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SLIDES: Technologies to Reduce Methane Emissions from Natural Gas Production Activities

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Technologies to Reduce Methane Emissions from Natural Gas Production Activities



epa.gov/gasstar

The Natural Gas STAR Program



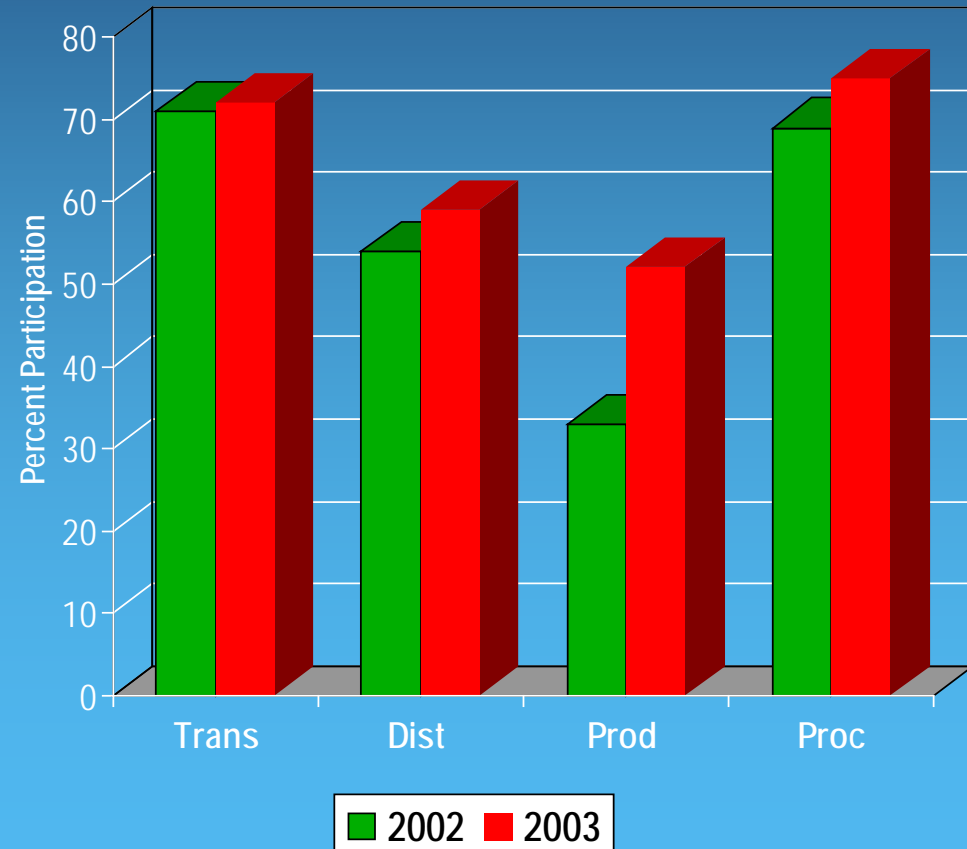
The Natural Gas STAR Program is a *flexible, voluntary partnership* between EPA and the oil and natural gas industry designed to *cost-effectively* reduce methane emissions from natural gas operations.

