Carbon & Innovation Working Group Workshop 7: The Future of Fuels

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Key Developments Since Last Workshop Meeting

- Paris Accord officially ratified Nov. 3rd, but future U.S. involvement is in question
- Nearly 200 nations reach agreement to phase out hydrofluorocarbon [HFC] refrigerants, which are also strong greenhouse gases [GHGs], through a Montreal Protocol Amendment
- Over 190 countries adopt a plan to regulate air travel GHG emissions through the International Civil Aviation Organization [ICAO] and the UN
- The latest International Energy Agency [IEA] global energy consumption estimates through 2040 show significant growth for natural gas and renewables, and slow growth for oil and coal
- The U.S. elections send mixed signals on domestic climate plans

Paris Accord Officially Ratified; Next Steps

- More than 20 world leaders signed documents legally binding their countries to the Paris Accord on September 21st at the UN's Climate Day
- Since then, a total of 63 countries have joined, representing more than 55% of global GHG emissions
- Under Article 21 of the agreement, 55 countries representing 55% of global emissions were needed to trigger effectiveness
- The first UN technical implementation meeting was held in mid-November in Marrakech, where discussions centered around emissions measurement protocols, requirements for mitigation plans, financing needs and the implications of moving forward without U.S. involvement in the accord

Nearly 200 Nations Reach Agreement to Phase out HFC Greenhouse Gases

- Hydrofluorocarbons (HFCs) are commonly used in refrigeration and air conditioning and can be 10,000 times more powerful as greenhouse gases than carbon dioxide
- The deal, reached in Rwanda by amending the Montreal Protocol, divides countries into three groups with differing deadlines to scale back on the use of HFCs, with an overall deadline of 2100
- Developed nations, including the U.S. and most European countries, must begin reducing HFC emissions by 2019
- A second group of over 100 developing nations, including China, will start reductions in 2024
- A third group of countries, such as India and Pakistan, will start in 2028.
- India has been a major concern, where people are just being to be able to afford air conditioning. HFCs are cheaper than alternatives.
- Overall, this agreement is expected to shave a half degree Celsius off warming this century

 Source: http://www.climatechangenews.com/2016/10/15/un-agrees-historic-deal-to-cut-hfc-greenhouse-gases/

