



Analysis of 2019 Data on Greenhouse Gases from Oil, Gas, and Petrochemical Production

December 17, 2020

Greenhouse gas emissions from oil and gas drilling in the U.S. increased by 6 percent in 2019 over the previous year, and 34 percent over 2016 levels, according to the [latest data from the U.S. Environmental Protection Agency](#) analyzed by the nonprofit Environmental Integrity Project.¹ This increase mirrors record-breaking production rates in areas like the Permian Basin in West Texas and New Mexico, where flaring also reached record highs. Reported emissions from oil refineries declined slightly over this time period. Emissions from chemical manufacturers fell from 2018 to 2019 but grew 5 percent from 2016 to 2019.

In 2020, the rapid expansion of the oil, gas and petrochemical industries ran into problems with overproduction and an economic slowdown caused by the global coronavirus pandemic. Oil and gas production declined by approximately 10 percent compared to the previous year.² The U.S. Energy Information Administration (EIA) expects oil and gas production to continue slowing in the near-term, before rebounding by 23 percent above 2019 levels in 2026. Demand for natural gas liquids and the base chemicals that are turned into plastics and petrochemicals is also expected to increase.

The oil, gas, and chemical industries that rely on natural gas and petroleum as primary ingredients accounted for approximately 25 percent of emissions from stationary sources reported to EPA in 2019, and over 60 percent when emissions from electricity generation are excluded from consideration. Our analysis found that the 10 most polluting companies released over 249 million tons of greenhouse gases and were responsible for 32 percent of the nearly 800 million ton total reported to EPA by these three sectors. ExxonMobil – which reported emitting over 46 million tons of climate warming pollution – was responsible for 6 percent of the total reported by those industries in 2019. The 10 companies linked to the highest emissions of greenhouse gases are listed in Table B in Appendix A.

Public records reviewed by the Environmental Integrity Project (EIP) show that the oil, gas, and petrochemical industries could add over 235 million tons of greenhouse gases per year by 2026.³ That's more climate-warming pollution than from 54 new coal-fired power plants operating around the clock for a year.⁴ Actual and potential greenhouse gas emissions from the oil, gas, and petrochemical industries are presented in Table A on the following page.

We estimated potential emissions increases using EIP's [Emissions Increases Database](#), which tracks the largest projects that have obtained or have applied for Clean Air Act construction permits since 2012. Our analysis is based on a review of final or draft Clean Air Act construction permits or permit applications that have been issued or requested for new or expanding oil, gas, and petrochemical infrastructure projects. We include estimated emission increases from 203 future projects that were

not yet operating by the end of 2019, based on the amounts allowed under permits already issued or requested in applications still pending. A map of future emissions sources can be found in on page 3.

Emissions reflect projects' maximum potential to emit, once fully-constructed, as specified in permit documents or federal environmental impact statements. Our estimates include projects that are expected to begin operating between 2020 and 2026, and exclude potential additional emissions from new or expanding facilities that began partially operating by the end of 2019. Some projects may be delayed or canceled, or may operate at lower capacity, which would reduce the potential emission increases presented in Table A. Conversely, Table A does not account for actual or potential emissions from thousands of smaller sources not included in EPA's greenhouse gas inventory or EIP's permit database.

Oil and gas drilling is not covered by EIP's online Emissions Increase Database, because upstream production sources are subject to different permitting requirements. In this report, we estimated potential greenhouse gas emission increases from increased oil and gas drilling using the EIA's 2020 Annual Energy Outlook for natural gas production. We used annual production rate changes in the reference case scenario to scale emissions each year between 2019 and 2026 and ultimately project a net 15 percent increase in emissions by 2026. However, the EIA's Annual Energy Outlook was published in January, before the coronavirus pandemic began to wreak havoc on global energy markets, and these projections are subject to a significant degree of uncertainty.

