

| Country       | GE technologies addressed | Details on the role of GE technologies  |
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| <b>Europe</b> |                           |   |
| Austria       | CCU                       | <p>The Austrian NECP (12/2019) proposes CCUS as a breakthrough technology for industry and suggests “greater consideration should be given to the key opportunities offered by Carbon Capture and Utilisation (CCU) for European industry”.</p> <p>Integrated National Energy and Climate Plan for Austria (2019) refers to "capturing and treating gas released from landfill" as well as CCU and the need for flexibility in all systems of "energy capture and use".</p> <p>Green Electricity Act (as updated in 2017) includes provisions and subsidies in respect of biogas plants.</p>  |
| Belgium       | CCS, CCUS                 | <p>The Belgian NECP (12/2019) proposes the large petrochemical clusters in Flanders as “an ideal region for developing new cooperation and integrating innovative systems allowing tens of millions of tonnes of CO<sub>2</sub> to be offset, collected or sequestered, or transformed into useful products” and announced studies in this context as well as to examine CO<sub>2</sub> capture at waste incineration facilities, aiming to use the captured CO<sub>2</sub> “as a raw material in a circular economy”. The <a href="#">Belgian NRRP</a> (04/2021) announced € 10 M to demonstrate CCS/CCUS as well as investments in the production of hydrogen in combination with CCS/CCUS.</p> <p>National Energy and Climate Plan for Belgium (2019) is a ten-year integrated document mandated by the European Union to each of its member states in order for the EU to meet its overall greenhouse gases emissions targets, and contemplates a "study into the creation of a CO<sub>2</sub> backbone network[...] to temporarily store, transport and use CO<sub>2</sub> in order to promote the circular economy of carbon". The plan provides an assessment of CCS pilot projects in various regions and refers to distortions in the bioenergy market in the Walloon area.</p> <p>Flemish Implementing Act of 6 June 2014 implements the EU CO<sub>2</sub> Storage Directive and provides rules for the provisions on the geological storage of CO<sub>2</sub>.</p> |
| Bulgaria      | BECCS                     | <p>The Bulgarian NECP (undated, accessed: 04/2021) considers CO<sub>2</sub> capture at biomass plants for CCS.</p> <p>National Climate Change Adaptation Strategy and Action Plan (2019) identifies "increased potential for renewable energy development (solar, biomass) and bioenergy production through capture and conversion to biogas, with consequent environmental benefits and potential cost benefits for consumers" and aims to achieve "synergies between [adaptation and mitigation strategies] (that is, reforestation for carbon capture and the use of regulating, cultural, some measure of provisioning ecosystem services)"</p> <p>Climate Change Mitigation Act (2014) refers to funding for projects that result in reduction of greenhouse gas emissions or their removal by implementation of methane capture and use, and for "the environmentally safe capture and geological storage of CO<sub>2</sub>, in particular from solid fossil fuel power stations and a range of industrial sectors and subsectors, including in third countries"</p>  |
| Croatia       | CCS, CCUS                 | <p>The Croatian NECP (12/2019) proposes a platform for CCS and CCUS, to evaluate “a) availability of a suitable location for storage, b) transport facilities are technically and economically feasible and c) upgrade of facilities for CO<sub>2</sub> capture is technically and economically feasible”. A National Feasibility Study will look at “emission sources, transport, injection and storage of CO<sub>2</sub>, and the interconnection of the CO<sub>2</sub> transport system with other EU countries” and “plans to inform</p>  |

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|         |                  | <i>the public about carbon dioxide capture and storage technology</i> ". The costs of the study are estimated at HRK 1 million.  |
| Cyprus  | CCS, CCU         | The Cypriot NECP (01/2020) proposes to "assess the exploitation of CCS and CCU technologies" and adds: "However, it has been noted that emerging technologies like hydrogen and carbon capture and storage have not been considered in the above scenario due to the lack of available data".  |
| Czechia | CCS, CCU         | The Czech NECP (11/2019) proposes to consider "a combination of natural gas with CCS or CCU".<br><br>Climate Protection Policy, Government Resolution no 207 (2017) notes that "this kind of CO2 storage [carbon sinks] is still far from reaching its potential, even though the volume of carbon stored in soil and wood products is substantial" and refers to the development of CCS technology.   |
| Denmark | BECCS, CCS, CCUS | The Danish NECP (12/2019) states that "CCS needs to be demonstrated at scale" and that "Bioenergy should be used in high-value sectors (transport), and sustainability remains a challenge". The Danish NRRP proposes DKK 200 million "for a subsidy scheme to support the development and demonstration of CO2 storage sites in depleted oil and gas fields in the Danish part of the North Sea". The NRRP adds that "CCS is foreseen to contribute significantly to the achievement of Danish greenhouse gas reduction targets" and that "storage sites for CO2 in depleted Danish oil and gas fields could play an important role in storage of CO2 from other EU member states". "CCUS is expected to be a growing industry."  |
| Estonia | CCS, CCUS        | The Estonian NECP states that "according to current knowledge, Estonia does not have suitable geological conditions for storing CO2". Currently, a study is conducted "to assess the suitability of different carbon capture technologies and develop scenarios for implementing these technologies in the Estonian oil shale industry". The NECP proposes to look into "cooperation opportunities of the Nordic countries and Baltic States [...] for the development of future technologies (energy storage, CCUS, hydrogen, etc.)".<br><br>Climate Change Adaptation Plan 2030 (2017) refers to carbon capture/ sequestration and bioenergy resources but does not discuss either in any detail.  |
| Finland | CCS, BECCS       | There was no reference to plans to use GE technologies in the European NDC or the Finnish NECP. The Finnish NRRP includes a goal to make "Finland a world leader in the hydrogen and circular economies" and a focus on "industrial circular economy solutions and low-emission innovations, e.g. investments in hydrogen technology and circular economy demonstration plants"<br><br>National Energy and Climate Strategy for 2030 (2016) sets out Finland's policy on carbon sinks, and includes the aim of "reinforcing the growth and carbon capture capacity of the forests over the long term." CCS is discussed as a technological solution to reduce emissions, but notes that this technology has not yet been applied to power plants on a commercial scale and suggests that such technologies be further developed so as to support a circular economy. The plan also addresses issues relating to bioenergy. |
| France  | BECCS, CCS, CCUS | The French NECP (2019) states that "carbon capture and storage will only compensate for residual non-energy emissions and the residual emissions from fossil fuels that are still used for certain means of transport (aviation)" and that "in 2050, these technologies would make it possible to avoid around 6 MtCO2/year in industry and to achieve a   |

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|         |               | <p>dozen or so MtCO<sub>2</sub> each year in negative emissions for biomass energy generation installations (BECCS)". The French NRRP (2021) proposes to decarbonize industry by "deploying decarbonised processes and carbon capture and storage or recovery".</p> <p>The France Relaunch Plan (2020) aims to enable the economic, social and ecological rebuilding of the French economy over the period 2020-2030, and includes sections in respect of the decarbonisation of industry, including support for low carbon heat production including the use of biomass.</p> <p>National Low-Carbon Strategy (SNBC) (first adopted in 2015, with a new version adopted in 2020) refers to the use of CCUS to supplement carbon sinks, as well as the use of biomass in conjunction with CCS and notes that "BECCS remains the only lever (alongside direct CO<sub>2</sub> capture from the atmosphere, but it is at a very early stage of development) that may allow us to generate negative emissions in the very long term (the forest storage eventually attaining an equilibrium in the very long term)".</p> <p>Decree No. 2020-456 relating to multi-year energy programming and the multi-annual energy program (PPE) it adopts are tools to guide energy policy. The PPE states that it does not cut across the SNBC and is intended to support it, and also makes reference to investments in biomass and CCS.</p> <p>Law no. 2019-1147 on Energy and the climate (2019) is a framework document on climate and energy matters, that enshrines the objective of carbon neutrality for 2050 and sets a number of quantified objectives for the energy sector, including in reference to the SNBC (GE technologies, other in respect of biomass, are not specifically mentioned but they are incorporated by reference).</p> |
| Germany | CCS, CCU, DAC | <p>The German NECP (2019) proposes to further develop "CCU/CCS options". It states that a "vast majority of studies and scenarios have now confirmed that from today's perspective, CCS technology is vital for the achievement of greenhouse gas neutrality by 2050" and that "technologies which separate carbon out of industrial exhaust gases and in particular the atmosphere are needed for this" The NECP adds that "research into carbon separation, transport, storage, long-term sequestration and use technologies will be stepped up so that domestic companies and research institutions can assume a pioneering role in this area".</p> <p>The Carbon Capture and Storage Act (KSpG), passed in 2012, is the national-level implementing legislation for the EU Directive on the geological storage of CO<sub>2</sub> which regulates the exploration, testing and demonstration of the permanent CO<sub>2</sub> storage technology.</p> <p>Climate Action Plan 2050 (2016) outlines the process for achieving the country's climate targets for all sectors in line with the Paris Agreement, including energy, the built environment, transportation, industry and business and agriculture and forestry. It refers to the use of industrial CO<sub>2</sub> recycling (carbon capture and utilisation, CCU)</p>  |
| Greece  | CCS, CCU      | <p>The Greek NECP (12/2019) proposes research to develop "CO<sub>2</sub> capture, storage and use technologies" and "ensuring the capture, storage and utilisation of carbon dioxide from power generation plants using conventional fuels and industrial uses".</p>  |
| Hungary | CCS           | <p>The Hungarian NECP (2019) states, that "power stations with CCS will be available only after 2030" and that "until CO<sub>2</sub></p>  |

