ES-12 Methane Reduction in Oil & Gas Operations (BMPs & PROs)

Policy Description:

CCAG Summary: *There are a number of ways in which methane emissions in the oil and gas industry can be reduced. Natural gas consists primarily of methane, so any leaks during production, processing, and transportation/distribution should be addressed. In addition to reducing potent GHG emissions, stopping these leaks may be economically beneficial because it can prevent the waste of valuable product. The EPA Natural Gas STAR program offers numerous methods of preventing leaks. These methods, called Best Management Practices (BMPs) and Partnership Reduction Opportunities (PROs), are divided by industry sub sector (production, processing, and transportation/distribution).*[9]

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The EPA Natural Gas STAR program offers numerous methods of preventing leaks. These methods, called Best Management Practices (BMPs) and Partnership Reduction Opportunities (PROs), are divided by industry sub sector: production, processing, and transportation/ distribution. Among the practices recommended are:

Preventive maintenance: Reduces emissions by improving the overall efficiency of the gas production and distribution system; minimizes the chance of leaks.

Reduce flashing losses: As the pressure on the liquid hydrocarbons in a storage tank, well, compressor station, or gas plant drops, some of the lighter compounds dissolved in the liquid are released or "flashed." Some of the compounds that are liquids at the initial pressure/temperature transform from a liquid into a gas/vapor and may be released or "flashed" to the atmosphere. The flashed gas can be captured rather than vented to the atmosphere.

Replace wet seals with dry seals on centrifugal compressors: Dry seals lead to fewer leaks than wet seals. Dry seals use high-pressure gas to seal the compressor and emit less methane, have lower power requirements, improve compressor and pipeline operating efficiency and performance, enhance compressor reliability, and require significantly less maintenance.

Compressor rod & ring replacement on reciprocating compressors: Replacing worn compressor rod packing rings and rods results in operational benefits, reduced methane emissions, and cost savings. Gas leaks from compressor rods may represent one of the largest sources of emissions at natural gas compressor stations.

[9] For a complete list, see http://www.epa.gov/gasstar/techprac.htm#tabnav

Low-bleed, air-based pneumatic devices: Replacing high-bleed devices with low-bleed devices, retrofitting, and improving the maintenance of high-bleed pneumatic devices are proven approaches to profitably reducing methane emissions. Natural gas emissions from pneumatic control devices are one of the largest sources of methane emissions in the natural gas industry.

Pump-down techniques prior to maintenance: Using fixed and portable compressors to lower pipeline pressure prior to maintenance and repair may significantly reduce methane emissions and save money. Pipeline pump-down techniques remove product from the section of pipeline under repair, thereby reducing the volume of natural gas vented to the atmosphere.

Policy Design:

The CCAG recommends that:

Subject to verification of technical and economic feasibility and reduction potential:

(a) New Mexico implement, on a voluntary basis, all BMPs, PROs, and available technologies starting in 2007 to reduce overall CO2e emissions due to methane emissions from the oil and gas sector by ~20% by 2020;

(b) New Mexico actively promote participation by oil and gas operators in EPA's Natural Gas Star program and New Mexico's San Juan VISTAS program; and

(c) As voluntary measures are implemented, if the State determines that oil and gas operators are not on track to achieve the above goal, the State should implement mandatory approaches where appropriate. Mandatory measures would be implemented only after following formal rule making or statutory change procedures with the appropriate "due process" requirements.

- **Goal levels:** As noted above.
- **Timing:** As noted above.
- **Parties:** Oil and gas production, processing, and transportation/distribution companies

Implementation method(s):

Policies to implement these practices could include:

- Information and education.
- Technical assistance.
- Funding mechanisms and/or incentives.
- Voluntary and or negotiated agreements.
- Codes and standards – coupled with cost and investment recovery mechanisms, if appropriate.

Related Policies/Programs in place:

- Some companies practice the measures outlined above, but currently there is no state or federal requirement for any company to implement any of these practices.

Type(s) of GHG Benefit(s):

- CH4: This policy could result in substantial reductions of methane emissions in the oil and gas industry.

Estimated GHG Savings and Costs Per Ton:

The specified goal level is translated into GHG reductions below. BMPs, PROs, and other technologies and practices cover a wide variety of options, the costs of which vary significantly by site and application, and are thus difficult to consolidate. Capital cost and other information for individual technologies and practices is available at EPA's Natural Gas Star website, http://www.epa.gov/gasstar/techprac.htm#tabnav

An initial consolidation analysis of GHG savings and costs per ton was developed by Dr. Lorna Greening to assist in the Energy Supply Technical Work Group's consideration of ES-12. A summary of this spreadsheet can be found in Attachment H-6. The full spreadsheet can be accessed electronically as Attachment H-7 at http://www.nmclimatechange.us/template.cfm?FrontID=4705.