The pandemic has already delayed several corporate final investment decisions, temporarily slowing the pace of some major construction projects. An October [report](#) published by EIP cautioned that at least 10 proposed liquefied natural gas (LNG) projects with the potential to emit 45.6 million tons of greenhouse gases a year have been significantly delayed and may not be built, given the economic uncertainty in the industry. The coronavirus pandemic has also hastened the shift to renewable fuels, like biodiesel, at several U.S. refineries. However, many new projects still have the green light from state and federal agencies to move forward, and many are still under construction.

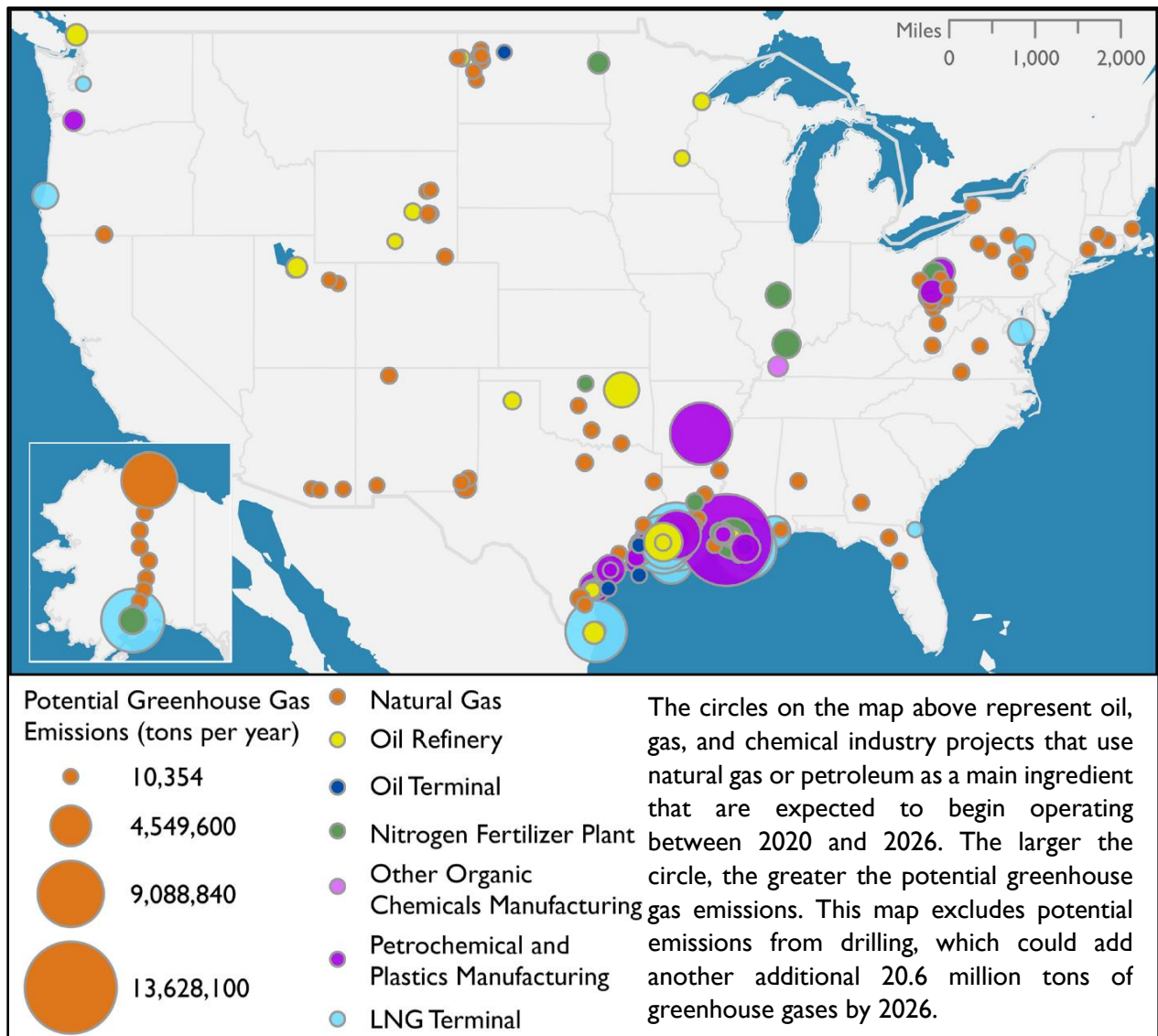
Table A: Actual and Potential Greenhouse Gas Emissions from the U.S. Oil, Gas, and Petrochemical Industries (million short tons per year)