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|           |          | capture and storage become economical it will probably not be profitable to build conventional coal-fired power plants in Europe".  |
| Ireland   | CCS      | <p>The Irish NECP (2019) proposes to "examine the feasibility of the utilisation of CCS in Ireland and to develop policy in the area" and "states that Carbon Capture and Storage (CCS) is recognised as a potential bridging technology that could support the transition to a low carbon economy". The NECP adds that "Ireland adopted a 5-year CCS review process, which will inform any decision to commit resources to put regulatory and permitting systems in place" and "is currently assessing a project at feasibility stage promoted by Ervia". The NECP proposes funding for various research areas, among them "carbon capture &amp; storage (CCS)".</p> <p>Climate Action Plan (2019) refers to the establishment of a Steering Group to examine and oversee the feasibility of the utilisation of CCS in Ireland. The Plan also identifies carbon capture and biomethane as bringing new business opportunities as the industries mature. It also refers to bioenergy.</p> <p>The National Mitigation Plan (2017) states that "carbon capture and storage (CCS) technology, driven by appropriate carbon price signals of a reformed ETS, will be in place to ensure that emissions from back-up gas generation are captured" and notes that there is a role for CCS in electricity generation from gas. The plan also contains sections on bioenergy.</p> <p>Ireland's Transition to a Low Carbon Energy Future 2015-2030 (2015) is a white paper which provides an update to the energy policy and sets out a framework to guide policy until 2030, and notes that "Ireland adopted a five-yearly CCS review process, the outcome from which will inform any decision on whether to commit resources to put regulatory and permitting systems in place. The Assessment of the Potential for Geological Storage of Carbon Dioxide for the Island of Ireland was carried out by Sustainable Energy Authority of Ireland in 2008.</p> |
| Italy     | CCS, CCU | The Italian NECP (12/2019) proposes to "promote the geological capture of CO <sub>2</sub> [...] both in the electricity and industrial sectors" and to employ CO <sub>2</sub> "in power-to-liquid [...] with CO <sub>2</sub> captured from the air or derived from waste".  |
| Latvia    | CCS, CCU | <p>The Latvian NECP (11/2020) proposes "innovative solutions for capturing and reuse of carbon" and states that "in addition, future technologies (energy storage, CCU, hydrogen, etc.) will be sought in cooperation with the Nordic countries and the Baltic States".</p> <p>Latvia's Strategy to achieve climate neutrality by 2050 (2019) concluded that "the efficiency of the creation of CO<sub>2</sub> storage sites (CCS) is too low and such solution would not be economically feasible at the moment" but it was necessary to continue research into the suitability and economic feasibility of CCS technologies in different industrial processes.</p>  |
| Lithuania | CCS, CCU | <p>The Lithuanian NECP (2019) states that it is "necessary to further develop carbon capture, use and storage technologies and to analyse their applications in Lithuania". The proposed analysis will cover an "assessment of CO<sub>2</sub> capture, use and storage chain alternatives" as well as "a feasibility study on the application of CO<sub>2</sub> capture, use and storage technologies in Lithuania". The NECP also proposes "a detailed analysis of the feasibility and usefulness of projects implemented with other countries of the EU common economic area (to the geological structures of which the CO<sub>2</sub> captured in Lithuania could be exported)".</p> <p>Strategy for the National Climate Change Management Policy until 2050 (2012) states that "the development of carbon</p>  |

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|             |                 | <p><i>capture and storage (hereinafter: 'CCS') technologies [...] is relevant to the industrial sector and beneficial to the achievement of international emission reduction goals" but notes that "practical application of CCS technologies in Lithuania in the near future is quite unlikely due to high cost of technology and absence of storage sites on the territory of the country".</i></p> <p>Law of the Republic of Lithuania on the Geological Storage of Carbon Dioxide (Official Gazette, No 91-4325, 2011) creates a legal framework for the exploration, use and closing of geological carbon dioxide storage sites.</p>  |
| Luxembourg  | -               | <p>There is no reference to the use of GE technologies in the European NDC and the Luxembourgian NECP. The Luxembourgian NRRP was not available at the time of research.</p> <p>Sustainability Bond Framework (2020) creates a framework for the issuance of bonds to support the development of the green, social and/or sustainability capital market. Eligible projects include bioenergy projects that meet certain criteria.</p>  |
| Malta       | -               | <p>There is no reference to the use of GE technologies in the European NDC and Malta's NECP. Malta's NRRP was not yet available at the time of research.</p> <p>National Climate Change Adaptation Strategy (2019) does not refer to GE technologies.</p> <p>Climate Action Act (2015) refers to the enhancement of greenhouse gases sinks and reservoirs.</p> <p>The Low Carbon Development Strategy (2017) notes that "<i>mitigation is the act of an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases (IPPC). It therefore involves human interventions to reduce the emissions of greenhouse gases by sources or enhance their removal from the atmosphere by "sinks" (UNFCCC)</i>" but does not set out any details.</p> <p>The National Environment Policy (2012) refers to afforestation projects as a means of carbon capture.</p>  |
| Netherlands | CCS, CCU, BECCS | <p>The Dutch NECP (11/2019) states that CCS is regarded "<i>as an inevitable transition technology for reducing CO<sub>2</sub> emissions in sectors where no cost-effective alternative is available in the short term</i>". The NECP proposes national "<i>grants for CO<sub>2</sub>-reducing measures</i>", to combine CCS with hydrogen production , and to work "<i>with other Member States to achieve [...] the joint development of CCU/CCS</i>".</p> <p>The Dutch National Climate Agreement (2019) contains agreements with the electricity, industry, built environment, traffic and transport, and agriculture sector and sets out what each will do to help achieve the country's climate goals. The agreement sets out several measures that involve GE technologies, including "<i>the capture of carbon dioxide at industrial sources for reuse as a nutrient in the greenhouse horticulture sector</i>" and possible uses for capture carbon. CCS is described as "<i>crucial activity to achieving the 2030 target</i>".</p> <p>The Dutch Government Strategy on Hydrogen (2020) refers to the "<i>production of blue hydrogen (where the CO<sub>2</sub> is captured during the production of hydrogen from natural gas), CCS will be able to compete in the SDE++ through the CCS category.</i>"</p> |
| Poland      | CCS, CCU        | <p>The Polish NECP (2019) points out that CCS technology is "<i>recommended by the European Commission</i>", but adds that "<i>however, CCS technologies have proved to be very difficult to apply widely</i>" and that "<i>a greater potential is seen in the</i></p>   |

