

# Natural Gas STAR International



## Annual Report 2010

### Company Information

Company Name: \_\_\_\_\_

Contact: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

City, State/Province: \_\_\_\_\_

Country: \_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

This report contains emissions reductions data for [*please specify country and business unit(s)*]\*:

Period of time covered by report:

From: \_\_\_\_\_ To: \_\_\_\_\_

### International Annual Report Summary

*Please provide information on the technologies and practices your company implemented and submit a report page for only those activities.*

This package includes the following:

- Five Annual Reporting forms (please make additional copies, if necessary)
- Additional Program Accomplishments form
- Appendices including proposed methane emissions reduction technologies and conversion factors

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**\*Please submit a separate annual reporting form for each country for which you are reporting emissions reductions.**

In addition to reporting methane emissions reductions, you are welcome to include other information about your company's participation in Natural Gas STAR International in the "Additional Program Accomplishments" section of this form. Natural Gas STAR International will use any information entered in this section to recognize the efforts and accomplishments of outstanding partners.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices

### Current Year Activities

**A. Facility/location identifier information:** \_\_\_\_\_

**B. Activity description: Please provide a separate reporting form for each technology or practice implemented. If reporting a DI&M activity, please use a separate page for each location/facility surveyed.**

Please specify the technology or practice that was implemented (choose from the list in the Appendix or describe your own):

Please describe how your company implemented this activity (including location or facility where implemented):

**C. Industry Sector (please indicate in which industry sector you implemented this activity):**

- Production (from underground to wellhead)
- Gathering and Processing (from gathering lines and processing plant to the point gas transfers to transmission pipelines)

- Transmission (transmission lines: from the point gas transfers to a transmission pipeline to the point gas transfers to city gate stations, including compressor stations along the transmission line(s))
- Distribution (gate stations to customer connections)

**D. Level of Implementation (check one):**

- Number of units installed: \_\_\_\_\_ units
- Frequency of practice: \_\_\_\_\_ times/year

**E. Are emissions reductions a one-year reduction or a multi-year reduction?**  One-year  Multi-year

**If Multi-year:**

- Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration\*.
- Partner will report this activity annually up to allowed sunset date.

**F. Methane emissions reduction:** \_\_\_\_\_ Mcf

Please identify the basis for the emissions reduction estimate. If needed, attach calculations separately.

- Actual field measurement
- Calculation using manufacturer specifications/other source
- Other (Please specify)

*\*Because the implementation of some technologies reduces emissions for multiple years, Natural Gas STAR allows certain activities to count towards a company's emission reductions beyond the initial year of implementation. Natural Gas STAR designates the maximum length of time that these reductions may accrue as "sunset dates." Appendix A lists these sunset dates. Companies can report the corresponding methane emission reductions each year up to the allowable sunset date. Or, companies may wish to report reductions only once for the implementation year, and have EPA automatically apply the sunset date and count those emissions for the allowable number of years.*

**G. Cost summary:**

Estimated cost of implementing this activity (including equipment and labor): U.S. \$ \_\_\_\_\_

**H. Total value of gas saved or other economic benefits (please describe):**

U.S. \$ \_\_\_\_\_

*Total value of gas saved (in U.S. Dollars) = Methane emissions reduction (in Mcf) x Gas value (in U.S. \$/Mcf)*

**I. To what extent do you expect to implement this activity next year?**

**Additional Comments:**

### Previous Years' Activities

Use the table below to report any past implementation of this technology or practice, but not previously reported to Natural Gas STAR International.

Year	Frequency of Activity or # of Installations	Total Cost of Activity (incl. equipment and labor) (U.S. \$)	Estimated Reductions (Mcf/yr)	Value of Gas Saved (U.S. \$)

**Comments/Additional Benefits:** Please describe any additional economic, operational, environmental, or safety benefits achieved by implementing this technology or practice. Use the back of the page for additional space if needed.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices

### Current Year Activities

**A. Facility/location identifier information:** \_\_\_\_\_

**B. Activity description: Please provide a separate reporting form for each technology or practice implemented. If reporting a DI&M activity, please use a separate page for each location/facility surveyed.**

Please specify the technology or practice that was implemented (choose from the list in the Appendix or describe your own):

Please describe how your company implemented this activity (including location or facility where implemented):