Industry Sector	2016	2017	2018	2019	Potential Emissions Increases by 2026
Petroleum and Natural Gas Systems	307.8	314.8	348.7	375.9	509.6
Oil and gas drilling	102.6	112.7	128.9	137.1	157.7
Liquefied natural gas (LNG) ⁵	2.2	4.2	7.4	11.3	99.8
Other petroleum and natural gas systems	203.0	197.9	212.3	227.5	252.1
Refineries⁶	204.8	202.7	205.7	203.3	220.7
Chemical Manufacturing	193.9	198.5	209.2	203.0	287.3
Petrochemicals and plastics	76.5	75.6	80.1	81.6	145.7
Ammonia fertilizers	31.3	36.5	39.5	38.8	54.5
Other organic chemicals	86.2	86.4	89.7	82.7	87.2
TOTAL	706.6	715.9	763.6	782.1	1,017.6

Source: EIP, Emission Increase Database (published November 30, 2020); U.S. EPA, FLIGHT Tool (published November 4, 2020); U.S. EIA, Annual Energy Outlook 2020, Table 1. Note: Greenhouse gases are measured in carbon dioxide equivalents (CO₂e), expressed in short tons per year. The potential emissions increases presented in the last column reflect projects' maximum potential to emit, once fully-constructed, as specified in their New Source Review permits or federal environmental impact statements.

Figure A below shows locations and estimated emission increases from 203 future projects that were not yet operating by the end of 2019. While 164 of these projects have been issued final or draft Clean Air Act construction permits by state agencies, the rest have applications pending and have the potential to emit over 32 million tons of greenhouse gases per year. Our projections assume that all pending projects will be issued final construction permits and, once fully-constructed and operational, will operate at full capacity and emit the full amounts allowed under their permits.

Figure A: Potential Greenhouse Gas Emission Increases from the Oil, Gas, and Chemical Sectors, 2020-2026



Source: Environmental Integrity Project, Emissions Increases Database (published November 30, 2020)

Petroleum and Natural Gas Systems

Petroleum and natural gas systems include drilling operations as well as storage tanks and boosters and compressors that move gas through pipelines. This category also includes processing plants that separate gas from liquids, and large LNG plants that liquefy gas, primarily for export.

The oil and gas sector witnessed the largest year-to-year growth in reported greenhouse gas emissions, with an 8 percent increase from 2018 to 2019. That rise was led by LNG, which reported the highest year-to-year emissions increase (52 percent), followed by gathering pipelines that compress and transport oil and natural gas (14 percent) and natural gas transmission/compression sub-sectors (10 percent).

Companies have been issued or have requested construction permits for 82 projects that could add another 22.5 million tons of greenhouse gases (carbon dioxide-equivalent tons) to the natural gas sector's annual emissions footprint over the next five years. While 17 of these projects are currently under construction, the rest are in the planning or engineering phases and have the potential to emit 19.5 million tons of greenhouse gases per year – largely from the construction of greenfield compressor stations (8.4 million tons) and gas processing facilities (7.9 million tons).⁷

The LNG sector added almost 2.57 billion cubic feet per day of liquefaction capacity in 2019, when it reported releasing 3.8 million tons of greenhouse gases above 2018 levels. An additional 2.82 billion cubic feet per day of liquefaction capacity came online in 2020, including two production units at the Cameron and Freeport LNG terminals in Louisiana and Texas, and six units at the Elba LNG export terminal in Georgia, which became fully-operational earlier this year. These recently completed expansion projects have the potential to emit almost 6 million tons of greenhouse gases per year.

