

NARUC Staff Subcommittee on Gas

DOE Methane Mitigation Efforts



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Natural Gas Infrastructure R&D

DOE Office of Oil & Natural Gas

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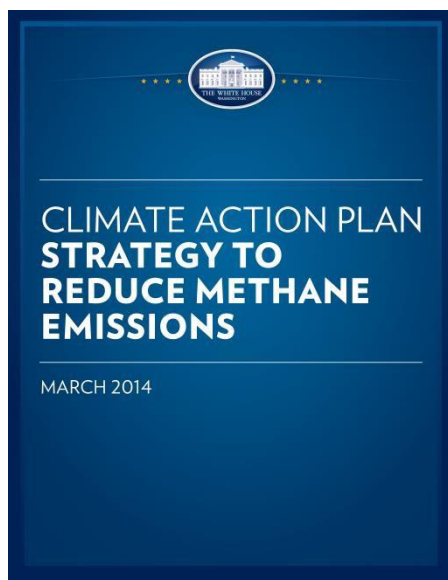


U.S. DEPARTMENT OF
ENERGY

Fossil
Energy



Interagency Methane Strategy – Three Pillars



President's Climate Action Plan

“Curbing emissions of methane is critical to our overall effort to address global climate change. ... To achieve additional progress, the Administration will”:

- Develop a comprehensive Interagency Methane Strategy (*completed March 2014*)
- Pursue a collaborative approach with state governments and the private sector and cover all methane emitting sectors

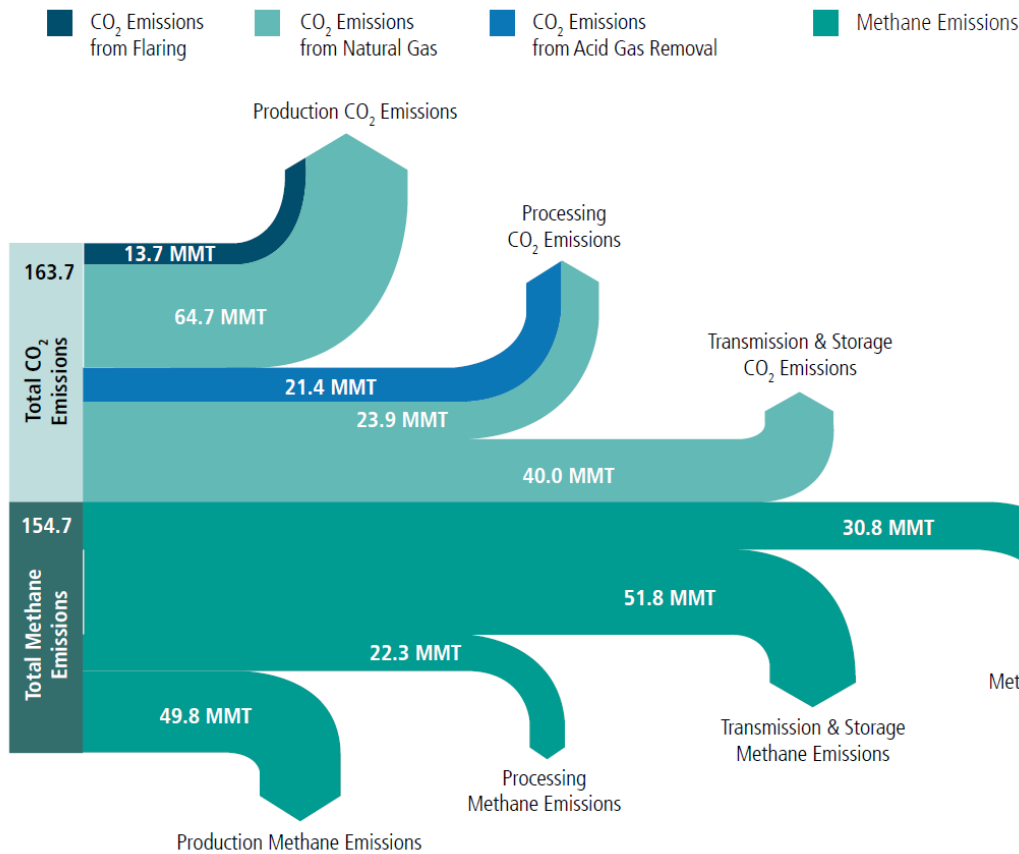
Three Pillars

Assessing current emissions data and addressing data gaps

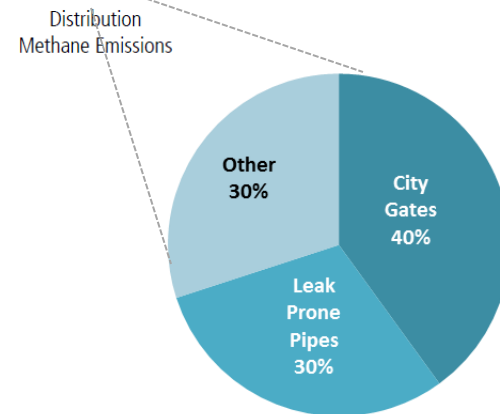
Identifying Technologies and Best Practices for Reducing Emissions