**C. Industry Sector (please indicate in which industry sector you implemented this activity):**

- Production (from underground to wellhead)
- Gathering and Processing (from gathering lines and processing plant to the point gas transfers to transmission pipelines)

- Transmission (transmission lines: from the point gas transfers to a transmission pipeline to the point gas transfers to city gate stations, including compressor stations along the transmission line(s))
- Distribution (gate stations to customer connections)

**D. Level of Implementation (check one):**

- Number of units installed: \_\_\_\_\_ units
- Frequency of practice: \_\_\_\_\_ times/year

**E. Are emissions reductions a one-year reduction or a multi-year reduction?**  One-year  Multi-year

**If Multi-year:**

- Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration\*.
- Partner will report this activity annually up to allowed sunset date.

**F. Methane emissions reduction:** \_\_\_\_\_ Mcf

Please identify the basis for the emissions reduction estimate. If needed, attach calculations separately.

- Actual field measurement
- Calculation using manufacturer specifications/other source
- Other (Please specify)

*\*Because the implementation of some technologies reduces emissions for multiple years, Natural Gas STAR allows certain activities to count towards a company's emission reductions beyond the initial year of implementation. Natural Gas STAR designates the maximum length of time that these reductions may accrue as "sunset dates." Appendix A lists these sunset dates. Companies can report the corresponding methane emission reductions each year up to the allowable sunset date. Or, companies may wish to report reductions only once for the implementation year, and have EPA automatically apply the sunset date and count those emissions for the allowable number of years.*

**G. Cost summary:**

Estimated cost of implementing this activity (including equipment and labor): U.S. \$ \_\_\_\_\_

**H. Total value of gas saved or other economic benefits (please describe):**

U.S. \$ \_\_\_\_\_

*Total value of gas saved (in U.S. Dollars) = Methane emissions reduction (in Mcf) x Gas value (in U.S. \$/Mcf)*

**I. To what extent do you expect to implement this activity next year?**

**Additional Comments:**

### Previous Years' Activities

Use the table below to report any past implementation of this technology or practice, but not previously reported to Natural Gas STAR International.

Year	Frequency of Activity or # of Installations	Total Cost of Activity (incl. equipment and labor) (U.S. \$)	Estimated Reductions (Mcf/yr)	Value of Gas Saved (U.S. \$)

**Comments/Additional Benefits:** Please describe any additional economic, operational, environmental, or safety benefits achieved by implementing this technology or practice. Use the back of the page for additional space if needed.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices

### Current Year Activities

**A. Facility/location identifier information:** \_\_\_\_\_

**B. Activity description: Please provide a separate reporting form for each technology or practice implemented. If reporting a DI&M activity, please use a separate page for each location/facility surveyed.**

Please specify the technology or practice that was implemented (choose from the list in the Appendix or describe your own):

Please describe how your company implemented this activity (including location or facility where implemented):

**C. Industry Sector (please indicate in which industry sector you implemented this activity):**

- Production (from underground to wellhead)
- Gathering and Processing (from gathering lines and processing plant to the point gas transfers to transmission pipelines)

- Transmission (transmission lines: from the point gas transfers to a transmission pipeline to the point gas transfers to city gate stations, including compressor stations along the transmission line(s))
- Distribution (gate stations to customer connections)

**D. Level of Implementation (check one):**

- Number of units installed: \_\_\_\_\_ units
- Frequency of practice: \_\_\_\_\_ times/year

**E. Are emissions reductions a one-year reduction or a multi-year reduction?**  One-year  Multi-year

**If Multi-year:**

- Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration\*.
- Partner will report this activity annually up to allowed sunset date.

**F. Methane emissions reduction:** \_\_\_\_\_ Mcf

Please identify the basis for the emissions reduction estimate. If needed, attach calculations separately.

- Actual field measurement
- Calculation using manufacturer specifications/other source
- Other (Please specify)

*\*Because the implementation of some technologies reduces emissions for multiple years, Natural Gas STAR allows certain activities to count towards a company's emission reductions beyond the initial year of implementation. Natural Gas STAR designates the maximum length of time that these reductions may accrue as "sunset dates." Appendix A lists these sunset dates. Companies can report the corresponding methane emission reductions each year up to the allowable sunset date. Or, companies may wish to report reductions only once for the implementation year, and have EPA automatically apply the sunset date and count those emissions for the allowable number of years.*

**G. Cost summary:**

Estimated cost of implementing this activity (including equipment and labor): U.S. \$ \_\_\_\_\_

**H. Total value of gas saved or other economic benefits (please describe):**

U.S. \$ \_\_\_\_\_

*Total value of gas saved (in U.S. Dollars) = Methane emissions reduction (in Mcf) x Gas value (in U.S. \$/Mcf)*

**I. To what extent do you expect to implement this activity next year?**

**Additional Comments:**

### Previous Years' Activities

Use the table below to report any past implementation of this technology or practice, but not previously reported to Natural Gas STAR International.