Companies have requested or received authorization to emit an additional 88.5 million tons of greenhouse gases per year from the construction of 19 new LNG terminals and six expansion projects at existing terminals. These estimates exclude potential emission increases from five LNG terminals that are still expanding but began partially operating by the end of 2019, including the three projects mentioned in the previous bullet point (see the methods section for more details). Excluding project-related emissions increases from LNG terminals that began partially-operating in 2019 lowers our projections by 14.3 million tons per year – more than the carbon output released by three coal-fired power plants.

An October report by EIP, "[Troubled Waters for LNG](#)," found that six proposed LNG projects that regulators have approved for construction were postponed by at least one year, as a result of oversupply and record-breaking declines in global LNG demand and natural gas prices spurred by the coronavirus pandemic. On top of these six projects are another four that were significantly delayed before the March 2020 outbreak of the coronavirus.

EIP's report highlighted investment delays affecting the Rio Grande LNG terminal proposed for Cameron County, TX. The company behind the project delayed making a final investment decision by as long as two years. Most recently, a \$7 billion import contract signed by France's Energie was scrapped due to concerns over greenhouse gas emissions associated with Permian shale.⁸ The decision was at least partially motivated by the European Commission's newly proposed Methane Strategy, indicating that a major trade partner may reconsider future deals because of growing environmental concerns.

Hydrocarbon Processing estimates that more than two dozen LNG projects were cancelled or postponed as a result of COVID-19 globally, and that final investment decisions for proposed U.S. LNG projects won't be made before 2022.⁹

Refineries

Facilities reporting to the refineries sector manufacture products such as transportation fuels (gasoline, diesel, and jet fuel), naphtha, kerosene, distillate fuel oils, residual fuel oils, lubricants, and asphalt. Refinery emissions were largely unchanged over the past three years, with a reported 204.8 million tons of greenhouse gases in 2016 versus 203.3 million tons in 2019.

Permits for 33 new refinery projects that are not yet fully operational could add another 21.2 million tons of greenhouse gases from this sector. However, travel restrictions imposed by global coronavirus lockdowns have significantly impacted demand for transportation fuels, like gasoline and jet fuel. U.S. crude inventories reached all-time highs in July 2020 and remain well above weekly averages reported in 2019.¹⁰ The U.S. EIA revised their December 2020 global oil demand forecast to reflect a 10.2 million barrel per day drop in global liquid fuels consumption compared with estimates published in December 2019 – and a downward revision of 200,000 barrels per day compared with last month's forecast.¹¹

Unfavorable economics and uncertainty surrounding fuel demand recovery have forced companies to permanently retire 1.7 million barrels per day of global refining capacity.¹² The International Energy Agency estimates that the majority of those shutdowns will occur in the United States, either through retirement or conversion to bio-refining. Notable closures include Shell's Convent Refinery in Louisiana, Marathon's refineries in Gallup, New Mexico and Martinez, California, and the Phillips 66 refinery in Santa Maria, California.¹³ The permanent shutdown of these four refineries will reduce the sector's reported emissions by nearly 5 million tons of greenhouse gases in 2021.

The pandemic is also driving a shift towards biofuels production, which the incoming Biden administration could accelerate through strengthened fuel economy standards and blending mandates. Several refinery conversions are already underway, like at Marathon Petroleum's Dickinson Refinery in Stark County, ND. According to permit documents, repurposing equipment and retrofitting the existing refinery to handle renewable fuels would increase net annual greenhouse gas emissions by 372 thousand tons.¹⁴ New renewable diesel plants have recently been announced in Louisiana and Illinois.¹⁵

Chemical Manufacturing

The chemical manufacturing sector includes plants that rely on oil, gas, or natural gas liquids as feedstock to manufacture petrochemicals, plastic resins, adhesives, rubber products, fertilizers, and industrial gases like hydrogen. Reported greenhouse gas emissions from chemicals manufacturers rose by 9.1 million tons between 2016 and 2019, largely as a result of increased petrochemicals and plastics production. The petrochemicals sector released an additional 5.1 million tons of greenhouse gases above 2016 levels in 2019, and was the only sub-segment to report an annual rise in emissions last year.

