Getting to 2030 – the Challenge

- To hold global warming at 2° C., global annual GHG discharges must be cut by at least 8 GtCO2e year by 2025 and ~20 GtCO2e/year between now and 2030.
- If we assume that all nations comply with existing 2030 Nationally Determined Commitments (NDCs) under the Paris Agreement, we still need to cut or offset an additional ~15 billion TCO2e/year by 2030.

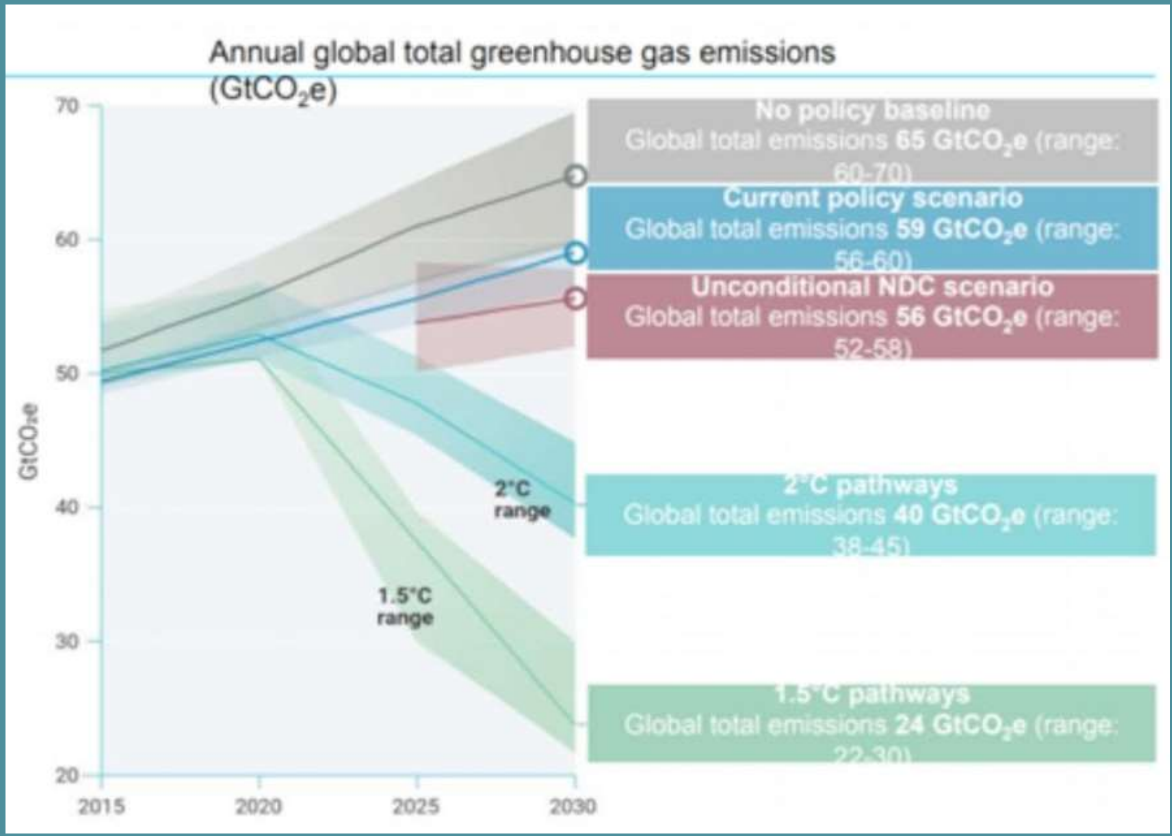


image source: **UNFCCC**, 2019

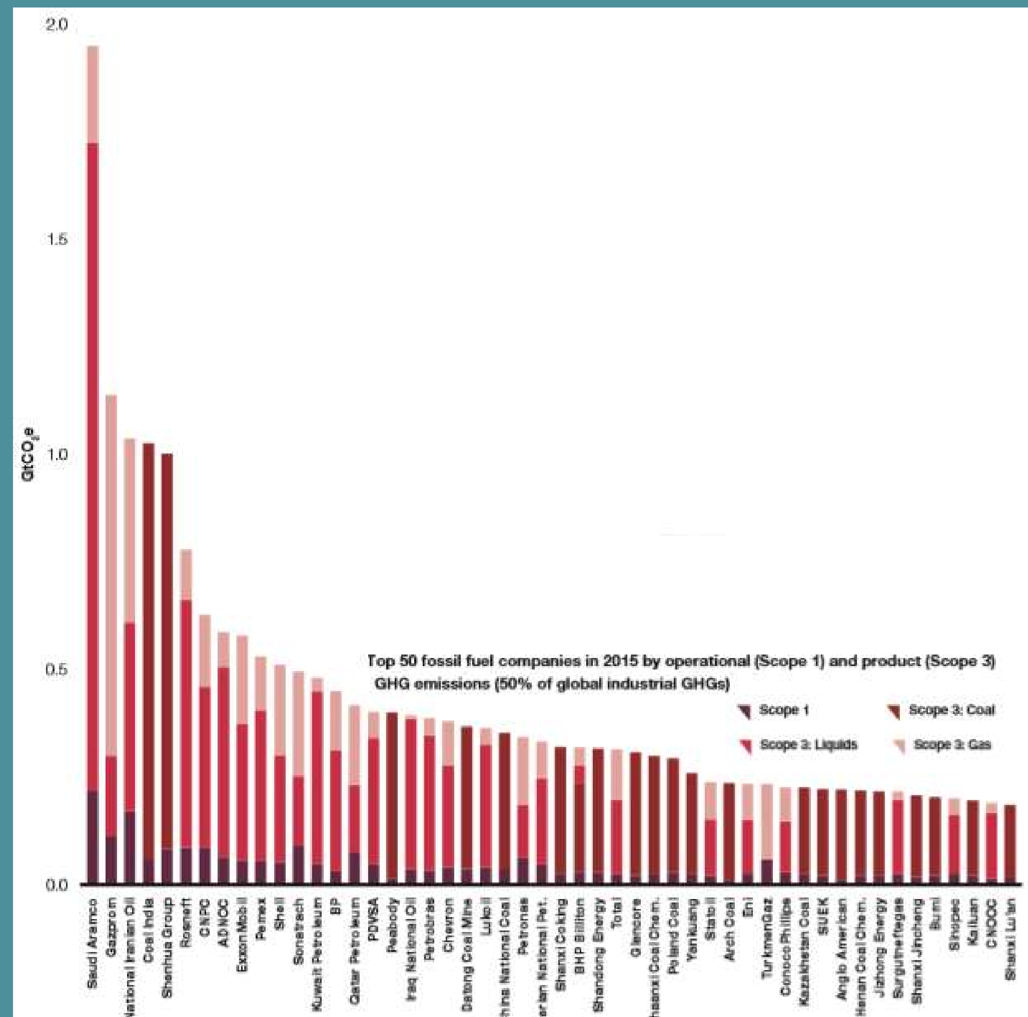
It Isn't Going to Happen

- According to the Carbon Disclosure Project, 244 corporations and the customers they supply account for ~55% of total (natural and man-made) annual global GHG discharges and 82% of all energy production, use and industrial process GHGs. In fact, ***only 50 companies (and their customers) accounted for >55% global energy and industrial GHGs released in 2015***.
- While many of the companies in this list have announced their intent to cut GHGs per unit of production by 2030, most of the "Top 50" – including but not limited to Equinor, Shell, BP – are still planning on absolute GHG discharge increases for the periods for which they have published any detailed GHG projections.

Find this report at:
https://www.cdp.net/en/articles/media/new-report-shows-just-100-companies-are-source-of-over-70-of-emissions

It Isn’t Going to Happen

- In order to achieve a ~15 GtCO2e reduction in annual GHG releases by 2030, *all* of the “Top 50” Carbon Majors would likely have to cut their total production and sales of fossil fuel-derived products and services by more than 50% over the next 10 years.
- Is that possible, let alone likely? ***This might depend, of course, on COVID-19!***



source: CDP, **Carbon Majors Report 2017**, **https://www.cdp.net/en/articles/media/new-report-shows-just-100-companies-are-source-of-over-70-of-emissions**

Who Are We Talking about?