Year	Frequency of Activity or # of Installations	Total Cost of Activity (incl. equipment and labor) (U.S. \$)	Estimated Reductions (Mcf/yr)	Value of Gas Saved (U.S. \$)

**Comments/Additional Benefits:** Please describe any additional economic, operational, environmental, or safety benefits achieved by implementing this technology or practice. Use the back of the page for additional space if needed.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices

### Current Year Activities

**A. Facility/location identifier information:** \_\_\_\_\_

**B. Activity description: Please provide a separate reporting form for each technology or practice implemented. If reporting a DI&M activity, please use a separate page for each location/facility surveyed.**

Please specify the technology or practice that was implemented (choose from the list in the Appendix or describe your own):

Please describe how your company implemented this activity (including location or facility where implemented):

**C. Industry Sector (please indicate in which industry sector you implemented this activity):**

- Production (from underground to wellhead)  
 Gathering and Processing (from gathering lines and processing plant to the point gas transfers to transmission pipelines)

- Transmission (transmission lines: from the point gas transfers to a transmission pipeline to the point gas transfers to city gate stations, including compressor stations along the transmission line(s))  
 Distribution (gate stations to customer connections)

**D. Level of Implementation (check one):**

- Number of units installed: \_\_\_\_\_ units  
 Frequency of practice: \_\_\_\_\_ times/year

**E. Are emissions reductions a one-year reduction or a multi-year reduction?**  One-year  Multi-year

**If Multi-year:**

- Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration\*.  
 Partner will report this activity annually up to allowed sunset date.

**F. Methane emissions reduction:** \_\_\_\_\_ Mcf

Please identify the basis for the emissions reduction estimate. If needed, attach calculations separately.

- Actual field measurement  
 Calculation using manufacturer specifications/other source  
 Other (Please specify)

*\*Because the implementation of some technologies reduces emissions for multiple years, Natural Gas STAR allows certain activities to count towards a company's emission reductions beyond the initial year of implementation. Natural Gas STAR designates the maximum length of time that these reductions may accrue as "sunset dates." Appendix A lists these sunset dates. Companies can report the corresponding methane emission reductions each year up to the allowable sunset date. Or, companies may wish to report reductions only once for the implementation year, and have EPA automatically apply the sunset date and count those emissions for the allowable number of years.*

**G. Cost summary:**

Estimated cost of implementing this activity (including equipment and labor): U.S. \$ \_\_\_\_\_

**H. Total value of gas saved or other economic benefits (please describe):**

U.S. \$ \_\_\_\_\_

*Total value of gas saved (in U.S. Dollars) = Methane emissions reduction (in Mcf) x Gas value (in U.S. \$/Mcf)*

**I. To what extent do you expect to implement this activity next year?**

**Additional Comments:**

### Previous Years' Activities

Use the table below to report any past implementation of this technology or practice, but not previously reported to Natural Gas STAR International.

Year	Frequency of Activity or # of Installations	Total Cost of Activity (incl. equipment and labor) (U.S. \$)	Estimated Reductions (Mcf/yr)	Value of Gas Saved (U.S. \$)

**Comments/Additional Benefits:** Please describe any additional economic, operational, environmental, or safety benefits achieved by implementing this technology or practice. Use the back of the page for additional space if needed.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices

### Current Year Activities

**A. Facility/location identifier information:** \_\_\_\_\_

**B. Activity description: Please provide a separate reporting form for each technology or practice implemented. If reporting a DI&M activity, please use a separate page for each location/facility surveyed.**

Please specify the technology or practice that was implemented (choose from the list in the Appendix or describe your own):

Please describe how your company implemented this activity (including location or facility where implemented):

**C. Industry Sector (please indicate in which industry sector you implemented this activity):**

- Production (from underground to wellhead)
- Gathering and Processing (from gathering lines and processing plant to the point gas transfers to transmission pipelines)

- Transmission (transmission lines: from the point gas transfers to a transmission pipeline to the point gas transfers to city gate stations, including compressor stations along the transmission line(s))
- Distribution (gate stations to customer connections)

**D. Level of Implementation (check one):**

- Number of units installed: \_\_\_\_\_ units
- Frequency of practice: \_\_\_\_\_ times/year

**E. Are emissions reductions a one-year reduction or a multi-year reduction?**  One-year  Multi-year

**If Multi-year:**

- Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration\*.
- Partner will report this activity annually up to allowed sunset date.

