



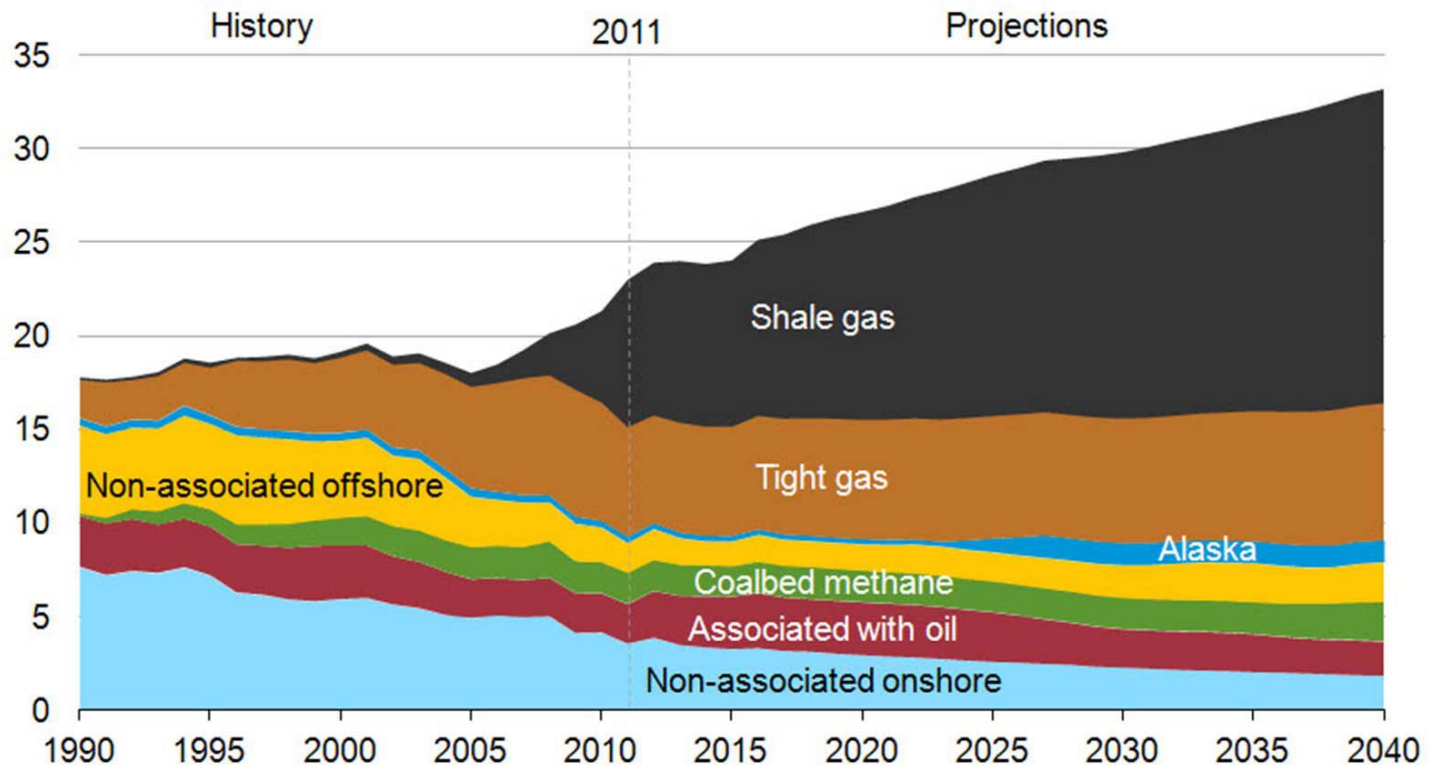
# Methane Emissions

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American Petroleum Institute  
June 27, 2016

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# In the U.S., natural gas production is increasing