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|          |           | <p><i>development of carbon processing technologies</i>". The NECP also states that "it is not a foregone conclusion when these technologies will be commercially available, given that the last 10 years have not brought any significant progress, especially in terms of cost reduction" and "as no industrial installation of this type has yet been put into operation". The NECP adds that "despite a wide-ranging research effort, it will be extremely difficult for CCS technologies to become commercially mature".</p> <p>Energy Policy of Poland until 2030 and 2040 (PEP 2030 and PEP 2040) (2009 and amended in 2020) focuses on improving energy security, efficiency and competitiveness contains a number of suggestions in respect of the applicability of CCS and notes that "Poland also carried out intensive activities to include Polish projects of installations for CO2 capture and storage (CCS) in the Flagship Programme consisting in building 10-12 CCS demonstration plants in the European Union".</p> <p>The draft PEP 2040 (2019) does not specifically refer to GE technologies.</p> <p>Act on the System to Manage the Emissions of Greenhouse Gases and Other Substances (2009) introduced the legal basis for the management of national GHG emissions and other substances and applies to projects which address the "avoidance or reduction of methane emissions through recycling and use in power generation; GHG sequestration; actions to reduce or avoid GHG emissions, to absorb CO2 and adapt to climate change"</p> |
| Portugal | -         | <p>There is no reference to the use of GE technologies in the European NDC and the Portuguese NECP. The Portuguese NRRP was not yet available at the time of research.</p> <p>However, Decree-Law 60/2012 on carbon capture and storage transposes Directive No. 2009/31/EC, of the European Parliament and of the Council, of 23 April, and establishes the legal regime for the geological storage activity of carbon dioxide.</p> <p>Decree-Law 71/2006 on the Portuguese Carbon Fund establishes the Portuguese Carbon Fund (FPC), a state financial instrument for acting on the carbon market to ensure compliance with national targets on climate change issues, and provides for funding to projects in Portugal related to the reduction of GHG, such as carbon sinks, geological capture and sequestration of CO2, and the adoption of new technologies.</p>  |
| Romania  | -         | <p>There is no reference to the use of GE technologies in the European NDC and the Romanian NECP. The Romanian NRRP was not yet available at the time of research.</p> <p>Relevant policies and legislation reviewed do not appear to contain reference to GE technologies.</p>  |
| Slovakia | CCS       | <p>The Slovakian NECP (12/2019) proposes "projects to convert other suitable geological structures into underground gas storage facilities, respectively to use them in another way for energy-related purposes (CCS)".</p>  |
| Slovenia | CCS       | <p>The Slovenian NECP (02/2020) states that "there are possibilities for CCS at existing power sites and also in energy-intensive industry" in Slovenia and assumes that CCS technologies will only become commercially interesting, "but this is not expected before 2040", if emission allowance prices rise significantly and electricity demand is not replaced by renewable, nuclear, or gas-fired power plants. The NECP stresses that "under the current legislation [...], the injection and storage of carbon dioxide is prohibited in Slovenia".</p>   |
| Spain    | CCUS, CCS | <p>The Spanish NECP (2019) proposes "the integration of CO2 capture technologies to reduce emissions" and to convert captured CO2 into synthetic natural gas.</p>  |

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|         |            | <p>National Climate Change Adaptation Plan 2021-2030 (2020) refers to mitigation measures to reduce "the accumulation of GHGs in the atmosphere, by reducing the emissions and by removing the already emitted gases by the so-called carbon "sinks""</p> <p>Spanish Strategy for Circular Economy (2020) states that "it is key to make all possible efforts in order to minimize the impact of the construction sector in sustainability and to ensure gradual implementation of technologies and practices that contribute to the adoption of circular economy", and addresses issues of greenhouse gas emissions in the waste sector.</p> <p>Long Term Decarbonisation Strategy 2050 (ELP 2050) (2020) includes references to carbon sequestration and notes that CCS could play a role in industry.</p>   |
| Sweden  | CCS, BECCS | <p>The Swedish NECP states that "capture and storage of carbon dioxide of fossil origin must be included in the measures" to enable Sweden to achieve its emission targets and adds that "CCS must be demonstrated on a large scale". A "three-year demonstration project for carbon capture and storage (CCS) at the <b>Preem refinery (4953)</b> in Lysekil" will investigate "the possibility of setting up a full-scale CCS plant".</p> <p>Circular economy – Strategy for the transition in Sweden (2020) refers to the "environmental impact" of bioenergy and notes "the Government intends to produce a Swedish bioeconomy strategy along with the green industries that contributes to greater access to biomass and employment throughout the county and also generates environmental and climate benefits. The national strategy will be well-anchored in scientific knowledge in areas including the importance of ecosystem services for society" but does not provide any details of how this will be accomplished.</p> <p>National Strategy for Climate Change Adaptation (Government Proposition 2017/18:163) (2018)</p> <p>The Swedish Climate Policy Framework (2017) sets out the framework for the Climate Act and the implementation of the Paris Agreement in Sweden .The framework notes that the aim to have net zero GHG emissions by 2045 will require the use of negative emission technologies such as capture and storage of biogenic carbon dioxide (BECCS). The framework states that CCS must be considered as a means of reaching the net zero target "where no other viable alternatives exist" and sets out the role that GE might play in some industries (eg "In the cement industry, a combination of a transition to bioenergy and CCS is currently seen as the most realistic alternative for reducing emissions from the basic process itself in the long term").</p> <p>Industry Leap (introduced in 2018 and due to be extended) is a government programme, that supports the development of technology and processes to reduce process-related greenhouse gas emissions by the Swedish industry sector. The scheme provides financial support to research, preliminary trials, testing, pilot and demonstration projects, detailed planning studies and investments in measures to reduce emissions as well as for measures that seek to attain negative emissions, for example bioenergy CCS (BECCS).</p> <p>Swedish Landfill Ordinance regulates the collection and management of methane gas from landfill.</p> |
| Iceland | CCS, DAC   | <p>The Icelandic NDC (02/2021) proposes to increase "carbon removals from the atmosphere", including by "carbon capture and mineralization in rock formations (Carbfix)".</p>  |

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|        |                 | <p>Iceland's Climate Action Plan for 2018-2030 and 2020 update aims to boost efforts in cutting net emissions in order to reach the government's aim to make Iceland carbon neutral before 2040, and includes measures to increase carbon sequestration in land use, by restoration of woodlands and wetlands, revegetation and afforestation. Measures for carbon capture from geothermal energy plants and heavy industry have either been implemented or are in preparation. It notes that "<i>as technology advances rapidly, new and more cost-effective ways to reduce emissions can be expected to emerge. [...] Evaluation of actions will be continually improved, the development of greenhouse gas emissions and carbon sequestration closely monitored, and actions further revised</i>".</p> <p>2012 Act no. 70 on Climate Change (2012) includes aims to reduce greenhouse gas emissions economically and efficiently and to increase the binding of carbon from the atmosphere, but does not provide much detail as to what GE technologies are to be used.</p> <p>Renewable Energy Action Plan (2014) refers to "<i>Biomass from industrial waste is expected production of methanol based on carbon dioxide captures from industrial emission</i>".</p>  |
| Norway | CCS, CCU, BECCS | <p>The Norwegian NDC (02/2020) states that "<i>economic measures like CO<sub>2</sub>- taxes and emission trading are central to Norwegian climate policy</i>". The NDC proposes to support the "<i>development and adoption of low emissions technologies, including carbon capture and storage technologies</i>".</p> <p>Norway's climate action plan (Meld. St. 13 2020-2021) (2021) is the Norwegian government's white paper laying out how it intends to meet its climate targets by 2030.</p> <p>Norway's long-term low-emission strategy for 2050 (2019) notes that "<i>carbon capture and storage (CCS) will be a necessary option for residual emissions that cannot be eliminated by using emission-free alternatives or technological advances</i>" and that "<i>the Government's ambition is to achieve a cost-effective solution for full-scale CCS in Norway, provided that this also results in technology development internationally. The overall goal of the Government's work in this field is to play a part in making CCS a cost-effective option to combating global climate change. Norway's plan is to develop a CO<sub>2</sub> storage site with considerably more capacity than is needed for the Norwegian full-scale project. If the project is realised, this will make it possible for other industrial operators to store their captured CO<sub>2</sub> in the same facility rather than having to develop their own storage sites.</i>" The strategy refers to the use of CCS in a number of sectors.</p> <p>The Better growth, lower emissions Strategy (2017) contains a section in respect of CCS and notes that "<i>Government's ambition is the construction of at least one full-scale CCS facility by 2020, and the roadmap from the process industry highlights CCS as an essential basis for achieving the sector's zero-emission ambition for 2050 while at the same time doubling production levels</i>". The strategy also states that "<i>Norway has devoted considerable resources to the development of CCS solutions and technology, for example through the CLIMIT research and demonstration programme, the Centres for Environment-friendly Energy Research (the FME scheme) and the Technology Centre Mongstad (TCM)</i>"</p> <p>Energi21 is Norway's national strategy for research, development, demonstration and commercialisation of new climate-friendly energy technology, and carbon capture and storage is currently one of the thematic areas of focus.</p> <p>Gassnova is a state-owned enterprise and its main task is to promote the development of technology and expertise for</p> |