- 244 companies & their customers account for 70% of anthropogenic GHG discharges.
- 28 state-owned and controlled entities account for 44% of the GHGs discharged by the “Top 244” and their customers.
- If these state-owned entities were to exploit only their reported proved and developed reported oil, gas and coal reserves—and write off reported proved but undeveloped reserves—they and their customers will release an additional ***~110 – 140 GtCO2e*** to the atmosphere by or before 2050.

	Scope 1		Scope 3		Scope 1+3	
	MtCO2e/year, as reported to the CDP project in 2017					
GHGs for Top 244 corporations in 2015	**2,965**	*9.7%*	**27,610**	*90.3%*	**30,575**	*100.0%*
of which...						
28 State-Owned Enterprises	**1,436**	*4.7%*	**12,039**	*39.4%*	**13,475**	*44.1%*
Saudi Aramco	215	*0.7%*	1,735	*5.7%*	1,950	*6.4%*
National Iranian Oil Co.	155	*0.5%*	870	*2.8%*	1,025	*3.4%*
Coal India	54	*0.2%*	971	*3.2%*	1,025	*3.4%*
Shenhua Group Corp Ltd	79	*0.3%*	922	*3.0%*	1,001	*3.3%*
China National Petroleum Corp	81	*0.3%*	544	*1.8%*	625	*2.0%*
Abu Dhabi National Oil Co.	91	*0.3%*	523	*1.7%*	614	*2.0%*
Petroleos Mexicanos	53	*0.2%*	477	*1.6%*	530	*1.7%*
Sonatrach	89	*0.3%*	404	*1.3%*	493	*1.6%*
Kuwait Petroleum Corp	43	*0.1%*	435	*1.4%*	478	*1.6%*
Qatar Petroleum Corp	73	*0.2%*	341	*1.1%*	414	*1.4%*
Petroleos de Venezuela	42	*0.1%*	366	*1.2%*	408	*1.3%*
Iraq National Oil Co	31	*0.1%*	360	*1.2%*	391	*1.3%*
Petroleo Brasileiro SA	27	*0.1%*	365	*1.2%*	392	*1.3%*
Datong Coal Mine Group	32	*0.1%*	333	*1.1%*	365	*1.2%*
China National Coal Group Co Ltd	30	*0.1%*	320	*1.0%*	350	*1.1%*
Petrolam Nasional Berhad	59	*0.2%*	281	*0.9%*	340	*1.1%*
Nigerian National Petroleum Corp	42	*0.1%*	287	*0.9%*	329	*1.1%*
Shanxi Coking Coal Group Co. Ltd	19	*0.1%*	298	*1.0%*	317	*1.0%*
Shandong Energy Group Co Ltd	24	*0.1%*	290	*0.9%*	314	*1.0%*
Shaanxi Coal Chemical Industry Group Co Ltd	23	*0.1%*	273	*0.9%*	296	*1.0%*
Poland Coal	25	*0.1%*	266	*0.9%*	291	*1.0%*
Yankuang Group CO Ltd	20	*0.1%*	236	*0.8%*	256	*0.8%*
Statoil ASA (now Equinor)	12	*0.0%*	219	*0.7%*	231	*0.8%*
TurkimenGaz	53	*0.2%*	177	*0.6%*	230	*0.8%*
Kazakhstan Coal	20	*0.1%*	203	*0.7%*	223	*0.7%*
Shanxi Jincheng Anthacite Coal Mining Group Ltd	13	*0.0%*	191	*0.6%*	204	*0.7%*
China Petrochemical Corp	23	*0.1%*	174	*0.6%*	197	*0.6%*
China National Offshore Oil Corp Ltd	8	*0.0%*	178	*0.6%*	186	*0.6%*

Who Are We Talking about?

