

CCAC OIL AND GAS METHANE PARTNERSHIP FRAMEWORK

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The Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership (the “Partnership”) seeks to achieve expanded and accelerated near-term reductions in methane emissions from oil and gas operations globally. Methane’s significant contribution to near-term global warming, combined with its role as an economically valuable cleaner energy source, the widespread availability of cost-effective control technologies, and the sophisticated management capacity of the oil and gas sector, creates a unique opportunity for the oil and gas industry to reduce emissions of this potent greenhouse gas. To take advantage of these opportunities, the CCAC is asking oil and gas companies to take on a set of voluntary commitments and be eligible for accompanying benefits. From a company perspective, the Methane Partnership will:

- provide a high-profile platform for companies to take concrete and credible actions to reduce methane emissions within their own operations/assets;
- create a community of leading peer companies in the oil and gas sector to facilitate learning and continuous improvement in reducing methane emissions;
- ensure that emissions are being reduced to the greatest extent possible in a cost-effective manner, and that the potential climate benefits of natural gas are being maximized; and
- help bolster the oil and gas sector’s “license to operate” in the face of increasing stakeholder concerns about climate change.

This Framework document lays out the structure of the Partnership and is intended to serve as a detailed addendum to the Memorandum of Understanding that companies will sign to join the Partnership (referred to throughout the Framework document as “Partner Companies”). Background on the development of this Framework can be found in Appendix 1. The Framework describes the following elements of the Partnership:

1. GENERAL PARAMETERS
2. SCOPE OF PARTICIPATION
 - a. *PARTNER COMPANY OPERATIONS/ASSETS*
 - b. *EMISSION SOURCES*
3. COMPANY COMMITMENTS
 - a. *IMPLEMENTATION PLAN*
 - b. *EMISSIONS SURVEYS*
 - c. *OPPORTUNITY EVALUATION AND IMPLEMENTATION OF MITIGATION ACTIVITIES*
 - d. *ANNUAL REPORTING*
4. PUBLIC REPORTING OF PROGRESS
5. ROLE OF CCAC PARTNERS
6. CCAC-DEVELOPED TOOLS AND GUIDANCE DOCUMENTS
7. CCAC OIL AND GAS METHANE PARTNERSHIP ADMINISTRATOR
8. TIMING AND PACE OF EFFORTS
9. 3RD-PARTY VERIFICATION
10. GOVERNANCE STRUCTURE AND CONTINUOUS IMPROVEMENT

1. GENERAL PARAMETERS

- Form of agreement: Each company deciding to participate in the CCAC Oil and Gas Methane Partnership will execute a Memorandum of Understanding (MOU) regarding voluntary participation in the Partnership. The MOU shall be countersigned by an authorized CCAC officer;

- Each Partner Company executing a MOU voluntarily agrees to undertake the actions described below;
- The CCAC agrees to undertake the actions described in the MOU (also described below) with each Partner Company;
- Participation in the Partnership and execution of the MOU does not constitute a legal or contractual obligation by either party and no recourse is available in the event of a breach;
- By notifying the other party in writing, either party can terminate an executed MOU at any time with no prior notice or penalties and no further obligation. The CCAC will maintain a website with a list of Partner Companies to the Oil and Gas Methane Partnership, updating the list following entry/exit of Partner Companies; and
- This is a voluntary partnership. The CCAC will play the role of facilitator and serve as a platform for sharing and learning of best practices on methane emissions quantification and control. The CCAC does not have any control over the decisions taken by any Partner Company and its management of its methane emissions.

2. SCOPE OF PARTICIPATION

a. PARTNER COMPANY OPERATIONS/ASSETS

Partner Companies will seek to include broad coverage of their global upstream (production through gathering and processing) operations/assets within the scope of their participation in the CCAC Oil and Gas Methane Partnership. Partner Companies shall strive to eventually include all of their upstream operated assets within the scope of their CCAC participation, including joint ventures operated by the Partner Company, with the ultimate goal of including as broad a scope (beyond only operated facilities) as possible. It is recognized that Partner Companies may need to gradually increase the scope of their participation over time as they learn from experience. While the CCAC Oil and Gas Methane Partnership is targeting upstream operations/assets, Partner Companies may choose – and are encouraged – to include other parts of their operations/assets as well.