According to the American Chemistry Council, the global economic recession ushered in by COVID-19 slowed industrial production by 10.5 percent and chemicals production by 9.3 percent in 2020.

Plastics production was more resilient to the economic shock, declining by only 5.6 percent, due to increased demand for personal protective equipment during the pandemic. Although the pace of recovery is uncertain, the chemicals industry is expected to rebound in 2021. Basic chemicals production – which includes bulk petrochemicals, plastic resins, and synthetic rubbers – is expected to grow by over 14 percent.¹⁶

Despite a brief slow-down in 2020, global plastics production is expected to double by mid-century.¹⁷ Permits issued to or requested for 27 major petrochemical and plastics projects that are still under construction or the planning stage would authorize over 63 million tons of greenhouse gas emissions per year.¹⁸

While emissions from fertilizer manufacturing took a 2 percent dip in the last reporting year, companies have requested permits but have yet to break ground on 8 new fertilizer plants that could emit 15.6 million tons of greenhouse gases per year by 2026.

Appendix A: Methods and Data Sources

EPA Greenhouse Gas Reporting Program:

For this analysis, we only considered source categories that process natural gas or natural gas liquids, or that use oil or natural gas as a primary feedstock for the manufacture of fuel or chemical products. This narrowed our selection to include Refineries and Petroleum and Natural Gas Systems, and six of the 11 chemical subsectors (petrochemicals, ammonia and nitric acid, adipic acid, hydrogen and other chemicals). We converted “actual” reported emissions from metric to short tons. We also included select facilities that reported under “other manufacturing” or “other-other” categories, as defined by the EPA. For more information on our methodology, please refer to our January 8, 2020 report, “[Greenhouse Gases from Oil, Gas, and Petrochemical Production](#).”

Facility IDs were matched with parent companies and North American Industry Classification System (NAICS) codes provided in the EPA’s [reported parent companies](#) dataset (published October 2020). NAICS descriptions were pulled in from the US census (2017-12 concordances [download](#)). EPA’s FLIGHT (Facility Level Information on GreenHouse gases) tool was then used to identify sources that reported to the ‘other petroleum and natural gas systems,’ ‘other chemicals,’ ‘other manufacturing,’ and ‘other-other’ sub-sectors in 2019 to better reflect greenhouse gas emissions associated with the production of these energy-intensive industries:

1. **Petroleum and Natural Gas Systems:** Six facilities reporting as ‘other-others’ were moved to the ‘other petroleum and natural gas systems’ sub-sector if they performed business operations associated with NAICS codes: 221210 (Natural Gas Distribution) or 493190 (Bulk Petroleum and Other Warehousing and Storage); 2 facilities were moved to the ‘liquefied natural gas storage’ sub-segment; and one facility was moved to ‘natural gas processing.’
2. **Refineries:** Reported emissions from four power plants associated with NAICS code 324110 (Petroleum Refineries) were moved to the refineries sector.
3. **Chemical Manufacturing:** Emissions reported by 92 facilities were added to petrochemical production. Included were facilities that reported to the ‘other manufacturing’ segment and performed business operations associated with NAICS codes: 325211 (Plastics Material and Resin Manufacturing), 325212 (Synthetic Rubber Manufacturing), 325222 (Artificial and

Synthetic Fibers and Filaments Manufacturing), 326113 (Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing), 326121 (Unlaminated Plastics Profile Shape Manufacturing), and 326211 (Tire Manufacturing). Emissions from one power plant associated with NAICS code 325211 (SABIC Innovative Plastics – Burkville in Lowndes County, AL) were also moved to petrochemical production.

