Tracking Methane in Your Portfolio

What Investors, Insurers, and Lenders Need to Know

AI Simulated Methane Superemitter

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GEOFINANCIAL ANALYTICS

FFI SOLUTIONS

Chris Ito, CEO (cito@ffisolutions.com)

November 15, 2023

Agenda

- Why Methane
- Game Changers
  - Innovations in Satellite Analytics
  - MethaneScan® Data Service
  - Inflation Reduction Act
- Capital Markets and Corporate Applications
- Q & A

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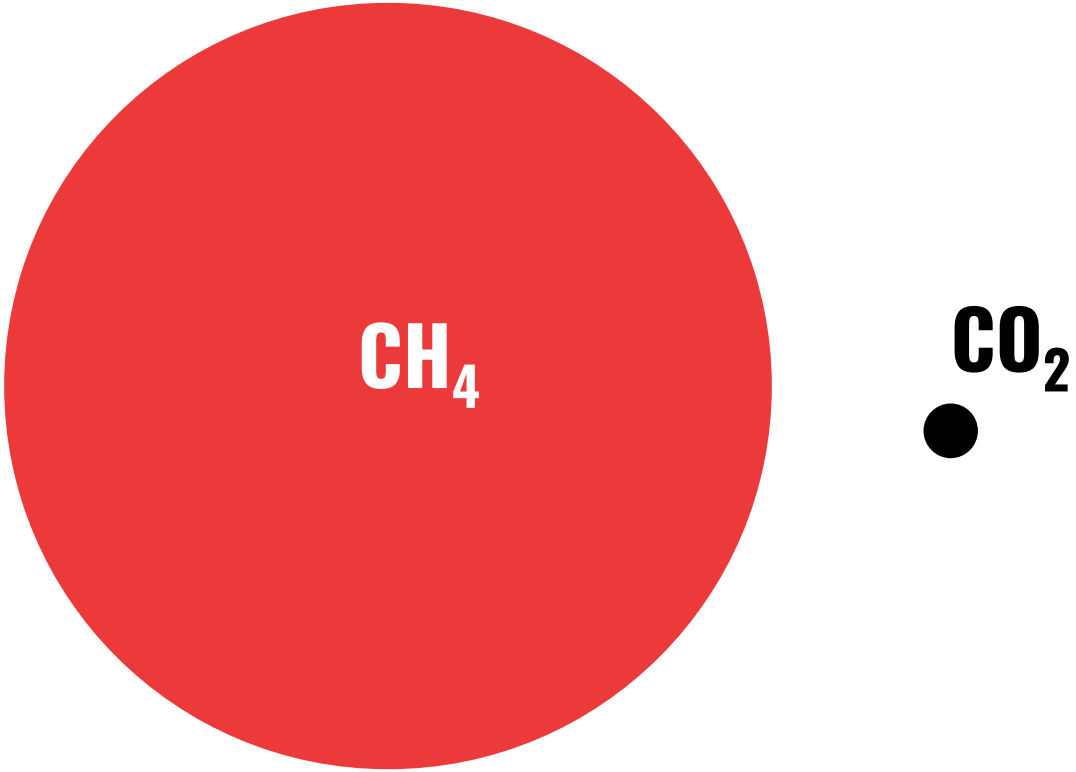
Methane has 85 times the global warming potential of CO_2



