Attachment 3

Declaration of Dr. Renee McVay, Hillary Hull, and Kate Roberts, Environmental Defense Fund and attachments

DECLARATION OF DR. RENEE McVAY, HILLARY HULL AND KATHERINE ROBERTS

We, Dr. Renee McVay, Hillary Hull, and Katherine Roberts declare as follows:

1. I, Dr. Renee McVay, am a Senior Research Analyst in the Energy program at the Environmental Defense Fund ("EDF"). I earned my PhD in Chemical Engineering from the California Institute of Technology, where my research focused on atmospheric chemistry and the formation of atmospheric aerosols. I also have an MS in Chemical Engineering from the California Institute of Technology and a BS in Chemical Engineering from Texas A&M University. After my PhD, I completed a postdoctoral fellowship at the National Oceanic and Atmospheric Administration working with the regional air quality model WRF-Chem to improve performance and predictions of the model. At EDF, my work focuses on using emission inventories to develop state and region-specific emission profiles from the oil and gas sector. My curriculum vitae is attached as Attachment 1.

2. I, Hillary Hull, am a Senior Research and Analytics Manager for the Energy program at EDF. I have an MS from Stanford University in environmental engineering (Atmosphere & Energy Program) and a BS from the University of Texas at Austin in civil engineering. In my role at EDF, I develop analytics in support of EDF's state, federal, and international natural gas work. My work includes emissions inventory compilation, data and economic analytics, technical support for

rulemaking and regulation, and policy analysis and development. My curriculum vitae is attached as Attachment 2.

3. I, Katherine Roberts, am a Research Analyst in the Energy Program at EDF. I have an MS in Civil and Environmental Engineering from Stanford University and a BS in Earth Systems from Stanford University. At EDF, my work focuses on analyzing emission inventories, regulatory proposals, economic data, and nationwide demographic data. My curriculum vitae is attached as Attachment 3.

4. We are aware that in 2016, the Environmental Protection Agency ("EPA") promulgated standards to reduce methane emissions at new and modified facilities in the oil and gas sector, *Oil and Natural Gas Sector Emission Standards for New, Reconstructed and Modified Sources*, 81 Fed. Reg. 35,824 (June 3, 2016) ("New Source Rule"). The standards reduced methane emissions by requiring regular leak detection and repair ("LDAR") and equipment upgrades at covered facilities in oil and natural gas production, processing, and transmission and storage segments. The New Source Rule had been fully in effect and securing reductions in methane at new and modified facilities for over four years. In addition, we understand that the promulgation of the New Source Rule triggered a legal obligation under Section 111(d) of the Clean Air Act, 42 U.S.C. § 7411(d), for EPA to issue emissions guidelines ("Methane Guidelines") for existing sources (sources that

predate the proposal of the New Source Rule in September 2015), but that EPA never issued such guidelines.

5. We are aware that in September 2020 EPA finalized a rule which rescinded key elements of the New Source Rule. *Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review*, 85 Fed. Reg. 57,018 (Sept. 14, 2020) ("Rescission Rule"). This action removed the transmission and storage segment from the source category regulated by EPA, such that the performance standards to control emissions of methane and volatile organic compounds ("VOCs") no longer apply to those sources, and removed the performance standards related to methane emissions for covered facilities in the oil and natural gas production and processing segments.

6. In doing so, EPA also found that it had removed its legal obligation to regulate emissions of methane from existing sources in these segments. As described below, EPA's failure to promulgate Methane Guidelines will allow substantial emissions of methane, VOCs, and HAP to continue, that could otherwise have been remediated. Methane is a powerful short-term climate forcer with over 80 times the global warming potential of carbon dioxide on a mass basis over the first 20 years after it is emitted. VOCs react with nitrogen oxides to form ground-level ozone, or smog, which can cause respiratory disease and premature death. Other hazardous air

pollutants emitted by oil and gas sources include benzene, a known human carcinogen.

7. In the Regulatory Impact Analysis ("RIA") for the Rescission Rule, EPA acknowledges that the rule will increase emissions of methane, VOCs, and hazardous air pollutants ("HAPs"). According to EPA, the Rescission Rule is "projected to forgo methane emission reductions of 22,000 short tons in 2021 and 58,000 short tons in 2030 and a total of 400,000 short tons from 2021 to 2030."[1] EPA also projects the Rule will increase VOC emission reductions by 610 short tons in 2021 and 1,600 short tons in 2030 and a total of 11,000 short tons from 2021 to 2030. Similarly, the agency projects the Rule will increase HAP emissions by 18 short tons in 2021 and 48 short tons in 2030 and a total of 330 short tons from 2021 to 2030.[2] EPA's analysis is solely for emissions associated with the Rule's impact on "potential new, reconstructed, and modified sources," as EPA deems analysis of the "potential impacts of removing the requirement to regulate existing sources under 111(d)… outside the scope of this RIA."[3] Table 1 summarizes EPA's own estimates of the impacts the Rescission Rule will have.

[1] Environmental Protection Agency, *Regulatory Impact Analysis for the Review and Reconsideration of the Oil and Natural Gas Sector Emission Standards for New, Reconstructed, and Modified Sources*, (Aug. 2020) ("RIA"), at 2-10.
[2] *Id.*
[3] RIA at 2-6.

Table 1: EPA Estimated Forgone Emissions Reductions at Affected New Transmission & Storage Sources (in metric tons)

Year	Methane (metric tons)	VOC (metric tons)	HAP (metric tons)
2021	20,000	550	16
2022	24,000	650	19
2023	27,000	750	23
2024	31,000	850	25
2025	34,000	910	28
2026	38,000	1,100	31
2027	42,000	1,200	34
2028	44,000	1,300	37
2029	48,000	1,400	40
2030	53,000	1,500	44
Total 2021-2030	363,000	10,000	300

8. While EPA acknowledges additional emissions will occur as a result of the Rescission Rule, the agency's estimates ignore and understate some of the key ways in which the Rescission Rule will increase emissions. Accordingly, we performed an analysis to more fully characterize sources that would be affected by the Rescission Rule along with emissions from these sources, in order to document the harm to the public from increasing emissions from transmission and storage facilities and the forgone reductions in emissions from existing oil and natural gas facilities.

9. Section I describes our analysis of the increases in emissions of methane, VOCs, and HAPs from transmission and storage facilities as a result of the Rescission Rule, including our methodology for identifying such sources, our

analysis of the emissions that the Rescission Rule will immediately allow from deregulated new and modified transmission and storage sources, and our analysis of emissions from existing sources in the transmission and storage segment that will be allowed to continue to emit unabated due to EPA's failure to adopt Methane Guidelines for these sources. Section II evaluates the limited set of compliance reports available in EPA's WebFIRE database for affected transmission and storage sources to specifically describe where some of these new, deregulated facilities are located, including facilities located in areas presently out of attainment with national, health-based standards for ozone.

10. Section III presents our methodology for identifying active, existing sources in the production, processing, and transmission and storage segments which will not be subject to Methane Guidelines as a result of EPA's removal of methane requirements in the Rescission Rule, and presents a map of the affected wells in the production segment. Section III also utilizes EDF's Methane Policy Analyzer model to characterize total emissions that have occurred at existing sources since the New Source Rule was promulgated in 2016, and quantifies the emissions that will result from an additional delay of existing source guidelines of 12 months due to the Rescission Rule, absent a stay. Section IV focuses on the local air quality impacts of failing to issue Methane Guidelines for existing sources due to the Rescission Rule.

SECTION I: EPA's Rescission Rule Increases Emissions from Transmission and Storage Facilities

11. EDF conducted an independent analysis of emissions increases associated with the rescission of standards for transmission and storage sources. To conduct this analysis, we utilized our EDF Methane Policy Analyzer model. Our model uses a baseline emissions inventory developed for 2015 and 2017 based on a combination of EPA Greenhouse Gas Reporting Program data and previously published measurement studies, as reported in Alvarez et al 2018[4] for the alternative inventory (section S1.4). To estimate emissions from transmission and storage ("T&S") sources, Alvarez et al 2018 uses EPA's 2017 GHG Inventory ("GHGI") T&S estimate of 1.349 million metric tons ("MMT") of methane, which includes 1.060 MMT for T&S station emissions. EPA calculated T&S emissions in the 2017 GHGI by adjusting an estimate of 2012 T&S station emissions found in Zimmerle et al[5] to reflect the 2015 T&S station count, but EPA excluded uncategorized/super-emitter emissions included in Zimmerle et al. Alvarez et al. increased the GHGI estimate by 200 metric tons ("MT") per station per year (or 437,000 MT per year total nationwide) to account for uncategorized/super-emitter emissions that are

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[4] Alvarez et al., *Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain*, 361 SCIENCE, 186–188 (2018).

[5] Zimmerle et al., *Methane Emissions from the Natural Gas Transmission and Storage System in the United States* Environmental Science & Technology 2015 49 (15), 9374-9383.

estimated in Zimmerle et al., but were excluded from the 2017 GHGI, for a total T&S emissions estimate of 1.786 MMT per year.

12. The Methane Policy Analyzer then projects emissions forward in time based on the U.S. Energy Information Administration's Annual Outlook projections for aggregate trends in natural gas production. We believe this is a reasonable methodology for estimating future transmission and storage sector emissions. As additional natural gas is produced, additional capacity (i.e. development of new facilities and modification of older facilities) will be needed to transmit and store the additional gas before it is distributed to end users. A similar approach based on estimated future aggregate production has also been utilized by the Clean Air Task Force in modeling oil and gas sector emissions and potential reductions.[6] Similarly, EPA relied on projected gas consumption as a driver for estimating future emissions in the transmission, storage and distribution sector in the agency's recent report on non-CO2 greenhouse gas mitigation opportunities.[7]

13. In 2019, we estimate that the transmission and storage sector released approximately 1.8 million metric tons of methane, 50,000 tons VOCs, and 1,400

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[6] Clean Air Task Force, Reducing Methane from Oil and Gas: A Path to a 65% Reduction in Sector Emissions (Apr. 2020), https://www.catf.us/resource/reducing-methane-from-oil-and-gas/.