U.S. dry natural gas production  
trillion cubic feet



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2013 Early Release*

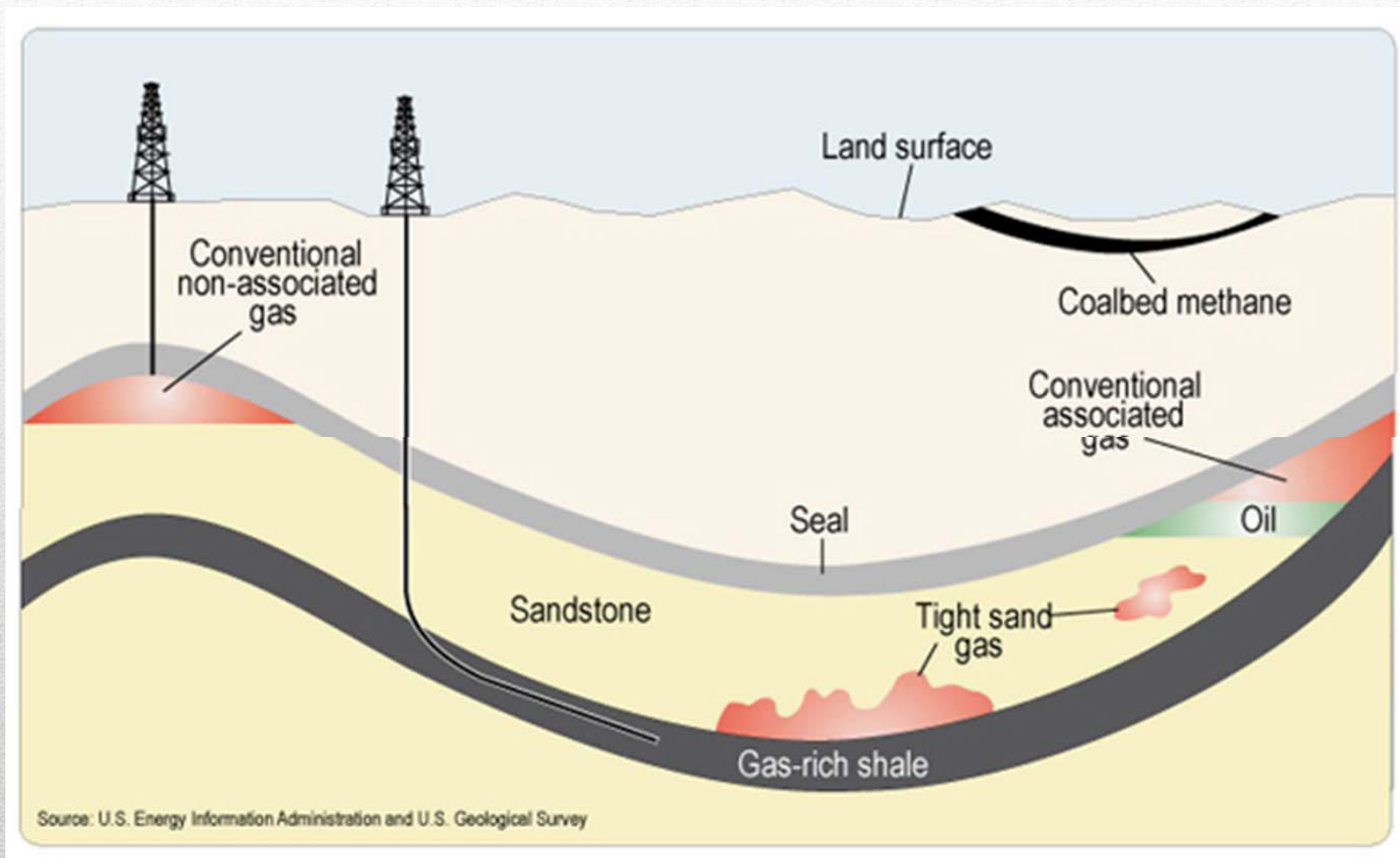
# Changes driven by horizontal drilling and hydraulic fracturing



[http://www.youtube.com/watch?v=WF3\\_gFTCN7A&feature=youtu.be](http://www.youtube.com/watch?v=WF3_gFTCN7A&feature=youtu.be)

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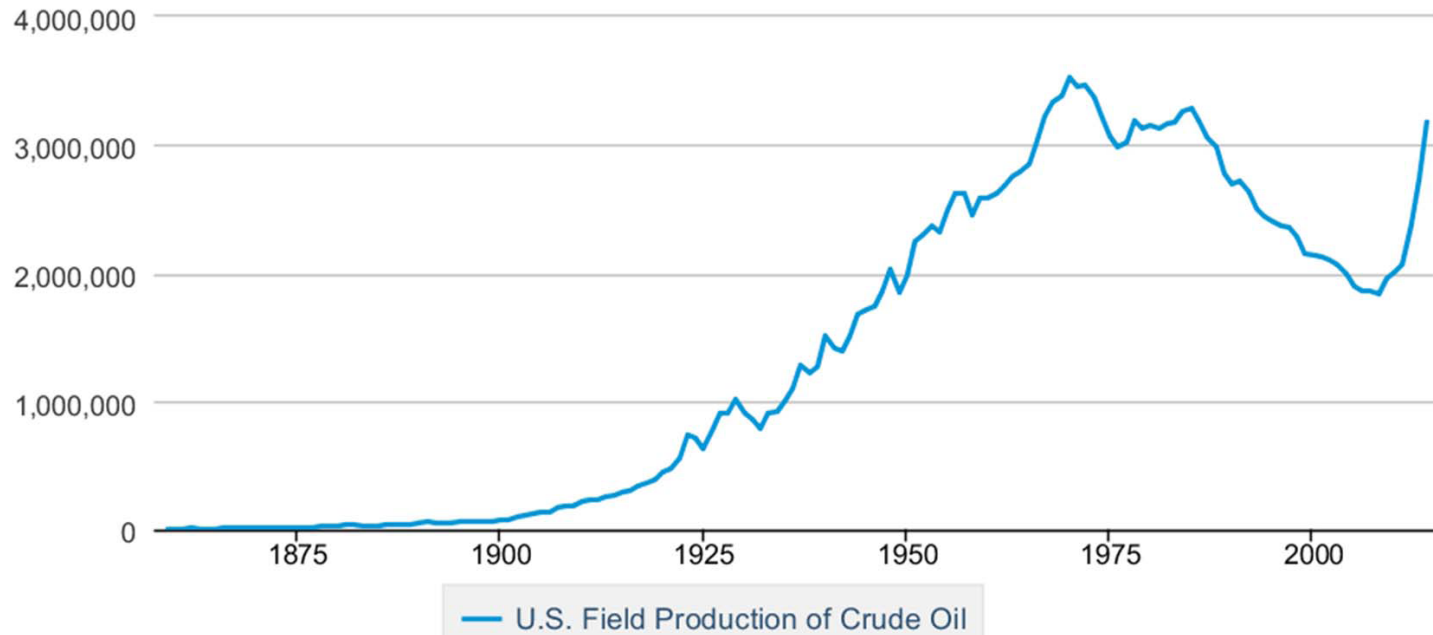
# Shale resources