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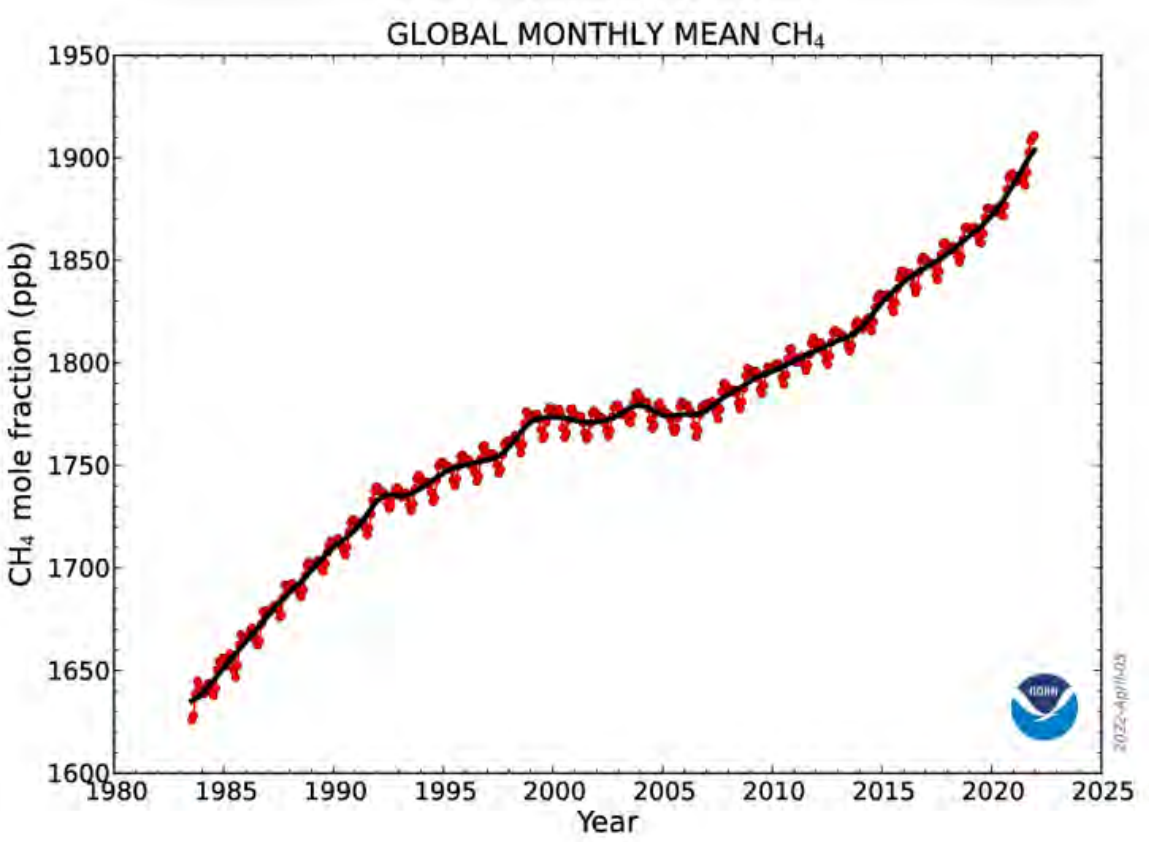
Methane management

