



July 2017

**ATTACHMENT "A"
TO THE _#_ JIP**

PROPOSAL

Project Title:

Survey of Methane Emissions from Marginal Wells and Associated Operations

Lead:

RPSEA Contact:

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Project Team:

- RPSEA
- HARC
- GSI Environmental Inc.
- Advisory teams from industry, academia, and state and federal government.
- RPSEA members on regional basis
- Data collection team (primarily university based, with the universities may include Texas A&M University, Utah State University, Colorado School of Mines, Colorado State University, West Virginia University and others) as appropriate.

RPSEA, a not for profit research organization located in Houston, Texas proposes to conduct a phased study of methane emissions focused on marginal wells.

RPSEA has funded several projects on air emissions. The project team has developed accepted protocols and methodologies that were partially developed under: RPSEA project 11122.45.01: *Reducing the Environmental Impact of Shale Gas Development – Advanced Analytical Methods for Air and Stray Gas Emissions and Produced Brine Characterization.*

Introduction:

Marginal oil wells are those with average production of not more than 15 barrels per day, those producing heavy oil, or those wells producing not less than 95 percent water with average



production of not more than 25 barrels per day of oil. Marginal gas wells are those producing not more than 90 Mcf a day.

There are more than 1.1 million oil and natural gas wells in the USA, of which about 760,000 are considered marginal. Production from marginal wells has held steady for a number of years accounting for 10 - 20 percent of the US oil production and about 13 percent of the US natural gas production.

The Environmental Protection Agency (EPA) issued a final rule on June 3rd 2016, to amend the New Source Performance Standards¹ (NSPS, 40 CFR Part 60, Subpart OOOOa) to reduce methane emissions from new and modified oil and gas facilities. These new requirements include marginal well sources which were not previously addressed. The EPA rules concerning methane emissions impact all producers and, in particular, will affect small oil and gas operators throughout the United States. EPA's decision to no longer exempt marginal wells from the Leak Detection and Repair (LDAR) requirements was developed based on limited data. The costs of compliance may have great economic impact on energy production, states and communities. According to comments used in the ruling, some marginal wells may have fugitive methane emissions that are greater than 1% of production.

EPA has stated that it believes emissions from low production and non-low-production well sites are comparable based on limited data from a variety of studies and technical publications. Measurement data on fugitive and ambient emissions from upstream unconventional oil and gas operations are scarce or locally specific to processes in a particular region. Current models being used to estimate these emissions rely heavily on a variety of default factors for chemical constants/coefficients and values that are not site-specific, thus creating a significant variance in the models leading to errors in estimation of emissions. Current standard practices for measurement of ambient emissions consist of stationary monitors that are expensive to install, maintain and operate. There is a plethora of protocols written "on the fly" that creates confusion about varying emission results across the United States.

¹ 40 CFR Part 60, Federal Register / Vol. 81, No. 107 / Friday, June 3, 2016 / Rules and Regulations [EPA-HQ-OAR-2010-0505; FRL-9944-75-OAR] RIN 2060-AS30; Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015.



*A Protocol for the Measurement of Ambient Air Emissions at Oil and Gas Sites using a Monostatic OP-FTIR, Meteorological Sensors and an Optical Imaging Camera*² that includes a foundation for mobile instrumentation standards, configurations and real time analysis was developed under a RPSEA funded program.³ This program assessed various advanced field tools and models to develop the protocol for measurement of air emissions from drilling operations, well completion/frac spread equipment, and storage units. A critical component of the project was the high level of participation and interest from industry stakeholders concerned with environmental aspects associated with shale gas development. The project team assembled two Technical Advisory Steering Committees (TASCs, Industry and Regulatory) that provided recommendations and feedback on project activities to ensure that the protocols being developed would be applicable, that project tasks were appropriate, and results can be applied across the industry. Participants in the TASCs included industry, regulatory and governmental agencies (including US EPA, US DOE, USGS, and various state agencies), academia and non-governmental organizations.

Problem Statement:

The EPA rules concerning methane emissions impact all producers but, in particular, will affect independent and small oil and gas operators throughout the United States. EPA's decision to no longer exempt marginal wells from the Leak Detection and Repair (LDAR) requirements was developed based on very limited data. However, because LDAR requirements impose permanent operating costs for these wells, they will affect the duration of operations as wells become marginal producers, and, potentially, result in early shutdown and abandonment. When marginal wells are recompleted/modified they may also be impacted by this rule. If EPA requires the same LDAR program for marginal wells that is imposed on non-marginal producers, these marginal wells will face a new economic burden that will dramatically reduce the future of these facilities. The costs of compliance may have great economic impact on energy production, states and communities.