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|                    |                 | <p>cost-effective, innovative CCS solutions. Gassnova is playing a key role in maturing the full-scale CCS project in Norway.</p> <p>The Research Council channels funding through research programmes, which issue calls for proposals at regular intervals. Most of its current research activity related to low-emission technologies is in the energy field, primarily renewable energy, energy efficiency and CCS.</p>  |
| Switzerland        | CCS, CCU, BECCS | <p>There is no reference to the use of GE technologies in the Swiss NDC.</p> <p>Long-Term Climate Strategy, 2021 (2021) outlines the path to reach net zero emissions by 2050 and includes several references to CCS, CCU, BECCS and the use of other "negative emissions technologies", noting that "reducing greenhouse gas emissions to net zero requires the use of negative emissions technologies (NET). [...] NET must remove the emissions remaining in 2050 which cannot be eliminated through measures to prevent or reduce them" but should not be a substitute for measures aimed at reducing the release of emissions.</p> <p>Switzerland's climate policy (2018) refers to the challenges of carbon capture and storage and achieving carbon neutrality, but does not discuss GE technologies in any detail.</p>   |
| The United Kingdom | CCS, CCUS       | <p>The British NDC (12/2020) states that "the Welsh Government is investing in people to develop the skills needed for a low-carbon, circular economy" and adds that Northern Ireland plans a "transition to a low-carbon circular economy".</p> <p>The Ten Point Plan For A Green Industrial Revolution (2020) identifies CCS as an area for investment, and CCS is seen as key to the production of hydrogen. The UK's goal is to capture 10Mt of carbon dioxide a year by 2030 and to invest £1 billion to support the establishment of CCUS in four industrial clusters (the first phase of this process was launched in Mary 2021). Bioenergy is identified as a priority area of focus for the £1 billion Net Zero Innovation Portfolio.</p> <p>Industrial Decarbonisation Strategy (2021) describes CCUS as a foundation for the delivery of the UK's net zero policy and this documents sets out how this should be achieved.</p> <p>Oil and Gas Authority (OGA) Strategy (2020) reflects the ongoing energy transition and features a range of net zero obligations on the oil and gas industry, including stepping up efforts to reduce production emissions, support carbon capture and storage (CCS) projects and unlock clean hydrogen production.</p> <p>Energy White Paper (2020) makes additional funding available for the development of new carbon capture and storage technologies.</p> <p>CCUS forms an integral part of the Clean Growth Strategy (2017), with the UK keen to "demonstrate international leadership in carbon capture usage and storage (CCUS), by collaborating with our global partners and investing up to £100 million in leading edge CCUS and industrial innovation to drive down costs"</p> |
| North America      |                 |  |
| Canada             | CCS, CCUS, CDR  | <p>The Canadian NDC (05/2017) refers to "protecting and enhancing carbon sinks including in forests, wetlands and agricultural lands", and states that "carbon sequestration could make an important contribution to the achievement of the 2030 target".</p> <p>Pan-Canadian Framework on Clean Growth and Climate Change (2016) is intended to "drive innovation and growth by increasing technology development and adoption to ensure Canadian businesses are competitive in the global low-</p>   |

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|  |  | <p>carbon economy" and refers to "land use and conservation measures that sequester carbon and foster adaptation to climate change"</p> <p>A Healthy Economy, and A Healthy Environment (2020) states that " Investments to protect nature and accelerate the sequestration potential of the natural environment have important co-benefits for society" and announces investment of Invest up to \$631 million over 10 years to boost carbon sequestration and " support improved land and resource management practices in sectors that have some of the greatest potential for increased carbon storage, and will conserve carbon-rich ecosystems". The Canadian government also proposes to "Develop a comprehensive carbon capture, use and storage (CCUS) strategy and explore other opportunities to help keep Canada globally competitive in this growing industry."</p> <p>In2020, the Government of Canada announced an investment of C\$3bn over 5 years through the Strategic Innovation Fund Net Zero Accelerator to accelerate the development and adoption of innovative technologies and processes, including CCUS, and scale up clean technology.</p> <p>Clean Fuel Standard Bill (2020) is intended to incentivise the uptake of technologies that reduce the lifecycle carbon intensity of fossil fuels, such as carbon capture and storage and renewable energy.</p> <p>Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations Canada (2018) are regulations made under the Canadian Environmental Protection Act, which establish a regime for the reduction of carbon dioxide (CO2) emissions that result from the production of electricity by means of thermal energy using coal as a fuel and include provisions relating to units integrated with carbon capture and storage systems.</p> <p>Several provinces also have their own geo-engineering policies and programmes, including Alberta and Saskatchewan. For example:</p> <ul style="list-style-type: none"> <li>• Alberta's Carbon Capture and Storage Funding Act (2013) is intended to encourage and expedite the design, construction and operation of carbon capture and storage projects in the province.</li> <li>• Alberta's Mines and Minerals Act makes it mandatory for carbon capture and storage operators to contribute to the Post-Closure Stewardship Fund, which the provincial government uses to finance ongoing monitoring and any required maintenance and remediation.</li> <li>• Alberta's Industrial Energy Efficiency and Carbon Capture Utilisation and Storage Grant Program has budgeted C\$80mn (US\$60mn) in funding to help emitters regulated by Alberta's carbon emissions legislation to reduce their emissions and lower compliance costs through technology and equipment upgrades related to energy efficiency and CCUS.</li> <li>• In 2013, Alberta published Carbon capture &amp; storage : summary report of the regulatory framework assessment, following the province's \$1.3 billion investment in two commercial-scale CCS projects.</li> <li>• The Saskatchewan Methane Action Plan (2019) sets out plans for "<i>a multi-year transition away from venting and flaring and towards methane capture</i>" and provides funding to "<i>prioritize all types of methane capture and commercialization projects and other emissions management projects in the [upstream oil and gas] sector</i>"</li> </ul> <p>CanmetENERGY is the Government of Canada's technical resource for energy-related standards, regulations, policies</p> |
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|               |           | <p>and programs, and leads the research and development of CO2 capture technologies, CanmetENERGY is also involved in funding and collaborative research in the following areas of CO2 storage: CO2 injection; monitoring, measurement, and verification; CO2 storage sites and opportunities; storage integrity; and capacity estimation through the Technology &amp; Innovation program, PERD, the ecoENERGY Technology Initiative, and other funding programs.</p>  |
| Mexico        | -         | <p>Mexico's updated NDC (12/2020) refers to "development of science and technology, encouraging research... within a framework of contrast technological innovation in order to achieve full territorialisation and engagement in adaptation and mitigation actions". In particular, it notes "actions pertaining capacity building, knowledge generation, scientific research and education, technological transfer and development, as well as the consolidation of financial mechanisms required by adaptation actions that will be implemented during the period leading to 2030."</p> <p>However, there is no reference to the use of GE technologies in the NDC.</p> <p>Energy Transition Law (2015) imposes a minimum share of clean energies in power generation. To qualify as clean energy, resources much have emissions below 100kg/MWh, including CCS.</p> <p>Technology Roadmap on CCS (2014), updated in 2018, proposes a national strategy and inventory and creation for a centre for technological R&amp;D and project execution (see <a href="#">here</a>).</p>   |
| United States | CCS, CCUS | <p>The US NDC (04/2021) refers to "strong and predictable policy frameworks support private investment in innovation and deployment of carbon pollution-free technology and infrastructure, spurring markets" to achieve their 2020 target. It also refers to a "diversity of available and accessible low-cost and low-carbon technologies to eliminate greenhouse gas emissions"</p> <p>The US has sector-by-sector emissions reduction policies, some of which include the use of carbon capture technologies:</p> <ul style="list-style-type: none"> <li>- Electricity: The NDC refers to the "rapid deployment of carbon pollution-free electricity generating resources, transmission, and energy storage and leverage the carbon pollution-free energy potential of power plants retrofitted with carbon capture and existing nuclear"</li> <li>- Buildings: US to "invest in new technologies to reduce emissions associated with construction, including for high-performance electrified buildings"</li> <li>- Industry: US plans to "incentivize carbon capture as well as new sources of hydrogen [from renewable sources] to power industrial facilities"</li> <li>- Agriculture and lands: US to "reduce emissions from forests and agriculture and enhance carbon sinks through a range of programs and measures for ecosystems ranging from our forests and agricultural soils to our rivers and coasts". NDC also refers to "efforts to increase sequestration in waterways and oceans by pursuing "blue carbon"".</li> </ul> <p>CO2 Capture and Sequestration Tax Credit (2008) updated in 2020, increasing tax credits for carbon capture from 10-20 USD to 35-50 USD per metric ton of CO2. Similarly, the Bipartisan Budget Act of 2018 (H.R.1892) enhances the carbon sequestration credit which is available to anyone using "carbon capture equipment".</p> <p>The Utilizing Significant Emissions with Innovative Technologies (USE IT) Act (2019). This act passed the US Senate in 2019. If it passes US House of Representatives and gains Presidential approval, it would amend the US Clean Air Act to</p> |

