

ON SYSTEM EMISSION REDUCTION

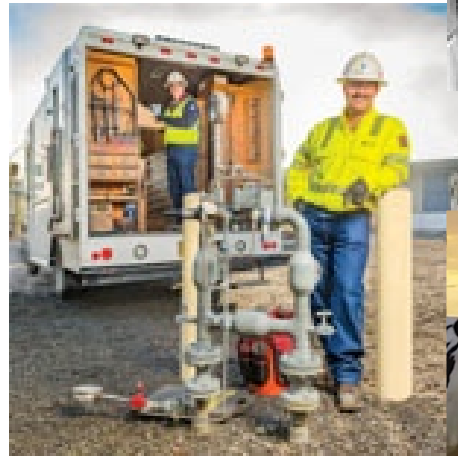
EPA Methane Challenge

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NW NATURAL

- Nearly 160 years of service
- Serving two million people in 140 communities in Oregon and SW Washington
- Completed system-wide bare steel and cast iron pipeline replacement in 2016
- Strategic focus on carbon emission reduction.
- Founding member of the EPA Methane Challenge



STRATEGIC FOCUS

We Agree

- There is a climate imperative

We Believe

- NW Natural has an important role to play in a smart and affordable climate strategy in Oregon

Our Vision

- Long-term goal of deep decarbonization that leaves no one behind.

We Are Taking Action Today

- We are pursuing emission reductions through our voluntary company savings goal

OUR METHANE CHALLENGE PARTICIPATION

Starting State:

- Accelerated pipeline replacement complete
- Evaluation of new opportunities :
 - Procedures for pipeline blowdown emissions:
 - No program requiring blowdown minimization
 - Established deodorization program to reduce odor calls
 - Embedded practices to reduce emissions of blowdowns, but not in standard operation procedure

Challenge Focus:

- Formalized emission reduction practices
- Introduction of flaring equipment
- Continued advancement





COLLABORATIVE PROCESS

- New program required coordination across company work areas-
 - Engineering
 - System Operations
 - Construction
 - Environmental Management
 - Environmental Policy
 - Government Affairs
 - Communications
 - Community Affairs
 - Business Operations/IT
- Unexpected benefit: Better connection and coordination for future projects.

WHY BLOW DOWNS?



- Direct release of gas to atmosphere is not in alignment with environmental goals
- Reducing impact fell within challenge recommendations
- Finite but meaningful savings and multiple strategies to achieve them
- Near term – anticipated construction and system reinforcement with significant opportunity.

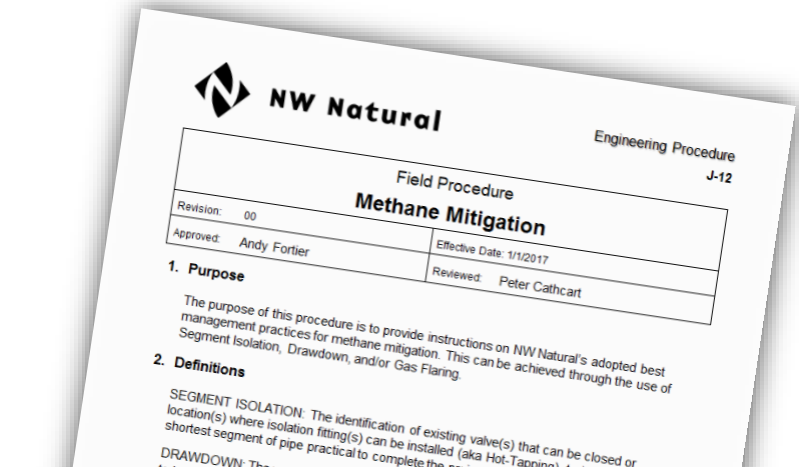
FLARING V. BLOWDOWNS

- Blowdowns
 - Fast
 - Less visible to community
 - Environmentally Impactful
- Flaring
 - More time consuming
 - Complimentary to other mitigation practices
 - Visible
 - Less environmentally impactful



PROGRAM IMPLEMENTATION

1. Integration of methane mitigation into Standard Operating Procedures
2. Integration of flaring equipment into company equipment fleet
3. Training in equipment use and reporting
4. First year- collecting feedback from field staff
5. Expansion into distribution pressure