In addition, EPA also created a Control Techniques Guideline (CTG) for existing source of Volatile Organic Compounds (VOC) in Ozone NAAQS nonattainment areas. It would require states to adopt its model regulations or provide for equivalent reductions. Because its source thresholds are low, marginal well equipment replacement or controls could be required. The CTG may

² Stuver, Susan, K., Richardson, Stephen, D., 2016. A Protocol for the Measurement of Ambient Air Emissions at Oil and Gas Sites using a Monostatic OP-FTIR, Meteorological Sensors and an Optical Imaging Camera. Report Submitted to Research Partnership to Secure Energy for America (RPSEA) July, 2016.

³ RPSEA Project 11122.45.01 "Reducing The Environmental Impact of Shale Gas Development – Advanced Analytical Methods for Air and Stray Gas Emissions and Produced Brine Characterization", P.I.: John Connor, GSI Environmental.



require implementation of the Subpart OOOO and OOOOa technologies for existing wells. For example, without the marginal well exemption, the rule may require the installation of vapor recovery units on storage tanks. Many of these tanks are associated with low volume oil/condensate and associated gas, too old to implement new technologies. If these facilities emissions fall above the EPA threshold, this would force small producers to replace or significantly modify these tanks – and the cost of doing this may be prohibitive, causing the operator to cease operations. Other equipment, such as pneumatic controllers could face similar replacement requirements. Collectively, the application of these technologies – decisions made without direct marginal well data and analysis – threaten thousands of small wells.

Unbiased data of methane emissions from marginal wells and associated facilities needs to be obtained to accurately estimate emissions.

Various reports concerning measurements of emissions have been reviewed.^{4,5,6,7,8,9,10,11,12,13,14} A common issue associated with these studies is the lack of documentation of operations that occurred during the time of emissions measurements. Operations can influence the amount of emissions and vary over time. Another issue is the statement, *“the number and type of equipment that could be potential leak sources generally scales with the number of wells.”*¹⁵ Equipment inventories were not performed during the studies. Additionally significant is the assumption that *“Because the population of functionally super-emitting sites is not expected to be static over time, continuous monitoring will likely be necessary to identify them and improve their operation.”*¹⁶

⁴ Zavala-Ariaza, et.al. “Reconciling divergent estimates of oil and gas methane emissions,” www.pnas.org/cgi/doi/10.1073/pnas.1522126112

⁵ Townsend-Small, et.al. “Integrating source apportionment tracers into a bottom-up inventory of methane emissions in the Barnett Shale hydraulic fracturing region,” *Environ. Sci. Technol.* 2015, 49, 8175–8182

⁶ Karion, et.al. “Aircraft-based estimate of total methane emissions from the Barnett Shale region,” *Environ. Sci. Technol.* 2015, 49, 8124–8131

⁷ Lavoie, et.al. “Aircraft-based measurements of point source methane emissions in the Barnett Shale basin,” *Environ. Sci. Technol.* 2015, 49, 7904–7913

⁸ Marchese, et.al. “Methane emissions from United States natural gas gathering and processing,” *Environ. Sci. Technol.* 2015, 49, 10718–10727

⁹ Allen, et.al. “Methane emissions from process equipment at natural gas production sites in the United States: liquid unloadings,” *Environ. Sci. Technol.* 2015, 49, 641–648

¹⁰ Lamb, et.al. “Direct measurements show decreasing methane emissions from natural gas local distribution systems in the United States,” *Environ. Sci. Technol.* 2015, 49, 5161–5169

¹¹ Johnson, et.al. “Methane emissions from leak and loss audits of natural gas compressor stations and storage facilities,” *Environ. Sci. Technol.* 2015, 49, 8132–8138

¹² Yacovitch, et.al. “Mobile laboratory observations of methane emissions in the Barnett Shale region,” *Environ. Sci. Technol.* 2015, 49, 7889–7895

¹³ Allen, et.al. “Methane emissions from process equipment at natural gas production sites in the United States: Pneumatic controllers,” *Environ. Sci. Technol.* 2015, 49, 633–640

¹⁴ Omara, et.al. “Methane emissions from conventional and unconventional natural gas production sites in the Marcellus shale basin,” *Environ. Sci. Technol.* 2016, 50, 2099–2107

¹⁵ Zavala-Ariaza, et.al. “Toward a functional definition of methane super-emitters: application to natural gas production sites,” *Environ. Sci. Technol.* 2015, 49, 8167–8174



The assumption is that air emissions from super-emitters remains constant. However, no data exists to confirm that statement.