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|                            |     | <p>support carbon utilisation and direct air capture research, as well as the construction and development of CCUS facilities and CO2 pipelines.</p> <p>The United States' Carbon Storage Assurance Facility Enterprise (CarbonSAFE) initiative (2016) aims to address R&amp;D gaps and to develop technologies needed for projects for CCUS deployment in 2025-2030. The projects relate to commercial scale CO2 storage (50+ million metric tons). Since 2016, and as of 2019, 19 projects have been funded.</p> <p>American Reinvestment and Recovery Act - CCUS elements allocated over USD 3 billion to support carbon capture, utilisation and storage (CCUS) technology and projects.</p> <p>The Underground Injection Control Act contains provisions relating to CO2 sequestration.</p> <p>Executive Order on Tackling the Climate Crisis at Home and Abroad (2021) refers to measures to encourage carbon sequestration (in agricultural sector and by protecting the environment).</p> <p><u>Research</u><br/>Geoengineering research programme at Harvard - <a href="https://geoengineering.environment.harvard.edu/">https://geoengineering.environment.harvard.edu/</a></p> |
| South and Central Americas |     |   |
| Argentina                  | -   | <p>The Argentinian NDC (12/2020) refers to "<i>its long-term low-emission and resilient development strategy (LTS)</i>" which will be presented at the COP 2021, but does not appear to make specific reference to GE technology.</p> <p>[Only the executive summary is in English].</p>  |
| Bolivia                    | CCS | <p>The Bolivian NDC (10/2016), refers to "<i>strengthened environmental functions (carbon capture and storage, organic matter and soil fertility, biodiversity conservation and water availability) in about 29 million hectors by 2030</i>" in relation to Bolivia's actions in the forests and agriculture sector.</p>  |
| Brazil                     | CCS | <p>The Brazilian NDC (12/2020) does not appear to refer to any GE technologies.</p> <p>Law 12.187/2009, establishing the National Policy on Climate Change (NPCC), regulated by Decree 7.390/2010 identifies reducing anthropogenic GHG emissions from all its sources and strengthening GHG sinks, as well as adaptation; preservation, conservation and recuperation of national biomes as a concern. The law also refers to the promotion and development of scientific and technological research concerned with mitigation and strengthening of carbon sinks.</p> <p><u>Research</u><br/>Centre of Excellence in Research on Carbon Storage (CEPAC) was launched in 2006 and is a joint initiative between Petrobras and the Pontifical Catholic University of Rio Grande do Sul with the purpose of analysing the potentiality, risk, capacity, durability and profitability of CO2 geological storage activities in Brazil. It has conducted a number of studies, including one in respect of matching sources and sinks throughout Brazil.</p>  |
| Chile                      |     | <p>The Chilean NDC (updated 04/2020), that "<i>the capacity of terrestrial ecosystems to capture carbon plays a vital role in the increase of the planet's average temperature. The reduction of emissions released into the atmosphere is equally important as the removal of those previously released. Only once the capture of greenhouse gases begins to exceed emissions in the same period, and these emissions are sequestered (permanently), it will be possible to begin the process of reversing the conditions driving climate change</i>". It notes that Chile has plans to "take on a leading role in</p>   |

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|           |     | <p>technology development and transfer".</p> <p>However, it does not mention the use of any GE technologies.</p>   |
| Colombia  |     | <p>The Colombian NDC (updated 12/2020) is in Spanish. It refers to science and technology as one of its five means of implementing change. It refers to the development of new technologies ("<i>desarrollo de nuevas tecnologías, procesos de transferencia y apropiación tecnológica</i>") but it is unclear whether there is any reference to GE technologies.</p>  |
| Cuba      | CCS | <p>The updated Cuban NDC (12/2020) does not specifically refer to GE technologies but it does refer to implementing "<i>mitigation actions that will require financial support in technology transfer and capacity building</i>".</p> <p>Tarea Vida plan to face climate change (2017) refers to the use of forests as carbon sinks and carbon storage un underground and underwater deposits ("<i>la absorción del CO2 en sumideros biológicos como los bosques o la captura del CO2 en depósitos subterráneos u oceánicos</i>") as a climate change mitigation measure.</p>  |
| Ecuador   | -   | <p>The NDC (03/2019) for Ecuador is in Spanish but refers to "<i>reservas de carbono</i>" (carbon sinks/ reserves) and includes provisions in respect of reforestation/ prevention of deforestation, but does not appear to contain specific references to GE technologies.</p>  |
| Guyana    | CCS | <p>The NDC (05/2016) for Guyana refers to the country's "<i>innovative and pioneering Low Carbon Development Strategy (LCDS)</i>", and notes that it is rich in forest carbon stocks. There does not appear to be any reference to GE technologies, however.</p> <p>Low Carbon Development Strategy (2009, updated in 2013) refers to "<i>encouragement of increasing carbon sink capacity of non-forest and forest land</i>"</p>  |
| Paraguay  | CCS | <p>The NDC (10/2016) for Paraguay is in Spanish but there appear to be no references to GE technologies.</p> <p>Decree 4056 to establish regimes for sustainable use of bioenergy resources (2015) provides for the certification, control and promotion of the use of bioenergy.</p> <p>Decree 2,794: National Development Plan 2030 (2014) includes an objective to use environmental services/ credits for carbon sinks to increase national income.</p> <p>Resolution 941/07 defining 'forest' for carbon capture and reduction projects refers to the necessity of forests in projects to reduce/ capture carbon.</p> |
| Peru      | CCS | <p>The Peruvian updated NDC (12/2020), in Spanish mentions that "<i>el Artículo 16 de la Ley Marco sobre Cambio Climático del Perú (LMCC) indica que el Estado, en sus tres niveles de gobierno, de manera articulada y participativa diseña e implementa programas, proyectos y actividades orientadas a la reducción de las emisiones de GEI, a la captura de carbono y al incremento de sumideros</i>".</p> <p>There does not seem to be further mention of GE technologies (but Spanish language confirmation may be required).</p>  |
| Uruguay   |     | <p>The NDC (11/2017) for Uruguay refers to "<i>promoting a low-carbon economy, based on environmentally, socially and economically sustainable productive processes and services, by including knowledge and innovation</i>". It refers to "methane capture" in relation to the waste sector.</p>  |
| Venezuela |     | <p>The NDC (02/2018) for Venezuela is in Spanish. It refers to "<i>aumento de la captura de CO2</i>" in relation to the sustainable use of woods/forests ("<i>bosques</i>").</p>   |