But methane emissions are still rising

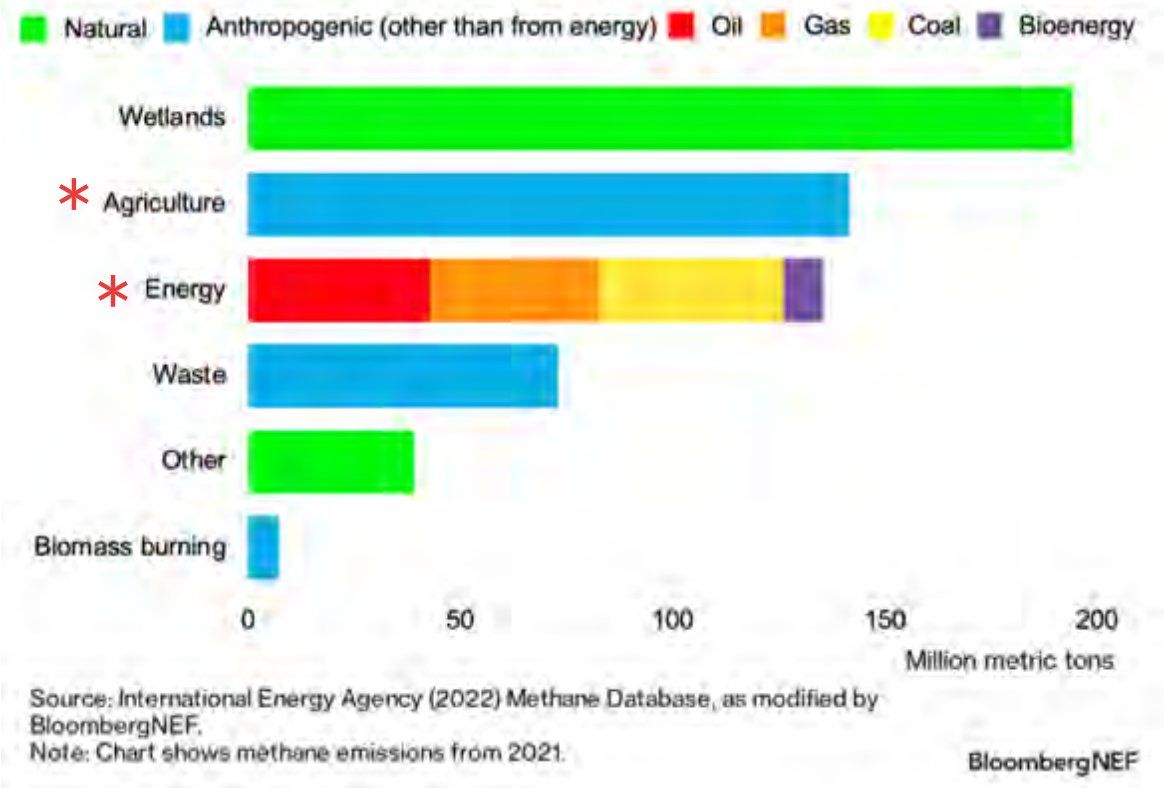


Source: NOAA

Methane management

Energy sector represents low-hanging fruit for rapidly reducing methane emissions between now and 2030

36% of anthropogenic methane emissions come from fossil fuel sector



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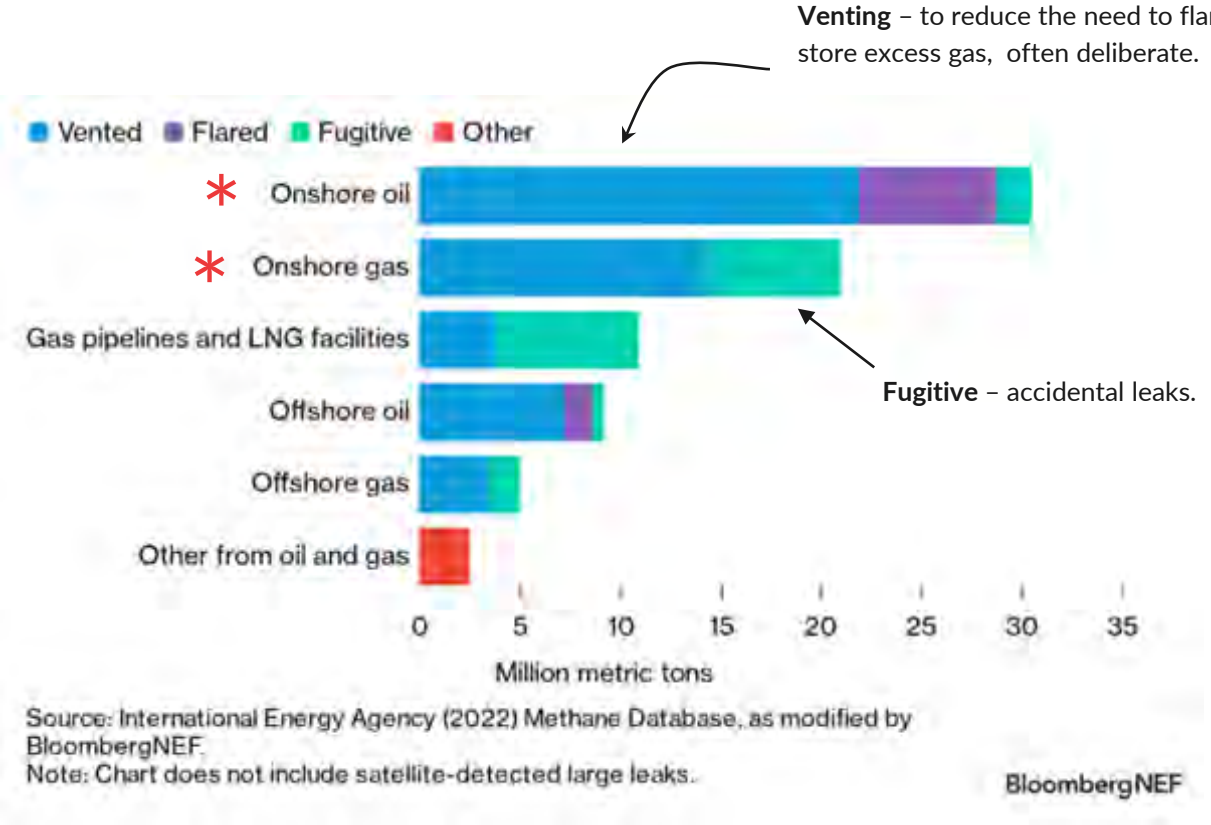
Methane management

Within energy sector, **onshore** oil & gas production represents best opportunity for major methane reductions needed to bend the GHG curve



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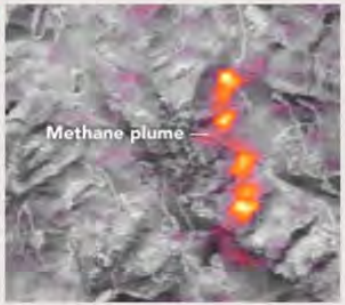
1995

EPA introduces emission inventory system for estimating methane emissions.