[7] EPA, Global Non-CO2 Greenhouse Gas Emission Projections & Marginal Abatement Cost Analysis: Methodology Documentation at 5-13 (Sept. 2019); https://www.epa.gov/sites/production/files/2019-09/documents/nonco2_methodology_report.pdf.

tons HAPs. We relied on the EPA ratios of methane to VOC and methane to HAPs to calculate those quantities (i.e., methane:VOC of 36.1:1 and methane:HAPs of 1,250:1). We analyzed increased emissions of methane, VOCs, and HAPs from new, modified and existing transmission and storage facilities as a result of the Rescission Rule over the next 10 years (2021-2030), similar to the approach EPA took in its RIA. Because of the Rescission Rule's removal of performance standards for new/modified T&S facilities, emissions at these new and modified T&S facilities will increase by an average of 368,000 metric tons of methane each year; an average of 10,000 metric tons of VOCs each year; and an average of 300 metric tons of HAPs each year. The Rescission Rule will also allow existing T&S sources to continue to emit an average of 640,000 metric tons of methane each year; an average 18,000 metric tons of VOCs each year; and an average 500 metric tons of HAPs each year that could be abated with Methane Guidelines that mirrored requirements in the New Source Rule. In total from new/modified and existing T&S sources, the Rescission Rule will allow emissions of an average 1 million tons of methane each year over the next ten years; an average of 28,000 tons of VOCs each year; and an average 800 tons of HAPs each year that could otherwise be abated. In the next five years, the Rescission Rule will result in 4.9 million tons of methane, 140,000 tons of VOCs, and 3,900 tons of HAPs emissions from new, modified and existing transmission and storage facilities that could otherwise be prevented.[8] Tables 2-4 summarize the emissions from affected new, modified and existing transmission and storage sources, as well as the potential reductions that would result from continued regulation of the transmission and storage sector and future regulation of existing sources.

Table 2: Estimated Emissions at Affected New/Modified Transmission & Storage Sources and Potential Reductions

	Total Transmission and Storage Sector Emissions from New Affected Sources [metric tons]			Foregone Emissions Reductions from Transmission & Storage [metric tons]		
Time Period	CH4	VOC	HAPs	CH4	VOCs	HAPs
2021	634,778	17,583	508	290,387	8,044	232
2022	671,339	18,596	537	307,312	8,513	246
2023	701,657	19,436	561	320,294	8,872	256
2024	743,334	20,590	595	338,347	9,372	271
2025	805,804	22,321	645	365,081	10,113	292
Total 2021-2025	**3,556,912**	**98,526**	**2,846**	**1,621,421**	**44,913**	**1,297**
2026	855,663	23,702	685	386,591	10,709	309
2027	880,129	24,380	704	396,718	10,989	317
2028	919,637	25,474	736	412,969	11,439	330
2029	949,525	26,302	760	425,542	11,788	340
2030	964,369	26,713	771	431,918	11,964	346
Total 2021-2030	**8,126,234**	**225,097**	**6,501**	**3,675,159**	**101,802**	**2,940**

[8] In the next 5 years, new and modified transmission and storage sources will result in an additional 1.6 million metric tons of methane, 45,000 metric tons VOCs, and 1,300 metric tons HAPs. Existing sources will result in an additional 3.3 million metric tons of methane, 91,000 metric tons VOCs, and 5,100 metric tons HAPs.

Table 3: Estimated Emissions at Affected Existing Transmission & Storage Sources and Potential Reductions Under Methane Guidelines

Time Period	Total Transmission and Storage Sector Emissions from Existing Affected Sources [metric tons]			Foregone Emissions Reductions from Transmission & Storage [metric tons]		
	CH4	VOC	HAPs	CH4	VOCs	HAPs
2021	1,656,973	45,898	1,326	668,000	18,504	534
2022	1,640,403	45,439	1,312	661,320	18,319	529
2023	1,623,999	44,985	1,299	654,707	18,135	524
2024	1,607,759	44,535	1,286	648,160	17,954	519
2025	1,591,682	44,090	1,273	641,678	17,774	513
Total 2021-2025	**8,120,816**	**224,947**	**6,497**	**3,273,866**	**90,686**	**2,619**
2026	1,575,765	43,649	1,261	635,262	17,597	508
2027	1,560,007	43,212	1,248	628,909	17,421	503
2028	1,544,407	42,780	1,236	622,620	17,247	498
2029	1,528,963	42,352	1,223	616,394	17,074	493
2030	1,513,673	41,929	1,211	610,230	16,903.36	488
Total 2021-2030	**15,843,631**	**438,869**	**12,675**	**6,387,279**	**176,928**	**5,110**

Table 4: Estimated Emissions at Affected New, Modified and Existing Transmission & Storage Sources and Potential Reductions Under Methane Guidelines

Time Period	Total Transmission and Storage Sector Emissions from New, Modified & Existing Affected Sources [metric tons]			Foregone Emissions Reductions from Transmission & Storage and Methane Guidelines [metric tons]		
	CH4	VOC	HAPs	CH4	VOCs	HAPs
2021	2,291,751	63,482	1,833	958,387	26,547	767
2022	2,311,742	64,035	1,849	968,632	26,831	775
2023	2,325,656	64,421	1,861	975,001	27,008	780
2024	2,351,093	65,125	1,881	986,507	27,326	789
2025	2,397,485	66,410	1,918	1,006,760	27,887	805
Total 2021-2025	**11,677,728**	**323,473**	**9,342**	**4,895,286**	**135,599**	**3,916**
2026	2,431,428	67,351	1,945	1,021,853	28,305	817

2027	2,440,136	67,592	1,952	1,025,626	28,410	821
2028	2,464,044	68,254	1,971	1,035,589	28,686	828
2029	2,478,488	68,654	1,983	1,041,936	28,862	834
2030	2,478,042	68,642	1,982	1,042,148	28,867	834
Total 2021-2030	**23,969,866**	**663,965**	**19,176**	**10,062,439**	**278,730**	**8,050**

14. The Rescission Rule will result in an immediate increase in emissions. As described above, over the next year (the remainder of 2020 and the first nine months of 2021), new sources in the T&S segment will emit 280,000 metric tons of methane, 7,800 metric tons of VOCs, and 220 metric tons of HAPs that would not have been emitted if the New Source Rules remained in place. In addition, existing sources will not be subject to regulation, allowing them to emit 670,000 metric tons of methane pollution, 18,000 metric tons VOCs, and 540 tons HAPs more than would have been emitted had the agency implemented Methane Guidelines during this time period.

15. The emissions impacts we project will result from the Rescission Rule are significantly higher than EPA's projections for several reasons. One key difference is how EPA estimated the number of new transmission and storage sources each year. In the 2016 NSPS as well as in the 2018 Proposal, EPA used the GHGI to estimate the count of newly affected transmission and storage sources each year. For example, the agency averaged the increases in year-to-year changes in total national equipment counts over a 10-year period. In the 2019 proposed rulemaking, EPA updated the 2016 analysis using average year-to-year changes from 2004-2014,

increasing their estimate of new T&S sources each year upwards from the 2016 NSPS OOOOa. In the Rescission Rule RIA, they maintain these methods for the majority of sources, except for storage vessels and centrifugal compressors. For these sources, they rely on data submitted in 2017 compliance reports for the New Source Rule. The EPA claims that because no centrifugal compressor or storage vessel affected facilities appear in the 2017 compliance reports they evaluated, there will be no new wet-sealed centrifugal compressors and no storage vessels in the transmission and storage sector over the next decade.

16. We believe this is an inaccurate assumption for a number of reasons. First, EPA did not consider *all* of the 2017 reports and indeed did not consider reports from Region 2, where limited publicly available information indicates that there are at least some new T&S compressor stations.[9] Moreover, the publicly available information reported in the 2017 compliance reports represent a very narrow fraction of all affected sources. Table 5 below compares the source counts identified in the 2019 NSPS and the Rescission Rule to the facility counts in the GHGI. Although the GHGI includes all sources, not just new and modified ones, only a small fraction of sources are included in those compliance reports, indicating that the compliance reports are not a fully representative sample. *See* Table 5. Finally, EPA appears to have considered only the reports for 2017, despite the fact

[9] *See* RIA at 2-14.

that reports for 2018 and some 2019 reports are now available. In sum, EPA draws conclusions for a 10-year period based on an incomplete set of compliance reports for just one year, when additional data was available. It is therefore unreasonable for EPA to assume that there are no newly affected centrifugal compressors based solely on compliance reports.

Table 5: Comparison of Source Counts in OOOOa Compliance Reports and GHGI

Source	OOOOa Compliance Reports (as reported in 2019 NSPS)	GHGI	% of Sources Submitting OOOOa Reports	Notes
Wells	2,991 well sites	978,176 wells	0.61%*	Comparison assumes 2 wells per well site based on EPA assumptions
Storage Vessels	697	No data on number of storage vessels, only throughput	--	
Pneumatic Pumps at Well Sites	663	126,932	0.52%	**Assuming all chemical injection pumps are pneumatic pumps
Compressor Stations	130	7,284	1.78%	
Reciprocating Compressors at Compressor Stations	148	5,331	2.78%	**GHGI value is number of reciprocating compressors at transmission and storage compressor stations only; no data available for compressor stations in the production segment

Reciprocating Compressors at Processing Plants	32	4,179	0.77%	

17. If EPA used methodology for centrifugal compressors consistent with the other T&S sources (estimating the average change in reciprocating compressors in the transmission and storage segment in the GHGI from 2004 to 2014 and representing decreases in total counts with zeros), we calculate that there would be on average 16 new wet seal centrifugal compressors each year. In our Methane Policy Analyzer, we therefore account for centrifugal compressor emissions and the potential reductions from a 95% control. This omission of potential emission impacts by the EPA is notable, as we estimate 16% of all potential T&S emission reductions from new sources are a result of centrifugal compressor regulations.