Purpose of Project:

A study of methane emissions from marginal vs. non-marginal well sites at various basins across the United States will be performed. This proposal recommends an initial study in one region, starting with the Permian Basin in Texas and New Mexico. Additional regions, possibly two, will be based on feedback from the project Steering Committee. The goal of the study is to collect and evaluate defensible and repeatable data using a stepwise approach.

First, data from existing sources, including published studies and information surveyed from operators, will be compiled, evaluated for its usability and representativeness, and analyzed to ascertain i) what conclusions can be reliably drawn based on existing available information, and ii) key gaps in our understanding of the relative frequency and magnitude of emission from marginal vs. non-marginal well sites. The findings of this *desktop study* will be used to develop a focused and detailed scope of subsequent field investigations, as needed, to address critical data gaps, including potential identification and implementation of appropriate best management practices (BMPs).

Phase 1A, Initial Survey – Project Development

For this phase of the project the RPSEA team will perform the following tasks:

- **Form a Steering Committee:** The Steering Committee will provide program direction, review plans and progress and will provide guidance concerning each phase of the project including field measurements.
- **Operator Survey:** An initial operator survey shall be performed to determine operator interest and potential participation in the field study. This survey will be performed using Survey Monkey Poll. The objectives of the survey are:
 - Gage interest in study
 - Identify operators to participate
 - Gather information to assist in prioritizing locations

Appendix 1 covers the information that will be contained in the poll.



- **Field Investigation Plan Development:** Based on the initial operator survey a detailed operator survey and the field investigation plan will be developed. The detailed operator survey will be performed in Phase 1B. The field investigation plan will be outlined and will include a list of operators that the field team will work with to identify what facilities will be visited to perform measurements. The field investigation plan will then be revised based on the detailed operator survey that will be performed in Phase 1B.

Phase 1B, Desktop Study

For this phase of the project the RPSEA team will perform the following tasks:

- **Literature Survey:** Compile and review published, peer-reviewed scientific articles to assess the quantity, quality, usability, and representativeness of data from previous studies pertaining to emissions from oil and gas production marginal and non-marginal well sites. Identify (with appropriate justification) usable/representative vs. usable/unrepresentative data which may support data mining efforts. Characterize key emission sources, activity data, and associated site metrics on a region-by-region basis.

Included in the Literature Survey will be information that may be available from the regulatory agencies concerning descriptions of facilities and wells.

- **Operator Survey:** Develop and conduct a blind survey of oil and gas producing companies, including IPAA members and others, as appropriate, to collect available data on key site metrics. Information to be solicited for populations of well sites will include, for example, the number and types of wells; oil, gas, and condensate production rates; and presence (quantity) or absence of various ancillary equipment. As a blind study, all information relating to the identity of survey respondents will remain strictly confidential to the RPSEA project team; however, summary information may be reported as long as no respondent is readily identifiable by others. *(Note: participation by a sufficient number of operators representing the full diversity of well site conditions expected in each evaluated region is critical to ensuring the scientific integrity of this effort. Support from IPAA and possibly other industry groups will be essential to securing sufficient operator participation and cooperation.)*

Appendix 2 provides the starting point for this survey.



- **Data Mining:** Compile a database of usable data from the literature and operator survey responses. Categorize well sites as marginal vs. non-marginal and by region and other relevant distinguishing criteria. For key categories, evaluate and compare the frequency of identified emissions sources and summary statistics of related activity data.
- **Data Gap Assessment:** Identify gaps in the current understanding of emissions from marginal vs. non-marginal well sites. Formulate specific scientific questions to be answered, or hypotheses to be tested, by a series of focused, subsequent field investigations, as needed, in order to address key data gaps.
- **Desktop Study Report:** A report that will characterize key emission sources, activity data, and associated site metrics on a region-by-region basis from the literature review and document input from oil and gas producing companies on the number and types of wells; This will probably include areas of wells within the basin what have: (a) oil wells with associated gas, (b) dry gas wells, and (c) gas/condensate production; and presence (quantity) or absence of various ancillary equipment will be prepared for submittal to the Steering Committee. Recommendations for proposed field investigation will also be provided in the report

This Phase is expected to take 6 to 8 weeks.