Partner Companies will define the scope of their participating operations/assets in an Implementation Plan within 6 months of joining the Partnership, and may increase or decrease their scope of covered operations/assets in future years as needed. It is acknowledged that some Partner Companies may choose to include operations/assets for which it is appropriate to seek national I government and national oil/gas company concurrence with respect to the activities covered by this Partnership (e.g., for joint ventures involving a state-owned enterprise). This can be done by, for example, signing the MOU or separately signalling concurrence with a public statement supporting the actions to be undertaken. As needed, Partner Companies can work with CCAC on a case-by-case basis to determine the appropriate way to memorialize this support and, if appropriate, solicit CCAC involvement in engaging potential Partner Governments and/or national oil/gas companies.

In the interest of continuous improvement, Partner Companies will seek to expand their scope of participating operations/assets throughout the duration of their program participation. Partner Companies should consider encouraging joint venture partners to become involved in the CCAC Oil and Gas Methane Partnership, and should work collaboratively with CCAC to identify assets in which CCAC governments and other partners may have a role in encouraging national oil/gas companies to participate in the Partnership.

b. EMISSION SOURCES

The following are considered “core” methane emission source categories:

- 1) Natural gas driven pneumatic controls and pumps;
- 2) Fugitive equipment and process leaks;

- 3) Centrifugal compressors with “wet” (oil) seals;
- 4) Reciprocating compressors rod seal/packing vents;
- 5) Glycol dehydrators;
- 6) Hydrocarbon liquid storage tanks;
- 7) Well venting for liquids unloading;
- 8) Well venting/flaring during well completion for hydraulically fractured wells; and
- 9) Casinghead gas venting

These nine core source categories were selected because they were found from experience to be the largest sources of methane emissions typically found in upstream oil and gas operations/assets, although different sources can be expected to be more or less relevant for each specific location

Partner Companies are encouraged to investigate sources beyond this list of “core” emission source categories to include other methane emission source categories. More details about each of the source categories listed above are provided in the accompanying “Methane Emission Source Detail Technical Guidance” documents, which include a technical description of the sources, details on mitigation options, suggested methodologies for quantifying methane emissions, expected reductions from mitigation options, and indicative economic considerations for the “Opportunity Evaluation” process. These documents are for reference only and Partner Companies can choose to use or disregard information provided in these documents. The CCAC, in cooperation with Partner Companies, will revise these documents over time in order to incorporate new information.

In the interest of continuous improvement, the Steering Group will evaluate the inclusion of additional “core” source categories over time for the Partnership as a whole.

3. PARTNER COMPANY COMMITMENTS

a. IMPLEMENTATION PLAN

Partner Companies will develop an Implementation Plan in conjunction with the CCAC Administrator within six months of joining the Partnership. The Implementation Plan will serve as a vehicle through which each Partner Company will plan, document, and communicate its intended scope of participation in the Partnership, and will describe the following:

- The scope of the Partner Company’s operations/assets that will initially participate in the Partnership (scope of participating operations/assets may increase/decrease in the future, per section 2.a. above);
- Any additional emission source categories that the Partner Company will include in its participation, beyond the list of “core” emission source categories listed in “Scope of Participation – Emission Sources” (Section 2.b. above);
- The general criteria the Partner Company will use to determine whether a particular methane emission reduction opportunity is feasible to implement;
- The Partner Company’s commitment to implement the methane emission reduction opportunities described in Appendix 2, unless deemed by the Partner Company to be infeasible in particular instances, or unless the Partner Company implements an alternative practice that is at least as effective at minimizing methane emissions; and
- The expected pace of the Partner Company’s actions under the Partnership.

A Partner Company’s initial Implementation Plan (to be submitted within six months of joining) will, at a minimum, include the scope of a Partner Company’s operations/assets participating in the Partnership. Additional elaboration will be provided as soon as possible, especially upon completion of initial Emission Surveys, with any remaining elements included by the time of the submission of

the first Annual Report. A Partner Company may amend its Implementation Plan as necessary by providing written notice to the Partnership Administrator.

The CCAC does not have control or veto authority on the decisions taken by a Partner Company in the drafting or alteration of its Implementation Plan. Implementation Plans will be used solely by the Administrator for the purposes of managing the Methane Partnership.

b. EMISSIONS SURVEYS

Each Partner Company will carry out Emissions Surveys for each of its participating operations/assets, consisting of the following:

- Identify the presence or absence of core emission sources (defined in “Scope of Participation – Emission Sources” above), plus any additional sources the Partner Company chooses to evaluate (Identification procedure):
 - Document the number of each source type that exists in the asset being surveyed;
 - Document the number of each source type that is already controlled and identify the control option(s) being implemented; and
 - Document the number of each source type not controlled.
- Quantify the methane emissions from the uncontrolled emission sources, using the CCAC-suggested quantification methodologies or methodologies deemed more appropriate by the Partner Company (Quantification procedure).