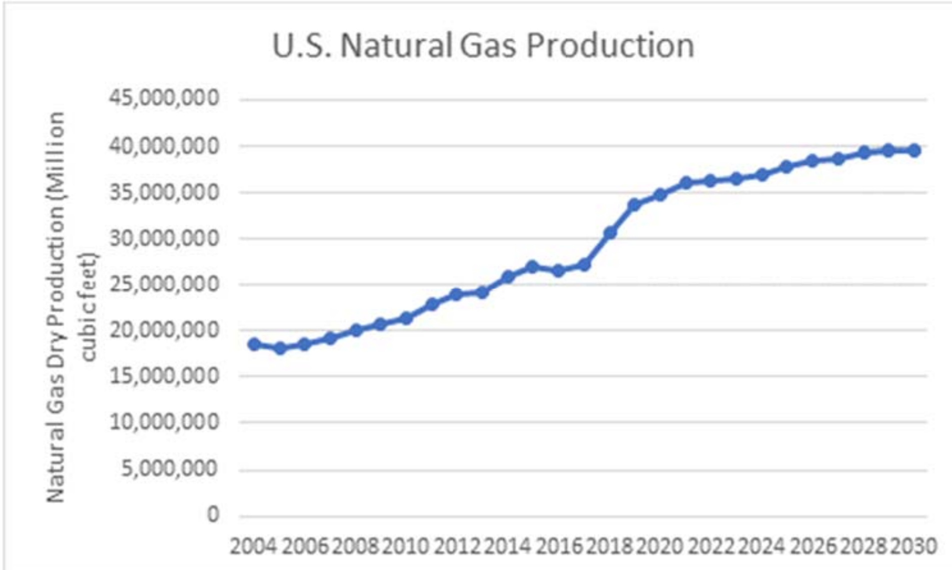
18. An additional difference in methodology concerns EPA's assumptions about the turnover of existing sources and the development of new sources in the transmission and storage segment. First, as EPA explains, "The estimates for affected sources are based upon projections of new sources alone, and *do not include replacement or modification* of existing sources. While some of these sources are unlikely to be modified, the impact estimates may be underestimated due to the focus on new sources" (emphasis added).[10] Second, EPA uses "the number of affected sources in the ten-year period leading up to 2014" in order to determine the average

[10] RIA at 2-17.

number of new sources each year, and therefore the foregone emission reductions each year.[11] EPA does not explain why it choose this methodology, rather than estimating new sources in the transmission and storage segment based on projected growth in oil and gas production. As EPA itself notes, "The number of affected sources in the transmission and storage segments is sensitive to the year-to-year changes over the ten-year period used." Figure 1 below shows U.S. natural gas production from 2004 to 2030. The increase from 2004 to 2014 (the time period EPA used) is smaller than the increase from 2015 onwards. Using the average number of new sources from 2004 to 2014 likely underestimates the number of new sources in years with significant increase of natural gas production, such as 2018 and 2019. This will miss new sources that have come online since the 2016 rule, and will underestimate foregone emission reductions. Our Methane Policy Analyzer scales emissions with gas production to better reflect the increase of emissions expected as gas production increases and uses a conservatively low turnover rate of 1% to represent the turnover (or modification) of existing sources to new/modified sources.

[11] RIA at 2-16.

Figure 1: U.S. Natural Gas Production



19. A final key difference in methodology is our inclusion of the super-emitter emission estimates from Zimmerle et al 2015. *See* ¶ 9. By requiring quarterly LDAR at T&S sources, the potential emission reductions from super-emitters account for approximately 42% of overall foregone emissions from new sources, which are not represented in EPA's analysis, but are included in our analysis.

SECTION II: The Rescission Rule Results in Localized Impacts from Removing Transmission and Storage Segment Standards

20. In addition, to better understand the potential scope of impacts of the Rescission Rule on emissions from T&S sources, including localized impacts, we reviewed compliance reports retrieved from EPA's online WebFIRE database for compressor stations in this industry segment. Specifically, we retrieved Air Emissions Reports (AER) for compliance with NSPS OOOOa. Through these

reports, we identified 37 compressor stations in the Transmission segment, including eight in ozone nonattainment areas in New York, Pennsylvania, Connecticut, Ohio, Illinois, and Utah.[12] This set of compressor stations represents a subset of Transmission compressor stations subject to NSPS Subpart OOOOa.[13] According to EPA's Environmental Mapping Screening tool (EJSCREEN), there are 182,740 people living within a three-mile radius of these 37 compressor stations , who will be directly and immediately impacted by the Rescission Rule. As we describe above, our evaluation of these 37 stations does not represent a comprehensive assessment of the impacts of the Rescission Rule on new and modified transmission and storage facilities (as a comparison, for 2021, EPA projects 270 affected new compressor stations, suggesting that many reports are thus likely unavailable in the WebFIRE database) but they do underscore the significant number of people who will be impacted by the Rescission Rule at even a small subset of affected facilities.

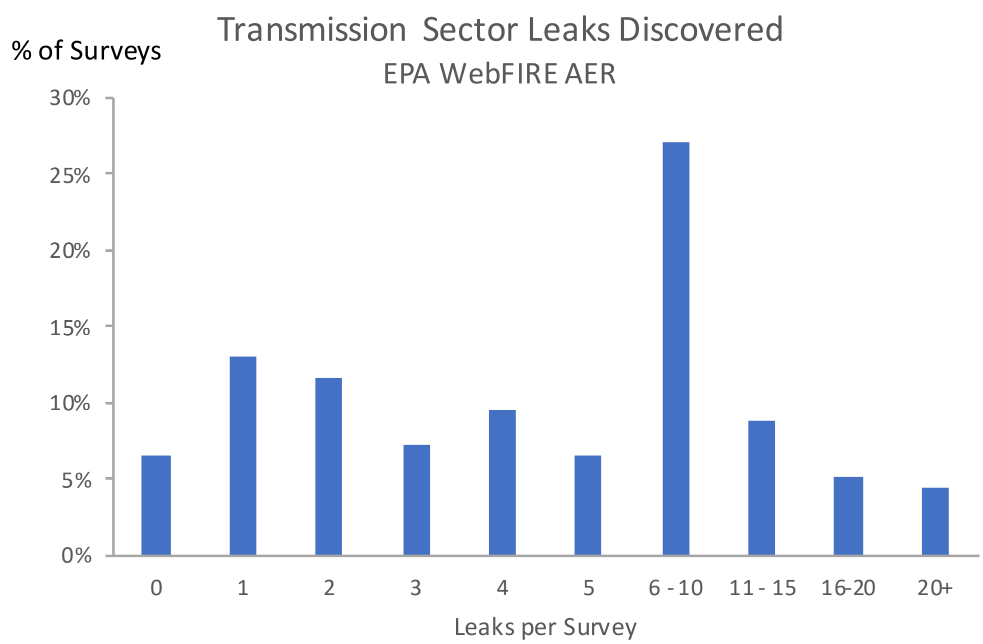
[12] *See* Appendix 2 for a discussion of Pennsylvania's regulation of transmission and storage segment sources.

[13] Since the AERs do not identify a sources' segment (e.g., Transmission and Storage, Processing, etc.) we cross-referenced sources with data in EPA's Greenhouse Gas Reporting Program, where possible, to identify stations in the Transmission segment. Moreover, because WebFIRE does not include a comprehensive set of compliance reports (because, as EPA has recognized, some of these reports are filed with the regions), the 37 Transmission segment compressor stations we identified in this analysis are clearly only a subset of Transmission segment compressor stations subject to NSPS Subpart OOOOa. Given the limited data available on this source, our analysis of potential impacts is based on a review of AERs for the sources we located in this manner.

21. Moreover, based on the survey history for the compressor stations we reviewed, twelve would be on schedule to survey for leaks within the next 30 days (i.e., 30 days from September 15, 2020), 18 would be on schedule to survey for leaks within the next 60 days, and 6 would be on schedule to survey for leaks in the next 90 days.[14] Of these compressor stations, many of them showed a history of identifying a significant number of leaks per survey, with 4 percent of sources finding as many as 20 leaks or more per survey (and over 50 leaks in one case). Figure 2 shows the distribution of leaks detected at these 37 compressor stations. Appendix 1 also includes more detail on each of these stations.

[14] This statement is based on estimated future survey dates; future surveys won't be conducted on a known date but will likely fall in close proximity to dates we estimated based on 98-day intervals from the most recent survey date and fourth quarter surveys conducted on the 1-year anniversary of the last survey. A 98-day survey interval reflects the average interval across the 37 compressor stations excluding intervals that were less than 60 days since the standards currently require quarterly surveys with at least 60 days of separation between two surveys.