U.S. Industry Participation

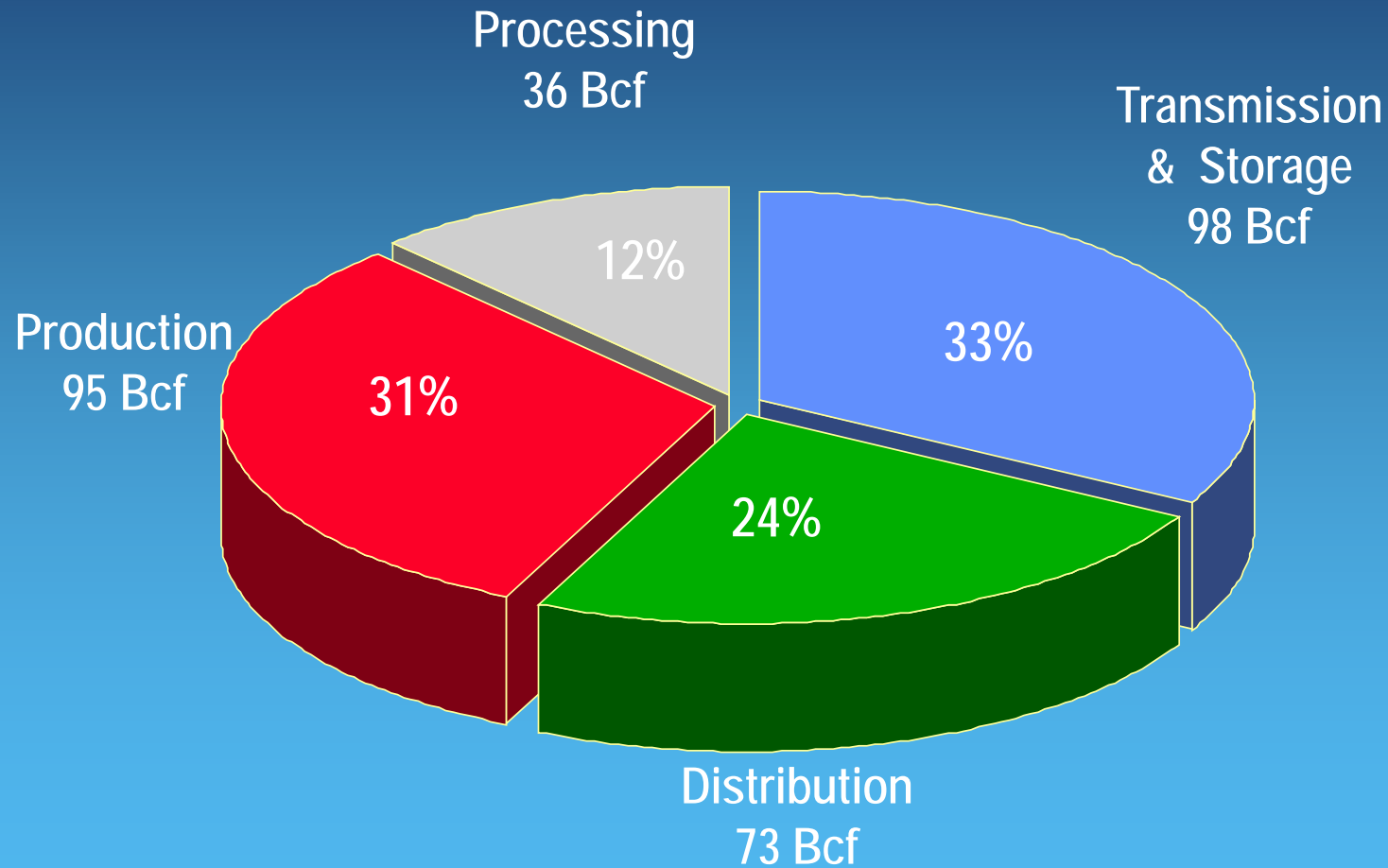


★ 111 Program Partners:

- ★ 72% of transmission
- ★ 28 partners
- ★ 59% of distribution
- ★ 49 partners
- ★ 52% of production
- ★ 23 partners
- ★ 75% of processing
- ★ 11 partners