While a Partner Company may carry out Emissions Surveys in preparation of its Implementation Plan, such surveys may take place after delivery of the Implementation Plan and in that case the Plan will provide the indicative pace of such surveys.

Appendix 2 presents common control options for each of the core emission sources. For purposes of this Partnership, a source is deemed “controlled” if: (i) the Partner Company implements a mitigation option described in Appendix 2 for that source category; or (ii) the Partner Company implements an alternative mitigation option that is at least as effective at minimizing methane emissions. In the latter instance, the Partner Company will describe the alternative practice in its annual report.

The CCAC, in consultation with Partner Companies, will define suggested methane emission quantification methodologies for each of the emission sources to encourage Partner Companies to use consistent, comparable approaches to quantify emissions levels and evaluate potential reduction volumes. The CCAC will identify at least two suggested methodologies for each source type, to allow for ease of implementation in accordance with Partner Company practice while also providing some level of consistency. Quantification methods suggested by CCAC are described in the Technical Guidance documents, and include direct measurement, emission factors, software, and other quantification methodologies, as appropriate to each core source category. Partner Companies have full discretion over the quantification methodology to be used. If a Partner Company believes that an alternative quantification methodology is more appropriate, they may use that methodology. In that event, the Partner Company will briefly explain its alternative methodology in its Annual Report.

The Partnership is structured to encourage innovation, and the Steering Group will look to add new information on common control options and quantification methods to the information provided in Appendix 2 and the Technical Guidance documents.

Documenting the results of the Emission Surveys will allow a Partner Company to have the data necessary to conduct the Opportunity Evaluations, as described in the next section. Partner Companies may use the findings of completed Emissions Surveys to inform decisions on the materiality of specific methane emission reduction opportunities.

c. OPPORTUNITY EVALUATION AND IMPLEMENTATION OF MITIGATION ACTIVITIES

Partner Companies agree to: (i) evaluate the mitigation options listed in Appendix 2 for each uncontrolled source identified during the Emissions Surveys; and (ii) implement a recommended mitigation option (or a more-effective alternative) to the greatest extent feasible, using criteria that may include:

- technical viability
- operationally safe to implement and operate
- operationally reliable
- economic costs and benefits
- materiality (as defined by the Partner Company)
- maintenance/operational efficiency improvements
- environmental and safety benefits (e.g., enhanced safety due to lower methane emissions; reduction of methane emissions and associated volatile organic compounds or hazardous air pollutants)
- maximization of use and/or sale of clean-burning, non-renewable hydrocarbon resources
- reputational benefits

Using the feasibility criteria described in its Implementation Plan, each Partner Company will determine whether and/or when to implement mitigation options for sources found to be present and uncontrolled for participating assets. Such determinations will underlie a Partner Company's planned hierarchy of mitigation action. Results of these evaluations will be communicated via Annual Reports, per the section below. Each Partner Company has the sole decision-making authority whether or not to implement a mitigation action.

Partner Companies may determine that certain sources will categorically be mitigated, which negates the need for evaluation. The intent is for Partner Companies to implement methane mitigation for as broad a scope of uncontrolled emission sources as possible.

d. ANNUAL REPORTING

Each Partner Company will submit an annual report to the CCAC Oil and Gas Methane Partnership Administrator. The report shall contain at least the following:

- A listing of each asset/operation(s) surveyed during the previous year
- The results of the Emissions Surveys conducted during the previous year, by asset/operation, for each of the listed core emission source categories and any additional sources a Partner Company chooses to add:
 - Number of emission sources present;
 - Number of emission sources already controlled and control option utilized; and
 - Estimated methane emissions from the uncontrolled source(s), including a description of the methodology used to quantify each source.
- The results of the Opportunity Evaluations conducted during the previous year for each of the listed core emission sources found to be uncontrolled, by asset/operation:
 - Number of uncontrolled emission sources evaluated for mitigation;
 - Number of uncontrolled emissions sources that will be controlled, and timing of implementation of the controls; and