# U.S. oil production has also been increasing

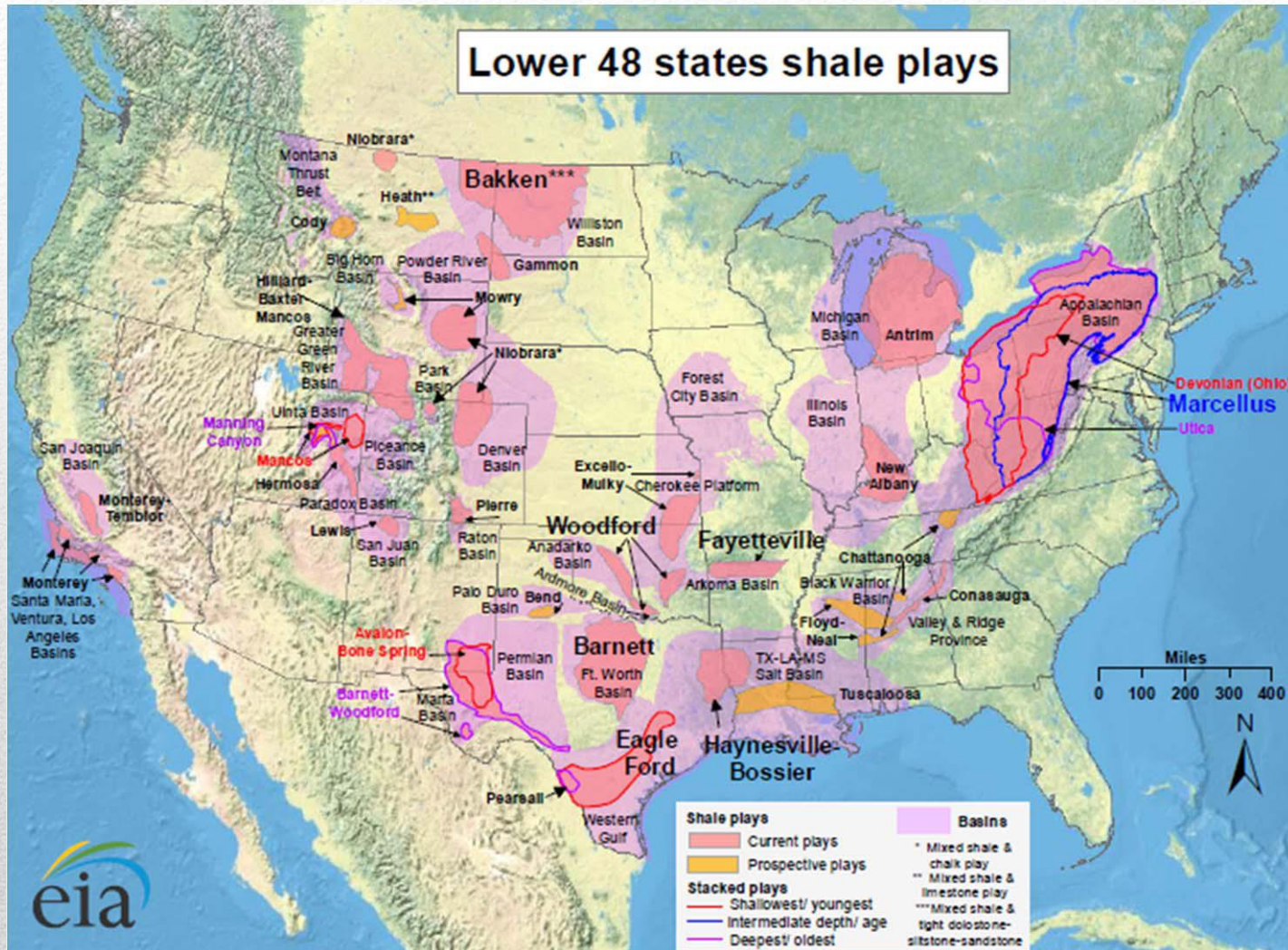
## U.S. Field Production of Crude Oil

Thousand Barrels



Source: U.S. Energy Information Administration

# Where is it happening?



## OIL & GAS EMISSIONS REGULATORY BACKGROUND

- January, 2015 – Administration and EPA announced plan to target methane and VOC emissions from oil and gas
  - To address new and existing sources
    - 111(b) for new and modified methane and VOC sources
    - Control Technology Guidelines for existing VOC sources