Phases 2 and 3, Initial and Supplemental Field Investigations (as necessary)

Based on the findings of the desktop study, the RPSEA team will perform an initial field investigation in the Texas/New Mexico Permian basin to measure air emissions from both marginal and non-marginal wells and their ancillary components. Emissions estimates will be developed for both. (This may be repeated at least two other regions if additional funding is provided and as decided by the Steering Committee, with at least one basin with a high representation of marginal wells). Supplemental field investigation(s) will be completed in additional basins to gain a better understanding of extent and variability of emissions on a regional basis. In particular, geography, oil and gas composition, and the percentage of marginal wells in a particular basin will be considered. This data can then be compared to data considered in the development of LDAR requirements. Supplemental field investigations will be performed by representatives from universities (e.g., USU, CSU, TAMU, others) who will implement field



programs similar to those performed during the initial field event. For all field programs, the following activities will be performed:

- **Work Plan Development:**

- Select appropriate sampling methodology and technologies, as best suited to address data gaps identified in the Phase 1 desktop study. Based on recent discussions with EPA, a combination of the following sampling methods will be applied.

Equipment	Proposed Activity	Goal
Optical Imaging Camera	Screening of fugitive emissions from equipment.	Accurate, real-time, efficient method of identifying leaks for further measurement.
High flow Sampler	Direct measurement of emissions from equipment	Accurate emissions rate and frequency from leaking valves, flanges, equipment.
Hot Wire Anemometer	Open-ended lines/vents on compressors	Accurate air flow, volume and temperature readings from small diameter vents.
Multiple mobile and/or fixed air monitoring technologies ¹⁶	Measurement of ambient and background methane concentrations in air	Accurate estimation of total site-wide emission rates.

- Develop site selection criteria, as needed to ensure adequate and defensible coverage of expected actual field conditions, as relate to site emissions.
- Develop Sampling and Analysis Plan (SAP). Review and augment applicable measurement protocols to ensure the use consistent procedures.
- Develop detailed quality assurance project plan (QAPP), including peer reviews, calibration of equipment, auditing of data collection.
- Develop detailed data management plan (DMP), including reporting/access of data and project management plan (PMP) to identify project resources.

- **Field Investigation(s):** Apply the workplans to collect repeatable, defensible emissions measurements from appropriate, representative populations of marginal and non-marginal oil and gas well sites.

¹⁶ Brantley, et.al. "Assessment of methane emissions from oil and gas production pads using mobile instruments," Environ. Sci. Technol. 2014, 48, 14508–14515



- Document location, history, production rates, ongoing operations (e.g., production, unloading). Documentation to remain confidential until requested otherwise.
- Locate well pad sites that may have methane leaks. Also identify and document well pad sites that do not appear to have leaks
- Perform equipment inventory at each site.
- Collection of emissions and other data from representative sites:
 - Perform optical imaging, high flow, and other emissions measurements, as necessary to identify and quantify emissions (see table above).
 - Identify potential influencing factors – weather, topography, location of other facilities and background sources of emissions.
 - Record activity log during measurements. Ensure calibration checks before and after measurement activities. Apply appropriate equipment protocols (e.g., RPSEA/GSI Methane Stray Gas Monitoring Protocol).

Appendix 3 shows a site access agreement that will be executed prior to any onsite measurements.

- **Data Analysis:**

- Apply QA/QC procedures to ensure that all data collected are defensible and comparable. Determine which data should be used for emissions estimation based on the representativeness and accuracy of each set of data points.
- Estimate component-specific and/or total methane emission rates from observed operations and activities.
- Group data into related clusters, determine statistical probability distributions, and calculate appropriate statistics (e.g., 95% confidence intervals) using standard parametric or nonparametric procedures.

- **Reporting:** Summarize and compare emissions among significant marginal and non-marginal well site populations. Develop reports for each basin and an overall report, including web based story map, GIS map linking all data, emissions estimates and activity factors. Communicate results to industry and discuss with regulators, upon industry approval.