- 22 publicly traded* or privately held entities account for 26% of the GHGs discharged by the "Top 244" and their customers.
- If these entities were to exploit only their proved and developed reported oil, gas and coal reserves—and write off their proved but undeveloped reserves—they and their customers will still release an additional ~***700 – 800 GtCO2e*** to the atmosphere by or before 2050.

** 8 of which are still largely under state control.*

	Scope 1		Scope 3		Scope 1+3	
	MtCO2e/year, as reported to the CDP project in 2017					
22 Publicly Traded or Privately Held	**638**	*2.1%*	**7,259**	*23.7%*	**7,897**	*25.8%*
Gazprom	108	*0.4%*	1,090	*3.6%*	1,198	*3.9%*
Rosneft OAO	83	*0.3%*	694	*2.3%*	777	*2.5%*
ExxonMobile Corp	54	*0.2%*	523	*1.7%*	577	*1.9%*
Royal Dutch Shell	48	*0.2%*	460	*1.5%*	508	*1.7%*
BP PLC	28	*0.1%*	420	*1.4%*	448	*1.5%*
Peabody Energy Corp	10	*0.0%*	387	*1.3%*	397	*1.3%*
Chevron Corp	36	*0.1%*	341	*1.1%*	377	*1.2%*
Glencore PLC	36	*0.1%*	287	*0.9%*	323	*1.1%*
Lukoil	3	*0.0%*	325	*1.1%*	328	*1.1%*
BHP Billiton Ltd	27	*0.1%*	290	*0.9%*	317	*1.0%*
Total SA	20	*0.1%*	293	*1.0%*	313	*1.0%*
Arch Coal Inc.	7	*0.0%*	225	*0.7%*	232	*0.8%*
Eni SPA	23	*0.1%*	208	*0.7%*	231	*0.8%*
ConocoPhilips	24	*0.1%*	199	*0.7%*	223	*0.7%*
SUEK Ltd	18	*0.1%*	200	*0.7%*	218	*0.7%*
Henan Coal Chemical Industry Group Co Ltd.	18	*0.1%*	197	*0.6%*	215	*0.7%*
Anglo American	5	*0.0%*	210	*0.7%*	215	*0.7%*
Jizhong Energy Group Co Ltd	19	*0.1%*	194	*0.6%*	213	*0.7%*
Surgutneftegas OAO	20	*0.1%*	193	*0.6%*	213	*0.7%*
Bumi Resources	18	*0.1%*	182	*0.6%*	200	*0.7%*
Kailuan Group Co Ltd	17	*0.1%*	175	*0.6%*	192	*0.6%*
Shanxi Lu'an Mining Group Ltd	16	*0.1%*	166	*0.5%*	182	*0.6%*

But…

According to the World Resources Institute:

"To have a medium chance of limiting warming to 1.5°C, the world can emit 770 gigatonnes of carbon dioxide (GtCO2). To have a likely chance (67 percent), the remaining budget drops to 570 GtCO2."

What Does an Aggressive "Top 50" Climate Change Action Plan Look Like—e.g. Equinor (Statoil)?

We expect around

15-20%

of our annual investments to be directed towards new energy solutions in 2030, assuming we can access and mature profitable projects.

From 2014 to 2018:

- Direct operating facility GHGs shrank by ~1MMTCO2e/yr, while
- GHGs discharged by consumers using their products grew by 26MM TCO2e/yr.

Indicators	Boundary	Unit	2018	2017	2016	2015	2014
Oil and gas production	OC	mmboe	1077	1099	1030	1073	997
Oil and gas production	Equity basis	mmboe	770	759	723	719	703
Renewable energy production	Equity basis	GWh	1251	830	423	475	536
Scope 1 GHG emissions	OC	million tonnes CO_2e	14.9	15.4	15.4	16.3	16.3
CO_2 emissions (Scope 1)	OC	million tonnes	14.4	14.9	14.8	15.4	15.3
CO_2 emissions (Scope 1)	Equity basis	million tonnes	11.6	12.0	12.7	12.3	12.4
Scope 3 GHG emissions	Equity basis	million tonnes CO_2e	314	310	296	295	288

In 2018 around

4%

of the USD 9.9 billion in organic investments was related to investments in new energy solutions.