Every facility reporting to EPA is required to list their highest-level U.S. parent company. We used percent ownership as a weight to approximate each parent company’s relative contribution to total facility-wide emissions reported to EPA in 2019. The 10 companies linked to the highest emissions of greenhouse gases are listed in Table B below.

While EPA’s reported parent companies dataset provides a good starting point for understanding the role that individual companies play in industry pollution, self-reported data are rarely free of errors. Spelling mistakes and minor variations in company names influenced how emissions totals were distributed and, in some cases, facility-wide emissions were underestimated if the weights applied did not sum to 100 percent.

Many large energy companies own subsidiaries and are often involved in limited partnerships with multiple public and private entities. These complex ownership structures change over time and make it difficult for the public to understand how large corporations contribute to the climate crisis. For example, Marathon Petroleum reported emissions under two company names in 2019 (Marathon Petroleum Corp and Marathon Oil Corp) and under a third company name (Marathon Petroleum Co LP) in earlier reporting years. While these are clearly the same company, they are distinct legal entities that reported emissions to EPA under three unique parent company names. These inconsistencies make it difficult to calculate company-wide emissions totals over multiple reporting years.

Table B: Top 10 Companies in the Oil, Gas, and Petrochemical Sectors Reporting the Highest Greenhouse Gas Emissions in 2019

Parent Company Name	No. Facilities	Total Reported Emissions (tons CO ₂ e)	Percent of Sector Total
Exxon Mobil Corp	87	46,803,220	6.0%
Marathon Petroleum Corp	25	34,932,321	4.5%
Phillips 66	34	27,481,954	3.5%
Chevron Corp	45	23,567,526	3.0%
Valero Energy Corp	14	23,514,887	3.0%
CF Industries Holdings Inc	5	22,119,546	2.8%
Energy Transfer LP	138	18,692,546	2.4%
BP America Inc	35	18,549,521	2.4%
Shell Petroleum Inc	35	18,531,075	2.4%
Koch Industries Inc	15	15,214,011	1.9%
	433	249,406,605	31.9

The column on the right shows each company’s share of greenhouse gas emissions reported to EPA by the petroleum and natural gas systems, refining, and chemical manufacturing sectors in 2019. Source: U.S. EPA, Reported Parent Companies, 2019 dataset (October 10, 2020). Company names appear as recorded by EPA. Greenhouse gases are measured in carbon dioxide equivalents (CO₂e), expressed in short tons per year.

Likewise, U.S. subsidiaries or limited partnerships that are created specifically to develop large infrastructure projects are considered distinct entities in the EPA reporting parent companies dataset. For example, LNG Freeport Development LP is listed as the highest-level parent company associated with the Freeport LNG Import Terminal, although it is being developed by Cheniere Energy Partners. Requiring more transparency in reporting and cooperating with government agencies like the U.S. Securities and Exchange Commission could help provide a truer picture of company-reported emissions.

EIP Emissions Increases Database

The data used to project future emissions increases is current as of November 30, 2020. All facilities that began fully-operating in or before 2019 were removed from the dataset, as well as minor permits that are exempt from greenhouse gas reporting requirements. For projects where operational status could not be determined, as well as projects that are currently on hold, it was assumed that these 'unknown' projects would move forward by 2026.

To remain consistent with the methodology used in EIP's January report, future emissions totals exclude sources that began partially operating in or before 2019. When accounting for emissions from phased projects that are expected to begin operating after 2019, it was assumed that emissions totals would only be realized once the project is fully-operational and total project-related emission increases were assigned to the last in-service date. When accounting for emissions from phased projects that have been issued multiple modification permits, emissions increases (when not explicitly provided in the permit) represent the difference between the two most recent permits authorizing construction.