- Number of uncontrolled emissions sources that will not be controlled, including a short explanation of why a methane prevention/control action at a particular asset/operation is deemed infeasible. Note that this explanation would only be needed for sources that the Partner Company intends not to control; no details are needed regarding the Opportunity Evaluations carried out for the sources that the Partner Company has decided to control.
- A brief, technical description of methane prevention/reduction activities/projects undertaken during the previous year (by source type);
- Estimated/measured methane emission reductions achieved from the methane prevention/reduction activities/projects undertaken during the previous year (by source type);
- A schedule of methane prevention/reduction activities/projects planned for the next year ; and
- Progress towards achieving overall milestones as specified in the Implementation Plan:
 - Percent of 1) operated and 2) total operations/assets that are included within the scope of participation (based on volume of production, throughput, etc.);
 - Percent of participating operations/assets for which Emissions Surveys have been carried out (i) during the previous year and (ii) to date; and
 - Number of emission sources identified as present (controlled and uncontrolled) in previous year and to date (by source type)
 - Percent of 1) total identified emission sources and 2) emission sources initially identified as uncontrolled that have been controlled to date (by source type).

The CCAC recognizes that Partner Companies may already be reporting some relevant information to regulatory and other voluntary programs, such as the Natural Gas STAR Program or the Carbon Disclosure Project. The CCAC Administrator will endeavour to design a system that aligns and streamlines Methane Partnership reporting with these systems in order to reduce burden for the Partner Companies. Any changes to the reporting format must be approved by the Steering Group. The CCAC intends to work with its member governments to encourage harmonization across relevant regulatory reporting regimes.

Individual Partner Company information collected in the annual reports shall be maintained as confidential by the CCAC Administrator except as provided in section 4 (Public Reporting of Progress) or if release of the information is otherwise authorized by a Partner Company. Should a Partner Company elect to disclose economic criteria used to CCAC, such economic criteria shall be kept strictly confidential by the CCAC Administrator. Economic criteria shall not be shared with CCAC Partner Companies, countries, multi-lateral organizations, or NGOs, without the express written consent of the Partner Company.

The Administrator – in conjunction with the Steering Group – shall establish a policy on data confidentiality and security. Features of this policy will include:

- Confidential information will only be available for those within the Administrator working directly on the Methane Partnership and for the purposes of performing services relevant to the Partnership. Such information shall not be available to CCAC Partners (including those on the Steering Group) nor to other Partner Companies;
- All those working with confidential data, including consultants/contractors, will be subject to confidentiality agreements; and
- Companies leaving the Methane Partnership may have their data removed from Partnership databases/servers, except anonymized data that already has been included in reports.

4. PUBLIC REPORTING OF PROGRESS

The CCAC Oil and Gas Methane Partnership is structured in such a way that Partner Companies will: (i) take actions to document, analyze, and manage their methane emissions; and (ii) be recognized for these actions on an on-going basis. Mitigation actions taken prior to participation in the Partnership will also be recognized.

To this end, the CCAC will annually publish the following information, on a company-specific basis, to highlight progress in evaluating and reducing methane emissions. (Partner Companies will have the opportunity to review the write-up of public data before publication to ensure accuracy.)

- Scope of Partner Company operations/assets that are included in the Partnership, presented in meaningful terms that will represent scale of included company operations/assets relative to company operations/assets overall
 - Metrics: Percent of 1) operated and 2) total operations/assets that are included within the scope of participation (based on volume of production, throughput, etc.);
- Progress in analyzing methane emissions and accomplishing actions and milestones described in the Implementation Plan
 - Metrics: Percent of participating operations/assets for which Emissions Surveys have been carried out (i) during the previous year and (ii) to date
 - Other qualitative and quantitative information: company may provide information that explains past, present, and future planned actions (e.g., relevant activities executed prior to joining the Partnership, relevant goals or management structures that guide participation, etc.); and
- Progress in mitigating methane emissions
 - Metrics: Number of emission sources identified as present (controlled and uncontrolled) in previous year and to date (by source type); percent of 1) total identified emission sources and 2) emission sources initially identified as uncontrolled that have been controlled to date (by source type); brief, technical descriptions of the methane prevention/reduction activities/projects undertaken to date (by source type); and estimated/measured methane emission reductions achieved in the previous year and to date (by source type, including information on quantification methodology).