**F. Methane emissions reduction:** \_\_\_\_\_ Mcf

Please identify the basis for the emissions reduction estimate. If needed, attach calculations separately.

- Actual field measurement
- Calculation using manufacturer specifications/other source
- Other (Please specify)

*\*Because the implementation of some technologies reduces emissions for multiple years, Natural Gas STAR allows certain activities to count towards a company's emission reductions beyond the initial year of implementation. Natural Gas STAR designates the maximum length of time that these reductions may accrue as "sunset dates." Appendix A lists these sunset dates. Companies can report the corresponding methane emission reductions each year up to the allowable sunset date. Or, companies may wish to report reductions only once for the implementation year, and have EPA automatically apply the sunset date and count those emissions for the allowable number of years.*

**G. Cost summary:**

Estimated cost of implementing this activity (including equipment and labor): U.S. \$ \_\_\_\_\_

**H. Total value of gas saved or other economic benefits (please describe):**

U.S. \$ \_\_\_\_\_

*Total value of gas saved (in U.S. Dollars) = Methane emissions reduction (in Mcf) x Gas value (in U.S. \$/Mcf)*

**I. To what extent do you expect to implement this activity next year?**

**Additional Comments:**

### Previous Years' Activities

Use the table below to report any past implementation of this technology or practice, but not previously reported to Natural Gas STAR International.

Year	Frequency of Activity or # of Installations	Total Cost of Activity (incl. equipment and labor) (U.S. \$)	Estimated Reductions (Mcf/yr)	Value of Gas Saved (U.S. \$)

**Comments/Additional Benefits:** Please describe any additional economic, operational, environmental, or safety benefits achieved by implementing this technology or practice. Use the back of the page for additional space if needed.



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Additional Program Accomplishments

The Natural Gas STAR International Program will use any information entered here to recognize the efforts and achievements of outstanding partners.

Please include any additional information you would like to share about your company's participation in Natural Gas STAR International. Examples may include:

- Activities to strengthen your program (e.g., training/education, innovative technologies or activities, pilot projects, employee incentive programs).
- Efforts to communicate your participation and successes (e.g., internal newsletters, press releases, company website).
- Participation in Natural Gas STAR International program activities (e.g., contributions to case studies, presentation at workshops).

---

### Additional Accomplishments:

*(Please use the back of the page for additional space if needed.)*



## Appendix A-1

### Methane Emission Reduction Technologies & Practices— Production Sector

The list below describes a variety of methane emission reduction technologies that Natural Gas STAR partners in the production sector have implemented and reported to Natural Gas STAR. You may use this list as a guide when completing your annual report. **Sunset dates (i.e., the length of time a technology or practice can continue to accrue emission reductions after implemented) are one year in duration unless otherwise noted in parentheses.** An asterisk (\*) indicates that a technical document related to the technology or practice is available online at [epa.gov/gasstar/tools/recommended.html](http://epa.gov/gasstar/tools/recommended.html).

#### Compressors/Engines

- Automate compressor systems operation to reduce venting\*
- Catalytic converter installation (10 years)
- Convert engine starting to nitrogen and/or CO<sub>2</sub> rich gas (10 years)\*
- Convert to low pressure compressor starters (10 years)
- Eliminate unnecessary equipment and/or systems\*
- Increase compression capacity to reduce venting/flaring
- Install automated air/fuel ratio control systems (10 years)\*
- Install electric compressors (10 years)\*
- Install electric motors (10 years)
- Install electric starters (10 years)\*
- Install lean burn compressor (10 years)
- Lower compressor purge pressure for shutdown\*
- Perform gas recovery using slipstream (10 years)
- Redesign blowdown/alter ESD practices\*
- Reduce emissions when taking compressors offline\*
- Replace compressor rod packing systems\*
- Replace gas starters with air (10 years)\*
- Replace ignition/reduce false starts\*
- Turbine fuel use optimization