Our estimates of potential greenhouse gas emissions increases from the chemicals sector are based on the following facility-type definitions:

- The petrochemicals and plastics sub-sector includes: ethylene, polyethylene, propylene, and methanol plants, as well as large industrial complexes that produce a variety of intermediate plastics products (e.g. the GCGV and FG LA). This category also includes emissions from 1 industrial gas plant (Praxair Clear Lake, hydrogen-carbon monoxide plant), 1 proposed power plant (Corpus Christi Polymers, M&G Utilities Plant (Project Jumbo), 1 gas-to-liquids plant (Energy Security Partners in Jefferson, AR), and 1 petrochemical storage facility (Mt. Airy Terminal in St. John the Baptist Parish, LA).
- The other organic chemicals sub-sector includes plants that produce: butadiene and other light olefin products, ethylbenzene and styrene, polyethylene terephthalate (PET) and terephthalic acid (PTA), adiponitrile, propylene oxide (PO) and tertiary butyl alcohol (TBA), vinyl chloride monomer, and monoethylene glycol (MEG). Also included were emissions from one herbicide plant, the Bayer/Monsanto Dicamba manufacturing facility in LA.

Notes and References

¹ U.S. Environmental Protection Agency. Facility Level Information on GreenHouse gases Tool (FLIGHT). November 4, 2020. Available at: <http://ghgdata.epa.gov/ghgp/main.do>. Reported emissions include all facility-level activity data and emissions calculations submitted before September 26, 2020.

² Energy Information Administration. Annual Energy Outlook 2020. Table 1: Total Energy Supply, Disposition, and Price Summary. Accessed December 8, 2020. Available at: https://www.eia.gov/outlooks/aeo/tables_ref.php

³ EIP's [Emissions Increases Database](#) tracks the largest projects to build or expand capacity at pipeline compressor stations, gas processing plants, natural gas liquids fractionators, LNG terminals, petroleum refineries, petrochemical plants, fertilizer manufacturing plants, industrial gas plants, and crude oil export terminals. Our analysis is based on a review of draft and final Clean Air Act construction permits and permit applications issued or requested between January 1, 2012 and November 30, 2020.

⁴ Assuming a baseload coal-fired power plant emits 4.35 million tons of greenhouse gases per year. For emissions factors, see: <https://www.eia.gov/tools/faqs/faq.php?id=74&t=11>

⁵ The following were excluded from the totals presented in Table A on page 1:

- Corpus Christi LNG Trains 1-3 were authorized under permit no. GHGPSDTX123. Although Train 3 is not expected to enter service until 2021, total project-related emissions were excluded because Trains 1 and 2 began operating in 2018/9.
- Cameron LNG Trains 1-3 were authorized by PSD-LA-766. Because T1 began operating in 2019, total project-related emissions increases from all three trains have been excluded from our projections.
- Freeport LNG Trains 1-3 were authorized by TCEQ permit no.100114. Although Trains 2-3 began operating in 2020, total project-related emissions increases from the expansion of Freeport LNG were excluded because Train 1 entered service in 2019.
- Trains 5-6 at the Sabine Pass LNG terminal were authorized by PSD-LA-703(M5). Because Train 5 began operating in 2019, emissions from the construction of both trains were excluded. Since Trains 1-4 began operating before 2020, project-related emissions increases from the expansion of Sabine Pass are not captured by our projections.
- Two trains at the Ebla LNG terminal were completed in 2019. Although the remaining units entered service in 2020, we exclude total project-related emissions increases from the expansion of this terminal.

⁶ Permanent shutdowns at four U.S. refineries were recently announced (Shell's Convent Refinery, Marathon Gallup and Martinez Refineries, and Phillips 66 Santa Maria Refinery). Our 2026 projections exclude emissions reported by these four facilities in 2019 (4.94 million tons of carbon dioxide-equivalents), in order to provide the most conservative estimate of potential increases.