If requested by Partner Companies, the CCAC Administrator will also include information to provide context on individual company circumstances. Such contextual information could include, for example, that data has been externally verified by an independent 3rd party. The Administrator will establish and clearly communicate timelines for this process so that partner companies have adequate time to provide company-specific text. While partner companies may add desired contextual text, agreement to publication of the above-described information is an inherent component of the partner company's agreement to join the Methane Partnership.

5. ROLE OF CCAC PARTNERS

Support activities that CCAC Partners will undertake include the following:

- Technical support and capacity-building to assist Partner Companies in 1) evaluating their methane emissions (for example, pre-feasibility studies, measurement studies, or assistance with inventory development); and 2) analyzing and implementing methane emission reduction projects;
- Develop policies and practices that encourage and support oil and gas methane emission reduction activities within participating CCAC country borders;
- Country-to-country engagement and sharing of best practices with other national governments and affiliated oil and gas companies to encourage and support oil and gas methane emission reduction activities outside participating CCAC country borders;

- CCAC funding for an Administrator of the CCAC Oil and Gas Methane Initiative to manage implementation of initiative. The Administrator would serve as the central hub for annual reporting of data, coordination with existing programs, monitoring and reporting on overall progress of initiative, and leading efforts to recognize Partner Company accomplishments; and
- Provide forums and opportunities to recognize past, present, and future efforts by leading companies, which includes helpful messaging to institutional investors and other key stakeholders.

The CCAC is committed to providing value added support to companies participating in the CCAC Methane Partnership and will strongly consider additions to this list per Partner Company request.

6. CCAC-DEVELOPED TOOLS AND GUIDANCE DOCUMENTS

The CCAC, in consultation with Partner Companies, will develop tools and guidance documents to facilitate company participation in the Partnership. Planned documents include the following, though others may be added as needed:

- Technical Guidance documents: These documents provide details about each of the Core Emission Source Categories, including a technical description of the source, details on mitigation options, suggested methodologies for quantifying methane emissions, expected reductions from mitigation options, and indicative economic considerations for the “Opportunity Evaluation” process. These documents are developed and provided by the CCAC for the convenience of Partner Companies. Partner Companies are not obliged to use the emissions quantification, economic parameters, control methods, or other information or methodologies described in these documents. The CCAC seeks input from Partner Companies on the content of the Technical Guidance documents so that the Partnership may improve and expand its recommended methods, as approved by the Steering Group.
- Economic Evaluation Parameters: To facilitate implementation of comparable evaluation processes across Partner Companies and across regional operations/assets, suggested economic evaluation parameters and guidance will be identified for individual mitigation options and for economic analyses overall (see Appendix 3 for examples of overall economic analyses parameters), however, it is up to each Partner Company to determine its own evaluation criteria;
- Emissions Survey and Opportunity Evaluation Form: This form will serve as a questionnaire/tool that Partner Companies can use to guide the identification of mitigation options; and
- Annual Report: A reporting form shall be developed by the Administrator, with input from Partner Companies.

Partner Companies will have full access to the Technical Guidance documents and any other materials that would facilitate the objectives of the Partnership. The CCAC and Partner Companies will evaluate the development of other tools that can be used to assist Partner Companies with their implementation of the CCAC Oil and Gas Methane Partnership.

7. CCAC OIL AND GAS METHANE PARTNERSHIP ADMINISTRATOR

The UNEP-based CCAC Secretariat will serve as the Methane Partnership Administrator with the roles and responsibilities enumerated in Appendix 4. The CCAC will fund and build Administrator capacity as needed for efficient and effective functioning of the overall Partnership.

8. TIMING AND PACE OF EFFORTS

The timing and pace of operations/assets Emissions Surveys, Opportunity Evaluations, and emission reduction project implementation shall be determined by the Partner Company and documented in the “Implementation Plan” produced by the Partner Company within six months after a company

joins the Methane Partnership. Any changes to planned timing will be documented in an amended Implementation Plan. The goal will be to allow Partner Companies flexibility to implement programmatic elements as appropriate for resource and other considerations while providing transparency such that Partner Companies can demonstrate serious action and progress in achieving the goals of the Methane Partnership. Partner Companies shall endeavour to balance Emissions Survey and Opportunity Evaluation work with implementation of mitigation activities in order to achieve near-term emission reductions as part of their participation in the Methane Partnership.