#### Dehydrators

- Install condensers on glycol dehydrators (10 years)
- Install/convert gas-driven chemical pumps to electric, mechanical, or solar pumps (10 years)\*
- Install desiccant dehydrator (10 years)\*
- Install flash tank separators on glycol dehydrators (10 years)\*
- Reduce glycol circulation rates in dehydrators\*
- Reroute dehy./tank vents to flare or station suction (10 years)\*
- Reroute glycol skimmer gas\*
- Shutdown glycol dehydrator stripping gas in winter
- Use rich glycol in glycol pumps

#### Directed Inspection and Maintenance

- DI&M at compressor stations\*

- DI&M: leak detection using IR camera/optical imaging
- DI&M: leak detection using lower emission threshold
- DI&M: survey and repair leaks

#### Pipelines

- Inject blowdown gas into low pressure system\*
- Pipeline replacement and repair
- Use fixed/portable compressors for pipeline pumpdown\*
- Use hot taps for in-service pipeline connections\*

#### Pneumatics/Controls

- Capture/use gas released from gas-operated pneumatic pumps
- Convert gas-driven chemical pumps to instrument air (10 years)\*
- Convert gas pneumatic controls to instrument air (10 years)\*
- Convert pneumatic devices to mechanical/electronic (10 years)\*
- Identify and replace high-bleed pneumatic devices (7 years)\*
- Install/convert gas powered separators to solar powered separators (10 years)
- Install controllers on gas-assisted methanol pump (10 years)
- Install no bleed controllers (10 years)
- Install non-venting dump controllers (10 years)
- Reduce gas pressure on pneumatic devices
- Reduce venting from unlit pilot: install electronic safety devices (10 years)\*
- Replace bi-directional orifice meter with ultrasonic meters\*
- Replace chemical pumps with electronic flow controllers (10 years)
- Use add-on controls to reduce emissions from pneumatics (10 years)

#### Tanks

- Change out vent pallet (10 years)
- Consolidate crude oil production and water storage tanks (10 years)\*
- Convert water tank blanket from natural gas to CO<sub>2</sub> (10 years)\*





# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Methane Emission Reduction Technologies & Practices— Production Sector

### Tanks

- Install evactors (10 years)
- Install flash gas compressors (10 years)
- Install hydrocarbon liquid stabilizer (10 years)
- Install pressurized storage of condensate (10 years)\*
- Install vapor recovery units (VRUs) (10 years)\*
- Install vapor recovery units on pipeline liquid/condensate tanks (10 years)\*
- Recycle line recover gas during condensate loading\*
- Reduce excess blanket gas blow-by to the atmosphere
- Replace leaking aboveground tanks (10 years)
- Route gas to compressor suction/blowcase vessel (10 years)
- Use protective tank coatings to reduce leaks (10 years)

### Valves

- Heat tracing to prevent control valves from freezing open
- Install plugs on valves and open ended lines (10 years)
- Reduce venting from unlit pilot: install BASO valves (10 years)\*
- Test and repair pressure safety valves\*

### Wells

- Artificial lift: gas lift (10 years)
- Artificial lift: install plunger lifts (10 years)\*
- Artificial lift: install pumpjacks or rod pumps on gas wells (10 years)\*
- Artificial lift: install smart lift automated systems on gas wells (10 years)\*
- Artificial lift: install velocity tubing strings (10 years)\*
- Artificial lift: pressure swabbing
- Artificial lift: use capillary strings (10 years)
- Artificial lift: use compression (10 years)
- Artificial lift: use pumping unit (10 years)
- Artificial lift: use to reduce blowdown in gas wells (10 years)\*
- Install automated shut-in cycle units to reduce well venting (10 years)

- Install flash tank separator on water gathering system (10 years)
- Install pumps for separators (10 years)
- Install snubbing unit at wellhead
- Install soap launcher/soap unit (10 years)
- Lower heater-treater temperature\*
- Optimize gas well unloading times\*
- Perform reduced emissions completions\*
- Route casinghead gas to VRU or compressor (10 years)\*
- Use foaming agents to reduce blowdown frequency\*

