

# CONTENTS

---

Study Motivation &  
Objectives

---

Key Challenges

---

Trends

# METHANE EMISSIONS REPORTING STUDY

---

## PRELIMINARY INSIGHTS

PREPARED BY:



SQUISHY  
ROBOTICS

PRINCIPAL INVESTIGATOR:

Dr. Alice Agogino  
Professor of Mechanical Engineering  
University of California, Berkeley

# MOTIVATION

---

The recent report by the United Nations' Intergovernmental Panel on Climate Change (IPCC) makes it abundantly clear that immediate action is required to mitigate the worst effects of climate change. Methane (CH<sub>4</sub>) is the second most common greenhouse gas, accounting for approximately 20 percent of global emissions.

In the Oil & Gas industry, methane emissions are particularly hard to detect and localize. Identifying these emissions requires improved tracking and analysis that can effectively provide early detection and trigger interventions for priority remediation.

# SCOPE & OBJECTIVES

---

Build on reviews of previous studies and data to identify current challenges and pain points in identifying and quantifying methane emissions. Interview industry leaders, researchers, and government regulators to develop a deeper understanding of barriers and to understand critical needs, identify trends and opportunities.

**If you would like further information or would like to get involved in this study, please email Dr. Alice Agogino at [agogino@berkeley.edu](mailto:agogino@berkeley.edu).**



# PRELIMINARY INSIGHTS



## KEY CHALLENGES

*MORE ACCURATE  
EMISSIONS DATA IS NEEDED*

- CHALLENGE #1: Current methods underestimate emissions
- CHALLENGE #2: It is costly and often infeasible to perform data monitoring where much of the emissions take place
- CHALLENGE #3: The safety of refinery and extraction personnel is of foremost concern

## TRENDS

*SUSTAINABILITY IS A TOP  
PRIORITY*

- TREND #1: Company efforts prioritizing sustainability
- TREND #2: Sustainability as a new standard for investing
- TREND #3: Government commitments toward sustainability

INTERVIEW  
COUNT:

15

OIL & GAS  
COMPANIES

11

PUBLIC SECTOR

11

SUPPLIERS

4

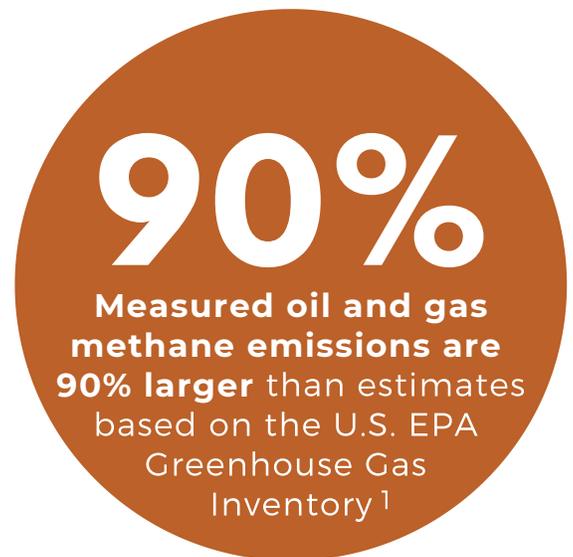
INVESTORS

## CHALLENGE #1

# CURRENT METHODS UNDERESTIMATE METHANE EMISSIONS

Methane emissions measurements can be classified as top-down or bottom-up. Top-down approaches aggregate data from aircraft, satellites or tower networks to quantify emissions over large areas. Bottom-up approaches estimate emissions using measurements made directly at the emission point from individual pieces of equipment, operations, or facilities.

Great discrepancies exist between satellite-gathered data and in situ measurements taken with physical sensors. These top-down versus bottom-up data gathering and calculation methods muddle the estimates and complicate solution planning.



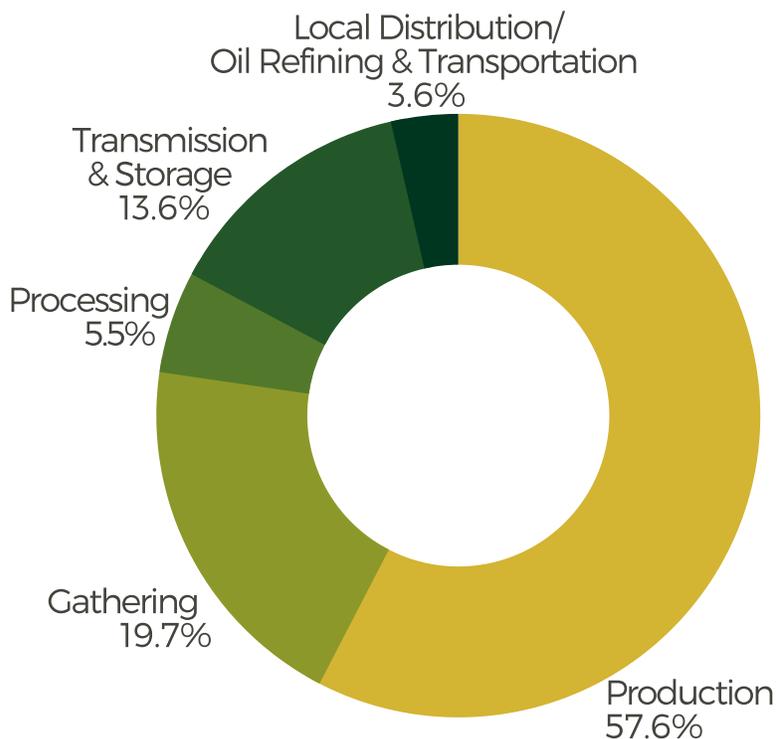
“

Calculating emissions from top down approaches give higher numbers than bottom up. A study came out in the past year that looked at data and suggested that tanks and equipment leaks are causes of the biggest discrepancy.