While each Partner Company's pace of implementation will be determined in its Implementation Plan, the CCAC expects that the following are reasonable timelines for implementation of programmatic milestones (from date of Implementation Plan):

- Emission Surveys carried out for all participating assets defined in the initial Implementation Plan: 3-4 years (incremental progress will be recognized through annual reporting and public disclosure processes);
- Implementation of feasible mitigation options: 1-2 years after evaluation, continuing throughout program participation;
- Significant progress in implementing all mitigation options deemed feasible: 4-6 years; and
- Consideration of expanding scope of participating facilities: 3-4 years, on-going thereafter (it is recognized that the eventual inclusion of all operated upstream facilities is a long-term aim and may not be accomplished in a 3-4 year time period).

9. 3RD-PARTY VERIFICATION

A Partner Company may elect to have its efforts under its Implementation Plan verified by a 3rd party as part of its annual report. Data that has been audited by an independent and qualified 3rd party should be indicated as such. Partner Companies that choose to do so should be recognized for such leadership.

10. GOVERNANCE STRUCTURE AND CONTINUOUS IMPROVEMENT

The CCAC and Partner Companies will work together collaboratively to continue improving the Partnership over time. Partner Companies are encouraged to seek out and share methods and strategies that increase the Partnership's efficiency and effectiveness to reduce emissions.

Steering Group

The governing body of the Methane Partnership will be the Steering Group, which will work in close cooperation with the Administrator. All Partner Companies will be members of the Steering Group. A limited number of CCAC Partners will also be members of the Steering Group (initially France, Norway, the United Kingdom, the United States, the Environmental Defense Fund, and the United Nations Environmental Programme).

Changes to the Framework document, including reporting, will require the approval of the Steering Group. All decisions of the Steering Group will be made by consensus. The Steering Group will determine additional aspects of the Partnership governance structure, including its own procedures. Any changes of CCAC Partner participation on the Steering Group will be decided by the Steering Group. The Steering Group will meet in-person at least once a year.

Expert Group

As stated in the Role of CCAC Partners section, CCAC Partners will provide technical support and capacity-building to assist Partner Companies in 1) evaluating their methane emissions (for example,

pre-feasibility studies, measurement studies, or assistance with inventory development); and 2) analyzing and implementing methane emission reduction projects. In order to ensure sufficient technical support to Partner Companies, the Steering Group shall create an Expert Group which, when requested, will coordinate the provision of technical and other assistance to Partner Companies. Nominations to the Expert Group shall be made by Steering Group members.

Encouraging Innovation and Sharing of Best Practices

In order to encourage innovation, the Administrator intends to organize periodic meetings and workshops of Partner Companies in order to promote learning and sharing of experience among its members. Outside experts may be invited to such meetings at the discretion of the Steering Group.

Appendix 1: Background on Framework Development

This Framework has been developed collaboratively by the CCAC Oil and Gas Initiative Working Group, which consisted of CCAC Partners and a variety of representatives from oil and gas companies that participate in the IPIECA Climate Change Working Group. The decision of whether to participate in the Partnership or not participate is reserved to each company. Participation by a company in the IPIECA CCAC Oil and Gas Initiative Working Group should not be viewed as an indication that the company will ultimately commit to participation in the CCAC Oil and Gas Methane Partnership.

In considering the overall approach for the CCAC Oil and Gas Methane Partnership, the Working Group acknowledged that the varying estimates of oil and gas production sectorⁱ methane emissions available at present means that an approach based on targets or methane emission intensity would be very challenging. The Partnership recognizes the currently available estimates of upstream oil and gas methane, which range from 8.65 million metric tonnes (MMT) of CH₄ to 52.52 MMT.ⁱⁱ Given the range of methane emission estimates, a technology-application approach appeared to be the most viable path for this Partnership, based on the success of other programs such as the Natural Gas Star International and the Global Methane Initiative.

Appendix 2: Common Control Options for Core Emission Sources

- 1) **Natural gas driven pneumatic controls and pumps:** If a facility or operation uses natural gas for pneumatic supply gas, then:
 - a) Install an instrument air system for pneumatic gas supply/use rather than using natural gas
 - b) Retrofit pneumatic gas controllers with low/no bleed devices to reduce gas emitted
 - c) Replace pneumatic pumps with electric pumps, including solar electric pumps for small units such as chemical and methanol injection pumps
 - d) Other alternative control option that is at least as effective at minimizing methane emissions (as identified by Partner Company and described in annual report)