### Other

- Capture and use waste heat to reduce gas usage and emissions
- Convert natural gas fired generator to solar power (10 years)
- Flare reduction program
- Improve system design/operation
- Install flares (10 years)\*
- Install pilotless burner controls (10 years)
- Install purge reducer on flare (10 years)
- Optimize nitrogen rejection unit to reduce methane in N<sub>2</sub> reject stream\*
- Recover gas from separators
- Re-inject gas for enhanced oil recovery
- Re-inject gas into crude
- Replace aged heaters with new efficient gas fired heaters (10 years)



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Appendix A-2

### Methane Emission Reduction Technologies & Practices— Gathering and Processing Sector

The list below describes a variety of methane emission reduction technologies that Natural Gas STAR partners in the gathering and processing sector have implemented and reported to Natural Gas STAR. You may use this list as a guide when completing your annual report. **Sunset dates (i.e., the length of time a technology or practice can continue to accrue emission reductions after implemented) are one year in duration unless otherwise noted in parentheses.** An asterisk (\*) indicates that a technical document related to the technology or practice is available online at [epa.gov/gasstar/tools/recommended.html](http://epa.gov/gasstar/tools/recommended.html).

#### Compressors/Engines

- Convert engine starting to nitrogen and/or CO<sub>2</sub> rich gas (10 years)\*
- Eliminate unnecessary equipment and/or systems\*
- Install automated air/fuel ratio control systems (10 years)\*
- Install electric compressors (10 years)\*
- Install electric starters (10 years)\*
- Redesign blowdown/alter ESD practices\*
- Reduce emissions when taking compressors offline\*
- Replace compressor rod packing systems\*
- Replace gas starters with air (10 years)\*

#### Dehydrators

- Install condensers on glycol dehydrators (10 years)
- Install/convert gas-driven chemical pumps to electric, mechanical, or solar pumps (10 years)\*
- Install flash tank separators on glycol dehydrators (10 years)\*
- Reduce glycol circulation rates in dehydrators\*
- Reroute dehy./tank vents to flare or station suction (10 years)\*
- Replace glycol dehydration units with methanol injection (10 years)\*
- Reroute glycol skimmer gas\*

#### Directed Inspection and Maintenance

- DI&M at compressor stations\*
- DI&M at gas plants and booster stations\*
- DI&M: aerial leak detection using laser and/or infrared technology
- DI&M: inspect/repair compressor station blowdown valves\*
- DI&M: leak detection using IR camera/optical imaging
- DI&M: leak detection using ultrasound\*
- Improve measurement systems to track gas loss

#### Pipelines

- Pipeline replacement and repair
- Recover gas from pipeline pigging operations\*
- Revise pigging schedule to reduce methane emissions
- Use composite wrap repair\*
- Use inert gases and pigs to perform pipeline purges\*

- Use fixed/portable compressors for pipeline pumpdown\*
- Use hot taps for in-service pipeline connections\*
- Use of improved protective coating at pipeline canal crossings (10 years)\*

#### Pneumatics/Controls

- Capture and use waste heat to reduce gas usage and emissions
- Convert gas pneumatic controls to instrument air systems (10 years)\*
- Install back-up power at booster sites to prevent venting (10 years)
- Install no bleed controllers (10 years)
- Use add-on controls to reduce emissions from pneumatics (10 years)

#### Tanks

- Direct liquids at compressor suction to pipeline (10 years)
- Install hydrocarbon liquid stabilizer (10 years)
- Install pressurized storage of condensate (10 years)\*
- Install vapor recovery units (VRUs) (10 years)\*
- Install VRUs on pipeline liquid/condensate tanks (10 years)\*
- Reduce excess blanket gas blow-by to the atmosphere
- Reduce vapors vented out of drip tanks
- Route inlet flash vapors to station suction (10 years)

#### Valves

- Convert gas operated valves to hydraulic operation (10 years)
- Heat tracing to prevent control valves from freezing open
- Rupture pin shutoff device to reduce venting (10 years)
- Test and repair pressure safety valves\*
- Test gate station pressure relief valves with nitrogen\*

#### Other

- Convert natural gas fired generator to solar power (10 years)
- Install flares (10 years)\*
- Optimize nitrogen rejection unit to reduce methane in N<sub>2</sub> reject stream\*
- Process/re-route acid gas to reduce venting



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Appendix A-3

### Methane Emission Reduction Technologies & Practices— Transmission Sector

The list below describes a variety of methane emission reduction technologies that Natural Gas STAR partners in the transmission sector have implemented and reported to Natural Gas STAR. You may use this list as a guide when completing your annual report. **Sunset dates (i.e., the length of time a technology or practice can continue to accrue emission reductions after implemented) are one year in duration unless otherwise noted in parentheses.** An asterisk (\*) indicates that a technical document related to the technology or practice is available online at [epa.gov/gasstar/tools/recommended.html](http://epa.gov/gasstar/tools/recommended.html).