# Oil & Gas New Source Performance Standards

## NSPS 0000a

- Rule expands sources to cover pneumatic pumps, hydraulically-fractured oil well completions, and equipment leaks.
  - Rule adds methane as regulated pollutant; triggers existing source rule under Clean Air Act Section 111(d)
  - Final rule published June 3, 2016
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# Oil & Gas New Source Performance Standards (cont')

## Information Collection Request (ICR)

- On March 10, EPA announced plans to pursue existing source rule
  - EPA will first conduct ICR to collect data from industry to inform existing source rule
  - Draft ICR released for comment by Aug 2
  - ICR process likely to take until 1<sup>st</sup> or 2<sup>nd</sup> quarter 2017 to complete
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## Control Techniques Guidelines (CTGs)

- Last September, the EPA released draft Control Technique Guidelines (CTGs) for existing oil and gas emissions sources located in ozone nonattainment areas to achieve VOC emission reductions.
  - While CTGs are intended to be limited to VOC emissions reductions to attain the ozone air quality standard, their release is largely driven by methane emission reductions as a co-benefit.
  - The CTGs address the same equipment covered in the current and newly proposed NSPS OOOOa control requirements.
  - When final in the next month or two, the CTGs will be used by the states and incorporated into their State Implementation Plans (SIPs) to meet the ozone standard.
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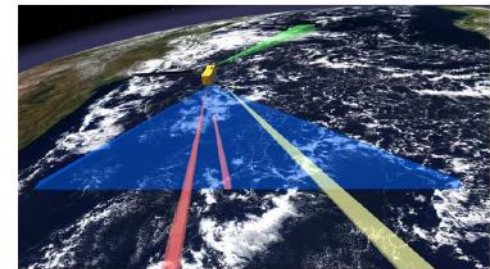
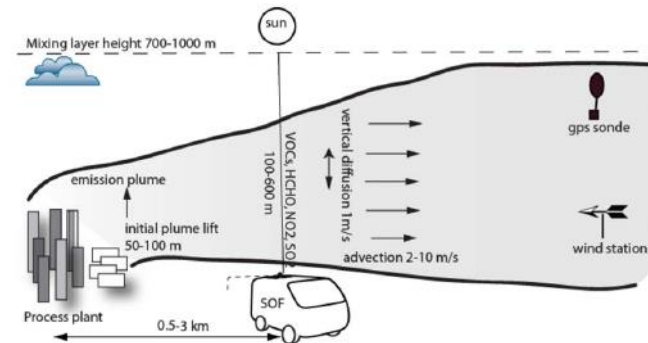
## **EPA Methane Challenge Program**

- EPA established a new voluntary program based upon the previous Natural Gas STAR Methane Challenge Program to reduce methane emissions across industry sectors.
  - API provided comments throughout the program development.
  - Most of the 41 founding partners are local distribution companies.
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# Multiple approaches for measurement

(bottom-up and top-down)

- Direct measurements of sources
- Fixed ground measurement network
- Mobile ground monitoring
- Aircraft monitoring
- Satellite measurements
- Different approaches provide complementary information



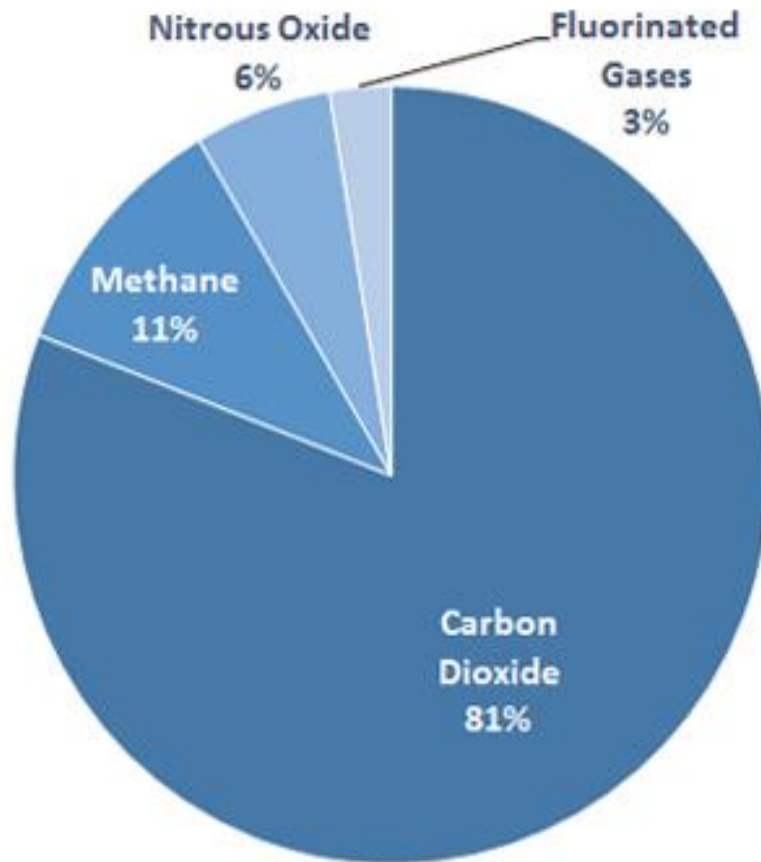
# What do the measurements tell us?