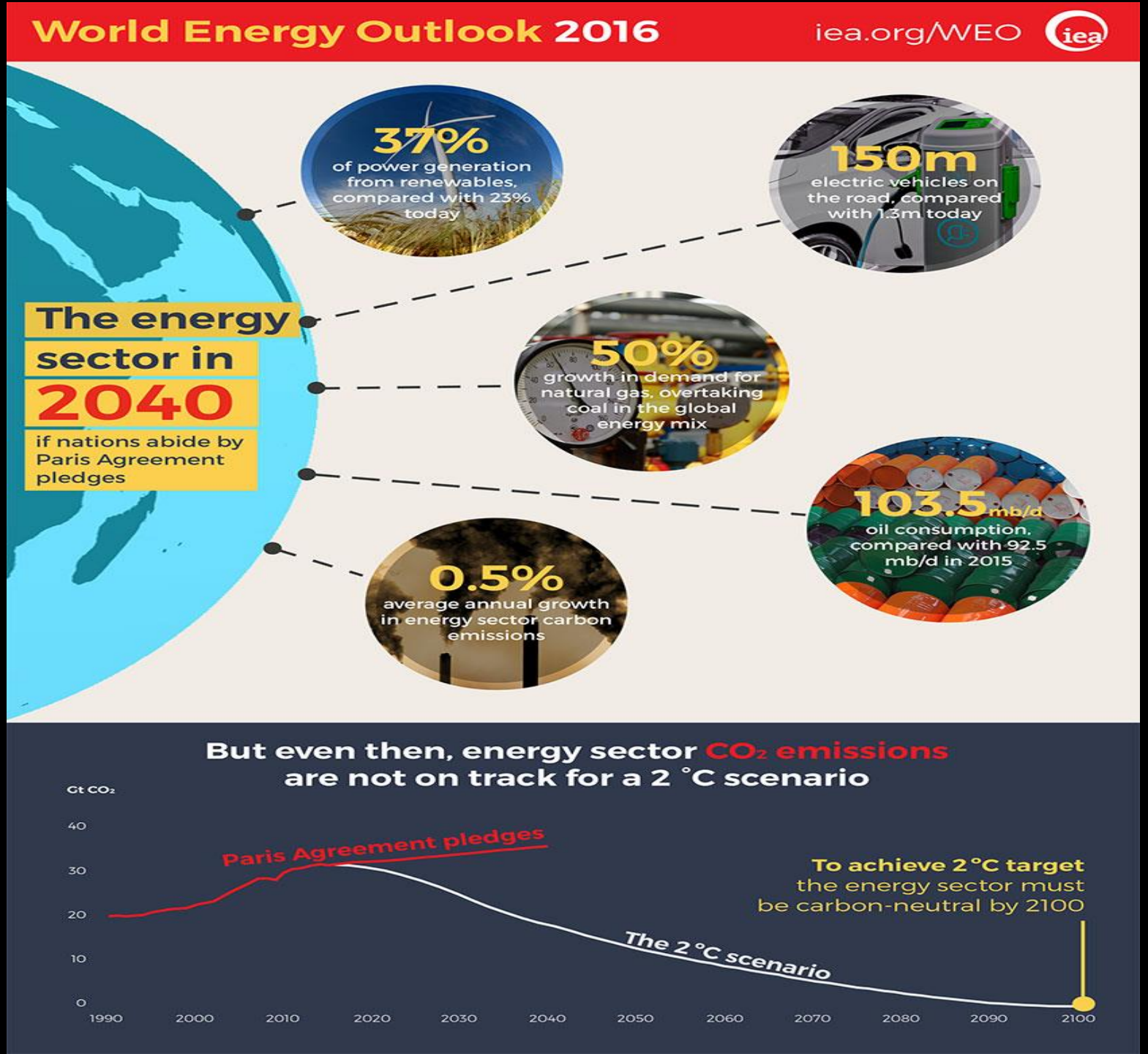
Over 190 Countries Adopt Plans to Offset Air Travel Emissions

- For the first time, nations have agreed on an accord to reduce the climate impact of air travel, at a meeting of the International Civil Aviation Organization in Montreal. The long-term objective is to make air travel carbon neutral by 2050
- Air travel currently is responsible for 2% of annual GHG emissions, but was not covered in the Paris Climate Accord last December
- Efforts to lightweight planes and improve engine efficiency are expected to provide some of the needed reductions
- Airlines will also buy credits to offset emissions. These credits will then go to finance alternative energy installations, forest conservation programs and other projects that prevent an equivalent amount of GHG emissions
- Russia and India are a few of the nations who will not participate for now

Source: https://www.theguardian.com/environment/2016/oct/06/aviation-emissions-agreement-united-nations

Latest IEA Estimates on World Energy Consumption

- Renewable energy is booming, with more capacity added in 2015 than for coal, oil and nuclear combined
- Oil and natural gas will continue to play a substantial role in the global energy mix for years to come
- The IEA estimated that the current share of fossil fuels in the energy mix is 81%. If the Paris goals are met, this would only drop to 74% by 2040
- IEA says, though, that the current reduction targets agreed to in Paris will not be enough to keep global temperature increases below 2 degrees Celsius


World Energy Outlook 2016
iea.org/WEO
The energy sector in 2040
if nations abide by Paris Agreement pledges
37%
of power generation from renewables, compared with 23% today
150m
electric vehicles on the road, compared with 1.3m today
50%
growth in demand for natural gas, overtaking coal in the global energy mix
103.5 mb/d
oil consumption, compared with 92.5 mb/d in 2015
0.5%
average annual growth in energy sector carbon emissions
But even then, energy sector CO2 emissions are not on track for a 2 °C scenario
Gt CO2
40
30
20
10
0
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Paris Agreement pledges
To achieve 2 °C target
the energy sector must be carbon-neutral by 2100
The 2 °C scenario