| Asia Pacific |                 |   |
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| Australia    | CCS, CCUS BECCS | <p>The Australian NDC (12/2020) refers to carbon capture and storage and soil carbon as two of the "five priority technologies" for investment, as well as a "Carbon Capture, Use and Storage Development Fund to support investment in pilot carbon capture projects."</p> <p>The Low Emissions Technology Statement (2020) is described as a research and development strategy, focused on new and emerging technologies "with the potential for transformational economic and emissions Outcomes". CCS and soil carbon are described as "priority technology stretch goals", and "Scaling geological and biological sequestration such that we provide globally significant permanent sequestration of CO<sub>2</sub>" is considered a big technological challenge but "will reduce hard-to-abate emissions by safely storing more carbon in Australia's landscape. A strong focus by the Government on sequestration recognises these technologies can boost the productivity of Australia's agriculture sector and provide decarbonisation pathways for new and existing industries, which will preserve jobs". This policy document also addresses BECCS</p> <p>The 2019 Climate Solutions Package, is an AUD 3.5 billion investment aimed at delivering Australia's 2030 Paris commitments, and includes investment for "pumped storage solutions" and "low cost abatement". Further, the 2021-2022 Budget includes investments of AUD 539 million in clean hydrogen and carbon capture and carbon capture, use and storage (CCS/CCUS) projects.</p> <p>The National Hydrogen Strategy, published in 2019, sets out Australia's plan to use CCS to produce hydrogen, noting that "Australia is also well situated to take advantage of carbon capture and storage technologies to produce low-emissions hydrogen from coal and natural gas. Carbon capture is likely to be more cost-effective for hydrogen production than for electricity generation"</p> <p>The ARENA's Bioenergy Roadmap report is currently being compiled following a public consultation. The aim of the roadmap is to "identify the role that the bioenergy sector can play in Australia's energy transition and in helping Australia further reduce our emissions. The Bioenergy Roadmap will help to inform the next series of investment and policy decisions in the bioenergy sector in Australia."</p> <p>The Australian Electricity Market Operator's Integrated System Plan (2020) "fully utilises the opportunities provided from existing technologies and anticipated innovations in Distributed Energy Resources (DER), large-scale generation, networks and coupled sectors such as gas and transport", and takes "the first steps towards including insights on the role of hydrogen" but does not "incorporate quantitative analysis of the use of hydrogen within the Australian energy system" at this stage.</p> <p>National Energy Productivity Plan 2015 – 2030 refers to investments in new emerging clean technologies.</p> <p>The National Climate Resilience and Adaptation Strategy (2015)</p> <p>Consultation is currently underway in respect of the Future Fuels Strategy, but the strategy will aim to "integrate the transport-related outcomes of the National Hydrogen Strategy and Bioenergy Roadmap" which address the production of hydrogen from carbon CCS.</p> <p>Offshore Petroleum and Greenhouse Gas Storage Act 2006 regulates CCS in Australia, setting out the regulatory</p> |

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|          |           | <p>regime for use of CCS in Australia (at a national level).</p> <p>In Victoria and South Australia, the Greenhouse Gas Geologic Sequestration Act 2008 (Vic) and the Petroleum and Geothermal Energy Act 2000 (SA) address issues relating to licenses for CCS from relevant environmental protection authorities, whilst licensing for greenhouse gas storage is regulated under the Environmental Protection Act 1994 in Queensland.</p> <p>Offshore Petroleum and Greenhouse Gas Storage Act 2006 (as amended in 2013) aims to provide an effective regulatory framework for petroleum exploration and recovery, and the exploration for potential GHG storage formations, injection and storage of GHG substances in offshore areas.</p> <p><u>Research</u></p> <ul style="list-style-type: none"> <li>- Australia's National Science Agency, CSIRO, is conducting research in order to improve the efficiency of CCS (see details <a href="#">here</a>)</li> <li>- The University of Queensland led a major research and scoping study into the potential for carbon capture and storage to help reduce emissions (details <a href="#">here</a>)</li> </ul>   |
| Cambodia | CCS       | <p>The Cambodian NDC (2020) refers to "<i>GHG emission reduction through restoration of mangrove and improvement of ocean capacity to capture the carbon from atmosphere</i>"</p> <p>The Climate Change Action Plan for Mines and Energy 2015-2018 (2020) refers to "<i>low-carbon planning and technologies to support sustainable Development</i>" and "<i>improvement of overall environmental quality and possible reduction of forest clearance, thus helping secure carbon sinks (i.e. emission removals by forests)</i>".</p> <p>The National Strategic Development Plan 2019 - 2023 refers to "<i>Promoting the efficiency of REDD+ implementation, reducing greenhouse gas emissions from deforestation, conserving forest carbon stocks, sustainable forest management, and increasing forest carbon inventory.</i>"</p> <p>The National Environmental Strategy and Action Plan 2016–2023 (2018) refers to the need to identify "<i>carbon stocks</i>".</p> <p>The Climate Change Strategic Plan 2014 – 2023 refers to "<i>Shifting towards a green development path by promoting low-carbon development and technologies</i>" but provides no further detail.</p> <p>National REDD+ Strategy 2017 –2026 refers to the importance of forests as a "<i>carbon sinks</i>" and notes that forest protection strategies are required as "<i>degradation of forest and loss of cover means the potential for absorbing GHGs will also be compromised</i>".</p> |
| China    | CCS, CCUS | <p>The Chinese NDC states that China intends to "<i>strengthen research and development (R&amp;D) and commercialization demonstration for low-carbon technologies, such as energy conservation, renewable energy, advanced nuclear power technologies and carbon capture, utilization and storage and to promote the technologies of utilizing carbon dioxide to enhance oil recovery and coal-bed methane recovery</i>" and "<i>develop technologies on biological nitrogen fixation, green pest and disease prevention and control and protected agriculture</i>".</p>  |

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|              |                         | <p>The 14th Five-Year Plan (2021) suggests plans to "improve the carbon sink capacity of the ecosystem" to achieve carbon neutrality by 2060" and "implement major energy-saving and low-carbon technology industrialization demonstration projects and carry out major project demonstrations such as near-zero energy- consumption buildings, near-zero carbon emissions, and carbon capture, utilization, and storage (CCUS)." The plan also includes provisions on bioenergy.</p> <p>China's National Medium and Long-Term Program for Science and Technology Development (2006-2020) (2006) includes an aim to "develop efficient, clean and near-zero emission fossil fuel energy utilization technologies".</p> <p>The 2016 "Technical Guideline for Environmental Risk Assessment of Carbon Dioxide Capture, Utilization and Storage (Trial)" and could serve as technological reference for CCUS environmental risk assessment. It can also serve to guide for environmental risk assessment of newly built or expanded carbon dioxide capture, geological utilization and geological storage projects on land.</p> <p>The Chinese Action Plan on Climate Change in Industry (2012-2020) reference projects to integrate carbon capture, utilisation and storage in the chemical, cement, and steel industries amongst others. It also noted the need to accelerate the application of CCS technology and the possibility of developing a national CCUS roadmap.</p> <p>The National Climate Change Plan (2014-2020) refers to carbon capture projects at coal-fired power plants and in respect of other industries.</p> <p>In 2018, the Ministry of Housing and Urban-Rural Development published the "Engineering Design Standard for Carbon Dioxide Capture And Purification of Flue Gas" which sets out requirements for carbon capture in respect of flue gas.</p> <p>China's Aerospace Science and Technology Corporation has recently commenced a large scale weather modification/ cloud seeding project on the Tibetan Peninsula.</p> |
| <p>India</p> | <p>CCS, CCUS, BECCS</p> | <p>The Indian NDC (2016) does not refer to CCS or CCUS, but it does refer to "low-carbon technologies" and "improving carbon stock" through sustainable forest management which is expected to enhance carbon sequestration. The NDC also refers to an aim "to create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030". The NDC also states that "In its pursuit of low carbon growth, India would be focusing on technologies that need to be moved from lab to field and those that require targeted global research along with those that are still in the realm of imagination. One of the important areas of global collaborative research should be clean coal and fossil fuel, energy management and storage systems for renewable energy. Given the current stage of dependence of many economies on coal, such an effort is an urgent necessity."</p> <p>The Notification S.O. 4259(E) creating the Apex Committee for Implementation of Paris Agreement (2020) refers to "creating an additional carbon sink of 2.5 to 3 billion tonnes of carbon dioxide equivalent through additional forest and tree cover by 2030".</p> <p>The Compensatory Afforestation Fund Act (Act no 38 of 2016) sets the legal framework around funds providing for compensatory afforestation, including carbon sequestration.</p>   |