- Spatial variability in emissions
- Temporal variability in emissions
- Super-emitting sub-populations



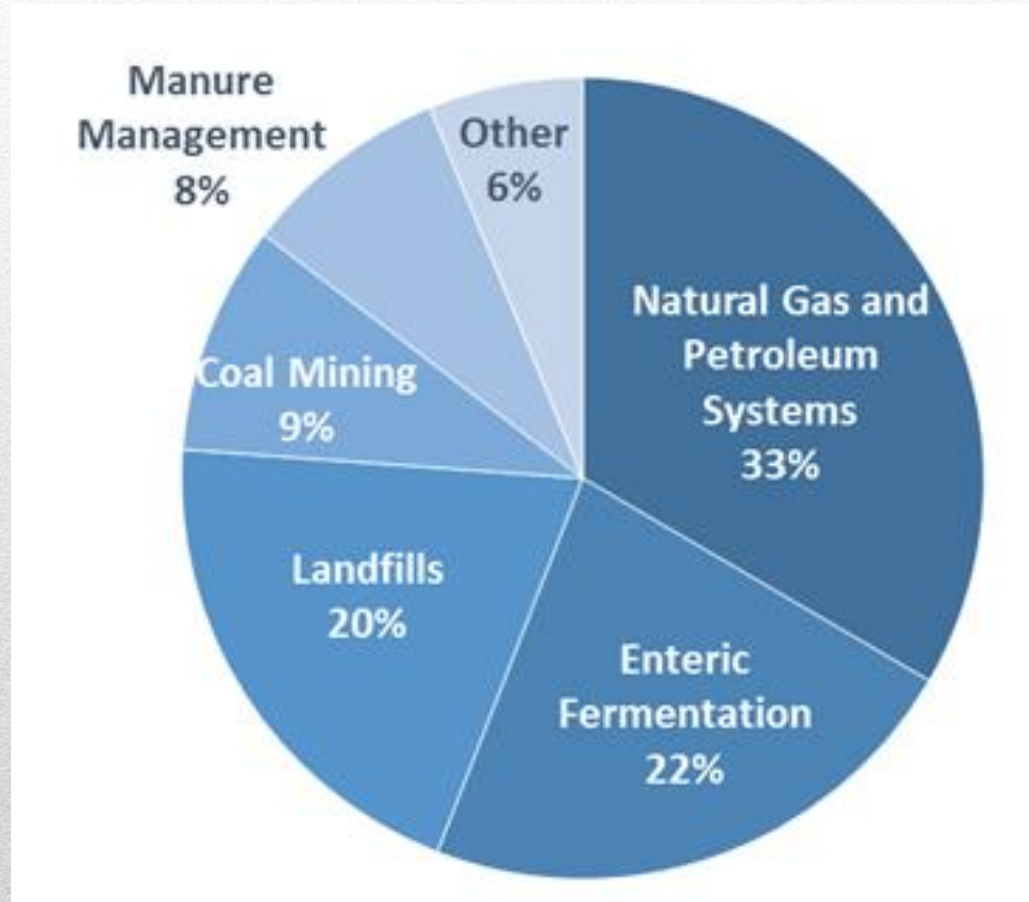
# Synthesis

- Emissions have significant spatial and temporal variability
  - Magnitudes of activity and emissions are changing
  - Some bottom-up and top down approaches lead to different assessments of emission magnitudes
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➤ **In 2014, Methane accounted for 11% of all anthropogenic GHG emissions.**

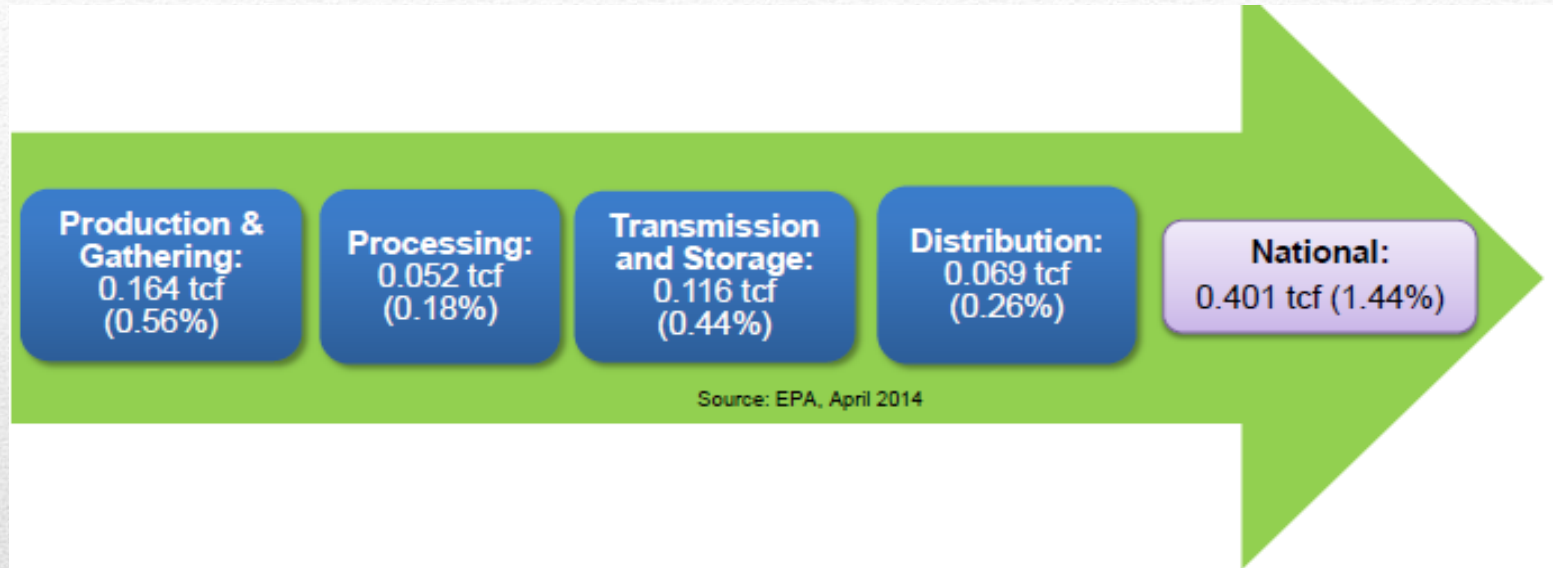
## In 2014, Natural Gas and Petroleum Systems were 33% of Total Methane Emissions