2015



First detection of methane super emitter from space. Climate impact of Socal leak greater than 2010 BP disaster

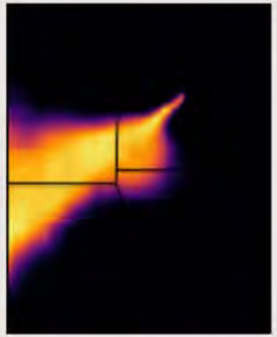
2018

European Space Agency launches Sentinel 5P, first daily monitoring of methane emissions worldwide

2022

US Inflation Reduction Act mandates fines for excessive methane emissions by oil and gas producers

2023



Innovations in processing satellite signals, powered by AI, boost attribution confidence by orders of magnitude

2024

EPA requires "empirical evidence" (direct observation) of methane emissions in compliance with 2022 IRA, replacing obsolete 30-year-old inventory method

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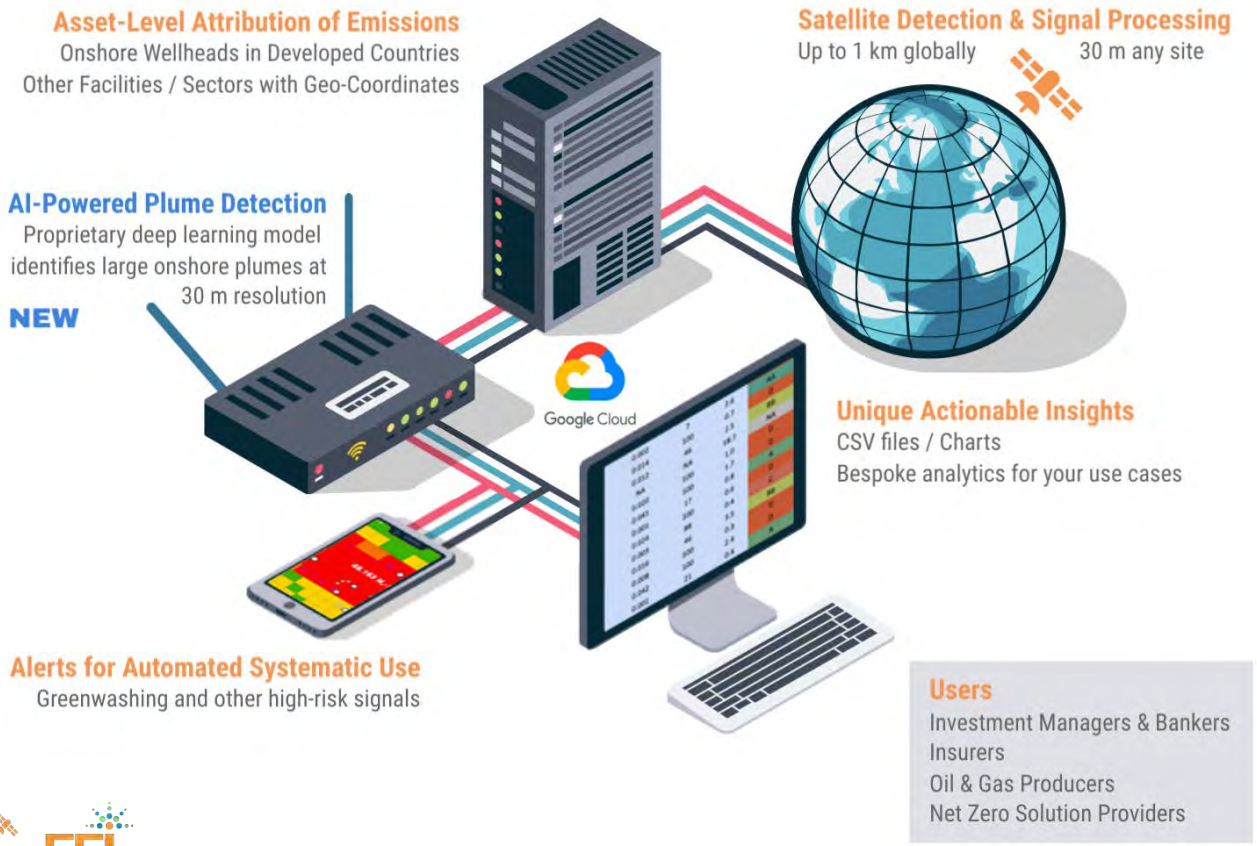
MethaneScan: Satellite Remote Sensing Platform