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|           |   | <p>The Integrated Energy Policy (2006) recommends "<i>Undertake a technology mission on carbon sequestration</i>", and notes that "<i>India's energy mix will remain dominated by coal at least to 2031-32 and possibly beyond. In order to grow in a sustainable manner capturing carbon and sequestering it would become critical for India in the years to come. Such technology has already been deployed commercially in conjunction with enhanced oil recovery from adjacent oil fields in three locations worldwide</i>"</p> <p><u>Research</u><br/>The Department of Science and Technology (DST) of India has been involved in climate modelling research program in geoengineering.</p>   |
| Indonesia |   | <p>The Indonesian NDC (2016) does not refer to GE technologies.</p> <p>Regulations No.11/2013 and No.36/2009 about procedures for Licensing Activities for Absorbing and Restoring Carbon in Forests amends the regulation No.36 of 2009 concerning the business licensing for the utilisation of Carbon Absorption and/or Storage of Carbon in Production Forests and Protected Forests.</p> <p>Government Regulation Number 3 Year 2008 regarding Forest Management and Compilation of Forest Management Plan, and Forest Utilisation refers to sequestration and/or storage of carbon as an environmental service provided by forests. This regulation sets out licensing requirements relating to commercial activities for carbon storage under the REDD scheme and carbon sequestration within the framework of the Indonesian government's clean development mechanism.</p> <p>Regulation No.20/2012 about Forest Carbon Management establishes the principles of forest carbon implementation to ensure a sustainable forest management, including carbon storage and / or absorption.</p> <p>Regulation No.70/2017 Implementing REDD+ and Sustainable Management of Forests addresses issues relating to carbon stocks.</p> <p>Presidential Decree 61/2011, National Action Plan to reduce GHG emissions (RAN-GRK) sets out national guidelines for emission reduction covering 70 programmes, including carbon sequestration.</p> |
| Japan     | - | <p>The Japanese NDC (updated 03/2020), states Japan will achieve its long-term goals "<i>through its GHG emission reduction measures presented in it INDC, and through actions that will be continuously taken into the future such as development and diffusion of low-carbon technologies and transition to a low-carbon socio-economic structure</i>". It also refers to "<i>the diffusion of low carbon technologies, products, systems, services, and infrastructures as well as implementation of mitigation actions in developing countries</i>". There is no specific mention of carbon capture or GE technologies, but a number of technologies (e.g. conservation technology using membranes for distilling process, technology using CO2 as feedstock, refrigerant control technology ("F-gases")) are referenced.</p> <p>The Actions for Cool Earth (ACE) Initiative launched in 2013 (Original title: 攻めの温暖化外交戦略), which is still in force, promotes the development of CCS as well as support for developing countries. This references Japan's plan to <a href="https://www.mofa.go.jp/files/000019537.pdf">https://www.mofa.go.jp/files/000019537.pdf</a></p>   |

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| Laos        |     | <p>The Laos NDC (2021) does not specifically refer to GE technologies but it does reference carbon stock in forests and strategies to prevent deforestation.</p> <p>The Strategy on Climate Change of the Lao PDR 2010 states an aim to pursue "<i>carbon market opportunities and early introduction of pragmatic, flexible mechanisms, particularly the REDD-plus (Reduced Emissions from Deforestation and Forest Degradation and Conservation in developing countries) by implementing more reforestation and afforestation programmes</i>".</p>  |
| Malaysia    | CCS | <p>The Malaysian NDC (2016) does not refer to GE technologies.</p> <p>The National Policy on Climate Change (2012) refers to the need to "<i>allocate adequate financing and appropriate technological measures for promoting low carbon economy</i>" and "<i>conserve and enrich carbon pools in natural ecosystems including plantations and promote rehabilitation of sensitive and degraded ecosystems through sound management practices and land use planning</i>".</p> <p>Green Technology Master Plan 2017-2030 (2017) outlines the strategic plans for green technology development to create a low-carbon and resource efficient economy, including methane capture from palm oil mill effluent.</p>  |
| New Zealand | CCS | <p>The New Zealand NDC (2016 and 2020 updated) does not to GE technologies.</p> <p>New Zealand Energy and Efficiency Conservation Strategy 2017-2022 (2017) refers to "Work is already underway to ensure that we are well positioned to adapt to, and take advantage of, emerging technologies and continue our transition to a more productive and lower emissions economy".</p> <p>Climate Change Response Act 2002 (as amended by the Climate Change Response (Zero Carbon) Amendment Act) addresses the storage of carbon dioxide after capture.</p> <p>The Wellbeing Budget (2019) includes "<i>\$106m injection into innovation to help New Zealand transition to a low@carbon future</i>"</p> <p>Sustainable Land Management and Climate Change Plan of Action (2007) is based on three pillars: adaptation, reducing emissions and enhancing sinks, and business opportunities, and includes a programme for bioenergy and a demonstration of new GHG mitigation technologies and practices through demonstration farms, project activity, farm monitoring and field days.</p> <p>Gas Amendment Act 2004 outlines a requirement to ensure that the gas sector '<i>contributes to achieving the Government's climate change objectives by minimising gas losses and promoting demand-side management and energy efficiency</i>'.</p> <p><u>Research</u><br/>University of Waikato into legal and regulatory framework for CCS</p> |
| Pakistan    | -   | <p>The Pakistani NDC (2016) refers to carbon sequestration in the Pakistani wetlands but notes that "<i>though there is no plan at present for carbon sequestration in the country due to uncertainty surrounding implementation potential and associated high costs, yet it would become relevant given the availability of resources</i>".</p>  |

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|                 |            | There do not appear to be references to GE in the main national legislation/ policies reviewed.  |
| The Philippines | -          | <p>The Philippine NDC does not refer to GE technologies.</p> <p>There do not appear to be references to GE in the main national legislation/ policies reviewed.</p>  |
| Russia          | CCS        | <p>The Russian NDC refers to <i>"joint projects, including scientific and technical cooperation in the field of climate, environmental protection, resource and energy conservation"</i>. The NDC also notes that the Russian National Action Plan, which is <i>"the first stage of adaptation to climate change for the period up to 2022"</i> provides for <i>"determination of priority measures to adapt economic sectors and spheres of government to climate change"</i> including <i>"technical regulation"</i></p> <p>The National Action Plan for the First Phase of Adaptation to Climate Change, approved by Order of December 25, 2019 No. 3183-r. (2020) is the first stage of measures to adapt the economy and the population to climate change and includes institutional, organizational and methodological measures aimed at the formation of state approaches to adaptation to climate change.</p> <p>Climate Doctrine of the Russian Federation (2009) recognises the potential of Russia's vast forests as a carbon sink and recommends their use.</p> <p>The Comprehensive Plan for Implementation of the Climate Doctrine (2011) includes measures in respect of the protection and enhancement of the capacity of carbon sinks, including sustainable forestry, forestation, and re-forestation.</p>   |
| South Korea     | -CCS, CCUS | <p>The South Korean NDC (updated 12/2020) states that Korea <i>"plans to significantly scale up R&amp;D investments for core emissions reduction technologies, e.g. renewable energy, zero emission vehicles and hydrogen technologies, under the recognition that climate change is caused by man-made GHG emissions and therefore, it could be dealt with by human endeavour as well, i.e. the technological development"</i>. Additionally, it states that <i>"the government will reduce the use of fossil fuels by technology innovation and deployment of new technologies, such as hydrogen reduction steelmaking. In the building sector, existing public buildings will be pursued to be converted into green buildings"</i>.</p> <p>Despite the discussion on technology, these are mostly plans to improve R&amp;D rather than start to deploy technology. There is no mention of GE technology in particular.</p> <p>The NDC refers to the Korea Adaptation Centre for Climate Change, a think tank launched in 2009, that has been <i>"working to draw up science-based adaptation measures by developing vulnerability assessment tools and conducting R&amp;D for an extensive analysis of the impact of climate change"</i>.</p> <p>South Korea had a National CCS Master Action Plan which included a "Korean CCS 2020 Project" involving the "Korea Carbon Capture &amp; Sequestration R&amp;D Centre" ("KCRC"). However, the Project ended in May 2020 after 9 years since its launch in November 2011.</p> |
| Thailand        |            | The Thailand NDC (2020) does not specifically refer to GE technologies but it makes reference to the need to <i>"facilitate, expedite and enhance technology development and transfer, capacity building and access to financial resources that support Thailand's sustainable transition towards low-carbon and climate-resilient growth"</i> .   |