⁷ This also includes 17 "minor" projects, including one LNG storage facility that was re-categorized for consistency with the GHGRP's definition of "petroleum and natural gas systems," which classifies LNG storage facilities as "other petroleum and natural gas systems."

⁸ Chathurika Gamage and Georges Tijbosch. (October 28, 2020). "French Government Puts US Gas Imports on Ice." *Rocky Mountain Institute*. Accessed December 9, 2020. Available at: <https://rmi.org/french-government-puts-us-gas-imports-on-ice/>

⁹ Hydrocarbon Processing. (December 4, 2020). HPI Outlook 2021: What Does 2021 Hold for the Downstream HPI? Webinar.

¹⁰ U.S. Energy Information Administration. *U.S. Stocks of Crude Oil and Petroleum Products*. Accessed December 9, 2020. Available at: <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WTTSTUS1&f=W>

¹¹ U.S. Energy Information Administration. *Short-Term Energy Outlook*. Published: December 8, 2020; November 10, 2020; and December 10, 2019. Accessed December 9, 2020. Available at: <https://www.eia.gov/outlooks/steo/outlook.php>

¹² International Energy Agency. (November 2020). Oil Market Report – November 2020. Available at: <https://www.iea.org/reports/oil-market-report-november-2020>

¹³ Elza Turner and Janet McGurthy. (November 12, 2020). "REFINERY NEWS ROUNDUP: Refinery closures loom across the globe." *S&P Global Platts*. Available at: <https://www.spglobal.com/platts/en/market-insights/latest-news/oil/111220-refinery-news-roundup-refinery-closures-loom-across-the-globe#:~:text=According%20to%20the%20International%20Energy,economics%2C%22%20the%20agency%20said.>

¹⁴ Permit No. PTC18016, Amendment No. 2 (issued October 30, 2020). As a standalone project, the Renewable Diesel Project at the Dickinson Refinery could emit over 441 thousand tons of greenhouse gases per year. However, these totals

do not include emissions reduction from equipment that will be permanently shut down as part of the conversion. Our estimates for net annual change in emissions are the difference between the petroleum refinery's facility-wide potential to emit, and facility's estimated potential to emit after completion of the Renewable Diesel Project.

¹⁵ St. Joseph Renewable Fuels, LLC announced plans to build a \$400 million renewable diesel plant in Jasper County, Illinois in May (see: <https://www.renewableenergymagazine.com/biofuels/400-million-renewable-biodiesel-plant-to-20200521>). In October, Renewable Energy Group, Inc. announced plans for a major capacity expansion at the Geismar, Louisiana bio-refinery (see: <https://www.businesswire.com/news/home/20201006005425/en/Renewable-Energy-Group-Announces-Planned-Expansion-of-Geismar-Renewable-Diesel-Plant-to-340-Million-Gallons-per-Year>). Their announcement was followed by Gron Fuels LLC, which submitted an initial minor source permit application to construct a greenfield renewable fuels plant in West Baton Rouge Parish in November (see: <https://edms.deq.louisiana.gov/app/doc/view.aspx?doc=12449942&ob=yes&child=yes>). Both projects proposed for Louisiana are expected to begin operating in 2023.

¹⁶ American Chemistry Council. (June 2020). *Mid-Year 2020 Situation & Outlook*. Accessed December 9, 2020. Available at: <https://www.americanchemistry.com/Media/PressReleasesTranscripts/ACC-news-releases/Mid-Year-2020-Chemical-Industry-Situation-and-Outlook.html#:~:text=Global%20industrial%20production%20will%20contract,rise%204.6%20percent%20in%202021>.

¹⁷ Hydrocarbon Processing. (December 4, 2020). HPI Outlook 2021: What Does 2021 Hold for the Downstream HPI? Webinar.

¹⁸ Total project-related emission (13.6 MtCO₂e) for the FG LA petrochemical complex were included in 2024, although the facility will only become fully-operational in 2029.