PROGAM LEARNINGS

Challenges

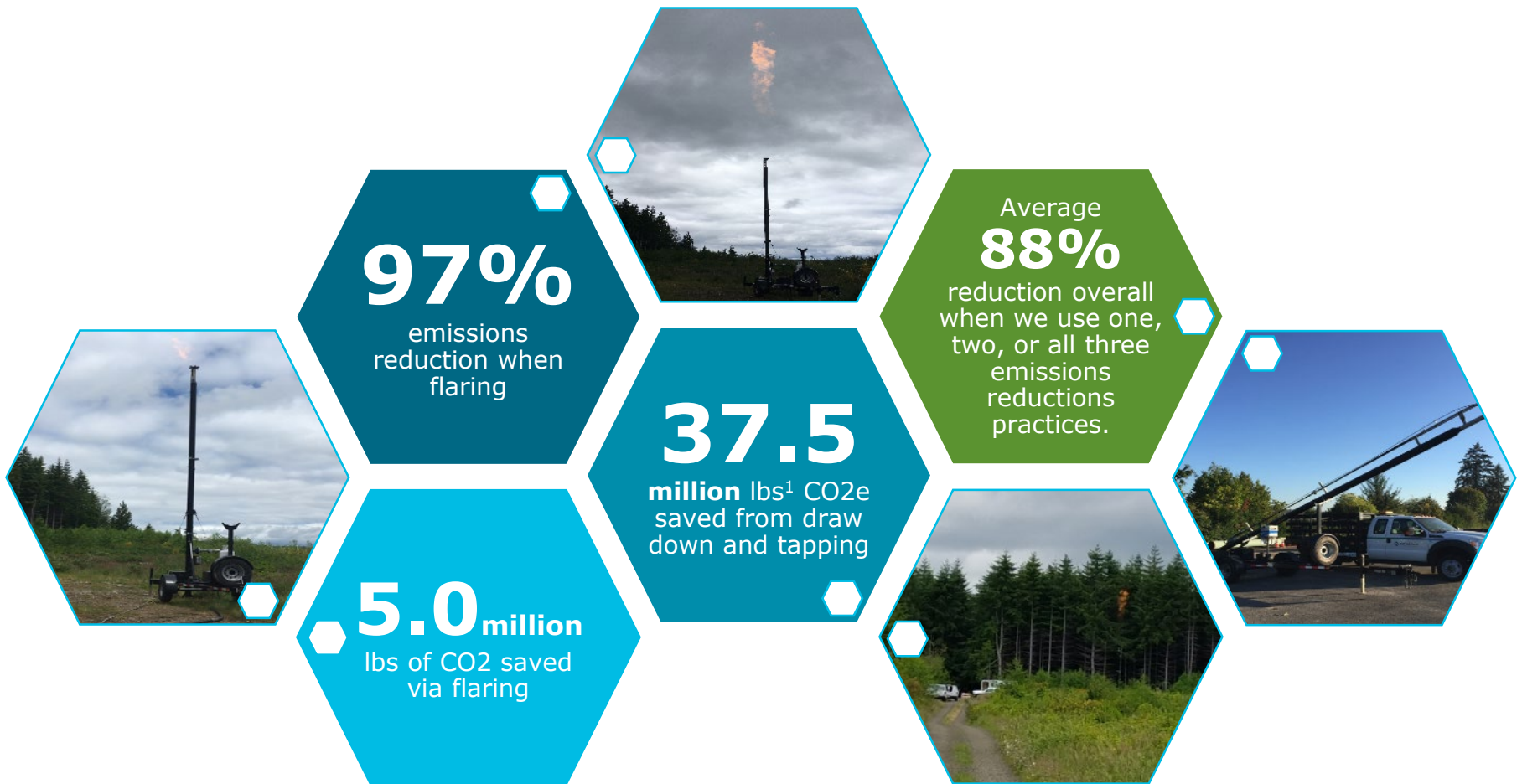
- Behavior Change-adoption of new practices and recording requirement
- Volume and time constraints
- Equipment size and setback
- Radiant heat considerations

Opportunities & Wins

- System Operations integration into procedure
- Regulator & Consumer advocate support
- Developing a more reliable reporting mechanism
- Communications support

METHANE MITIGATION IMPACTS

complete year, 2018



1. Note, in 2018 the company completed a number of very large pipeline evacuations.

FUTURE OPPORTUNITY

Additional smaller flares for increased coverage.

Revisit blowdown compression

Continuous improvement of data capture and use.

Application of this program's success to future multi-discipline initiatives.

Likely regional carbon regulation in OR and WA supports pursuit of additional emission reduction initiatives.