Figure 2: Transmission Sector Leaks from Compressor Stations Per Survey



22. The Sandwich Compressor Station, located in Kendall County, Illinois, is a striking example of the potentially significant community-level impacts of the Rescission Rule. This station's survey history shows a sustained track record of finding a significant number of leaks. Specifically, from November 2018 to October 219, five leak surveys at the station found 15, 8, 17, 12, and 45 leaks. Kendall County, Illinois in a nonattainment area for the 2008 and 2015 ozone National Ambient Air Quality Standards. In addition, 5,727 people live within a 3-mile radius of the Sandwich Compressor Station. Within this population: 28% identify as low-

income; 16% identify as a minority; 7% are children under the age of 5; and 16% are elderly adults over the age of 65.[15]

SECTION III: EPA's Rescission Rule Allows Hundreds of Thousands of Oil and Natural Gas Facilities to Forego Emissions Reductions

23. Because of the Rescission Rule, EPA recognizes that existing sources will not be subject to regulation, but the agency declines to assess those impacts. 85 Fed. Reg. at 57,033.[16] As a result, we also conducted an independent analysis of the facilities in the production, processing, and transmission and storage segments which

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[15] EPA EJSCREEN defines:
(1) Percent low-income as the percent in households where the household income is less than or equal to twice the federal "poverty level"
(2) Percent Minority as the percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.

[16] EPA's failure to analyze the Rescission Rule's impacts on existing source emissions is notable given that, in the same month as it proposed these changes, EPA also released a report analyzing global non-CO2 GHG mitigation opportunities. EPA, *Global Non-CO_2 Greenhouse Gas Emissions Projects & Mitigation, 2015-2050*, (Oct. 2019), https://www.epa.gov/sites/production/files/2019-09/documents/epa_non-co2_greenhouse_gases_rpt-epa430r19010.pdf. In the report, EPA found that the United States had the second highest technical abatement potential of methane emissions from the oil and gas sector across all countries, concluding that, by 2030, the U.S. could reduce approximately 5.4 million metric tons of methane from this industry. The main contributors to these reductions are directed inspection and maintenance programs, like the 2016 rule's leak detection and repair requirements, along with measures to reduce emissions from pneumatic controllers.

will not be required to reduce emissions, and those foregone emissions reductions resulting from the Rescission Rule. Existing transmission and storage emissions are also shown in Table 3. We include them in this section as well to highlight the overall impact of EPA's conclusion that the Rescission Rule will preclude it from regulating existing sources.

24. To identify wells that would have been subject to EPA Methane Guidelines, we obtained well data from Enverus (formerly known as DrillingInfo), a proprietary database that compiles a wide range of drilling- and production-related information from state oil and gas commissions. In September 2020, we obtained data for all wells in the U.S., filtering to include only onshore wells with active oil and gas production during 2019 and 2020 in order to exclude abandoned and shuttered wells, avoid any discrepancies due to short-term shut-downs or inactivity, and account for the several month reporting delay for Enverus production and well data. We then excluded from the dataset wells that would be regulated as new or modified facilities under the New Source Rule.[17] The remaining wells, drilled or last

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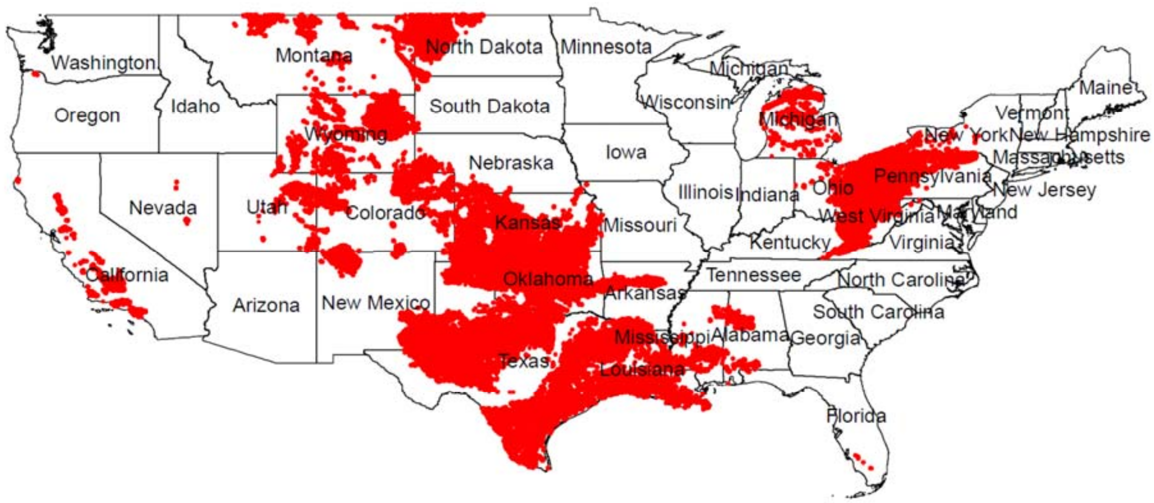
[17] The New Source Rule applies to facilities "constructed, modified or reconstructed" after September 18, 2015—the date of EPA's proposed rule. 81 Fed. Reg. 35,824, 358,44 (June 3, 2016). As described above, *id.* at 35,826, EPA's LDAR standards apply to new well sites and compressor stations that commenced construction after September 18, 2015. The standards also apply to modified well sites and compressor stations. The New Source Rule defines particular circumstances that constitute a modification at each of these facilities. For well sites, these include when a well at an existing site is fractured or re-fractured, an operation that is designed to increase production of natural gas. 40 C.F.R.

modified before September 18, 2015 (denoted as "existing wells"), would be covered by Methane Guidelines issued by EPA. In total, there are 821,630 actively producing, existing wells that would be covered by EPA Methane Guidelines. Figure 3 displays a map of existing wells.

Figure 3: Map of Total Active Existing Well Sources



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§ 60.5365a(i)(3) (2019). For compressor stations, the New Source Rule defines modifications to include the addition of a compressor at an existing station. 40 C.F.R. § 60.5365a(j) (2019).

Enverus includes information on the "spud date" for wells, or the date on which drilling commenced. The database also includes information on well "completion dates," or the most recent date on which a well was cleared of flowback gas associated with hydraulic fracturing or re-fracturing. Using the database, we excluded wells with a spud date after September 18, 2015, which would be "new" for purposes of the 2016 Rule's LDAR requirements. Separately, we excluded wells with a spud date on or before September 18, 2015 but a completion date after September 18, 2015. This distinct category of sources includes both older, re-fractured wells and new wells with their initial fracture delayed to after September 18, 2015, which would be "modified" for purposes of the 2016 Rule's LDAR requirements.

25. EPA has concluded that it will be precluded from promulgating Methane Guidelines for existing sources in the oil and natural gas sector due to the Rescission Rule. EPA's failure to promulgate these guidelines will allow substantial emissions of methane, VOCs, and HAP to continue, that could otherwise have been abated.

26. We estimate the total emissions that have occurred, and will continue to occur due to the Rescission Rule, at affected existing sources, as well as the amount of emissions that could have been prevented had EPA timely adopted Methane Guidelines.

27. For this analysis, we assume that Methane Guidelines would have extended the methane emissions reduction requirements found in the New Source Rule to all affected existing sources, specifically covering high-bleed pneumatic controllers at well sites and transmission and storage compressor stations, all continuous bleed pneumatic controllers at natural gas processing plants, equipment leaks from gas processing plants, well sites, and compressor stations, reciprocating and centrifugal compressors at both processing plants and compressor stations, and pneumatic pumps at well sites and processing plants. Though more protective standards, including new technologies and best practices, have shown promise of even greater emission reductions, we assume that the same technologies used in the New Source Rule would apply equally to existing sources. Several states that

regulate both new and existing sources (including Colorado and California) largely apply the same measures at both sets of facilities, lending further support to this assumption.

28. To estimate the total emissions that have occurred at affected existing sources, as well as the amount of emissions that could be prevented had EPA adopted Methane Guidelines when it promulgated the New Source Rule,[18] we used our EDF Methane Policy Analyzer model, described above. All emissions in 2015 were considered to be "existing" because the relevant date for the NSPS was near the end of 2015. We assumed that emissions attributable to existing sources decline year-over-year as existing sources are removed from operation or undertake modifications that subject them to regulation as modified sources under the New Source Rule based on a turnover rate of 5% for production sources, 4% for gathering and boosting sources, and 1% for all downstream sources. Emissions from sources subject to state regulations applicable to existing sources (California, Colorado, Utah, Wyoming in the Upper Green River Basin ozone non-attainment area, and Texas to a very limited extent) are subtracted from the projected emissions. We estimate that in the four

[18] Although EPA did not promulgate existing source guidance when it promulgated the New Source Rule in 2016, we understand that those rules would now be in place, achieving emissions reductions, if EPA had not stopped work on development these regulations in in March 2017. *See* Plaintiffs' Statement of Undisputed Material Facts in Support of Motion For Summary Judgment at ¶38, *State of New York and Envtl. Def. Fund v. Wheeler*, No. 18-773 (D.D.C., filed July 3, 2020).

years since EPA has promulgated the New Source Rule, over 43.6 million metric tons of methane have been emitted by existing oil and natural gas sources. We further estimate that 16 million metric tons of those methane emissions, or 37%, could have been avoided if Methane Guidelines were in effect and being implemented.

29. In the Rescission Rule, EPA criticizes EDF's estimates of turnover values and also describes the American Petroleum Institute's analysis, which assumes significantly higher turnover and so substantially understates the importance of existing source standards. However, our model reasonably describes emissions over time. First and foremost, API's analysis is focused on the percentage of aggregate *production* covered by new source standards, as opposed to the percentage of sources or emissions. However, production does not directly correlate with emissions at individual well sites. In fact, studies indicate that smaller wells have disproportionately higher emissions rates relative to their production,[19] and the average existing well (pre-2015) produces less than the average new well (post-

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[19] *See, e.g.*, Zavala-Araiza, et al., (2015) "Toward a Functional Definition of Methane Super-Emitters: Application to Natural Gas Production Sites," *ENVT'L SCI. & TECH.* 2015, 49, 13, at 8167−8174; David R. Lyon et al., Aerial Surveys of Elevated Hydrocarbon Emissions from Oil and Gas Production Sites, 50 Envtl. Sci. & Tech. 4877 (Apr. 5, 2016); M. Omara et al 2016, Methane Emissions from Conventional and Unconventional Natural Gas Production Sites in the Marcellus Shale Basin, 50 Envtl. Sci. & Tech. 2099 (Feb. 16, 2016) (DOI: 10.1021/acs.est.5b05503).