Identifying Existing Authorities and Incentive-based Opportunities for Reducing Emissions

GHG Emissions From Natural Gas Systems



- The distribution sector accounts for about 20% of methane emissions from the natural gas sector
- Cast iron and uncoated steel pipes account for 30% of emissions from distribution systems
- Leaks at city gate stations (from regulators and meters) account for roughly 40% of emissions from distribution systems



Note: GHG emissions from end-use result in the large majority (80%) of GHG emissions from natural gas systems

Data sources: EPA, 2014, EIA, 2014

Secretary's Methane Stakeholder Roundtables (2014)

Convened broad range of stakeholders, discussing opportunities to *modernize natural gas infrastructure & reduce mid- and downstream methane emissions*

Key lessons learned:

- *There is broad stakeholder support for taking action*
- *The drivers for action vary by stakeholder group*
 - Improve safety
 - Conserve energy and save money
 - Promote efficiency
 - Protect the climate
 - Create jobs



Dr. Ernest Moniz
Secretary of Energy

A capstone roundtable took place at the White House on July 29, 2014. Afterward, Secretary of Energy Ernest Moniz announced several new initiatives as DOE's part of the larger Administration Strategy to Reduce Methane Emissions.

DOE Natural Gas Modernization Initiative

Path Forward From Stakeholder Capstone & Roundtables – Key Actions

	Action	DOE Office
1	Energy Efficiency Standards for Natural Gas Compressors	EERE
2	Regulatory Incentives for Cost Recovery for Natural Gas Infrastructure Modernization	EPSA
3	Technical Partnership on Infrastructure Modernization	FE
4	Advanced Natural Gas System Manufacturing R&D Initiative	EERE-AMO
5	Pipeline Efficiency Research, Development and Demonstration Program (Midstream)	FE
6	Loan Guarantees for Advanced Fossil Energy Projects that Reduce Methane Emissions	LPO
7	Invest in Technologies for Leak Detection and Measurement	ARPA-E, FE

FE Upstream Methane Emissions Quantification Research

NETL Field Projects Matrix

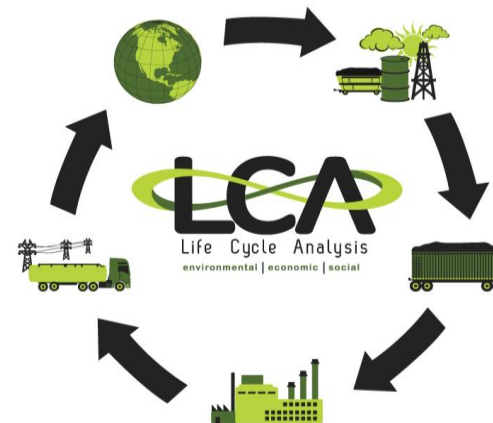
Project	Location	Source	Emissions Data	Platform	Primary Product	Completion Date
Penn State	Marcellus, NE PA	Gas Production Agriculture Landfills Wetlands	<i>Methane</i>	Aircraft Tower Vehicle	Tops-down, Bottom-up Reconciliation	September 2016
Carnegie Mellon	Marcellus, SW PA	Gas Production Agriculture Landfills Coal Activities	<i>Methane</i> VOCs	Vehicle	Source Apportionment	September 2016
West Virginia	Marcellus, N WV	Well Pad Engine Operations	<i>Methane</i> CO2	Portable Field Stations	CH4 Inventory	March 2016
NETL	Marcellus, SW PA	Well Pad - lifetime	<i>Methane</i> CO2 VOCs NOx	Mobile Trailer	Lifetime Evaluation	September 2015
Utah Sate	Uinta Basin, NE UT	Water Ponds Land Farms Natural Seepage Soils Near Wells	<i>Methane</i> CO2 VOCs	Portable Field Stations	Predictive Models	September 2016
Colorado School of Mines	Denver Basin, NE CO	All area sources	<i>Methane</i> VOCs	Aircraft Tower Vehicle	Tops-down, Bottom-up Reconciliation	September 2016

Methane Emission Assessment

NETL Life Cycle Analyses

Life Cycle Analysis

- Understand temporal, technological, play level, and other key emission source differences
- Reducing single year activity bias → evaluate methane emissions over a 30-year operating perspective
- What are the true costs and benefits associated with incremental reductions?



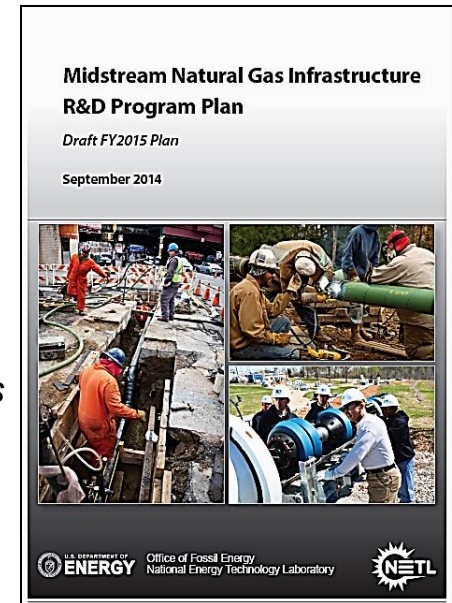
NETL CRADA status with EDF

- Cooperative Research and Development Agreement with the Environmental Defense Fund on-going.
- 14 methane emissions measurement studies to inform existing NETL LCA Models
- Objective is to identify R&D needs and reconcile with on-going ARPA-E, PHMSA and EPA efforts
- Results, Fall 2015.