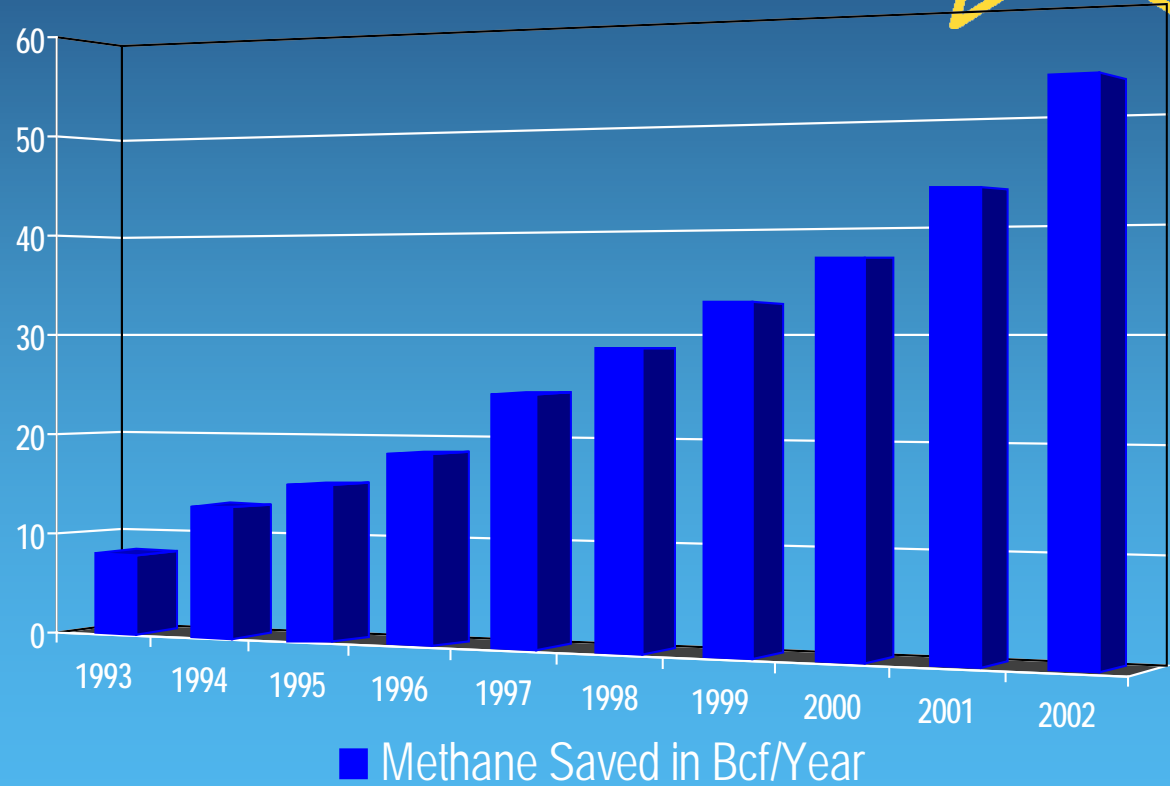
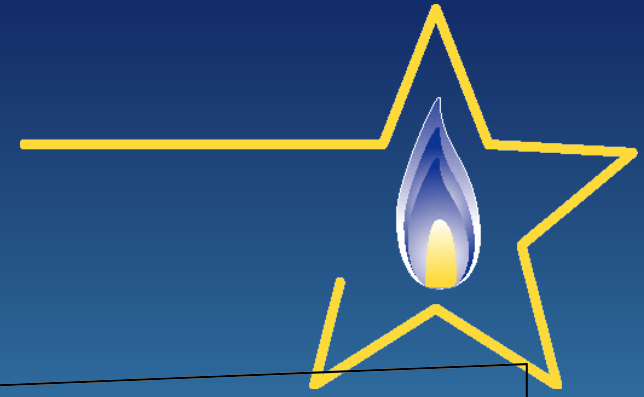