2015)[20]. Even if the majority of aggregate production is covered by OOOOa by 2028, the majority of *wells* (sources) will not be. We analyzed the age of existing wells using data from Enverus/DrillingInfo and found that a number of existing, producing wells are significantly older than 25 years, including over 200,000 wells in operation longer than 30 years, and nearly 60,000 in operation for over 50 years. In the absence of Methane Guidelines, these wells will not be regulated and will continue to emit. The EDF Methane Policy Analyzer uses a turnover rate based on facility turnover. The 5% turnover rate for production sources was based on an EDF analysis of well shut-ins over the last 15 years using data from Enverus/DrillingInfo: on average, for wells that started producing in a given year, 5% were shut in each year for the subsequent 10-15 years.

30. In addition, the API model fails to consider emissions from sources located outside the production segment (i.e. well sites), including gathering and boosting equipment, processing plants, and transmission and storage segments, all of which had been regulated under the 2016 New Source Rule. Emissions from equipment outside a well site, as described above for the transmission and storage segments, are significant. Excluding non-production sources—and focusing solely on the benefits of Methane Guidelines for the production sector—is improper due to

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[20] For this analysis EDF pulled 2019 Enverus production data and averaged the production profiles for "new" versus "existing" wells. On average, new wells produce more BOE/well than existing wells.

the substantial emissions benefits that could be delivered by Methane Guidelines which apply to all sectors covered by the 2016 New Source Rule.

31. To estimate the total emissions that will continue to occur at affected existing sources based on EPA's conclusion that it is now precluded from promulgating Methane Guidelines, as well as the amount of emissions that could be prevented if EPA promulgated Methane Guidelines, we extended the Methane Policy Analyzer to 2030. Each year that EPA does not regulate methane emissions from existing sources will allow substantial additional emissions. For example, in 2021, 9.8 million metric tons of methane will be emitted by affected existing sources. We further estimate that 3.6 million metric tons of those methane emissions, or 37%, could be avoided if Methane Guidelines mirroring the New Source Rule were in effect and being implemented. Table 6 summarizes the emissions without promulgation of Methane Guidelines, as well as the emissions reductions possible if Methane Guidelines could be and were promulgated.

Table 6: Estimated Emissions at Affected Existing Sources and Potential Reductions Under Methane Guidelines

Time Period	Total Emissions from Affected Sources [metric tons]			Emissions that Could be Prevented by Methane Guidelines [metric tons]		
	Methane	VOC	HAPs	Methane	VOC	HAPs
2017	11,689,715	2,741,847	103,115	4,253,249	1,022,588	38,484
2018	11,099,151	2,597,590	97,684	4,067,664	977,969	36,805
2019	10,622,933	2,472,822	92,978	3,915,227	938,202	35,305
2020	10,184,924	2,360,138	88,729	3,740,813	893,495	33,620
2021	9,785,180	2,256,193	84,809	3,583,294	852,460	32,072
2022	9,413,009	2,158,703	81,132	3,438,607	814,377	30,635
2023	9,025,023	2,059,736	77,402	3,287,058	775,799	29,181
2024	8,647,856	1,964,209	73,802	3,136,680	737,802	27,749
2025	8,294,707	1,874,858	70,434	2,997,488	702,609	26,423
2026	7,967,127	1,791,676	67,299	2,867,333	669,482	25,175
2027	7,657,181	1,712,896	64,330	2,744,475	638,148	23,994
2028	7,366,050	1,639,260	61,555	2,629,755	609,015	22,896
2029	7,099,500	1,571,426	58,998	2,524,569	582,076	21,880
2030	6,854,814	1,508,791	56,637	2,428,541	557,245	20,944
Average 2021-2030	**8,211,045**	**1,853,775**	**69,640**	**2,963,780**	**693,901**	**26,095**

32. These emissions estimates, along with potential reductions, are conservative, as emerging data not reflected in the Methane Policy Analyzer indicates methane emissions from oil and gas sources in the United States are even greater than estimated in the Alvarez et al 2018 study. For example, Zhang et al

2020[21] documents significant oil and gas methane emissions at the basin level in the Permian Basin in Texas and New Mexico. Based on 11 months of satellite data encompassing 200,000 individual readings taken across the 160,000 square-kilometer basin by the European Space Agency's TROPOMI instrument from May 2018 to March 2019, the study found that Permian oil and gas operations are losing methane at a rate equal to 3.7% of their gas production. The peer-reviewed study estimated that annual methane emissions from oil and gas sources in the Permian basin are 2.7 million metric tons per year, more than twice as much as estimated for the region based on EPA's greenhouse gas inventory.

33. EPA claims that several major oil and gas producing states, including California, Colorado, Texas, Utah, and Wyoming, already regulate oil and gas methane emissions, which will help mitigate foregone methane emissions from the Rescission Rule. 85 Fed. Reg. at 57,043. However, EPA has not analyzed in any meaningful way whether or not these state rules are applicable to existing sources. We assessed the applicability of these state standards to existing sources. These states take widely divergent approaches that vary significantly in stringency and applicability with respect to existing sources. Appendix 2 provides a detailed analysis of how these state standards apply to existing sources.

[21] Zhang et al, *Quantifying methane emissions from the largest oil-producing basin in the United States from space*, Science Advances (April 22, 2020), *available at* https://advances.sciencemag.org/content/6/17/eaaz5120.

34. Our Methane Policy Analyzer allows us to also look at the projected reductions from state standards for existing sources. In 2020, state standards applicable to existing sources (certain standards in California, Colorado, Utah, Wyoming in the Upper Green River Basin ozone non-attainment area, and Texas) will reduce only 180,000 metric tons methane, roughly 5% of what federal Methane Guidelines could achieve.

35. We also estimate the total amount of emissions associated with a 12-month delay in promulgating existing source methane guidelines due to the Rescission Rule remaining in place during the pendency of this litigation, absent a stay. EPA has estimated that promulgation of an existing source methane guidance would take 27.5 months without an Information Collection Request ("ICR"), or 44.5 months with an ICR.[22] We assume that the promulgation process would begin January 2021, with promulgation without an ICR occurring in April 2023. If EPA fails to promulgate existing source Methane Guidelines in April 2023 due to a delay associated with this litigation over the Rescission Rule, we estimate that over the following 12 months (April 2023-April 2024), an additional 3 million metric tons of methane would be emitted from existing sources that could be mitigated with

[22] Exhibit 9 to Plaintiffs' Motion for Summary Judgment, 30(b)(6) Deposition of Paul Gunning, (Feb. 11, 2020) at 108, 111, *State of New York and Envtl. Def. Fund v. Wheeler*, No. 18-773 (D.D.C., filed July 3, 2020).

Methane Guidelines. For each month that the promulgation is delayed past April 2023, we estimate that 260,000 tons of methane will be emitted that could have been reduced by Methane Guidelines. This delay would also result in emissions of over 850,000 tons of VOCs and 32,000 tons HAPs over those 12 months that could have been prevented with Methane Guidelines.

36. This example is illustrative. Based on the well-established measures to reduce emissions from existing sources, promulgation of Methane Guidelines could occur more swiftly. But regardless of the precise amount of time EPA takes to promulgate and implement Methane Guidelines, the Rescission Rule will delay those eventual reductions, allowing emissions to persist longer than they otherwise would.

SECTION IV: The Rescission Rule Results in Substantial Local Air Pollution from Existing Sources due to Failing to Issue Methane Guidelines

37. We also analyzed the effect of the Rescission Rule—and its alleged preclusion of Methane Guidelines—absent a stay, on other harmful air pollution (including ozone-forming volatile organic compounds and hazardous air pollutants like benzene) from existing sources. We focus exclusively on production sources because the Enverus database allows us to identify precisely where wells are located (and therefore emissions will occur). Because of that, we can assess impacts in areas that already suffer from harmful levels of ambient air pollution, like ozone. As a

result, the analysis in this section is not intended to capture the total, harmful impact of the Rescission Rule.

38. We have identified 101,850 wells that would have been subject to Methane Guidelines in areas that are currently not in attainment with the 2015 national ambient air quality standards (NAAQS) for ozone. Appendix 3 provides a full list of nonattainment area counties with existing wells. Of these wells, 53%, or 53,860, are in marginal nonattainment areas and thus would not be subject to the Control Technique Guidelines (CTGs).

39. This estimate is conservative and does not fully capture the effects of the Rescission Rule and the preclusion of the Methane Guidelines. The analysis does not account for the many affected wells located just outside of ozone non-attainment areas, which can still contribute to the formation of ozone that can be transported into the non-attainment areas. Furthermore, the analysis in this section does not include additional emissions in these areas attributable to midstream and downstream segments that would have been mitigated by Methane Guidelines.