Trump's Views on Climate Unclear

- During the campaign, Trump supported withdrawing the United States from the Paris Agreement, cancelling the Clean Power Plan and significantly reducing the EPA's role in climate regulation
- He also discussed "bringing back coal"
- Myron Ebell, a well known climate skeptic, is currently leading the President-Elect's EPA transition team
- Trump also pledges to cut all "climate change financing", which would include the US's contribution to the $100 billion pledged by world leaders to help developing nations meet the carbon reduction requirements of the Paris Agreement
- On November 17th, nearly 100 large U.S. companies, from Starbucks to Mars to Nike, asked the President-Elect not to withdraw from the Paris Agreement, saying "failure to build a low-carbon economy puts American prosperity at risk"

Sources: http://www.environmentalleader.com/2016/11/10/trump-presidential-victory-what-industry-leaders-are-saying/
http://www.nytimes.com/2016/11/17/business/energy-environment/us-companies-to-trump-dont-abandon-global-climate-deal.html?ref=business&_r=0

California Adopts Ambitious New Greenhouse Gas Reduction Targets

- Governor Jerry Brown recently signed two related bills that will tighten greenhouse gas limits and increase legislative oversight over the California Air Resources Board. Highlights include:

  -A new statewide target for reductions in GHG emissions (40% below 1990 levels by 2030)

  -Public reporting of GHG and other emissions

  -Prioritized direct reductions in GHG emissions by large emitters

- The state also has the only economy-wide carbon cap and trade system in the U.S.

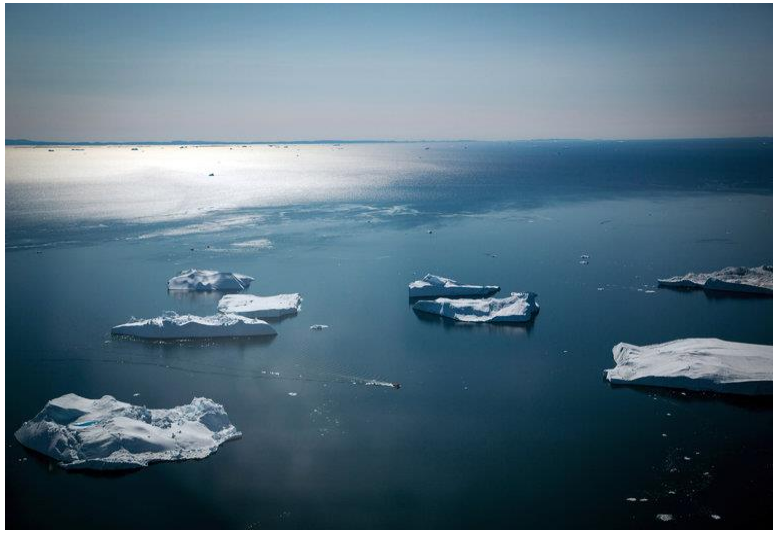
Sources: https://www.californialandusedevelopmentlaw.com/2016/10/07/california-adopts-ambitious-new-greenhouse-gas-reduction-targets/
http://www.ecosystemmarketplace.com/articles/the-ripple-effect-of-california-cap-and-trade/

Poll Shows Americans Appear Willing to Pay for a Carbon Tax Policy

- The Energy Policy Institute at the University of Chicago center for public affairs conducted a poll asking if Americans would support a fee on their monthly electric bill to combat climate change
  - -57% of respondents said they would pay at least $1
  - -39% would pay at least $10
  - -29% would pay at least $20
  - -24% would pay at least $30

Source: www.nytimes.com/2016/09/15/upshot/americanws-appear-willing-to-pay-for-a-carbon-tax-policy.html?ref=business&_r=0

- Net result: On average, American households are willing to pay $15-$20 per month more on their electricity bill to combat climate change