Note: All emission estimates from the [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014](#).



# Methane Emissions are low across the system



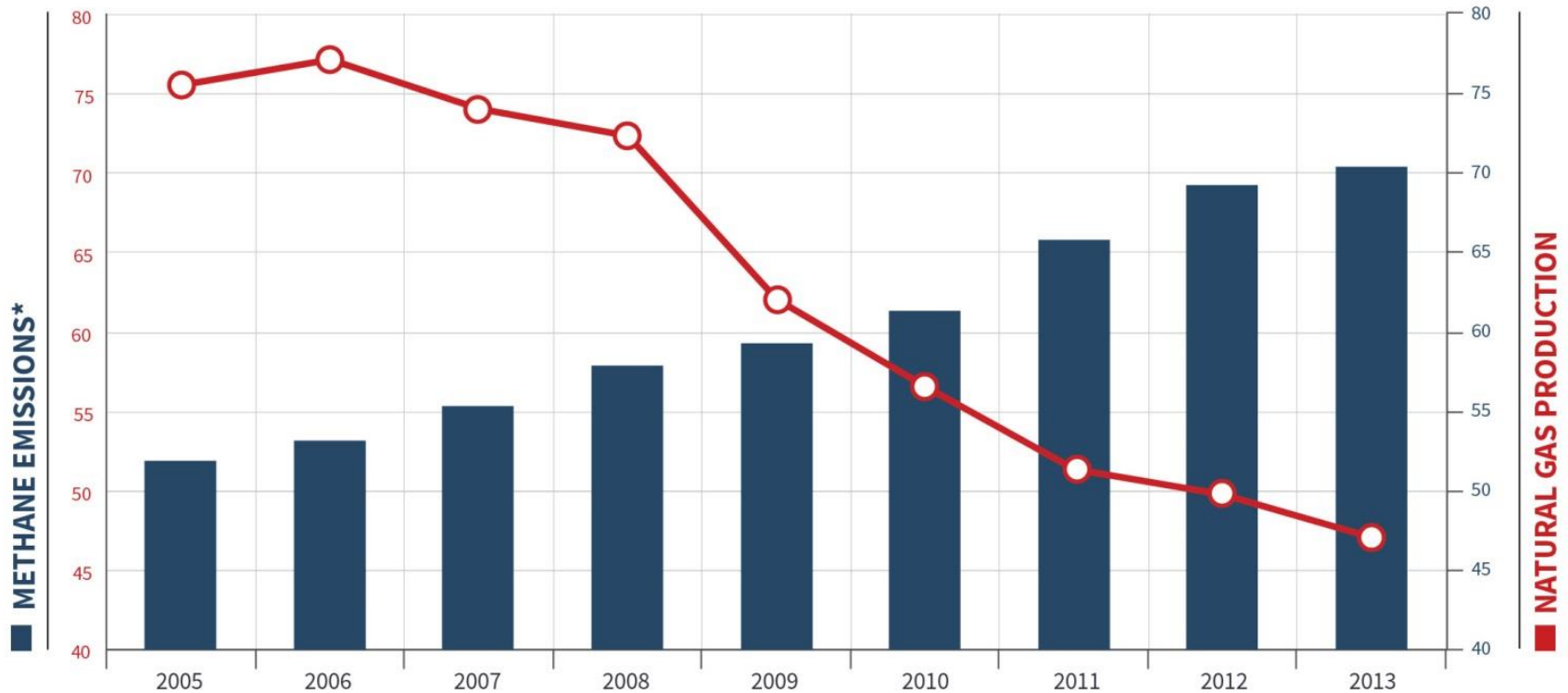
Source: EPA, April 2014

In April 2016, the EPA issued updated methane emissions inventory and resulting methane leakage for CY 2014 is computed at 1.62% or 0.47 tcf