40. By identifying existing well sites, we are also able to identify the local communities that are disproportionately impacted by the air pollution allowed from the Rescission Rule, as result of EPA not promulgating Methane Guidelines for existing sources. Using the US Census Bureau's American Community Survey 5-year estimates for 2012-2016, we were able to estimate the populations living within

a half mile radius of the previously identified existing wells using areal apportionment. This method determines the area encompassed within a half mile buffer radius of all affected wells, and overlays those buffers onto census tracts to calculate the percentage of each tract comprised of buffers (i.e. the area of each tract within a half mile of an affected well). The areal apportionment method assumes that populations are spread evenly across a given census tract (excluding water bodies), and thus we are able to estimate the populations at a census tract level of those living within a half mile of an existing well. This method is commonly used in published literature utilizing distance-based analysis.[23] While some studies have used finer spatial resolutions such as census block groups, we performed our analysis using census tracts in order to minimize margin of error in census estimates. Census tracts, and even larger regions such as zip codes, have often been used in similar analyses.[24] We used a half mile radius because recent scientific evidence indicates close

[23] *See, e.g.* J. C. S. Long, L. Feinstein, J. T. Birkholzer, W. Foxall, "An Independent Scientific Assessment Of Well Stimulation In California, Vol. 3" (California Council on Science and Technology, 2016), *available at* https://ccst.us/publications/2015/2015SB4-v3.php; J. Chakraborty, J. A. Maantay, J. D. Brender, Disproportionate Proximity to Environmental Health Hazards: Methods, Models, and Measurement. American Journal of Public Health. 101, S27–S36 (2011).

[24] *See, e.g.*, T. Srebotnjak and M. Rotkin-Ellman, "Drilling in California: Who's at risk?" Natural Resources Defense Council, 2014; Mohai P, Saha R. Reassessing racial and socio-economic disparities in environmental justice research. Demography. 2006;43(2):383–399; Kearney G, Kiros GE. A spatial evaluation of socio demographics surrounding National Priorities List sites in Florida using a distance-based approach. Int J Health Geogr. 2009; 8:33.

proximity to oil and gas development is associated with HAP exposure and other adverse health impacts for local populations.[25]

41. Using this methodology, we find that approximately 9,100,000 people live within half a mile of an existing well in the U.S., including 580,000 children under the age of five years and 1,400,000 elderly people over the age of 65 years, who are especially sensitive to the health risks posed by ozone and other local air pollution. Additionally, approximately 1,400,000 people living below the poverty line, who may face greater barriers such as accessing medical care, and nearly 2,700,000 people of color live within half a mile of an existing well.

Conclusion

42. EPA's failure to adopt Methane Guidelines for existing sources has already allowed significant air pollution. The Rescission Rule exacerbates the issue and precludes EPA from adopting Methane Guidelines for existing sources in the future. If the Rescission Rule is not stayed, there will be an immediate increase in emissions from the transmission and storage segments and numerous sources will continue operating without controls to reduce methane, VOC, and HAP emissions, allowing significant emissions to persist from these sources with each additional year. Cumulatively, the Rescission Rule will allow each year an average of 3.33

[25] *See* Declaration of Ananya Roy and Tammy Thompson ¶¶22-33.

million metric tons of methane, 704,000 metric tons of VOC, and 26,400 metric tons of HAPs that could otherwise be mitigated by the 2016 NSPS at new and modified transmission and storage sources and Methane Guidelines at existing sources between 2021-2030. These methane emissions have the 20-year climate impact of the CO_2 emissions from 60.5 million passenger vehicles driving for one year.

I declare under the penalty of perjury that the foregoing is true and correct.

Renee McVay

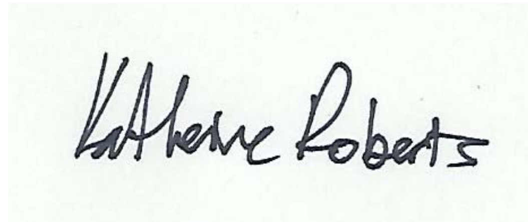
September 15, 2020

I declare under the penalty of perjury that the foregoing is true and correct.

Hillary Hull

September 15, 2020

I declare under the penalty of perjury that the foregoing is true and correct.



Katherine Roberts

September 15, 2020

Appendix 1

EPA WebFIRE AER SITE INFORMATION						EPA EJSCREEN DEMOGRAPHIC DATA					
COMPANY NAME	FACILIY SITE NAME	COUNTY	STATE	ZIP CODE	IN NONATTAINMENT AREA?	POPULATION W/IN 3 MILES OF SOURCE ADDRESS	MINORITY POPULATION	LOW INCOME POPULATION	POPULATION UNDER AGE 5	POPULATION OVER AGE 65	APPROXIMATE DATE OF NEXT SURVEY BASED ON PAST SURVEYS*
Millenium Pipeline Company LLC	Highland Compressor Station	Sullivan	NY	12732		1,844	8%	37%	8%	21%	10/30/20
Millenium Pipeline Company LLC	Hancock Compressor Station	Delaware	NY	13783		279	8%	28%	4%	28%	10/30/20
Algonquin Gas Transmission	Southeast Compressor Station	Putnam	NY	10509		15,358	25%	13%	5%	14%	9/24/20
Algonquin Gas Transmission	Stony Point Compressor Station	Rockland	NY	10980	Ozone	26,613	40%	19%	4%	16%	9/23/20
TransCanada	Gibraltar Compressor Station	Washington	PA	15323	Ozone	1,853	4%	19%	5%	20%	11/4/20
Algonquin Gas Transmission	Chaplin Compressor Station	Windham	CT	06235	Ozone	3,967	11%	17%	4%	19%	10/25/20
Algonquin Gas Transmission	Oxford Compressor Station	New Haven	CT	06478	Ozone	13,622	22%	15%	8%	18%	10/24/20
Algonquin Gas Transmission	Cromwell Compressor Station	Middlesex	CT	06416	Ozone	40,801	25%	13%	5%	20%	12/1/20
Northwest Pipeline	Boise Compressor Station	Ada	ID	83716		94	25%	16%	8%	11%	
Texas Eastern Transmission	Opelousas Compressor Station	St. Landry	LA	70570		6,179	73%	63%	6%	16%	11/29/20
Transcanada	Lake Arthur Compressor Station	Jefferson Davis	LA	70549		3,767	11%	53%	7%	18%	10/28/20
Kinder Morgan Louisiana Pipeline, LLC	Eunice Compressor Station No 760	Acadia	LA	70535		776	6%	27%	9%	13%	10/17/20
Transcanada Columbia Gulf Transmission, LLC	New Albany Compressor Station	Union	MS	38652		5,279	36%	43%	8%	12%	9/29/20
Transcanada Columbia Gulf Transmission, LLC	Holcomb Compressor Station	Grenada	MS	38940		358	5%	33%	3%	25%	9/30/20
WBI Energy Transmission, Inc.	Tioga Compressor Station	Williams	ND	58852		1,252	10%	29%	6%	22%	9/22/20
WBI Energy Transmission, Inc.	Charbonneau Compressor Station	McKenzie	ND	58838		41	7%	27%	13%	7%	9/24/20
WBI Energy Transmission, Inc.	Williston Compressor Station	Williams	ND	58801		1,053	16%	19%	8%	3%	9/23/20
WBI Energy Transmission, Inc.	Mapleton Compressor Station	Cass	ND	58059		991	15%	16%	8%	8%	9/24/20
TransCanada	Crawford Compressor Station	Fairfield	OH	43155		2,895	2%	31%	4%	16%	9/11/20
TransCanada	Summerfield Compressor Station	Noble	OH	43779		673	1%	44%	4%	20%	11/6/20
TransCanada	Oak Hill Compressor Station	Jackson	OH	45656		2,965	3%	35%	5%	16%	11/10/20
Texas Eastern Transmission, LP	Tompkinsville Compressor Station	Monroe	KY	42141		838	3%	36%	3%	17%	11/20/20
Transcanada Columbia Gulf Transmission, LLC	Paint Lick Compressor Station	Garrard	KY	40461		996	3%	40%	7%	17%	12/17/20
Transcanada Columbia Gulf Transmission, LLC	Morehead Compressor Station	Rowan	KY	40351		878	1%	51%	4%	14%	9/23/20
TransCanada	Grayson Compressor Station	Carter	KY	41143		6,995	7%	47%	4%	20%	11/26/20
Texas Eastern Transmission, LP	Colerain Compressor Station	Belmont	OH	43917		3,946	2%	30%	4%	24%	10/15/20
Texas Eastern Transmission, LP	Salineville Compressor Station	Columbiana	OH	43945		993	2%	37%	3%	17%	10/16/20
Nexus Gas Transmission, LP	Clyde Compressor Station	Sandusky	OH	43410		1,206	5%	28%	5%	14%	10/18/20
Nexus Gas Transmission, LP	Hanoverton Compressor Station	Columbiana	OH	44427		2,083	4%	41%	4%	10%	10/17/20
Nexus Gas Transmission, LP	Wadsworth Compressor Station	Medina	OH	44273	Ozone	6,452	3%	13%	6%	19%	10/18/20
TC Energy	Clifton Junction CS	Wayne	TN	38425		138	36%	32%	1%	8%	9/15/20
Kinder Morgan Altamont LLC	Ravolla Compressor Station	Uintah	UT	84021	Ozone	138	42%	39%	9%	7%	10/18/20
Transcanada	Strasburg Compressor Station	Strasburg	VA	22657		8,291	11%	30%	8%	17%	11/13/20
TransCanada	Louisa Compressor Station	Louisa	VA	23093		3,363	34%	42%	4%	22%	11/14/20
TransCanada	Sandwich Compressor Station	Kendall	IL	60548	Ozone	5,727	16%	28%	7%	16%	10/16/20
Natural Gas Pipeline Company of America, LLC	Lufkin Compressor Station 303	Angelina	TX	75901		3,781	27%	23%	4%	18%	11/25/20
Tennesssee Gas Pipeline Company, LLC	Edna Compressor Station 11A	Jackson	TX	77957		6,255	48%	37%	7%	18%	10/23/20

* NOTE: these survey dates are estimates; surveys won't necessarily be conducted on this date but will likely fall in close proximity to it. These dates are estimated based on 98-day intervals from the most recent survey date and fourth quarter surveys conducted on the 1-year anniversary of the last survey. A 98-day interval reflects the average survey interval across this dataset, excluding survey intervals less than 60 days since the standards currently require quarterly surveys with at least 60 days of separation between two surveys.