- These numbers are significantly higher than a similar poll taken in 2009

- Also of note, however, is Washington State's rejection of a carbon tax in this Fall's elections

Canada's Trudeau Steps Up on Climate Change

- Prime Minister Trudeau announced on October 5th that Canada would be putting a price on carbon
- Each of Canada's 10 provinces and 3 territories can choose its own method of carbon pricing (direct tax on emissions vs cap and trade)
- These initiatives must be in place by 2018 with a minimum price per ton of carbon emitted of 10 Canadian dollars (US$7.60)
- The government is likely to use the revenue raised to invest in clean energy projects or lower other taxes
- Also of note, Trudeau has recently approved 2 new pipelines to carry oil sands crude to Vancouver and Wisconsin

Source: http://www.nytimes.com/2016/10/07/opinion/canadas-trudeau-steps-up-on-climate-change.html

Significant Carbon Developments, Through a Corporate Lens

- U.N. Sustainable Development Goals [SDGs] are slowly being embraced by the world's largest corporations
- Alliances are being formed to make renewable energy more affordable and easily accessible
- Development of renewables and carbon technologies is accelerating
- "We see clear winners for the next 25 years – natural gas but especially wind and solar – replacing the champion of the previous 25 years, coal," said Fatih Birol, executive director of the International Energy Agency. "But there is no single story about the future of global energy: in practice, government policies will determine where we go from here."

Source: http://www.environmentalleader.com/2016/11/23/renewables-and-natural-gas-big-winners through-2040/

Ingersoll Rand & The U.N. Sustainable Development Goals

- The UN SDGs were agreed upon last Fall –17 goals adopted by more than 190 countries to tackle climate change, clean water and poverty issues
- Scott Tew, Ingersoll Rand's Executive Director for their Center for Energy Efficiency & Sustainability, has said that companies should tie the SDGs into their business plans and climate targets
- The company has set a goal to achieve a 50% reduction in the direct GHG emissions potential of its products by 2020 and a 35% reduction in the company's operational GHG footprint, both compared to 2013 levels
- "We have our 2020 targets, and they add value to us as a business and to our customers. We've also looked at our goals and targets and asked, 'Which of the SDGs can we map through our existing goals so there is a direct link?'

Source: http://www.environmentalleader.com/2016/09/19/climate-week-2016-businesses-lead-the-transition-to-a-low-carbon-economy/

Renewable Energy Buyers Alliance Forms to Power Corporate Clean Energy

- Four non-governmental organizations [NGOs] have formed the Renewable Energy Buyers Alliance [REBA], a new coalition to empower multinationals to transform electricity systems with renewable energy
- REBA's goal: Help facilitate and deploy 60 gigawatts of new corporate renewable energy in the U.S. by 2025
- REBA facilitates solutions among customers, renewable energy suppliers, utilities and policy makers, to overcome market barriers and drive collaboration among all parties
- The participating NGOs are: Business for Social Responsibility, Rocky Mountain Institute, World Resources Institute and the World Wildlife Fund
- Additionally of note: Microsoft announced its largest wind energy purchase to date on November 14th, bringing its total U.S. wind investment to $500 billion. Creative risk financing was a big part of this deal

Sources: http://www.environmentalleader.com/2016/11/15/how-microsofts-latest-wind-energy-purchase-will-enable-faster-adoption-of-renewables/

Bill Gates Sees a Future in Low-Carbon Plastics

- Start up company Renmatix announced a $14 million investment round led by Gates, allowing it to take to take its patented process from the lab to commercial use
- This process, called Plantrose, uses high-pressure, high-temperature water to convert biomass into a usable cellulosic sugar state, or intermediate material
- This material can then be made into plastic-like materials for products ranging from drinking cups to cell phone parts to industrial adhesives. 4% of global oil production is used for plastics
- This technology has the potential to infuse a renewable materials process into the industrial base: plastic-like substances now being made with a biomass instead of petroleum based material

Source: www.greenbiz.com

Shell's Carbon Capture Project Reaches Milestone, Operating Under Budget

- Shell's Quest carbon capture and storage (CSS) project in Alberta has captured and stored one million metric tons of CO2 after one year of operation
- This is a joint development between Shell, Chevron Canada, and Marathon Oil, with government assistance as well
- Quest is designed to capture 1/3 of the emissions from Shell's upgrader, which turns oil sands bitumen into synthetic crude
- Shell says these results show CCS technology is a viable solution to mitigate climate change and that CCS can be applied to other industries to reduce CO2 emissions, most likely in petrochemicals.