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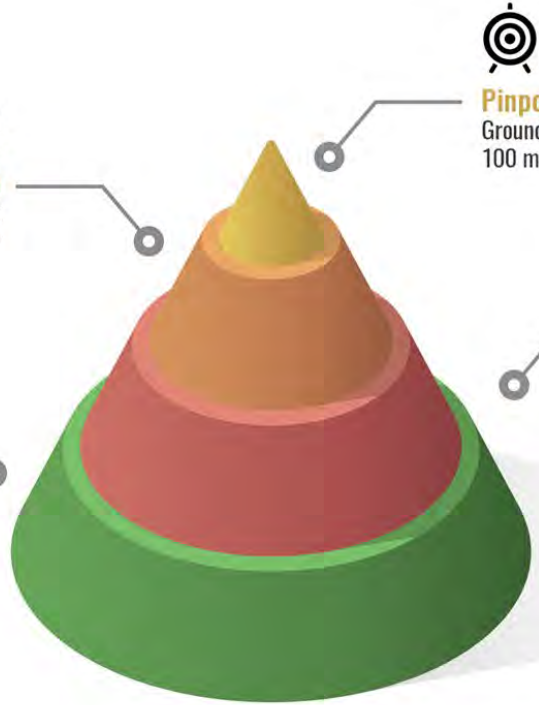
MethaneScan: Insights at Different Scales



Pinpoint Attribution
Ground Sensors
100 m to 10 cm

Fine-Scale Attribution
Ultra-High Resolution Satellites & Aircraft
30 m or better

Mid-Scale Attribution
Native Mid-Resolution Satellites
7 x 5 km

METHANESCAN

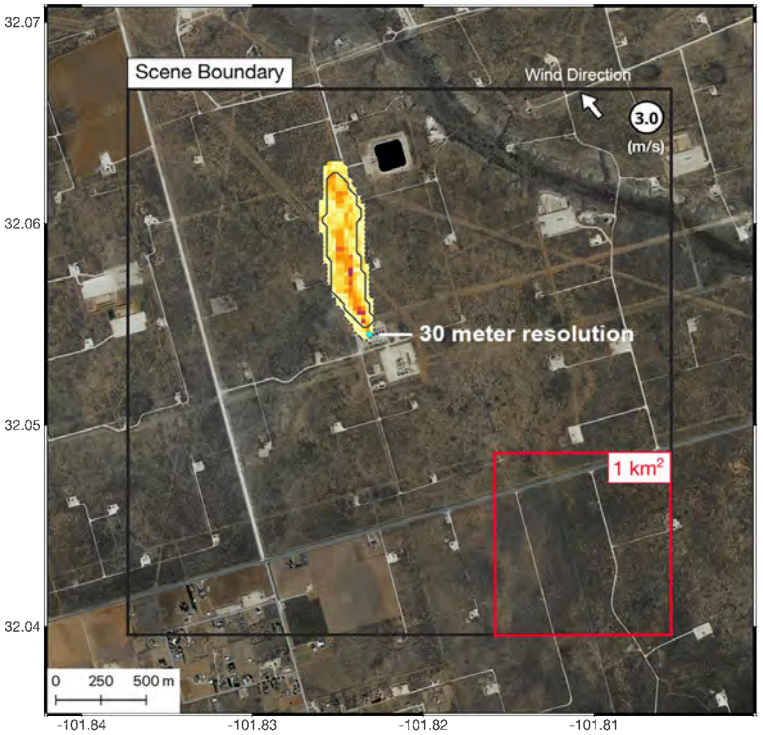
Algo-Enhanced Multi-Scale Attribution
Open Data + Machine Learning:
TROPOMI, Sentinel-2, Landsat, etc.
1 km to 30 m

= Company-Level Methane Emissions Ratings for Finance, Insurance and Commodity Markets