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|                            |           | <p>Climate Change Master Plan (CCMP) 2015-2050 (2016) notes that <i>"the use of carbon capture and storage (CCS) technology may be considered for implementation. This technology, however, has not been used extensively on a commercial scale and requires importation. Studying the physical capacity of potential sites for setting up such technology is also mandatory; since it captures and stores carbon dioxide underground or in the sea, risks of leaks need to be examined"</i> and <i>"for GHG emissions reduction technology (mitigation), the energy sector emphasises smart grids, waste to-energy technology, second-generation biofuels, improvement of fuel combustion efficiency in the industrial sector, and CCS."</i></p> <p>National Strategy 2018-2037 (2018) refers to <i>"expanding forest areas to function as carbon storage areas"</i>.</p>   |
| Vietnam                    | CCS, BESS | <p>The Vietnamese NDC (09/2020) refers to <i>"enhancing carbon sequestration and environmental services"</i> and <i>"Protecting, conserving and sustainably using forests and forest land to increase carbon sequestration"</i></p> <p>PM Decision 1775/2012 On GHG Emission and Carbon Credit Management (2012) states that one of its targets is <i>"Disseminating and applying technologies to reduce emissions and increase the capability to absorb potential greenhouse gas in Vietnam"</i> as well as <i>"developing biogas technology and system of collection, storage and handling of manure in livestock and poultry breeding"</i>, with a <i>"target of increasing the absorption of greenhouse gases compared to 2005"</i> of 20%.</p> <p>The National Climate Change Strategy approved by Decision no 2139/QĐ-TTg (2019) makes GHG emission reduction and removal a mandatory index in social and economic development, and includes references to efforts to <i>"develop and implement GHG emission reduction programs through efforts to restrict deforestation and forest degradation"</i></p> <p>Vietnam's Green Growth Strategy and related PM Decisions( 2017) notes that decreasing and removing greenhouse gas emissions are becoming essential indicators in social-economic development, and proposes <i>"developing a legal basis to prepare for the application of technologies to capture, restore and trade various types of greenhouse gases"</i> and replicating <i>"widely technologies that treat and reuse by-products and waste from agriculture production to produce animal feed, mushrooms, materials for industries, biogas and organic fertilizer while reducing greenhouse gas emissions"</i>.</p> <p>Decision 177/2007/QĐ-TTg Approving the Scheme on Development of Biofuels up to 2015, with a Vision to 2025 (2011) promotes the production and use of biofuels, and encourages research and development in the field and the development of the relevant technologies (including the production of ethanol from biomass).</p> <p>Law on Environmental Protection No: 55/2014/QH13 (2015) requires the management of greenhouse gas emissions, including through <i>"conserving and increasing forest carbon stock"</i></p> <p>PM Decision 1775/2012 On GHG Emission and Carbon Credit Management (2012) refers to <i>"disseminating and applying technologies to reduce emissions and increase the capability to absorb potential greenhouse gas in Vietnam;"</i> and <i>"assessing technology needs, dissemination and application of technology to reduce emissions and increase the ability to absorb greenhouse gas potential in Vietnam"</i> in key areas such as energy production and agriculture.</p> |
| Africa and the Middle East |           |  |
| Egypt                      | CCS       | <p>The Egyptian NDC (06/2017) refers to "carbon capture and storage "CCS" as a technology alternative that can be used in the future if proven economically feasible,(iii) co-utilization of fossil fuel and biomass in the same plants" as "key</p>   |

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|          |     | <p>technology-related requirements essential for transformation".</p> <p>The National Environmental, Economic and Development Study (NEEDS) for Climate Change (2010) makes several references to CCS.</p> <p>Strategy for Energy Supply and Use (2007) notes that the Supreme Council for Energy adopted a strategy for energy supply and use, which includes carbon capture and storage.</p>  |
| Ethiopia | CCS | <p>The Ethiopian NDC (12/2020) refers to participation in carbon markets but does not refer to GE technologies.</p> <p>The Growth and Transformation Plan II (2016) states that "<i>the third strategic direction is to expand biomass energy</i>"</p> <p>Climate-Resilient Green Economy (CRGE) Strategy (2011) states that "<i>Carbon capture and storage (CCS) technologies are still at a nascent stage and are assumed to represent little or no significant abatement potential for Ethiopian industry.</i>" It also suggests increased use of biogas from waste.</p>   |
| Israel   | -   | <p>The Israeli NDC (11/2016) does not refer to GE technologies.</p> <p>Israel National Plan for the Implementation of the Paris Agreement (2016) refers to "<i>the collection and use of landfill gases in waste disposal sites.</i>"</p> <p>Other relevant policies and legislation reviewed do not appear to refer to GE technologies.</p>  |
| Jordan   |     | <p>The Jordanian NDC (11/2016) does not refer to GE technologies.</p> <p>The National Climate Change Policy of the Hashemite Kingdom of Jordan 2013-2020 (2013) mandates that legislation/regulations should include reference to methane capture and utilization and provide general guidance on how and when to consider this option in respect of waste water and solid waste, but notes that "<i>methane capture projects are very difficult to realize in Jordan currently, even with additional financial revenues from CDM or other carbon finance mechanisms for a range of reasons</i>". The policy notes that "<i>there will be neither demand nor significant potential for CCS in Jordan in the short- to mid-term (2020)</i>".</p> |
| Kenya    |     | <p>The Kenyan NDC (12/2020) does not refer to GE technologies.</p> <p>National Climate Change Action Plan 2018-2022 (NCCAP) (2018) refers to "<i>options for methane capture and power generation at landfill sites</i>" and "<i>promotion of a circular economy approach to waste management</i>".</p> <p>Other relevant policies and legislation reviewed do not appear to refer to GE technologies.</p>  |
| Ghana    |     | <p>The Ghanaian NDC (09/2016) refers to the enhancement of forest carbon stocks but does not refer to any specific GE technologies.</p> <p>National Climate Change Policy (NCCP) (2013) notes that emissions will increase as Ghana develops but states that this can be mitigated by low carbon development and the use of appropriate technology. The policy states that "<i>a significant proportion of urban waste in Ghana is biodegradable and can potentially be recycled for raw material or energy with the appropriate technology and</i></p>   |

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|                      |     | resources. Investing in more efficient systems and upgrading existing structures would also help cut greenhouse gas emissions and still drive economic growth", and suggests measures to "establish sustainable recycling and waste management technologies that generate energy (e.g., biomass energy, biogas, methane, etc.) and reduce emissions from solid and liquid wastes". It also recognises the important role of natural ecosystems in carbon capture and storage.  |
| Nigeria              |     | The Nigerian NDC (05/2017) does not refer to GE technologies, and neither do other relevant policies and legislation reviewed. The focus of the NDC and policies reviewed is instead on, for example, policies to decrease carbon emissions, preserve Nigeria's forestry and an increasing focus on renewable energy.  |
| Oman                 |     | The Omani NDC (05/2019) does not refer to GE technologies.<br><br>Oman's Intended Nationally Determined Contribution (decided in 2015 and updated in 2019), relates to controlling its GHG emissions growth by 2% during the period from 2020-2030 (i.e. limiting total GHG emissions to 88714 Co2 gigagrams, as opposed to the 90524 Co2 gigagrams expected by 2030 without these measures). Other relevant policies and legislation reviewed do not appear to refer to GE technologies.  |
| South Africa         | CCS | South Africa's NDC (11/2016) refers to CCS technology in passing in the context of technologies identified that may assist the country to fight climate change, but does not delve into the role of these technologies any further.<br>"Some technologies that could help South Africa to further reduce emissions that have been identified include: Energy efficient lighting; variable speed drives and efficient motors; energy efficient appliances; solar water heaters; electric and hybrid electric vehicles; solar PV; wind power; carbon capture and sequestration; and advanced bio-energy."<br><br>Similarly, CCS technologies are referred to in the South African government's "Vision, Strategic Direction and Framework for Climate Policy" (07/2008), which includes a commitment to explore and develop CCS for coal fired power stations and all coal-to-liquid plants, and "not approving new coal fired power stations without carbon capture readiness") |
| Tanzania             |     | The Tanzanian NDC (05/2018) does not refer to GE technologies.<br><br>The other reports and policies reviewed do not appear to refer to GE technologies; Tanzania's climate change-related policies (such as the National 5 Year Development Plan 2016/17-2020/21) focus instead on matters such as the shift to renewable energy sources and research into new agriculture-related technologies to mitigate the effects of climate change.  |
| United Arab Emirates | CCS | The UAE's NDC (12/2020) refers in several places to an ongoing utilisation of CCS technologies, including "the region's first commercial-scale network for carbon capture, use and storage. Inaugurated in 2016, the Al Reyadah project, captures CO2 at an Emirates Steel facility, and compresses, dehydrates and transports it through a pipeline for injection into oil wells for enhanced oil recovery applications. The project's current installed capacity to capture, transport and inject CO2 is up to 800,000 tonnes per year. Building on the success of Al Reyadah, plans are underway to expand carbon capture capacity in the country".<br><br>Several other GE-adjacent technologies are referred to in the NDC, but there is limited detail as to the technologies' deployment. For example, "The UAE government is undertaking further field research to determine mangrove soil   |

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|  |  | <i>carbon sequestration rates using radiometric dating techniques. The findings will aid development of emission inventories and inform coastal management."</i> |
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