Source: http://www.environmentalleader.com/2016/09/16/shells-quest-carbon-capture-reaches-milestone-operating-under-budget

World's Largest Carbon-Capture Plant to Open Soon

- The Petra-Nova carbon capture and storage (CSS) system outside of Houston, Texas is expected to open by yearend
- The project is a 50-50 joint venture between NRG Energy and JX Nippon Oil & Gas Exploration Corp., Japan's largest oil producer, with additional funding from the U.S. Department of Energy Clean Coal Power Initiative and loans from Japanese financial institutions.
- It will filter out 90% of the carbon dioxide, along with particulates, sulfur oxides and nitrogen oxides from an existing Shell refinery
- Captured CO2 is pumped 82 miles away where oil drillers inject it into depleted wells to squeeze out extra crude oil

Source:

Automakers Outperform Greenhouse Gas Emissions Standards for 4th Consecutive Year

- In model year 2015, passenger vehicles achieved record-high fuel economy while outperforming GHG standards, according to the EPA
- Fuel economy increased by 0.5 miles per gallon [mpg] to a record 24.8 mpg average, with improvements across all vehicle types
- With the automotive industry seeing significant sales growth, including an all-time sales record last year, these new vehicles are better for the climate than ever before
- Since initial implementation, these automotive fuel economy standards have slashed about 130 million metric tons of CO2 (20 million homes worth of electricity use)
- However, low gas prices continue to encourage consumers to buy cars and trucks with lower mpg

Source: http://www.epa.gov

- California is expected to remain the leader in U.S. jurisdictions in enforcing fuel economy standards

A Brief Preview of a Low-Carbon Economy

- Goldman Sachs predicts in a November 2015 report an accelerated growth in the "Low Carbon Economy" over the next ten years and identifies four markets likely to reshape existing global industries
  - Those markets are LED Light Bulbs, Solar PVs, Onshore Wind and Hybrid and Electric Vehicles
- A winning mix of policy support, technological improvement, scale, and cost advances are keys to success

Report here: http://www.goldmansachs.com/our-thinking/pages/new-energy-landscape-folder/report-the-low-carbon-economy/report.pdf

Addendum I: The Canadian GHG Policy Landscape

- The 3 largest provinces all have carbon pricing regulations and a 4th has a well-developed plan (QB and ON linked to WCI cap and trade, BC carbon tax and Alberta carbon levy)
- Prime Minister Trudeau announced on October 5th a federal carbon tax framework that requires each province to have "an equivalent" carbon pricing regime, or meet the federal carbon price.
- These mechanisms must be in place by 2018 with a minimum price per tonne of carbon emitted of Cdn $10 (US $7.60/tonne), rising to Cdn $50/ton by 2023
- Each of Canada's 10 provinces and 3 territories can choose its own method of carbon pricing (cap and trade, carbon tax, or hybrid) and apply, at their discretion, mechanisms to manage the competitiveness of their Energy Intensive, Trade Exposed (EITE) sectors.
- Provinces and territories can determine how they wish to use carbon pricing proceeds – revenue neutral approach, invest in clean technology, mass transit, etc. Any carbon tax levied by the federal government will be returned to the province in which it was levied.
- Coal generation (without CCS) will essentially be phased out in Canada by 2030. Alberta has just reached a compensation settlement with coal generators.
- The largest provinces have RFS and the federal government has announced its intention to implement a Clean Fuel Standard that will address the carbon intensity of transportation fuels, home heating, building and industrial fuels.