Methane Emissions from the U.S. Gas Industry

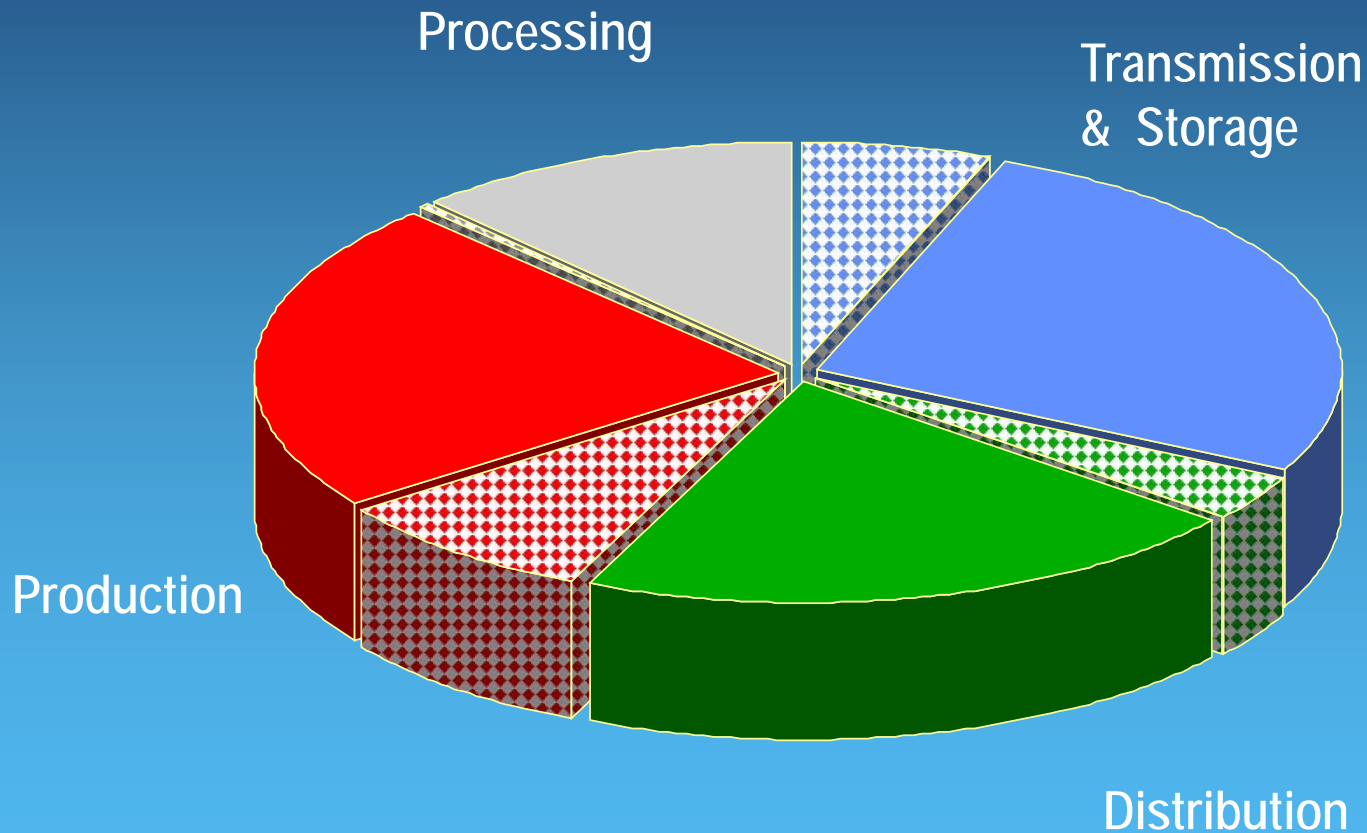


Program Accomplishments

★ 300 Billion cubic feet
in reductions!



Additional Reduction Opportunities



- 2002 Emissions
- 2002 Reductions



Gas Production Best Management Practices to Reduce Methane Emissions



PNEUMATIC DEVICES

Pneumatic Devices



- ★ About 35 Billion cubic feet of methane is vented each year from pneumatic devices in the USA, resulting in over \$140 million dollars in losses at \$3 per mcf.

Pneumatic Devices



- ★ Gas loss can be minimized by retrofitting or replacing high-bleed with low-bleed models or air driven pneumatic systems.
- ★ Cost of implementation varies with design, size, and operating conditions.
- ★ Payback generally less than 1 year.



DEHYDRATORS

Dehydrators



- ★ 38,000 glycol dehydrator systems in the US natural gas production sector emitting approximately 25 billion cubic feet of methane per year.
- ★ Many ways to reduce methane emissions from these dehydrator systems.

Dehydrators - flash tanks

- ★ Installing flash tanks results in up to 90% recovery of methane emissions.
- ★ Flashed gas can be used to fuel on-site equipment or re-injected into pipeline for sale.
- ★ Flash tanks have low operating and maintenance costs.
- ★ Payback generally less than 2 years.



Dehydrators - reduced glycol circulation



- ★ Common practice to set glycol circulation rates higher than is necessary or to neglect calibration as well production decreases. By optimizing the glycol circulation rate, methane emissions are lowered.
- ★ Payback on investment is immediate.

Dehydrators - electric pumps



- ★ Gas-assisted pumps are the most common circulation pumps. Electric pumps, in contrast, eliminate methane emissions by using electricity as the power source.
- ★ Payback can be as short as two months.

Dehydrators - desiccant dehydrator



- ★ Installation of a desiccant dehydrator instead of a glycol dehydrator reduces methane emissions.
- ★ Wet gas passes through a drying bed of desiccant tablets. The tablets pull moisture from the gas and gradually dissolve in the process - the unit is fully enclosed, so the gas does not escape.
- ★ Payback is approximately 3 years.