- **Supplemental Data Collection Team:** Establish local data collection teams in additional regions to be identified in coordination with industry and based on desktop study and initial field investigation.
 - Engage regional researchers (typically universities) to perform data collection
 - Establish reporting guidelines, communication plan
 - Perform training and oversight of data collection teams
 - Conduct workshop(s) with regional sampling teams to:
 - Review methodologies and associated protocols that will be used
 - Review data collection and reporting requirements
 - Discuss peer review process, auditing of data collection practices
 - Discuss schedule

Technical Advisory Groups: Technical advisors from industry, regulatory agencies, academia, governmental representatives and other stakeholders will be engaged during the project to provide feedback on project activities and review results.

1. A project management plan will be reviewed by the Steering Committee and provided to IPAA (Quality control plan, data management plan, project management plan, technology transfer plan).
2. Working with operators or associations who have agreed to participate, an initial survey will be conducted to select well pad sites at which field measurements will be taken.
3. Using the RPSEA air emissions measurement protocol previously discussed with EPA, a process for an internal audit of the teams performing measurements and will peer review all data collected by GSI.
4. The data collection team will:
 - a. Collect emissions data and other associated data
 - b. Submit data to GSI for review
 - c. Develop report on data measurement and findings
5. Data analysis based on all data gathered.
6. The project team will develop final report, presentations.

Meetings held:

- **IPAA (lead organization)**



- **IPAA Cooperating Associations**
- **Liaison Committee**
- **US Oil & Gas Association**
- **RPSEA members**
- **State Oil and Gas Associations**
- **HARC/EFD Advisory Meeting and Workshop**
- **US EPA in Research Tringle Park**

RPSEA has discussed this with several IPAA members, and support from the US Oil & Gas Association. Discussions have also included state regulators, land management organizations such as the TX GLO and the University Lands office about participating as well. RPSEA and GSI participated with a HARC Environmentally Friendly Drilling Program workshop in April 2017 to review the study proposal. That meeting was comprised of several SMEs including 3 operators.

RPSEA and GSI met with EPA emissions team at their technology center in North Carolina this past January 2017. Lee Fuller from IPAA helped coordinate the meeting. On February 14, 2017 Tom Williams presented the proposal and summary of that meeting at the IPAA Strategic Planning Conference on Land Access and Environmental Issues in Houston. The presentation described the proposal and a summary of where EPA provided suggestions on testing methods and analysis and gave general acceptance of incorporating these testing methods and the study.

The next step is to secure sufficient funding to get the project started.

Funding Requirements

Phase 1 will cost approximately \$75,000 to \$100,000. This will enable the project team to perform phases 1A and 1B.

To complete a program for the Phase 2 field study of one basin will require approximately \$400,000. Once the project Phase 1 is initiated, a detailed budget will be developed as a part of this phase. RPSEA and the team have already contributed a considerable amount of time and travel costs to get this project to this point. RPSEA is a research organization with low Overhead and G&A allowing this project will be managed efficiently.

The rest of the funding will be needed to carry out the field investigation efforts, phases 2 and 3.



APPENDIX 1 – Initial Operator Survey

RPSEA has pulled together a team to perform a study of methane emissions from marginal vs. non-marginal well sites at various basins across the United States. Unbiased data of methane emissions from marginal wells and associated facilities needs to be obtained to accurately estimate emissions. The goal is to collect and evaluate defensible and repeatable data using a stepwise approach.

This poll is to identify operators interested in participating in the study and to gather data to outline a field investigation.

1. Operator Information

- a. Operator
- b. Headquarters Address
- c. Point of Contact
 - i. Name
 - ii. Title
 - iii. Email
 - iv. Phone (office)
 - v. Phone (cell)

2. Operator Interest

- a. Willing to participate on Technical Advisory Group (Y/N)
- b. Willing to provide confidential information concerning wells and facilities (Y/N)
 - i. Approximate number of marginal wells
 1. Less than 100
 2. Between 100 and 1,000
 3. Between 1,000 and 5,000
 4. Greater than 5,000
- c. Willing to allow field measurements to occur at well sites and facilities (Y/N)

3. Prioritization of Plays

The study team wants to include a mix of wet gas, dry gas and associated gas. For example, the Wolfcamp formation is present throughout the Permian Basin and is roughly 60% crude, 20% wet gas and 20% dry gas.