- U.S. EPA Scientist,  
Climate Change Division

”

# IT IS COSTLY AND OFTEN INFEASIBLE TO PERFORM DATA MONITORING WHERE MUCH OF THE EMISSIONS TAKE PLACE



**Roughly 60% of the emissions from bottom-up estimates occur during production.**<sup>2</sup>

Extraction sites, which are often vast and remote, add to the difficulty in emission monitoring.

Furthermore, these sites are often impermanent, and installing specialized equipment at these temporary locations is not cost-effective. Fixed, permanent monitoring stations are not a realistic option in oil fields or hydraulic fracturing drilling sites.

“

A refinery is a small area, so leaks are hazardous, and monitors are in place at potential sources. The seals aren't perfect. There is preventative maintenance before seals get bad. Fracking operations, on the other hand, are widespread and automated with fewer personnel.

- Oil & Gas Executive,  
Crisis Preparedness & Management

”

## CHALLENGE #3

# THE SAFETY OF REFINERY AND EXTRACTION PERSONNEL IS OF FOREMOST CONCERN

The fatality rate for workers in the oil and gas extraction industry is seven times higher than the average U.S. worker.<sup>3</sup> It is important for oil and gas industry employers to implement safety measures that target causes of the most frequent fatal events. Emerging technologies can significantly reduce risk to oil and gas extraction workers.

According to the U.S. Department of Labor's Bureau of Labor Statistics, there were **1,189 work-related fatalities** in the U.S. oil and gas extraction industry during 2003-2013.<sup>3</sup>

# 50+%

More than half of fatally injured workers were employed by companies that service wells.<sup>3</sup>

“

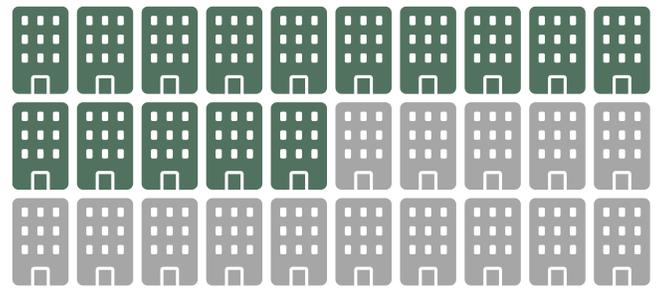
Our lens, coming out of military/law enforcement, is based on saving lives. At a big site like mine, where we have super structures that are almost 400 feet in the air, I'm not having to get somebody lifted up some way. I can put that drone up there and get a great visual of what needs to be done and then decide how we respond to that event.

- Oil & Gas Security Manager

”

<sup>3</sup> <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6420a4.htm>

# COMPANIES ARE MAKING SUBSTANTIAL CHANGES TO PRIORITIZE SUSTAINABILITY



15 of the 30 largest U.S. and European upstream and midstream operators have made pledges for net-zero emissions by 2050 or earlier.

“

In the last 18-24 months, there is far more effort into measurable emissions reductions efforts. **20% of our annual bonus are due to being able to achieve sustainability goals** set by the Board and senior leadership.

**-Sustainability Manager**

”

ANNUAL BONUSES FOR ACHIEVING SUSTAINABILITY GOALS

COMPANIES NEED NEW SOLUTIONS AND ARE WILLING TO PAY

“

Companies want their own emissions data, not just use third party data.

My observation is that they are pretty interested in figuring this out and finding solutions. **There is willingness to spend money.**

**-Sustainability Manager**

”

# SUSTAINABILITY AS A NEW STANDARD FOR INVESTING

**\$130**  
TRILLION  
in private  
capital

to help reach  
**NET-ZERO**  
BY 2050

pledged by  
**450**  
FINANCIAL  
FIRMS

“

Given the growing investment risks surrounding sustainability, we will be increasingly disposed to vote against management and board directors when companies are not making sufficient progress on sustainability-related disclosures and the business practices and plans underlying them.<sup>4</sup>

**BlackRock 2020 Letter to CEOs**

”

“

5-years ago I put my crisis group through a sustainability drill... And they claimed investors don't care, at least not in the immediate-term...

But NOW they would perceive the risk to be much more immediate.

**-Sr. Crisis Management Specialist**

”

# GOVERNMENTS ACROSS THE WORLD ARE INCREASING REGULATORY ACTIONS AND SETTING NET-ZERO GOALS

## NET-ZERO PLEDGES

set by:

**136**  
countries

**115**  
regions

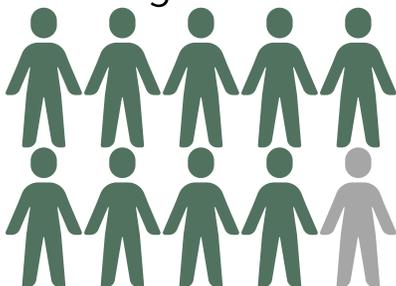
**235**  
cities

**682**  
companies

representing

**90%**

of the global GDP



**U.S.  
EPA  
GOAL**

reduce  
**41 MILLION  
TONS**  
of methane  
emissions  
by 2035

**\$4.5  
BILLION**  
in  
climate  
benefits  
per year

As prudent fiduciaries, we believe virtually eliminating methane emissions as part of a low-carbon transition can support the financial goals of both companies and investors. By taking action on methane emissions, the government can achieve valuable greenhouse gas reductions while helping American industry become cleaner and more competitive.

Call on the  
Biden administration  
to advance methane regulations  
signed by  
**168 INVESTORS REPRESENTING  
\$6.23 TRILLION IN ASSETS<sup>5</sup>**