- >50% of capital spending is still being allocated (in most current financial disclosure) to the exploration and development of fossil fuel supply
- <20% of capital spending is allocated to "new energy solutions" through 2030. 100% of investments in "new energy solutions" depend on continuing revenues from fossil fuel sales, which translate into growing "Scope 3" GHG emissions
- ***Since COVID-19, Big Oil has cut capital spending commitment, but not changed % of their capital budgets going to FF E&D.***

So 1.5° to 2° of Warming is Almost Inevitable

- Therefore, accelerating investment in activities and technologies that can remove heat-trapping gases from the atmosphere and retain the recovered carbon (C) in terrestrial reserves (e.g. soils, root systems, sustainable above-ground biomass stocks, mineral deposits, the built environment) is essential.
- ***Accelerated investment in the adoption of food & fibre production practices that coincidentally draw down and store recovered C, while improving soil health & resilience, and our capacity to produce food in the event of warming, should be our top priority.***

Where Can We Store More C in Ag Soils?

- Scientists estimate that soil organic carbon (SOC) stocks in croplands and grasslands are half of what they once were and can potentially be recovered to historical SOC stock levels at rates typically ranging from 0.4 to 2.5 TCO2e/cropland acre/year.
- That translates into **potential to draw a net ~10 to 25B* TCO2e/year from the atmosphere for ~30 years**.

** This net CO2 drawdown range is conservative and relies on many significant assumptions, including but not limited to natural C respiration rates, GHG discharges from equipment used in crop production, etc.*

Note that when 1 TCO2e is drawn out of the atmosphere, 0.272 tonnes of C might be added to terrestrial SOC stocks.

What is the US Incremental CO2 Drawdown and SOC Stock Growth Potential?