- a. In the table that follows, please number (1, 2, 3) the top three plays, in priority order, which you believe should be included in the study.

Priority (Top 3, numbered 1, 2, 3)	Region	Play	Discussion
	Gulf Coast	Barnett Shale	Core area (Denton, Johnson, Tarrant and Wise counties) is largely dry gas, although Wise County is generally oilier. Montague, Cooke, Jack and Wise counties have liquids-rich portions.
	Gulf Coast	Eagle Ford Shale	Counties include: Atascosa, Bee, DeWitt, Dimmit, Fayette, Frio, Gonzales, Karnes, LaSalle, Lavaca, Live Oak, Maverick, McMullen, Webb, Wilson, Zavala.
	Gulf Coast	Eaglebine	Counties include: Brazos, Burleson, Grimes, Houston, Lee, Leon, Madison, Milam, Robertson, Waller.
	Gulf Coast	Haynesville Shale	Dry gas formation.
	Gulf Coast	Lower Smackover/Brown Dense	Oil and gas reservoir underlying northern Louisiana, parts of southern Arkansas and Mississippi.
	Gulf Coast	Permian – Abo Formation	Tight Sands – Oil: NM, TX
	Gulf Coast	Permian – Avalon Shale	Shale – Gas: NM, TX
	Gulf Coast	Permian – Bone Springs (2 nd & 3 rd)	Tight Sands – Oil: NM, TX
	Gulf Coast	Permian – Cline Shale	Shale – Oil: TX
	Gulf Coast	Permian – Penn Shale	Shale – Oil: TX
	Gulf Coast	Permian – Spraberry	Tight Sands – Oil: TX
	Gulf Coast	Permian – Wolfberry	Shale/Tight Sands – Oil: TX
	Gulf Coast	Permian – Wolfbone	Shale/Tight Sands – Oil: TX
	Gulf Coast	Permian – Wolfcamp Shale	Shale – Oil: NM, TX
	Gulf Coast	Permian – Yeso Formation	Carbonate – Oil: NM
	Gulf Coast	Tuscaloosa Marine Shale	Liquids-rich natural gas.
	Mid-Continent	Arkoma-Woodford Shale	Primarily a dry gas formation, although the western half tends to be more liquids-rich.
	Mid-Continent	Cana-Woodford Shale	Liquids rich shale formation.
	Mid-Continent	Fayetteville Shale	Dry gas formation.
	Mid-Continent	Granite Wash	Liquids-rich tight gas
	Mid-Continent	Mississippian Lime	Carbonate formation that primarily produces oil.
	Mid-Continent	Anadarko Basin	Liquids-rich play in Oklahoma
	Mid-Continent	Cherokee Platform	Liquids-rich play in Oklahoma
	Mid-Continent	Wichita Uplift	Liquids-rich play in Oklahoma
	Mid-Continent	Ardmore Basin	Liquids-rich play in Oklahoma



	Mid-Continent	Arbuckle Uplift	Liquids-rich play in Oklahoma
	Mid-Continent	Ouachita Mountain Uplift	Liquids-rich play in Oklahoma
	Mid-Continent	Woodford Shale	Liquids-rich play in Oklahoma
	Mid-Continent	South Central Oklahoma Oil Province – SCOOP	Liquids-rich play in Oklahoma
	Mid-Continent	Sooner Trend (oilfield) Anadarko (basin) – STACK	Liquids-rich play in Oklahoma
	Mid-Continent	Central North Oklahoma Woodford – CNOW	Liquids-rich play in Oklahoma
	Northeast	Marcellus Shale	Primarily dry gas.
	Northeast	Utica Shale	Oil window to the west, dry gas window to the east, wet gas window in between.
	Rockies/West Coast	Bakken Shale	High quality crude.
	Rockies/West Coast	Green River Basin	Production dominated by gas and gas liquids from tight sands formations (Pinedale Anticline, Jonah Field, Wamsutter Field)
	Rockies/West Coast	Niobrara-DJ Basin	Crude oil and liquids-rich gas play.
	Rockies/West Coast	Paradox Basin	Conventional oil and gas production
	Rockies/West Coast	Piceance Basin	Tight sands – liquids-rich gas.
	Rockies/West Coast	Powder River Basin	Coalbed methane – dry gas. Oil production.
	Rockies/West Coast	San Juan Basin	Conventional and unconventional tight gas sands, coal bed methane and shale formations. Also crude oil production.
	Rockies/West Coast	Uinta Basin	Crude oil production.

b. For the top three that you identified, please provide comments on why you selected the play.