#### Compressors/Engines

- Automate compressor systems operation to reduce venting\*
- Eliminate unnecessary equipment and/or systems\*
- Install automated air/fuel ratio control systems (10 years)\*
- Install electric compressors (10 years)\*
- Install electric motors (10 years)
- Install electric starters (10 years)\*
- Install lean burn compressor (10 years)
- Lower compressor purge pressure for shutdown\*
- Redesign blowdown/alter ESD practices\*
- Reduce emissions when taking compressors offline\*
- Reduce frequency of engine starts with gas\*
- Replace compressor cylinder unloaders\*
- Replace compressor rod packing systems\*
- Replace gas starters with air (10 years)\*
- Replace ignition/reduce false starts\*
- Replace wet compressor seals with dry seals (10 years)\*
- Use of turbines at compressor stations (20 years)

#### Dehydrators

- Install condensers on glycol dehydrators (10 years)
- Install flash tank separators/controls on Tran. sector glycol dehydrators (10 years)\*
- Install/convert gas-driven chemical pumps to electric, mechanical, or solar pumps (10 years)\*
- Replace glycol dehydrator with separator & in-line heaters (10 years)\*
- Reroute dehy./tank vents to flare or station suction (10 years)\*
- Reroute glycol skimmer gas\*

#### Directed Inspection and Maintenance

- DI&M at compressor stations\*
- DI&M at remote sites\*
- DI&M: aerial leak detection using laser and/or infrared technology

- DI&M: inspect/repair compressor station blowdown valves\*
- DI&M: leak detection using IR camera/optical imaging
- DI&M: leak detection using ultrasound\*
- DI&M: survey and repair leaks

#### Pipelines

- Inspect/repair valves during pipeline replacement\*
- Pipeline replacement and repair
- Recover gas from pipeline pigging operations\*
- Reduce/downgrade system pressure
- Reduced emissions through third-party damage prevention
- Use composite wrap repair\*
- Use fixed/portable compressors for pipeline pumpdown\*
- Use hot taps for in-service pipeline connections\*
- Use inert gas/pigs for pipeline purges\*

#### Pneumatics/Controls

- Convert gas-driven chemical pumps to instrument air (10 years)\*
- Convert gas pneumatic controls to instrument air (10 years)\*
- Identify and replace high-bleed pneumatic devices (7 years)\*
- Install no bleed controllers (10 years)
- Reduce meter run blowdowns
- Replace bi-directional orifice meter with ultrasonic meters\*
- Use add-on controls to reduce emissions from pneumatics (10 years)

#### Tanks

- Install flash gas compressors (10 years)
- Install vapor recovery units on pipeline liquid/condensate tanks (10 years)\*



## Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

### Methane Emission Reduction Technologies & Practices— Transmission Sector

#### Valves

- Close valves during repair to minimize blowdown\*
- Design isolation valves to minimize gas blowdown volumes (10 years)\*
- Move in fire gates at compressors (10 years)\*
- Test and repair pressure safety valves\*
- Use of YALE closures for ESD testing\*

#### Wells

- Switch from underbalanced to overbalanced drilling in gas storage field

#### Other

- Convert natural gas fired generator to solar power (10 years)
- Improve system design/operation
- Inject blowdown gas into low pressure system\*
- Install flares (10 years)\*
- Replace aged heaters with new efficient gas fired heaters (10 years)
- Require improvements in quality of gas received\*



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Appendix A-4

### Methane Emission Reduction Technologies & Practices— Distribution Sector

The list below describes a variety of methane emission reduction technologies that Natural Gas STAR partners in the distribution sector have implemented and reported to Natural Gas STAR. You may use this list as a guide when completing your annual report. **Sunset dates (i.e., the length of time a technology or practice can continue to accrue emission reductions after implemented) are one year in duration unless otherwise noted in parentheses.** An asterisk (\*) indicates that a technical document related to the technology or practice is available online at [epa.gov/gasstar/tools/recommended.html](http://epa.gov/gasstar/tools/recommended.html).

