GHG Mitigation Briefs – April 2016

The IEA Greenhouse Gas R&D Programme (IEAGHG) is part of the IEA's Energy Technology Network. Its role is to assess the potential to mitigate greenhouse gas (GHG) emissions from the use of fossil fuels in the power, oil and gas and industry sectors. Further details of the activities of the IEA Greenhouse Gas R&D Programme can be found on our website: **www.ieaghg.org**.

This GHG Mitigation Brief has been prepared to summarise key climate change science, policy and technology developments, identified by IEAGHG, in the last 6 months and aims to provide information for both its members and the broader community. For those requiring further information, the IEAGHG provides more detailed papers and webinars on key issues relating to greenhouse gas mitigation which can be found on its web site (**www.ieaghg.org**). Those directly relevant to this GHG Mitigation Brief some are referenced at the end of the document.

Global Atmospheric CO_2 Levels

The National Oceanic and Atmospheric Administration (NOAA) of the USA has reported[1] that:

- The average global atmospheric carbon dioxide (CO_2) level stood at 402.59 ppm in February 2016
- The annual growth rate of atmospheric carbon CO_2 jumped by 3.05ppm in 2015; the largest year-to-year increase in 56 years and the fourth consecutive year that the CO_2 concentrations in the atmosphere grew by more than 2 ppm.

The observed increases were attributed to the current El Niño weather pattern affecting CO_2 uptake by ecosystems and continuing greenhouse gas emissions[4]. The increase in global CO_2 emissions highlights the need for global action to mitigate greenhouse gas emissions and thus climate change.

International Agreement on Greenhouse Gas Mitigation

The 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) closed on December 12th 2016 with a historic agreement from 195 counties to reduce the global temperature rise caused by greenhouse gas emissions to below 2°C[2]. The Paris Agreement was signed by 175 countries In New York on 22nd April 2016. We now await ratification of the agreement by countries in the coming months/year

Mitigation Technology at the Centre of the UNFCCC Process

The Intended National Commitments (INDCs) outline the technologies they plan to deploy to mitigate climate change. In the energy sector highlighted in the INDC's submitted included[3]:

- Renewable energy actions aimed at increasing the share of/improving access to clean energy,
- Energy efficiency improvements through infrastructure modernization, smart grids, efficiency improvements in industrial processes, and energy conservation standards,
- CCS featured in 11 country INDC's including that of the EU INDC (covering the 28 EU member states).

The INDC's relate to the period up to 2020 to 2030 and will be converted to National Determined Contributions after the Paris Agreement is ratified. The NDC's will be updated every 5 years, starting in 2020, with progressively stronger mitigation action needed each time.

The Technology Mechanism and Accelerating the Transfer of Low Carbon Technologies

One of the COP21 outcomes is the desire to strengthen the Technology Mechanism (created in 2010, The Climate Technology Centre and Network (CTCN) is the operational arm of the Technology Mechanism[5]. The CTCN, which IEAGHG is a member of, provides technical assistance (at the request of developing countries) to accelerate the transfer of climate technologies. IEAGHG have co-operated with the CTCN on the exchange of CCS related technology information by:

- Holding a joint webinar on IEAGHG's work on assessing the potential for BIOCCS[6],
- CTCN were involved in an official side event at COP21 hosted by IEAGHG and other parties on the potential for CCS in developing countries[7].

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The COP21 Side Event Carbon Capture and Storage (CCS): Achievements and Opportunities for Developing Country Involvement, was attended by 200 delegates, many from developing countries. It provided information on the technical status of CCS at both the pilot and commercial demonstration scale. CTCN provided information on how developing countries could apply for technical assistance on low carbon technology.

The event was reported by the official reporters for COP meetings the IISD, see ***http://www.iisd.ca/climate/cop21/enbots/1dec.html#event-6 and on the Japanese news channel NHK News***

Technology Innovation at COP21

In a major development at COP21, twenty countries launched a new programme called Mission Innovation in Paris[8]. The programme requires Governments to double their R&D spend over 5 years on Low Carbon technology. In parallel, a major independent private sector initiative called the Breakthrough Energy Coalition allows entrepreneurs, investors, and businesses to deploy billions more dollars to drive innovation from the laboratory to the marketplace.

CO_2 Emissions and Economic Growth

The IEA have reported that, for the second year running, the global energy-related CO_2 emissions have remained flat ; suggesting that the growth in these emissions has been decoupled from economic growth[9]. The reasons for this were that the two largest emitters, USA and China, both reduced their energy related emissions in 2015 due to a significant increase in low carbon technology deployment. China has made significant progress in introducing more efficient coal burning power plants and through increased nuclear and renewable energy deployment. Whilst in the USA, the emission reduction can be attributed to reduced coal use and an increase in renewable energy generation in the electricity sector.

Global Methane Emissions

The Clean Air and Climate Coalition (CACC) to Reduce Short Lived Climate Pollutants in its recent Science Status Report reported that methane emissions, after peaking in 2007 are increasing again[10]. The increase is attributed to a combination of increased emissions from agricultural production in South East Asia and increases in emissions from natural gas production, storage and distribution networks in North America.