- 2) **Fugitive equipment and process leaks:** Unlike other source types, in which the presence of a specific piece of equipment or process and practices related to that equipment or process are easily identifiable in operational information, equipment and process leaks are unintended and therefore require dedicated study with specialized equipment to identify their presence. While emission factors can be used to quantify potential leaks, Partner Companies must carry out targeted emissions studies to identify and quantify the actual presence of uncontrolled emissions for this source category. Sources of fugitive equipment and process leaks must be addressed through a periodic (monthly or quarterly is recommended, annually is minimum frequency necessary to be considered controlled) directed inspection and maintenance survey in which specialized equipment is used to detect and quantify leaks.
 - a) A survey program can be done using optical imaging approaches (e.g. FLIR or OPGAL cameras, preferred option), leak sensors such as a PID or OVA device, or Snoop/soap-solution, keeping in mind technical limitations on any given approach (e.g. soap solution is not viable for open-ended lines or physically inaccessible components)
 - b) Equipment surveyed shall include, but not be limited to, facility piping, valves, connectors, flanges, compressor casing, open-ended lines, etc.
 - c) Leaks identified will be repaired as soon as feasible in order to count them as controlled
 - d) Because leaks can reappear at any time, operations/assets must undergo periodic directed inspection and maintenance surveys in order to annually report status as controlled/uncontrolled (monthly or quarterly is recommended; annually is minimum frequency necessary to be considered controlled).

- 3) **Centrifugal compressors with “wet” (oil) seals:** If a facility or operation has centrifugal compressors with “wet” (oil) seals ,then:
 - a) Recover and use or sell the gas separated from the seal oil (e.g. by routing de-gassing vents to VRU or installing an intermediate pressure seal oil/gas separation system such that gas can be routed to pressurized inlet such as compressor suction, fuel gas, etc.)
 - b) Convert the wet seal centrifugal compressors to dry seals
 - c) Route gas that is vented from seal oil degassing to flare
 - d) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)

- 4) **Reciprocating compressors:** If a facility or operation has reciprocating compressors, then:
 - a) Periodically (annually) check each rod seal for excessive seal/packing leakage and replace rings/rods on seals/packing found to be excessively leaking
 - b) Equip each rod “distance piece” with a leak indicating device and replace seals/packing when they exhibit excessive leaking
 - c) Route reciprocating compressor “distance piece” vents (point where rod packing leakage exits the compressor) to recovery or flare

- d) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)
- 5) **Glycol dehydrators:** If the facility or operation has glycol based gas dehydration, then:
- a) Route flash tank (if present) and dehydrator still overheads to recovery, such as fuel gas (may require a Vapor Recovery Unit (VRU) type device) and replace the gas assist lean glycol pump (if gas assist pump is used) with an electric lean glycol pump
 - b) Route flash tank (if present) and dehydrator still overheads to flare/combustion device and replace the gas assist lean glycol pump (if gas assist pump is used) with an electric lean glycol pump
 - c) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)
- 6) **Hydrocarbon liquid storage tanks:** If the facility or operation has hydrocarbon liquid storage tanks, then:
- a) Recover the tank vapours by installing Vapor Recovery Unit (VRU) system or otherwise route the gas to productive use (e.g. fuel gas, compressor suction, gas lift, other)
 - b) Reduce the differential pressure between the last oil/gas separation step prior to the atmospheric tank to reduce the amount of entrained gas and flash gas emitted from the tank(s)
 - c) Install stabilization towers ahead of tanks to reduce the amount of entrained gas and flash gas emitted from the tank(s)
 - d) Route the tank vapours to a flare/combustion device
 - e) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)
- 7) **Well venting for liquids unloading:** If the operation conducts atmospheric well venting for purposes of unloading liquids from the well-bore (s), then:
- a) Install equipment/systems that assist with unloading liquids from well-bores and reduce natural gas/methane vented to the atmosphere (e.g. plunger lifts, gas lift, compression to lower back pressure on the well, artificial lift)
 - i) If wells are equipped with plunger lifts, then implement automatic controlled shut-in cycles to assist plunger lift return (in lieu of venting cycles); or
 - b) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)
- 8) **Well venting/flaring during well completion for hydraulically fractured wells:** If the operation conducts venting of gas during new or re-completed well completion/clean-up, particularly for hydraulically fractured wells flowing back fluids following a hydraulic fracture operation, then:
- a) Conduct reduced emission (green) completions, using speciality flow-back equipment if necessary, and route flow-back gas to sales or flare rather than vent; or
 - b) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)
- 9) **Casinghead gas venting:** If the facility or operation has oil wells that vent casinghead gas (i.e., natural gas that collects in the annular space between the tubing and casing on depleted low production oil wells), then:
- a) Install compressors/Vapor Recovery Units to capture casinghead gas
 - b) Connect casing to tanks with Vapor Recovery Units
 - c) Route casinghead gas to flare