BLOWDOWN COMPRESSION

Opportunity to Revisit

- Flaring success adds to context to older ideas
 - Experience with operational adjustments
 - Another tool in the toolbox

Challenges

- Even more time restrictive
- More expensive
- More equipment to mobilize

Opportunities

- 100% emissions reduction
- Neither seen nor heard... nor smelled
- Fight complacency

THANK YOU

Questions, contact Mary Moerlins mom@nwnatural.com



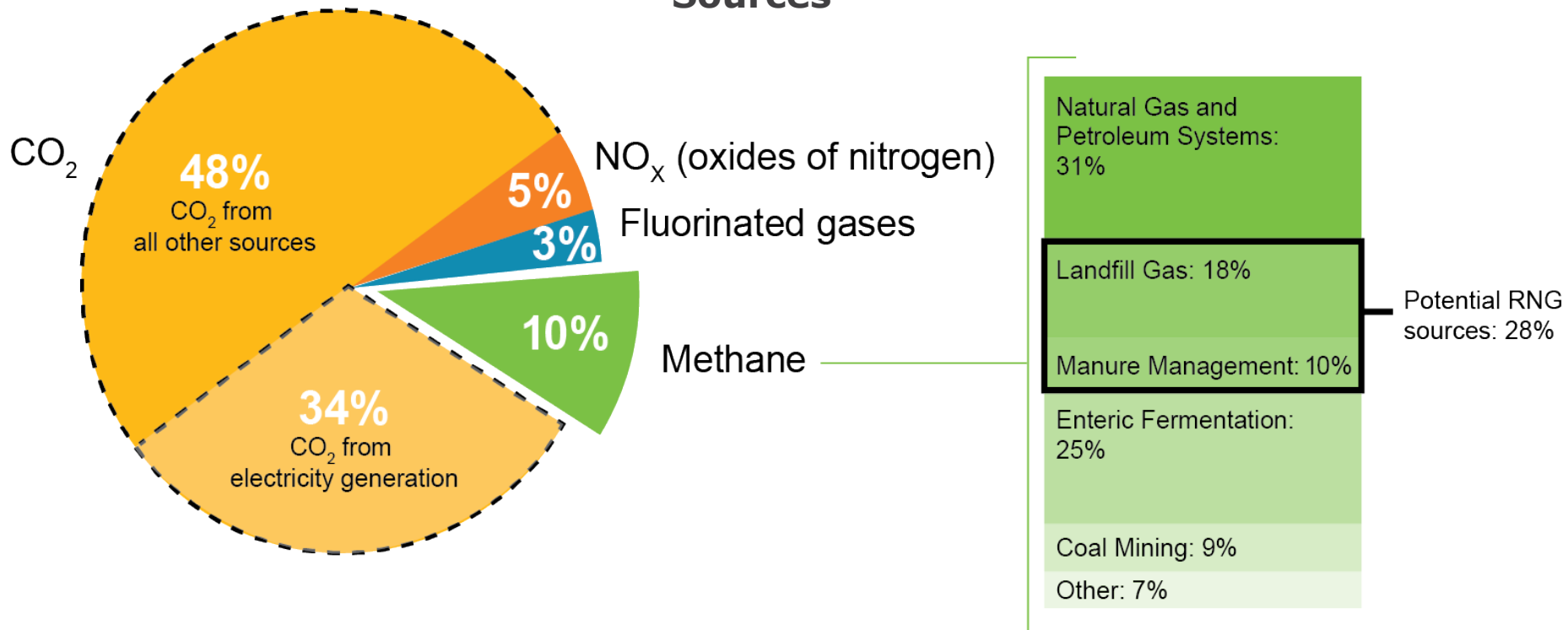
APPENDIX



GREENHOUSE GAS IMPACTS OF CH₄

Waste streams that could be RNG emit as much methane as oil and natural gas sectors combined.

U.S. 2015 GHG (CO₂e) Emissions By Type From Anthropogenic Sources



EMISSIONS IN SUPPLY CHAIN

High Level of Interest in Lifecycle Emissions of Natural Gas

- Conflicting research has increased public interest in topic
- Carbon policy decisions and trends highlight upstream fugitives

Regional Emission Intensity Varies

- Regional regulation and geology lead to significant variance within North American NG supply
- Most policy and research focus is on national averages, and/or on combustion emissions

Production Best Practices are Known

- NRDC and ICF work to identify wellhead reduction opportunities
- Production Sector adoption- Ex. Environmental Partnership through API
- NW Natural participation in Natural Gas Supply Collaborative.