Priority	Region	Play	Comment on why selected
1			
2			
3			



APPENDIX 2 –Operator Survey – Blind Survey

RPSEA has pulled together a team to perform a study of methane emissions from marginal vs. non-marginal well sites at various basins across the United States. Unbiased data of methane emissions from marginal wells and associated facilities needs to be obtained to accurately estimate emissions. The goal is to collect and evaluate defensible and repeatable data using a stepwise approach.

This blind survey is to collect available data on key site metrics. Information to be solicited for populations of well sites will include, for example, the number and types of wells; oil, gas, and condensate production rates; and presence (quantity) or absence of various ancillary equipment. As a blind study, all information relating to the identity of survey respondents will remain strictly confidential to the RPSEA project team; however, summary information may be reported if no respondent is readily identifiable by others.

The following describes the type of data the project team would like to obtain from participating operators concerning oil and gas marginal and non-marginal well facilities. The project team will first discuss what information is readily available/already collected with each operator before asking for further information. This information will be instrumental in finalizing the field investigations.

The project team will work with the Technical Advisory Steering Group to finalize the survey.

- General location information
 - Site names, identification numbers (i.e. API well number)
 - County, State and Basin location
 - Well type (e.g., natural gas, oil)
 - Well classification (marginal, non-marginal)
 - Well condition (e.g., storage, injection, producing, shut-in, plugged, abandoned)
- Equipment types and counts
 - Wells
 - Separators
 - Compressors
 - Reciprocating
 - Dry Seal Centrifugal
 - Wet Seal Centrifugal



- Storage tanks
- Dehydrators
- Flares
- Thermal combustors
- Equipment characteristics (e.g., age, size)
- Production rate (e.g., bbls of oil, MCF gas)
- Existing emissions control devices (e.g., vapor recovery units, flares, enclosed combustion devices)
- Controllers (high bleeds, low bleeds, electric, etc.), other pneumatic devices
- Stripper wells
 - Artificial lift equipment



Appendix 3

SITE ACCESS AGREEMENT

In consideration of good and valuable consideration, _____ (hereinafter "Company") grants to **RESEARCH PARTNERSHIP TO SECURE ENERGY FOR AMERICA, a non-profit Texas corporation** (hereinafter "RPSEA") access to Company Property located at _____ for the purpose of conducting a methane emissions study. This agreement is effective as of _____ and will end on _____.

RPSEA agrees that:

1. RPSEA, its staff, agents, contractors and subcontractors shall not interfere with Company operations on the property.
2. RPSEA staff, agents, contractors and subcontractors shall have required safety training prior to arriving on the Property and shall comply with Company's safety policies and procedures while on the Property.
3. RPSEA staff, agents, contractors and subcontractors shall possess and use appropriate personal protective equipment while on the Property.
4. RPSEA shall maintain reasonable general liability insurance, professional liability insurance, worker's compensation insurance, and motor vehicle insurance to cover its staff. RPSEA's agents, contractors and subcontractors shall also maintain comparable insurance coverage. Proof of coverage will be provided to Company upon request.
5. RPSEA expressly agrees to retain in confidence all information shared to it by Company that the Company identifies as being confidential or proprietary or that, by the nature of the information or the disclosure, ought to in good faith be treated as confidential or proprietary ("Confidential Information"). RPSEA expressly agrees not to use or disclose the Confidential Information except for the purposes of fulfilling its obligations hereunder. The Parties expressly agree that Confidential Information will not include any information that: (a) is at the time of disclosure or subsequently becomes publicly available without RPSEA's breach of any obligations owed to



Company; (b) became known to RPSEA prior to Company's disclosure of such information to RPSEA; (c) became known to RPSEA from a source other than Company other than by the breach of an obligation of confidentiality owed to Company; or (d) is independently developed by RPSEA.

6. RPSEA acknowledges that this Agreement is personal to RPSEA and may not be transferred or assigned without Company's explicit, written approval.

Acknowledged this ____ day of _____, 2017:

(COMPANY)

Research Partnership to Secure Energy for America