The USA has introduced measures to mitigate methane emissions from oil and gas production[11], which include; new pipeline safety standards to both improve safety and reduce emissions, modernisation of the US Natural Gas Transmission and Distribution Infrastructure and development of cost-effective leak detection technologies and more efforts to control leaks. In March 2016, Canada and the USA committed their respective countries to reducing methane emissions from their oil and gas sectors by at least 40 percent over the next decade from 2012 levels[12]. Amongst the joint measures proposed; were improving methane data collection and reporting, knowledge sharing and jointly endorsing the World Bank's Zero Routine Flaring by 2030 initiative.

Reducing methane emissions resulting from crop production, especially rice production and cattle farming is not an easy issue to tackle since Governments need to balance the need for increased food production to meet population/economic growth again greenhouse gas mitigation needs.

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The IEA led a side event at COP21, "Delivering Innovation through Energy Technology Co-operation" to launch the Mission Innovation Programme. IEAGHG were invited to participate in Session 2 entitled "Implementing Energy Technology Collaboration: Gaps, Opportunities and Synergies Stemming from Experiences of Multilateral Innovation" along with other IEA Technology Co-Operation Programmesm to share its experiences on international technology collaboration.

Is the Terrestrial Biosphere a Contributor to Climate Change?

In an interesting development, new research from Carnegie Mellon's Department of Global Ecology suggests that if you consider human-induced emissions of methane and nitrous oxide from ecosystems, rather than look at CO_2 alone, the terrestrial biosphere becomes a net contributor to climate change. These results are regarded as surprising and could revise the current thinking on how human activity contributes to global warming. The scientists also found that greenhouse gas emissions vary considerably by region. The human-induced emissions from Southern Asia (due to food production) had a larger net warming effect compared to other regions of the globe[13].

Solving one Problem Creating another by Technology Deployment

Refinement of Hydrofluorocarbon (HFC) emissions inventories at the global/regional levels, to date and projected into the coming decades, points to a rise in emissions which are expected to grow steadily in coming years, mainly in developing countries. Particularly important is the growth in the production, consumption and emissions of high global warming HFCs. The findings highlight the importance of opportunities to mitigate emission growth in order to minimise their current and future climate forcing[10]. HFC' are a replacement for the ozone depleting CFCs that have been successfully phased out under the Montreal Protocol. HFCs were originally regulated under the Kyoto Protocol but, in November 2015, the Montreal Protocol agreed to include HFCs under that international agreement. Replacement options for HFCs include CO_2 and hydrocarbons[14]. A meeting of the Montreal Parties to include HFCs will be held in October 2016.

In a further development, a link between increased Arctic warming due to Europe cutting air pollution in the 1970s/1980s has been postulated. The reduction in SO_2 emissions to the atmosphere and hence the formation of sulphate aerosols, brought about by introducing flue gas desulphurisation technology on coal fired power plants, switching from coal to gas for power generation and introducing low sulphur transport fuels[15],[16]. If China then follows the rest of the world in cutting sulphate aerosols to reduce air pollution, a new study published in the journal Nature suggests that global temperatures could rise even faster in the coming decades since there would be less of a cooling effect from sulphate aerosols to offset the warming from greenhouse gas emissions[17].

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Further Reading

1. IEAGHG Information Paper, IP2016-07, Update on CO2 emissions and Global temperatures, http://www.ieaghg.org/docs/General_Docs/Publications/Information_Papers/2016-IP7.pdf
2. https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf
3. IEAGHG Information Paper: 2015-IP24; INDC's and Implications for CCS, http://www.ieaghg.org/docs/General_Docs/Publications/Information_Papers/2015-IP24.pdf
4. IEAGHG webinar, A reflection on COP21 and Outcomes for CCS. https://www.youtube.com/watch?v=v7yXotkGn5w
5. https://www.ctc-n.org/
6. IEAGHG Webinar, Biomass and CCS : A Review at a Systems Level. See:
http://www.ieaghg.org/docs/General_Docs/Webinar/2015-08-26%2014.02%20Biomass%20with%20carbon%20capture%20and%20storage%20%E2%80%93%20A%20review%20at%20the%20systems%20level.mp4
7. IEAGHG Information Paper: 2015-IP32; COP21 IEAGHG Side Event – Carbon Capture and Storage (CCS): Achievements and Opportunities for Developing Country Involvement. See http://www.ieaghg.org/docs/General_Docs/Publications/2015-IP32.pdf
8. http://newsroom.unfccc.int/clean-energy/mission-innovation-clean-energy/
9. IEA Press Release 16 Mar 2016, see: https://www.iea.org/newsroomandevents/pressreleases/2016/march/decoupling-of-global-emissions-and-economic-growth-confirmed.html
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11. https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1
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13. IEAGHG Information Paper: 2016-IP6; A new debate on Increases in Methane Emissions and Terrestrial Carbon Uptake, see http://www.ieaghg.org/docs/General_Docs/Publications/Information_Papers/2016-IP6.pdf
14. IEAGHG Information Paper: 2015-IP28; HFC's included In Montreal Protocol, see http://www.ieaghg.org/docs/General_Docs/Publications/Information_Papers/2015-IP28.pdf
15. http://www.carbonbrief.org/cuts-in-europes-air-pollution-have-boosted-arctic-warming
16. IEAGHG Information Paper: 2016-IP9; The Air Pollution/Climate Change Conundrum, see http://www.ieaghg.org/docs/General_Docs/Publications/Information_Papers/2016-IP9.pdf
17. http://www.nature.com/nature/journal/v531/n7594/full/nature17165.html