#	Policy	Scenario	Reductions (MMTCO2e)			NPV (2007–2020) $ Millions	Cost-Effective-ness $/tCO2
			2012	2020	Cumulative Reductions (2007-2020)		
ES-12	Methane reductions in oil and gas operations through BMPs and PROs	Specified goals translated into tons GHG reduced.	2.71	3.43	35.34	*Not Estimated*	*Not Estimated*

See the EPA Natural Gas Star website (www.epa.gov/gasstar/techprac.htm#tabnav) and Dr. Lorna Greening's spreadsheet analysis for additional information regarding GHG savings, costs, and cost-effectiveness.

Data Sources, Methods and Assumptions (for quantified actions):

- **Data Sources:** See the EPA Natural Gas Star website (www.epa.gov/gasstar/techprac.htm#tabnav) and Dr. Lorna Greening's spreadsheet analysis for information concerning data sources.
- **Quantification Methods:** See the EPA Natural Gas Star website (www.epa.gov/gasstar/techprac.htm#tabnav) and Dr. Lorna Greening's spreadsheet analysis for additional information.
- **Key Assumptions:** See the EPA Natural Gas Star website (www.epa.gov/gasstar/techprac.htm#tabnav) and Dr. Lorna Greening's spreadsheet analysis for additional information regarding assumptions.

Key Uncertainties:

- See the EPA Natural Gas Star website (www.epa.gov/gasstar/techprac.htm#tabnav) and Dr. Lorna Greening's spreadsheet analysis for additional information regarding uncertainties.

Contributing Issues, if applicable:

- Proportionally more natural gas would get to market rather than being consumed or lost in the production and distribution process.
- Companies increase their sales, and possibly their profits, by selling rather than wasting valuable product.

Feasibility Issues, if applicable:

- Feasibility of specific BMPs and/or PROs vary on a site-by-site basis.

Status of Group Approval:

Complete.

Level of Group Support:

Unanimous consent.

Barriers to consensus (if less than unanimous consent):

None.

ES-13 CO2 Reduction from Fuel Combustion in Oil & Gas Operations

Policy Description:

CCAG Summary: There are a number of ways in which CO2 emissions in the oil and gas industry can be reduced, including (1) new efficient compressors, (2) optimize gas flow to improve compressor efficiency, (3) improve performance of compressor cylinder ends, (4) capture compressor waste heat, (5) replace compressor driver engines, and (6) waste heat recovery boilers. Policies to encourage these practices include education and information exchange, financial incentives, and mandates or standards – coupled with cost and investment recovery mechanisms, if appropriate – that require certain practices.

There are a number of ways in which CO2 emissions in the oil and gas industry can be reduced, including (1) new efficient compressors, (2) optimize gas flow to improve compressor efficiency, (3) improve performance of compressor cylinder ends, (4) capture compressor waste heat, (5) replace compressor driver engines, and (6) waste heat recovery boilers.

Given the wide range of costs and technologies involved the CCAG identified three key categories: (1) compressor efficiency improvements, (2) waste heat recovery for compressors and boilers, and (3) replacement of gas-driven compressors with electrical generators. Of these three categories, the focus should be efficiency improvements and waste heat recovery. Compressor replacement was considered a less fruitful area for analysis because (a) new compressors present high costs relative to the GHG reduction potential the provide, and (b) because switching the compressor fuel from gas to electricity simply moves the GHG production – at least in part – to another locale, and evidence indicates that compared to grid average CO2 emissions per kWh at this time, natural gas fueled compressors may emit less CO2 per kWh.[10]

Policy Design:

The CCAG recommends that New Mexico focus attention on reducing GHG emissions from fuel combustion in the oil and gas industry through education, financial incentives, or mandates and/or standards – coupled with cost and investment recovery mechanisms, if appropriate – to: (1) improve the efficiency of compressors; (2) boost waste heat recovery for compressors and boilers including the deployment of CHP systems that could sell excess power back to the grid; and to a lesser extent, (3) replace gas-driven compressors with electrical compressors when doing so reduces CO2 emissions.