# 2013 Data Trends: Methane vs. Production

Million Metric Tons of CO<sub>2</sub> Equivalent

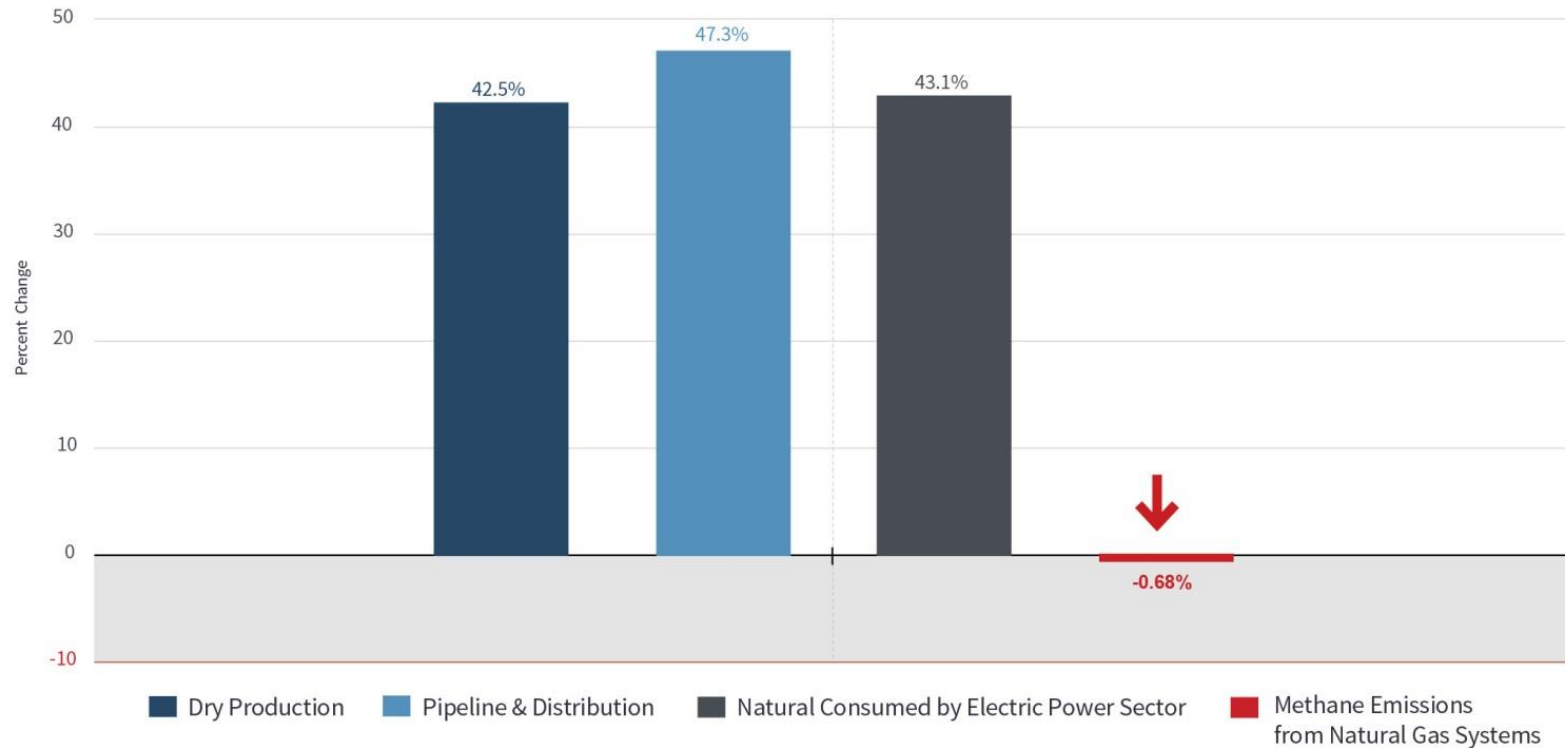
Billions of Cubic Feet Per Day



# 2014 Data Trends: Production vs. Emissions

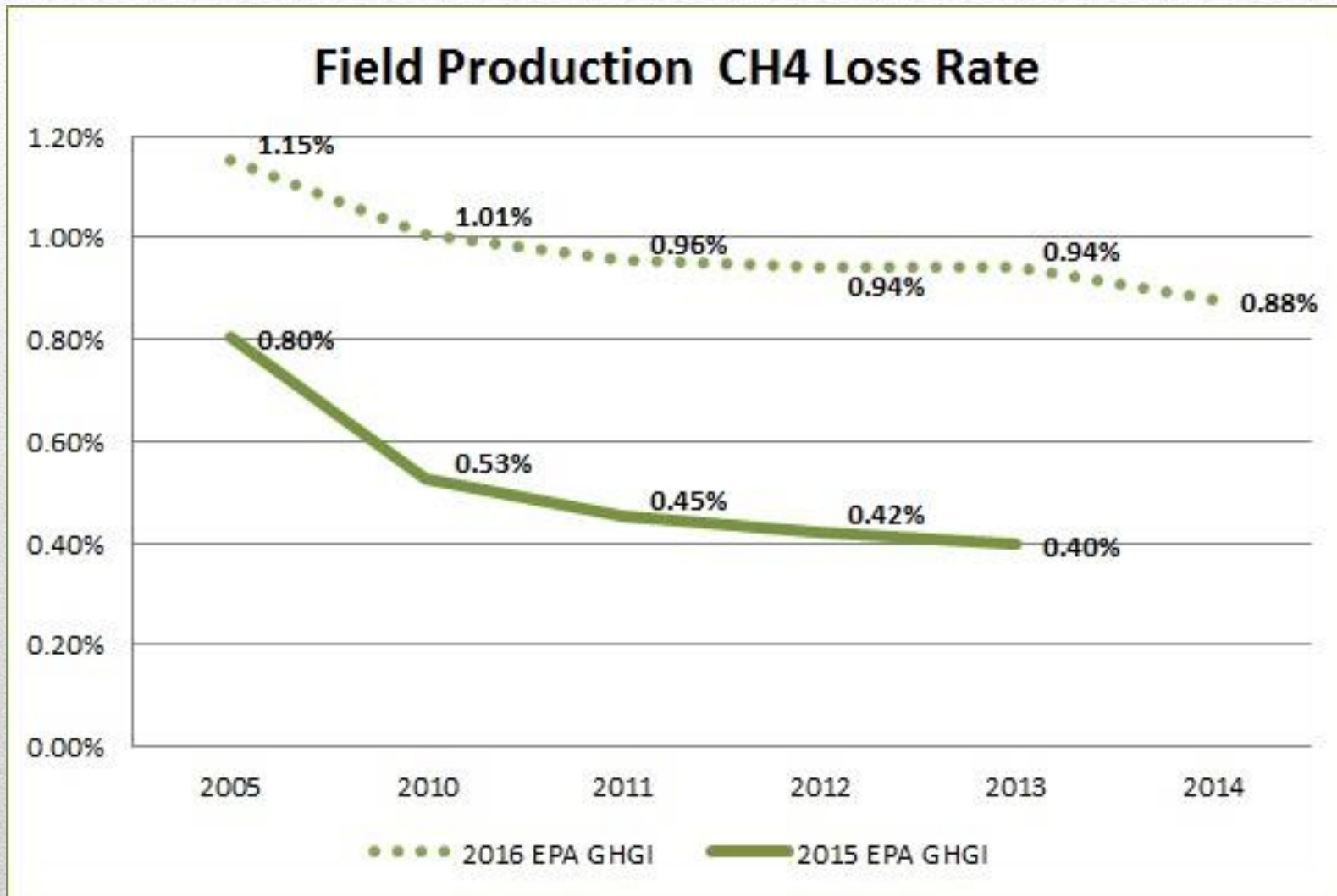
## METHANE EMISSIONS FALLING WHILE PRODUCTION RISES

U.S. Natural Gas 2005 to 2014



Source: EPA, Emissions and Production Data.

# The Emissions Reduction Trend Continues



# Key Takeaways from the ICF 2016 Methane Abatement Cost (MAC) Analysis

- **ICF builds on its 2014 EDF analysis – but updates inputs with current pricing and more recent recoverable gas estimates.**
  - Economics of methane recovery at a natural gas price of \$3.00/Mcf, which is more consistent with current market projections.
  - Well-head price is adjusted for royalties and fees in the production segment to \$2.25/Mcf
  - Incorporates actual ONE Future member experiences related to costs of various technologies and practices
  - Incorporates latest literature on abatement costs and mitigation potential
- **Cost-effective abatement technologies are available**
  - Over 88 bcf of methane reductions across value chain
- **But costs are on an average 5x higher than the 2014 ICF estimate for EDF**
  - While the previous EDF study found that the cost of methane abatement is less than a penny per Mcf of natural gas produced, or \$0.66/Mcf of methane reduced, the new ICF study finds the cost to be \$3.35/Mcf of methane reduced.
  - Regional variations exists
- **With varied costs and abatement potential, a performance-based metric is the preferred framework for methane mitigation at existing facilities**