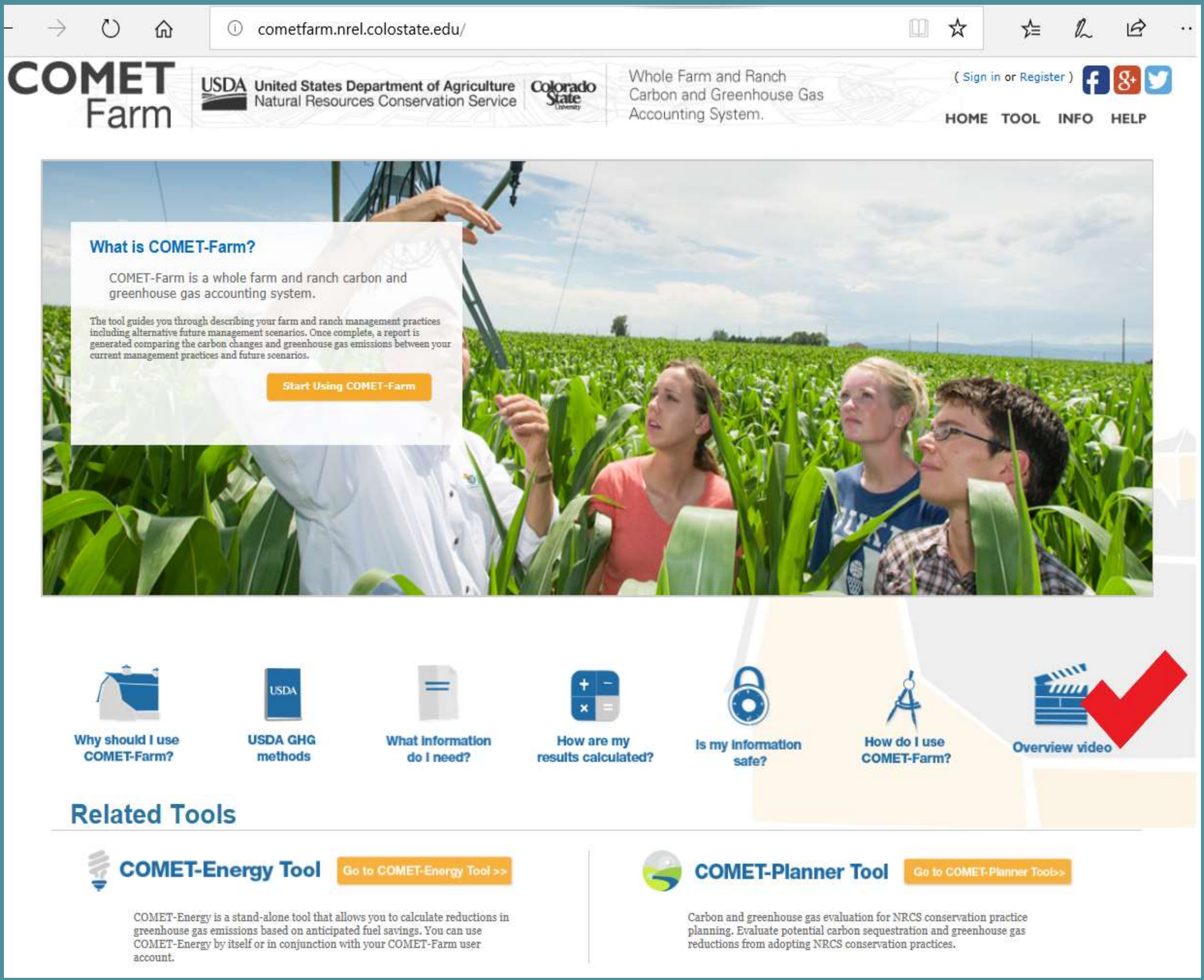
- US topsoils currently store ~54 petagrams (billion tonnes) of organic carbon (C). Scientific consensus is that the C stored in US croplands can be doubled (at least).
- Of the 886 million ha. of managed US lands, 162 million ha., or ~400 million acres, were deemed "croplands" in 2018 (source: US EPA).
- US croplands, therefore, (conservatively) have the theoretical potential to draw down from 180 to 390 $MMTCO_2e$/year, every year, for up to 94 years.
- When we combine croplands and managed grasslands, this range jumps to 400 to 700 $MMCO_2e$/year.
- For 100% of US managed lands, it is 530 to 1,580 $MMTCO_2e$/year

#	description	data source
400	total US cropland acres in 2018 (millions), not all of which are planted every year	US EPA, US GHG Inventory, Trends, page 2-19 https://www.epa.gov/sites/production/files/2020-02/documents/us-ghg-inventory-2020-main-text.pdf
48 to 105	teragrams (million tonnes), incremental SOC stock growth potential in US croplands (includes soil restoration), *per year*	Chambers, Lal & Paustian, doi:10.2489/jswc.71.3.68A, https://www.jswconline.org/content/jswc/71/3/68A.full.pdf
178 to 386	million TCO2-equivalent, total incremental CO2 drawdown potential of US croplands, *per year* (includes soil restoration)	Chambers, Lal & Paustian, doi:10.2489/jswc.71.3.68A, *ibid.*
528 to 1,584	million TCO2-equivalent, total incremental CO2 drawdown potential per acre of US cropland, grazing land, forest land and other land use combined, *per year.*	Chambers, Lal & Paustian, doi:10.2489/jswc.71.3.68A, *ibid.*

In a Rational Climate Change Policy/Regulatory Context, There Would Be Only 3 “credits”

- In the context of the rational, declining sales portfolio cap on global C content per mmBTU or Gj of delivered energy, there should be only 3 “alternative compliance” or “credit”-generating options available to the obligated parties:
  - ***Credit for drawing heat trapping gases from the atmosphere and storing the recovered C in terrestrial reserves, particularly but not limited to agricultural soils and root systems*.**
  - Credit for investments that reduce energy demand, increase transmission and electricity storage capacity.
  - Credit for private investment in public/mass transport options. ***(Does this one drop off the list if COVID-19 persists?)***

Working With COMET-Farm (CSU) to Establish Dynamic Project Baselines



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