The CO2 reduction goals stated below are being provided for the sole purpose of partially meeting the targets set by Governor Richardson's directive and are not necessarily confirmed or validated by any current study or analysis regarding economic or technical feasibility. It is the intent of the CCAG to require further study and analysis of the approaches recommended above by the NMED and other appropriate agencies, and that from this study and analysis, changes in goals and determinations regarding the economic and technical feasibility of these approaches

[10] See Attachment H-9.

may result.

Subject to verification of technical and economic feasibility and reduction potential:

- **Goal levels:** Reduce CO_2 emissions from fuel combustion by 75% by 2020.
- **Timing:** As noted above.
- **Parties:** Oil and gas production, processing, and transportation/distribution companies

Implementation method(s):

Policies to implement these practices could include:

- Information and education.
- Technical assistance.
- Funding mechanisms and/or incentives.
- Voluntary and or negotiated agreements.
- Codes and standards – coupled with cost and investment recovery mechanisms, if appropriate.

Related Policies/Programs in place:

- Some companies may practice the measures outlined above, but there is currently no state or federal requirement for any company to implement any of these measures.

Type(s) of GHG Benefit(s):

- CO2: CO2 emissions would be reduced directly through the implementation of these measures. Methane emissions would also be reduced, but these are addressed in ES-12.

Estimated GHG Savings and Costs Per Ton:

The specified goal level is translated into GHG reductions below. Current uncertainties regarding costs and emission reduction benefits of these approaches inhibit comprehensive and thorough estimation of GHG savings and costs per ton at this time. These shortcomings will be addressed by the NMED-led study referenced in the policy design for ES-13. A preliminary analysis of GHG savings and costs per ton, developed to assist in the Energy Supply Technical Work Group's consideration of ES-13, can be found in Attachment H-8.

#	Policy	Scenario	Reductions (MMTCO2e)			NPV (2007–2020) $ Millions	Cost-Effective-ness $/tCO2
			2012	2020	Cumulative Reductions (2007-2020)		
ES-13	CO2 reduction from fuel combustion in oil & gas operations	Specified goals translated into tons GHG reduced.[11] **(See Attachment H-9)**	.61	1.42	10.63	*Not Estimated*	*Not Estimated*

Data Sources, Methods and Assumptions (for quantified actions):

- **Data Sources**: To be determined by the NMED-led study specified in the ES-13 policy design.
- **Quantification Methods**: To be determined by the NMED-led study specified in the ES-13 policy design.
- **Key Assumptions**: To be determined by the NMED-led study specified in the ES-13 policy design.

Key Uncertainties:

- Data regarding the horsepower, type, location, and grouping of internal combustion engines in New Mexico was not available in time for this analysis. Also, significant uncertainties exist regarding the cost, applicability, and GHG reduction benefits achievable, particularly with respect to grid access (i.e., access to electricity at compressor sites) and cost, as well as the relative CO2 emissions associated with electric vs. natural gas fueled compressors.
- These and other uncertainties are to be identified, determined, and addressed by the NMED-led study specified in the ES-13 policy design.

Contributing Issues, if applicable:

- Proportionally more natural gas may get to market rather than being consumed or lost in the production and distribution process. This could yield a net payback for producers, and negative cost/ton results (i.e., savings).
- Some of the criteria air pollutant emissions that would have resulted from less efficient compressors may be eliminated, lowering health impacts and associated health costs.

[11] Omission of compressor electrification from this total reflects the concern raised in Attachment H-9 that replacing natural gas fueled compressors at this time may not reduce CO2 emissions because of the current carbon intensity of grid average electricity in New Mexico.

- Decreased emissions of criteria pollutants could lead to relaxation of throughput and production limits that may exist in permits, possibly enabling increased production and profits.
- Operation and maintenance costs may be reduced through the use of electric compressors and automated air/fuel ratio controllers.
- Power generation using ORC CHP systems could yield a payback through the sale of electricity and provide additional power for electric compressor engines where grid connections and power purchase opportunities are available.
- Organic Rankine cycle CHP systems do not require water for steam generation and generate no waste, limiting these indirect environmental impacts. Organic Rankine cycle CHP systems may be more feasible than steam driven CHP systems.

Feasibility Issues, if applicable:

- Available data suggests that installation and operation of all scenarios may be feasible to varying degrees. Additional, more detailed, analysis is necessary to quantify the feasibility of these options.

Status of Group Approval:

Complete.

Level of Group Support:

Unanimous consent.

Barriers to consensus (if less than unanimous consent):

None.