#### Compressors/Engines

- Eliminate unnecessary equipment and/or systems\*
- Install electric starters (10 years)\*
- Redesign blowdown/alter ESD practices\*
- Reduce frequency of engine starts with gas\*
- Replace compressor rod packing systems\*
- Replace ignition/reduce false starts\*

#### Dehydrators

- Reroute dehy./tank vents to flare or station suction (10 years)\*

#### Directed Inspection and Maintenance

- DI&M at compressor stations (non-mainline transmission)\*
- DI&M at gate stations and surface facilities\*
- DI&M: survey and repair leaks
- DI&M: increase frequency of leak surveys\*
- Improve measurement systems to track gas loss

#### Pipelines

- Identify and rehabilitate leaky distribution pipes
- Insert gas main flexible liners (10 years)\*
- Reduce/downgrade system pressure
- Reduced emissions through third-party damage prevention
- Use fixed/portable compressors for pipeline pumpdown\*
- Use hot taps for in-service pipeline connections\*
- Use no-blow insertion fittings

#### Pneumatics/Controls

- Convert gas-driven chemical pumps to instrument air (10 years)\*
- Convert gas pneumatic controls to instrument air (10 years)\*
- Convert pneumatic devices to mechanical/electronic (10 years)\*
- Use add-on controls to reduce emissions from pneumatics (10 years)

#### Valves

- Install excess flow valves (10 years)\*
- Install overpressure protection system (10 years)
- Test and repair pressure safety valves\*
- Test gate station pressure relief valves with nitrogen\*

#### Other

- Convert natural gas fired generator to solar power (10 years)
- Improve system design/operation
- Inject blowdown gas into low pressure system\*
- Install flares (10 years)\*
- Re-inject CNG cylinder test gas
- Retighten LNG pump seals
- Use automated systems to reduce pressure



# Natural Gas STAR International Annual Report

OMB Control No. 2060-0328  
Expires 07/31/2011

## Appendix B

### Conversion Factors

Please see below for a variety of conversion factors that might be useful when completing your annual report. Please contact Natural Gas STAR if you have questions about this information.

#### Gas Conversions

Please report methane emissions reductions to Natural Gas STAR International in thousand cubic feet (Mcf).

1 Cubic foot of methane	= 1,014.6 Btu
1 Btu	= 0.000986 Cubic feet of methane
1 Cubic foot	= 0.02832 Cubic meter
1 Cubic meter	= 35.312 Cubic feet
1 Mile	= 1.609 Kilometer
1 Kilometer	= 0.6214 Mile
1 Btu	= 251.996 Calories
1 Calorie	= 0.00397 Btu
1 Btu	= 1055.056 Joules
1 Joule	= 0.00095 Btu

#### Natural Gas STAR Program Managers:

Scott Bartos  
Phone: +1 (202) 343-9167  
Fax: +1 (202) 343-2202  
E-mail: [bartos.scott@epa.gov](mailto:bartos.scott@epa.gov)

Jerome Blackman  
Phone: +1 (202) 343-9630  
Fax: +1 (202) 343-2342  
E-mail: [blackman.jerome@epa.gov](mailto:blackman.jerome@epa.gov)

Carey Bylin  
Phone: +1 (202) 343-9669  
Fax: +1 (202) 343-2202  
E-mail: [bylin.carey@epa.gov](mailto:bylin.carey@epa.gov)

Roger Fernandez  
Phone: +1 (202) 343-9386  
Fax: +1 (202) 343-2202  
E-mail: [fernandez.roger@epa.gov](mailto:fernandez.roger@epa.gov)

Suzie Waltzer  
Phone: +1 (202) 343-9544  
Fax: +1 (202) 343-2202  
E-mail: [waltzer.suzanne@epa.gov](mailto:waltzer.suzanne@epa.gov)

#### Mailing Information:

Standard Mail:  
The Natural Gas STAR Program  
U.S. EPA (6207J)  
1200 Pennsylvania Ave, NW  
Washington, DC 20460  
U.S.A.

Express/Overnight Mail:  
The Natural Gas STAR Program  
U.S. EPA (6207J)  
1310 L Street, NW  
Washington, DC 20005  
U.S.A.

The public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours for each new response and 27 hours for subsequent responses. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.