W/IN 30 DAYS
W/IN 60 DAYS
W/IN 90 DAYS

Appendix 2

Appendix 2

State Standards Applicable to Existing Source Emissions

In the Rescission Rule, EPA claims that several major oil and gas producing states already regulate oil and gas methane emissions, and so a federal rule would be duplicative. 85 Fed. Reg. 57,018, 57,043 (Sept. 14, 2020). However, EPA has not analyzed in any meaningful way whether or not these state rules would apply in the same manner as potential Methane Guidelines. EPA claims that California, Colorado, Texas, Utah, and Wyoming already regulate oil and gas methane emissions, which will help mitigate foregone methane emissions from the Rescission Rule. *Id.* As described below, however, several of these state standards apply to significantly fewer sources than the New Source Rule and likely would not lead to similar methane emissions reductions as those which could have been achieved under Methane Guidelines.

California oil and gas methane regulations apply to both new and existing sources and took effect in 2018/2019. The rules cover equipment leaks at well sites, processing plants, and compressor stations, pneumatic pumps at well sites, storage tanks at well sites with emissions greater than 10 metric tons per year ("tpy") methane, compressors at well sites, processing plants, and compressor stations, and pneumatic controllers at well sites and compressor stations. California also regulates emissions from existing sources in the transmission and storage sector.

Colorado oil and gas regulations apply to both new and existing sources, often with different emission limits for new versus existing sources. Most regulations took effect in 2015, with an update for sources in the ozone non-attainment area that took effect in 2017. Colorado again updated its regulations for new and existing sources in 2019. The regulations cover equipment leaks at well sites and compressor stations (tiered leak detection and repair ("LDAR") frequency tied to volatile organic compounds ("VOC") emissions), pneumatic controllers at well sites and processing plants, liquids unloading, tanks at well sites with VOC emissions greater than 2 tpy, associated gas venting, oil well completions, centrifugal compressors at well sites and processing plants, reciprocating compressors at processing plants, and dehydrators at well sites and processing plants. In 2019, Colorado developed a performance standard with the intent to set leak rate goals for transmission and storage sources; those goal figures have not yet been established.

Texas regulations have various effective dates depending on the location of a facility, but at least one regulation applies to new sources that were constructed/modified after September 2000. Because this date predates the New Source Rule effective date, some sources considered "existing" for the New Source Rule will be considered "new" under Texas regulations. However, Texas regulations apply to significantly fewer sources than the New Source Rule. Texas regulations apply to new sources, relative to either 2000, 2011, or 2012 depending on location and type of permit. Texas requires a LDAR program for certain mid-sized to large oil and gas facilities. The specific requirements vary depending on the facility's location and potential to emit uncontrolled VOCs. Most well sites are not subject to LDAR due to the high emissions threshold uncontrolled VOC emissions (>10 or 25 tpy) and distance from a sensitive receptor, such as a home or school, that triggers the application of LDAR. EDF's analysis of Texas Standard Permits found that only roughly 5.5% of well sites in Texas are required to conduct LDAR, an analysis with which EPA concurred.[1]

Utah regulations apply to both new and existing sources and primarily incorporate OOOOa by reference for well sites. New sources were covered beginning in 2014, and existing sources were added in 2018. Regulations for well sites cover equipment leaks, tanks (with an emissions threshold), dehydrators, associated gas venting, and pneumatics. Regulations for processing plants and compressor stations cover pneumatics. Utah state regulations do not apply on tribal lands (approximately 20% of emissions are on tribal lands).

In Wyoming, only existing sources within the Upper Green River Basin ("UGRB") above a certain emissions threshold are covered, so the majority of existing sources within that state are not covered. Wyoming regulations apply to new sources, as well as existing sources within the Upper Green River Basin (a nonattainment area). Regulations cover equipment leaks, pneumatic controllers, tanks (with an emissions threshold), oil well completions, pneumatic pumps, and dehydrators (with an emissions threshold). Less than 20% of total production emissions are within the UGRB. While the monitoring frequency and monitoring instrument are acceptable, there is no specified initial monitoring date or repair deadline for facilities with emissions greater than or equal to 4 tpy of VOCs within the UGRB. When analyzing the equivalency of Wyoming's regulation to the 2016 NSPS OOOOa, EPA considered the version of Wyoming DEQ's regulation of PAD

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[1] *See* EPA, *Regulatory Impact Analysis for the Review and Reconsideration of the Oil and Natural Gas Sector Emission Standards for New, Reconstructed, and Modified Sources*, (Aug. 2020) ("RIA"), at 3-23.

facilities that was finalized prior to that analysis in 2018.[2] Since that analysis was conducted, Wyoming has released a more comprehensive update to that rule. While this update expands coverage to well sites outside of the UGRB, many of the issues which prevented EPA from considering the previous rule adequate still apply.

Although not analyzed by EPA, Pennsylvania also regulates emissions from sources in the transmission and storage segment.

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[2] EPA, *Memorandum: Equivalency of State Fugitive Emissions Programs for Well Sites and Compressor Stations to Proposed Standards at 40 CFR Part 60, Subpart OOOOa* (Apr. 12, 2018), *available at* https://www.epa.gov/sites/production/files/2018-09/documents/equivalency_of_state_fugitive_emissions_programs_for_well_sites_and_compressor_stations.pdf.

Appendix 3

Appendix 3

Counties with wells that would be subject to Methane Guidelines in areas that are currently not in attainment with the 2015 national ambient air quality standards (NAAQS) for ozone are as follows:

Kern (CA), Ventura (CA), Contra Costa (CA), Sacramento (CA), Fresno (CA), Los Angeles (CA), Orange (CA), Kings (CA), Tulare (CA), Solano (CA), San Joaquin (CA), Santa Clara (CA), Madera (CA), Yolo (CA), Alameda (CA), San Luis Obispo (CA), San Mateo (CA), San Bernardino (CA), Weld (CO), Adams (CO), Broomfield (CO), Arapahoe (CO), Larimer (CO), Morgan (CO), Boulder (CO), Washtenaw (MI), St. Clair (MI), Wayne (MI), Oakland (MI), Macomb (MI), Livingston (MI), Monroe (MI), Muskegon (MI), Allegan (MI), Licking (OH), Cuyahoga (OH), Portage (OH), Fairfield (OH), Summit (OH), Geauga (OH), Medina (OH), Lake (OH), Lorain (OH), Delaware (OH), Mahoning (OH), Parker (TX), Tarrant (TX), Montgomery (TX), Brazoria (TX), Fort Bend (TX), Denton (TX), Wise (TX), Galveston (TX), Harris (TX), Kaufman (TX), Chambers (TX), Johnson (TX), Bexar (TX), Dallas (TX), Ellis (TX), Uintah (UT), Duchesne (UT).

Attachment 1

Renee C. McVay

Environmental Defense Fund
301 Congress Ave, Suite 1300, Austin, TX 78701
Email: rmcvay@edf.org, Phone: (512) 691-3474

Education

Ph.D., Chemical Engineering — ***2016***
California Institute of Technology — Pasadena, CA
Advisor: Dr. John H. Seinfeld
National Science Foundation Graduate Research Fellowship (GRFP)
National Science Foundation Graduate Research Opportunities Worldwide (GROW) Award

M.S., Chemical Engineering — ***2014***
California Institute of Technology — Pasadena, CA
Advisor: Dr. John H. Seinfeld — GPA: 4.0

B.S., Chemical Engineering — ***2011***
Texas A&M University — College Station, TX
Minors in Chemistry and Spanish — GPA: 4.0
International Engineering Certificate

Experience

Environmental Defense Fund — Austin, TX
Senior Research Analyst — 2017-Present
Research Focus: Using emission inventories to develop state and region-specific emission profiles from the oil and gas sector.

Cooperative Institute for Research in Environmental Sciences (CIRES) — Boulder, CO
Postdoctoral Fellow — 2016-2017
Research Focus: Modeling atmospheric chemistry and secondary organic aerosol (SOA) formation using the Weather Research and Forecasting model coupled to Chemistry (WRF-Chem).

California Institute of Technology — Pasadena, CA
Ph.D. Candidate — 2011-2016
Advisor: Dr. John H. Seinfeld
Research Focus: Modeling secondary organic aerosol (SOA) formation from the gas-phase oxidation of volatile organic compounds to compare with experimental observations in environmental chambers

Laboratoire Interuniversitaire des Systèmes Atmosphériques — Paris, France
International Research Collaboration — Jan-May 2015
Advisor: Dr. Bernard Aumont
Research Focus: Working with and updating the Generator for Explicit Chemistry and Kinetics of Organics in the Atmosphere (GECKO-A) and comparing model predictions to experimental observations

Eastman Chemical Company — Longview, TX
Engineering Intern — Summer 2010
Job Focus: Material balances, rate studies, and sampling programs

Publications and Presentations

Peer-Reviewed Journal Publications

Schwantes, Rebecca H., Katherine A. Schilling, Renee C. McVay, Hanna Lignell, Matthew M. Coggon, Xuan Zhang, Paul O. Wennberg, and John H. Seinfeld. Formation of Highly Oxygenated Low-Volatility Products from Cresol Oxidation, *Atmos. Chem. Phys. Discuss.*, **2017**, *17*, 3453-3474, doi:10.5194/acp-17-3453-201.