Natural Gas Midstream Infrastructure R&D Program Plan

Research Opportunities & Challenges

- **External Leak Detection & Monitoring**
Identification, measurement of methane leaks
- **Pipeline Inspection & Repair**
Reduce need to evacuate gas from the pipe
- **Next Generation Compressor Technology**
Increase operating efficiency, pipeline capacity utilization; reduce emissions
- **Smart Sensors for Pipeline Operational Efficiency**
Continuous in-pipe communication for methane emissions and operational parameters
- **Advanced Materials Research**
Accelerate advances in materials science that can directly reduce the likelihood of methane leaks or indirectly improve the efficiency of midstream infrastructure operation



Natural Gas Midstream Infrastructure R&D FY2016 Budget Request

- *\$15 million request in funding for a midstream natural gas infrastructure subprogram*
- *Focused on operational efficiency and reducing methane emissions downstream of the wellhead to the utility distribution system*

Proposed Research Areas:

1. External Leak Detection & Monitoring
- 2. Pipeline Inspection & Repair**
3. Next Generation Compressor Technology
- 4. Smart Sensors for Pipeline Operational Efficiency**
- 5. Advanced Materials Research**

Emission Quantification From Natural Gas Infrastructure FY 2016 Budget Request

- *\$10MM for Emission Quantification from Natural Gas Infrastructure program*
- *Focused on better quantifying methane emissions from natural gas infrastructure*
- *FE research plan to be created with input from DOE's Office of Energy Policy and Systems Analysis and in consultation with EPA*

Proposed Research Areas:

1. Update and Improve Component Level Emissions Factors
2. Characterize Regional Variability of Methane Emissions
3. Reconcile “Top-down” and “Bottom-up” Measurements

QER Recommendations to Help Reduce Methane Emissions



- **Improve quantification of emissions from natural gas infrastructure.** \$10 million requested in the FY 2016 Budget to help update Greenhouse Gas Inventory estimates of methane emissions from natural gas systems. DOE and EPA should undertake a coordinated approach.
- **Expand DOE research and development (R&D) programs** on cost-effective technologies to detect and reduce losses from natural gas TS&D systems. \$15 million requested in the FY 2016 Budget for DOE's midstream natural gas infrastructure program.
- **Demonstrate and Deploy continuous emissions monitoring equipment.** Continuous emissions monitoring can be a valuable component of leak detection and repair programs. DOE should provide the additional funding needed to ensure that the most successful MONITOR projects are field tested and deployed.

QER Recommendations Related To The Environment (Complete List)

1. **Improve quantification of methane emissions from natural gas infrastructure.** Congress should approve the \$10 million requested in the Fiscal Year 2016 Budget to help update Greenhouse Gas Inventory
2. **Expand research and development (R&D) programs at DOE on cost-effective technologies to detect and reduce losses from natural gas TS&D systems.** Congress should approve the \$10 million requested in the Fiscal Year 2016 Budget.
3. **Invest in R&D to lower the cost of continuous emissions monitoring (CEM) equipment,** to further improve safety and reduce emissions from natural gas systems.
4. **Funding to reduce diesel emissions.** Protect workers and communities through programs that reduce diesel particulate matter emissions from ports and rail yards.
5. **Collaborative R&D on the beneficial use and/or disposal of dredging material.** The Army Corps of Engineers and other Federal agencies should undertake collaborative R&D on dredging.
6. **Improve environmental data collection, analysis, and coordination.** DOE should work with other Federal agencies to improve data and analysis on environmental, safety and other impacts of TS&D infrastructures.
7. **Work with states to promote best practices for regulating and siting carbon dioxide (CO2) pipelines.** Building on successful state models for CO2 pipeline siting, DOE should convene to promote sharing of best practices among states on siting and regulating CO2 pipelines.
8. **Enact financial incentives for the construction of CO2 pipeline networks.** Congress should enact the Administration's proposed \$2 billion Carbon Dioxide Investment and Sequestration Tax Credit.
9. **Enhance TS&D resilience** to a variety of threats, including climate change and extreme weather.
10. **Establish a competitive funding program to provide rate relief for low-income customers** to help enable greater investments in natural gas distribution systems improvements that achieve the dual goals of enhanced safety and lower emissions through pipeline replacement and other measures
11. **Accelerate current development of uniform methods for measuring energy savings** and promote widespread adoption of common methods across public and private efficiency programs.
12. **Partner with the Arctic Council on Arctic energy safety, reliability, and environmental protection.**

energy.gov/fe/science-innovation/oil-gas-research

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