year. Carbon intensity reductions are based on reformulated petrol mixed with 10 per cent maize-derived ethanol and low-sulphur diesel fuel. In September 2015, CARB re-adopted the LCFS rules streamlining the application process for alternative fuel producers seeking carbon intensity credits and implementing cost containment provisions such as a cap on LCFS credit prices.

As a result of federal and state biofuels programmes, the US is the world's largest producer of biofuels.

25 Carbon capture and storage

Describe, in general terms, any policy on and regulation of carbon capture and storage.

Carbon capture storage (CCS) is a process by which CO₂ from a stationary source is captured, transported and permanently stored, typically in underground injection wells. CCS has a substantial potential to reduce GHG emissions from industrial sources, but has not been widely demonstrated on a commercial scale.

Several large CCS demonstration projects in the US are currently moving through the entitlement or financing process. These projects are largely supported by resources allocated by the American Recovery and Reinvestment Act of 2009, as well as a variety of federal and state incentives, including tax credits and loan guarantees. However, CCS projects are enormously expensive and difficult to implement successfully: recently, regulators in Mississippi suggested that the developers of a coal gasification and CCS project should scrap the project, after investing over US\$7.5 billion, and re-engineer the facility to use natural gas instead. That project, already US\$4 billion over budget, demonstrates the technological and economic difficulties that still persist for CCS. One area where CCS has experienced partial success is in conjunction with enhanced oil recovery.

CCS regulatory framework

The federal Safe Drinking Water Act requires an injection well permit for the long-term storage or geologic sequestration of CO₂. Class VI injection well permits require the use of materials compatible with geological sequestration and impose certain financial responsibility requirements. Class VI wells must also comply with certain Monitoring, Reporting and Verification (MRV) requirements as part of EPA's GHG Mandatory Reporting Rule programme. At present, no states have been delegated Class VI permitting authority by EPA.

Class II injection well permits have authorised enhanced oil recovery (EOR) activities for many years, as discussed below. Some CCS projects may rely upon Class II injection wells for both EOR and sequestration purposes, provided drinking supplies are not adversely impacted. Most states have permitting authority over Class II wells based on delegation from EPA. Use of a Class II well does not require EPA approval of an MRV programme, although facilities may choose to opt into EPA's MRV programme.

On 1 December 2010, EPA published its final rule concerning an expansion of its GHG reporting rule to include facilities that inject and store CO₂ for geologic sequestration or enhanced oil and gas recovery. CCS has also begun to play an important role as a potential control technology for GHG regulations for power plants and President Trump has called for the expansion of technologies to reduce the emissions generated from coal-fired power plants.

In January 2014, EPA issued a final rule excluding CO₂ streams in CCS projects from classification as a hazardous substance under the Resource Conservation and Recovery Act, provided that the streams are injected into Class VI wells and not mixed or co-injected with any hazardous wastes. CCS projects are potentially affected by several other regulatory programmes. For instance, NEPA and state equivalents may present regulatory hurdles by requiring environmental review of project impacts. State and local agencies may also impose permitting requirements on CCS projects.

Co-benefits of CO₂: enhanced oil recovery

EOR has been used successfully since the early 1970s to recover additional oil from existing sources. The DOE estimates that EOR may allow the extraction of 30 to 60 per cent of a reservoir's original oil compared with 20 to 40 per cent extracted by primary and secondary recovery. The EIA estimates that domestic use of CO₂ for EOR can produce over 4 billion additional barrels of oil between 2011 and 2035. DOE estimates that CO₂ EOR, over 30 years, for the US could potentially spur US\$10 trillion in economic development, create 2.5 million jobs and drive a 30 per cent to 40 per cent reduction in imported oil.

CCS has long been touted as a potentially critical means for reducing GHG emissions from carbon-intense industrial sources. In October 2014, Canada began operating the first commercial scale coal-fired power plant fitted with CCS technology. A portion of the CO₂ captured by the plant will be pumped underground and sold to oil companies for use in priming oil fields. The Canadian plant received C\$240 million in subsidies from the Canadian federal government.

In the United States, the Department of Energy has awarded US\$7 billion in funding since 2008 to develop 'clean coal' technologies, including US\$68 million in funding announced in July 2016 for CCS research. However, despite lauding CCS' potential, the Trump administration's proposed 2018 budget calls for the Department of Energy's CCS programmes to receive a 75 per cent cut in funding, arguing that such research is best done by the private sector.

However, high costs, complex regulatory schemes and the low price of natural gas have hindered the widespread development of CCS projects. Only about 17 large-scale CCS projects are operating globally. Despite these challenges, there have been several important developments in the past year. In 2016, Petra Nova Carbon Capture commenced

operation of a CO₂ capture facility at the WA Parish power plant near Houston, Texas. It is the world's largest post-combustion capture facility at a power plant. The captured CO₂ is used for enhanced oil recovery in nearby oil fields. In April 2017, the first large-scale bio-energy CCS project began operating in Illinois. The project is administered by the Department of Energy and operated by Archer Daniels Midland.

In the future, lower technology costs and the development of multiple revenue streams from the CO₂ associated with CCS projects, particularly using captured CO₂ for EOR, may help spur CCS additional development.

Climate matters in transactions

26 Climate matters in M&A transactions

What are the main climate matters and regulations to consider in M&A transactions and other transactions?

Entities must consider a range of climate issues when undertaking M&A transactions. Risks generally fall into three categories: regulatory, economic and operational risk related to climate change impacts. Some matters also present M&A opportunities, such as incentives related to renewable energy. Matters to consider include:

- GHG reporting and permitting obligations for certain sectors;
- EPA regulation of GHG emissions and related costs for higher-emitting industries;
- regulatory uncertainty resulting from a lack of a comprehensive national climate change programme;
- regulatory costs associated with assuring compliance with a plethora of federal, state and local climate change, energy efficiency and renewable energy programmes;
- litigation exposure to claims based upon alleged climate impact of corporate operations or of climate changes on corporate operations;
- direct and indirect effects of higher energy costs;
- financial disclosure and compliance obligations under Securities and Exchange Commission rules and state laws;
- adherence to Equator Principles, if applicable, which include requirements for climate impacts;
- impacts to coastlines, ports and other infrastructure related to increased storm intensity and rising sea levels;
- impacts to natural resources and commodities related to climate change, such as water supplies, fisheries, forestry products and crops;
- global economic and security risks related to potentially destabilising impacts of climate change in certain regions; and
- market opportunities related to renewable power, REC and offset trading, GHG mitigation and energy efficiency.



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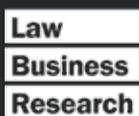
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