PLUNGER LIFT SYSTEMS

Plunger Lifts



- ★ Accumulation of liquid hydrocarbons or water in the well bores of gas wells reduces and can halt production.
- ★ Common practice to temporarily restore production or “dewater a well” is to release significant quantities of methane by venting, or “blowing” the well to the atmosphere.
- ★ On average, 50 thousand cubic feet to 600 thousand cubic feet per well is emitted each year.

Plunger Lifts



- ★ Plunger lifts automatically expel liquids without blowing the well to the atmosphere.
- ★ Gas wells with properly adjusted plunger lift systems are kept productive without operator attention.
- ★ Approximately 7 billion cubic feet per year of natural gas is saved with plunger lift installations.



VAPOR RECOVERY UNITS

Vapor Recovery Units



- ★ Methane and other light hydrocarbons often “flash out” of crude oil in storage tanks.
- ★ Installing vapor recovery units will reduce emissions from tanks by about 95%.
 - Natural gas can be sold or used on site.
- ★ On average, each unit serves four storage tanks
 - Recovers 5 to 100 million cubic feet / year.
- ★ Payback can occur in 6 months to 12 years depending on unit and tank battery design.



COMPRESSORS

Compressors - Rod Packing Systems



- ★ Compressor rod packing systems contribute more than 9 billion cubic feet of methane emissions annually.
- ★ New packing systems may lose 60 standard cubic feet/hour; increasing to 900 cubic feet/hour over time as the rod packing ages.
- ★ Increases life for existing equipment, improves operating efficiencies, and generates long-term savings.
- ★ Payback occurs in less than 1 year.

Compressors - Replacing Wet Seals



- ★ Centrifugal compressors normally use “wet” seals where high pressure oil forms a barrier against escaping gas.
- ★ Little gas escapes through the barrier but significant gas is absorbed by the oil. Emissions occur when the gas is taken out of the circulating oil.
- ★ Methane emissions from wet seal systems range from 40 to 200 standard cubic feet per minute.

Compressors - Replacing Wet Seals

- ★ Replace an entire compressor with one using dry seals.
- ★ Replace a worn out wet seal with a dry seal.
- ★ Replace a fully functioning wet seal with a dry seal.
- ★ Dry seal systems, which use high pressure gas to seal the compressor, emit less methane - only up to 5 standard cubic feet per minute.



Compressors - Off-line Techniques



- ★ When compressors are off-line, methane leaks from a number of sources such as rod packing and closed blowdown valves.
- ★ Depressurization through “blowdowns” also emits large amounts of methane.

Compressors - Off-line Techniques

- ★ Keeping compressors pressurized when they are off-line avoids “blowdowns”.
- ★ Connecting the blowdown vent lines to the fuel gas system allows normally vented gas to be used while the compressor is off-line.
- ★ Installing a static seal on compressor rods can eliminate rod packing leaks during pressurized shut downs.





Other Practices to Reduce Methane Emissions

Production Sector PROs



- ★ Connect Casing to Vapor Recovery Unit
- ★ Consolidate Production and/or Tank Batteries
- ★ Eliminate Unnecessary Equipment and/or Systems
- ★ Install Downhole Separator Pumps
- ★ Install Electric Compressors
- ★ Replace Burst Plates with Secondary Relief Valves
- ★ Install Electronic Flare Ignition Devices
- ★ Lower Heater Treater Temperature
- ★ Convert Water Tank Blanket to Produced CO₂ Gas
- ★ Pipe Glycol Pump to Vapor Recovery Unit
- ★ Reroute Glycol Skimmer Gas
- ★ Install Pressurized Storage of Condensate
- ★ Convert Gas-driven Chemical Pumps
- ★ Convert Pneumatics to Alternative Controllers
- ★ Install Compressors to Capture Casinghead Gas
- ★ Install Velocity Tubing Strings
- ★ Install Flares
- ★ Recycle Line Recovers Gas During Condensate Loading
- ★ Use Ultrasound to Identify Leaks
- ★ Green Completions
- ★ Use Foaming Agents

Workshops



Cost-effective Methods for Reducing Methane Emissions

Natural Gas STAR Production Workshop

June 29

Colorado Springs, CO

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