**U.S. EPA administrator Gina McCarthy:**  
**“Responsible development of natural gas is an important part of our work to curb climate change.”**

- While some call for new government-directed efforts to reduce emissions, industry is pushing ahead—through its own leadership and investments—and is achieving strong results. **America is leading the world in producing natural gas and reducing greenhouse gas emissions and that is not an accident.**
-

## **U.S. Secretary of Energy Ernest Moniz:**

**“About half of that progress we have made [on GHG emissions] is from the natural gas boom.”**

- Even while our companies are leading a domestic energy renaissance, creating jobs and growing the economy, they’re setting the pace for reducing emissions.
  - **Economic growth** —spurred by increased domestic oil and natural gas development—and reducing carbon emissions need not be mutually exclusive.
  - **The U.S. is near twenty year lows in CO<sub>2</sub> emissions**—not from pursuing policies of “less” but “more.”
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## **America's oil and natural gas industry is a leader in the effort to reduce GHG emissions.**

America's oil and natural gas industry has a long-standing commitment to safety and environment.

- Since 2000, U.S. oil and natural gas industry's investments in zero- and low-carbon technologies have totaled \$90 billion, more than twice the next largest industry sector (at \$38 billion) and almost as much as the federal government (at \$110 billion).
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## Largely due to increased Natural Gas usage, US CO2 emissions are near 20 year lows.

U.S. energy-related carbon dioxide (CO2) emissions (2005-15)  
million metric tons