- d) Other alternative practice that is at least as effective at minimizing methane leakage (as identified by Partner Company and described in annual report)

Appendix 3: Suggested Economic Evaluation Criteria

Given the variability in such factors as labor rates, equipment costs, and gas value, each Partner Company will use their own criteria for determination of an economic opportunity in the evaluation of opportunities identified. Economic criteria may be different between different Partner Companies and different in different operations/assets of the same Partner Company. To assist in streamlining analyses, indicative costs, expected control efficiency, and other guidance will be identified for each source type. Additionally, the anticipated lowest cost mitigation option(s) will be identified for each source in the "Methane Emission Source Detail" document. Partner Companies should always include the lowest cost option in their economic feasibility analysis, unless another technology has already been selected for implementation, in which case the other technologies listed need not be evaluated.

Suggested parameters for use in determining the economic feasibility of each reduction opportunity include:

- Capital and installation cost
- Annual operating costs
- Total annual savings/revenue
 - Value of incremental gas sales
 - Value of incremental condensate or NGLs sales
 - Savings in purchased fuel or electricity costs when directing gas to power generation
 - Reservoir benefits from additional gas available for injection/gas lift
 - Other operational or maintenance savings (e.g. savings through reduction in maintenance costs, etc.)
- Return on Investment (ROI)
- Payback period
- Internal Rate of Return
- Net Present Value

For operations/assets where the operating Partner Company does not have rights to monetize natural gas or natural gas markets do not exist, the economic evaluation may not be relevant and need not be conducted. However, Partner Companies may consider options that allow for reduction in venting/flaring of gas through extraction of liquids from the gas stream in order reduce venting/flaring volumes. Also, Partner Companies may choose to implement methane prevention/reduction activities/project even when not economic based on the above criteria.

Appendix 4: Roles and Responsibilities of CCAC 3rd-Party Administrator

The UNEP-based CCAC Secretariat will serve as the Methane Partnership Administrator and undertake the following roles and responsibilities:

- Collect/aggregate data and ensure maintenance of confidentiality for data that is reported to the initiative;
- Manage administration of program, including annual planning; intake, processing, and dissemination of data; event coordination; communications with companies, existing programs and CCAC Partners; facilitating receipt and distribution of funds from a variety of sources;
- Provide technical support and leverage technical support and capacity building from other sources (e.g., vendors, existing programs, CCAC Partners, etc.);
- Coordinate with and seek support from relevant experts from CCAC Partners, existing oil and gas programs (e.g., GMI, NGS, GGFR), oil and gas industry associations, development banks, and other multilateral organizations;
- Align the CCAC Oil and Gas Methane Partnership with existing programs (to the extent possible) and maintain two-way communication with existing programs regarding planning, implementation, and results;
- Develop and implement system for tracking program progress and disseminating information on program results, including annual reports as enumerated in the framework;
- Engage with stakeholders (e.g., media, investor groups, national and regional governments, etc.) to recognize and publicize Partner Company accomplishments; and
- Coordinate with countries and companies with experience managing methane emissions that may contribute to this effort with financial and in-kind support

ⁱ For purposes of this initiative the production sector includes operations/assets from the well to the tail-gate of gas processing facilities and encompasses production wells/fields, gathering infrastructure, and gas plants.

ⁱⁱ Methane emission estimates commonly cited include: 1) OGP - 8.65 MMT; 2) US EPA Report “Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions: 1990-2030” - 39.94 MMT; (<http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html>); 3) IEA Report “World Energy Outlook Special Report: Redrawing the Energy-Climate Map” (http://www.iea.org/publications/freepublications/publication/WEO_RedrawingEnergyClimateMap.pdf) - 45 MMT; 4) International Institute for Applied Systems Analysis (IIASA) Report “Global Anthropogenic Methane Emissions 2005–2030: Technical Mitigation Potentials and Costs” (<http://www.atmos-chem-phys.net/12/9079/2012/acp-12-9079-2012.html>) - 52.52 MMT. The US EPA and IIASA totals have been reduced by 50% (consistent with the IEA view) to provide an estimate for only the production sector.