T. Nah, R. C. McVay, J. R. Pierce, J. H. Seinfeld, and N. L. Ng. Constraining uncertainties in particle wall-deposition correction during SOA formation in chamber experiments, *Atmos. Chem. Phys.*, **2017**, *17*, 2297-2310 doi:10.5194/acp-17-2297-2017.

Nah, Theodora, Renee C. McVay, Xuan Zhang, Christopher M. Boyd, John H. Seinfeld, and Nga L. Ng. Influence of Seed Aerosol Surface Area and Oxidation Rate on Vapor-Wall Deposition and SOA Mass Yields: A case study with α-pinene Ozonolysis, *Atmos. Chem. Phys.*, **2016**, *16*, 9361-9379, doi:10.5194/acp-16-9361-2016.

McVay, Renee C., Xuan Zhang, Bernard Aumont, Richard Valorso, Marie Camredon, Yuyi S. La, Paul Wennberg and John H. Seinfeld. SOA formation from the photooxidation of α-pinene: Systematic exploration of the simulation of chamber data, *Atmos. Chem. Phys.*, **2016**, *16*, 2785-2802, doi:10.5194/acp-16-2785-2016.

Zhang, Xuan, Renee C. McVay, Dan D. Huang, Nathan F. Dalleska, Bernard Aumont, Richard E. Flagan, and John H. Seinfeld. Formation and evolution of molecular products in α-pinene secondary organic aerosol. *Proc. Natl. Acad. Sci.*, **2015**, *112*, 14168-14173, doi:10.1073/pnas.1517742112.

Zhang, X., R. H. Schwantes, R. C. McVay, H. Lignell, M. M. Coggon, R. C. Flagan, and J. H. Seinfeld. Vapor wall deposition in Teflon chambers. *Atmos. Chem. Phys.*, **2015,** *15*, 4197-4214.

McVay, Renee, Christopher Cappa, and John Seinfeld. Vapor Wall Deposition in Chambers: Theoretical Considerations. *Environ. Sci. and Technol.*, **2014**, *48*, 10251-10258.

Zhang, Xuan, Christopher Cappa, Shantanu Jathar, Renee McVay, Joseph Ensberg, Michael Kleeman, and John Seinfeld. Influence of vapor wall loss in laboratory chambers on yields of secondary organic aerosol. *Proc. Natl. Acad. Sci.*, **2014**, *111*, 5802-5807.

Conference Presentations

McVay, Renee, Theodora Nah, Jeffrey R. Pierce, John Seinfeld, Nga Lee Ng. Uncertainties in Particle Wall Loss Correction during Secondary Organic Aerosol Formation in Chamber Experiments. American Association for Aerosol Research, 27-21 October 2016, Portland.

McVay, Renee, Xuan Zhang, Bernard Aumont, Richard Valorso, Marie Camredon, Stéphanie La, and John Seinfeld. Uncertainties in SOA Formation from the Photooxidation of α-pinene. American Geophysical Union, 14-18 December 2015, San Francisco.

McVay, Renee, Xuan Zhang, Christopher Cappa, and John Seinfeld. Vapor Wall Loss in Chambers: Theoretical Considerations. American Geophysical Union, 15-19 December 2014, San Francisco.

Attachment 2

HILLARY F HULL
650-646-1737
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Home Address
1145 Pine St, Apt 16
San Francisco, CA 94109

Office Address
123 Mission St, 28th Floor
San Francisco, CA 94105

Objective: Seeking permanent employment in the environmental policy, science or engineering field.

Education:

Master of Science, Environmental Engineering: Atmosphere and Energy, January 2012
Stanford University

Relevant Coursework Includes: Air Pollution Physics and Chemistry; Energy Resources; Environmental Planning Methods; Distributed Generation and Grid Integration of Renewables; Air Pollution: Urban Smog to Global Change; Energy Efficient Buildings; Greenhouse Gas Mitigation; Indoor Air Quality; Electric Power: Renewables and Efficiency; Air Quality Mgmt; Lifecycle Assessment; Research, Analysis, and Writing for the Public

Bachelor of Science, Civil Engineering, May 2010
The University of Texas at Austin
Overall GPA: 3.67/4.00

Relevant Coursework Includes: Environmental Sampling and Analysis; Air Pollution Engineering; Introduction to Environmental Engineering; Water and Wastewater Treatment and Design

Experience

06/2014 - Current

Research and Analytics Senior Manager, Environmental Defense Fund (San Francisco, CA)
Manage development of analytics and policy for EDF's state, federal and international oil and natural gas advocacy efforts, including regulatory advocacy, emissions inventory compilation, data and economic analytics, technical support for rulemaking and regulation, and policy analysis and development.

09/2012 – 06/2014

Senior Project Engineer, Environmental Resources Management (Austin, TX & Walnut Creek, CA)
Managed and worked on projects in the Air Quality and Performance & Assurance practice areas. Experience writing state and federal air permits, completing calculations for air emissions inventories, performing environmental site assessments, compiling Spill Prevention, Control and Countermeasure plans, and performing regulatory compliance reviews.

06/2011 - 08/2011

Climate and Air Intern, Environmental Defense Fund (Washington, DC)
Worked with Dr. Jason Funk and the international climate team to help construct and support climate policies worldwide. In particular, completed extensive research on the use of alternative fuels for aviation as well as an overall biofuels profile.

05/2008 - 08/2008

Engineering Intern, Bechtel (Richland, WA)
Worked as an intern on the nuclear waste vitrification project at the Department of Energy Hanford site in the Civil, Structural and Architectural department of Bechtel. Completed a variety of tasks pertaining to: concrete/steel structural design, radiation shielding design, steel embedment calculations, and drawing inspections.

HILLARY F HULL
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Academic Experience

Study Abroad (Ankara, Turkey)
Studied abroad in Ankara during the summer of 2009. Took a course pertaining to the fundamentals of fuel cell engines, and a Turkish language course. Interacted routinely with Turkish engineering students to design fuel cell systems and evaluate cultural differences during time of study at the Middle Eastern Technical University in Ankara.

Engineers Without Borders (Limbe, Cameroon)
As a member of Engineers Without Borders and the Project Lead for the Cameroon Project, worked to implement a sanitary, reliable water supply for the Saker Baptist College in Limbe, Cameroon. Traveled to Limbe in January of 2008 for exploration, and again in January of 2009 for assessment. Work completed for the project includes: CADD designs for the existing and proposed tank and pipeline system, travel logistics, and intensive water testing.

Study Abroad (London, England)
Studied abroad in the summer of 2007 in London, England. Took a course in sustainable architecture and a course in energy. The architecture course included visits to many prominent architecture firms and engineering firms in London and the energy course explored the many facets of the energy market, as well as different energy sectors, such as: nuclear, coal, solar, biofuel, geothermal and wind.

Skills

Proficient in Microsoft Word, Power Point, and Excel
Experience using Marlab, Fortran, SolidWorks, Microstation, SketchUp, Pipe2000
Experience in surveying and project site assessment
Basic Spanish and limited Turkish language skills

Accomplishments

Honors Engineering Program, University of Texas at Austin
Cameroon Project Lead and Internal Education Chair, Engineers Without Borders
Director of Operations, Engineers Without Borders
Member, American Society of Civil Engineers
Published Article on-line in the Stanford Magazine: "Finding the Greenest Car"
(http://alumni.stanford.edu/get/page/magazine/article/?article_id=46694)

Certifications

Engineer in Training (E.I.T.)
40-Hour Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)
Heartsaver First Aid CPR AED

Employability Status: US Citizen/Permanent Resident

Attachment 3

KATHERINE "KATE" ROBERTS

1362 47th Ave • San Francisco, CA 94122 • (425) 269-9212 • karoberts.wa@gmail.com

EDUCATION:

Stanford University Palo Alto, CA

M.S. Civil & Environmental Engineering September 2017 – June 2018

- Academic: GPA: 3.741

B.S. Earth Systems September 2014 - June 2017

- Academic: GPA: 3.715, School of Earth, Energy and Environmental Sciences Dean's Award for Undergraduate Academic Achievement

ENVIRONMENTAL WORK EXPERIENCE:

Environmental Defense Fund, Research Analyst San Francisco, CA 2018 - Present

- Analyzes emission inventories, regulatory proposals, economic data, and nationwide demographic data
- Uses ArcGIS and Python to conduct spatial analyses of emissions and populations in proximity to oil and gas facilities

Environmental Defense Fund, Schneider Fellow San Francisco, CA Summer 2018

- Used ArcGIS, Python, and Tableau to determine and visualize populations living near oil and gas wells
- Assisted in the creation of a New Mexico emissions inventory

Stanford Sierra Camp, Naturalist South Lake Tahoe, CA Summer 2017

- Developed curriculum and led adults in interactive environmental education activities (i.e. nature hikes, orienteering, birding)

San Francisco Estuary Institute, Intern Richmond, CA Summer 2016

- Conducted historical ecology research on the Petaluma River
- Contributed to a written report on the Sacramento-San Joaquin River Delta

Student Researcher, Fendorf Lab Stanford University, CA Summer 2015

- Researched the impact of seasonal flooding on carbon and arsenic cycling
- Completed technical lab analyses and completed field work in Cambodia
- Presented poster at AGU 2015: "*Impacts of Seasonal Flooding on Arsenic Release in Tropical River Deltas*"

Stanford Sierra Camp, Kids' Naturalist South Lake Tahoe, CA Summer 2014

- Developed programming and led families and children on nature walks and through interactive nature-themed games

Earth Corps Forest Monitor Kirkland, WA June-November 2012

- Gathered baseline data in local parks for forest health parameters

TECHNICAL SKILLS:

- ArcGIS, Python, Microsoft Word, Excel, PowerPoint, Adobe Photoshop, digital photography, some Java