= Leak Detection & Repair (LDAR) for Producers

MethaneScan: New AI-powered* methane plume detection ups precision 10,000 times

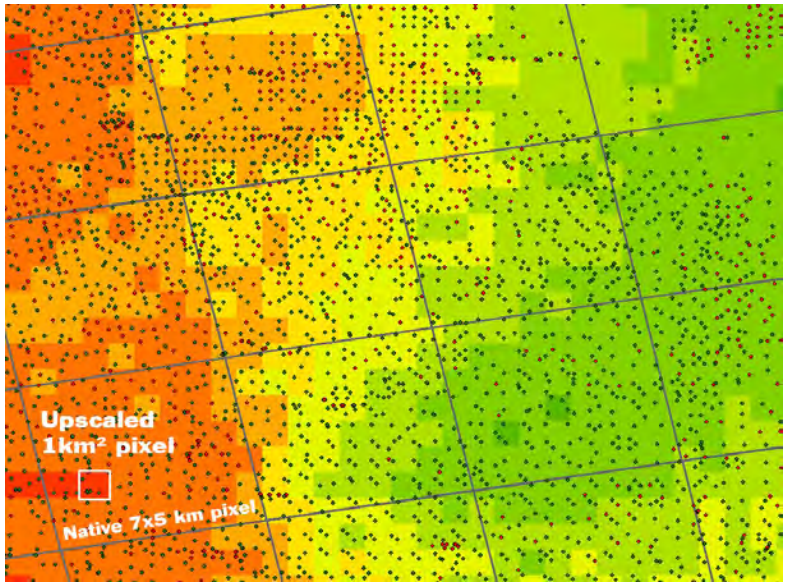
30 meter resolution (2023 -)



Large Methane Plume Identified at a West Texas Wellhead (January 20, 2023)

Much higher confidence

Up to 1km² resolution (current technology)



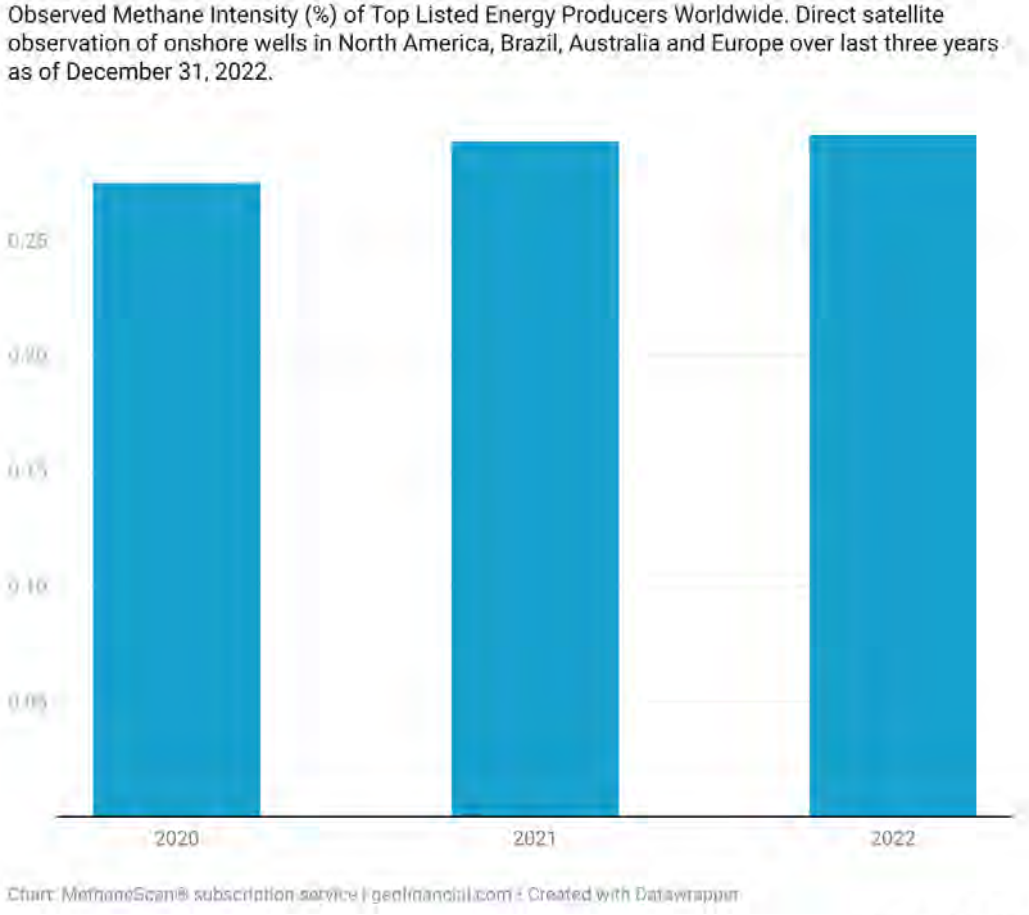
High confidence when there are a large number of observations across many sites

* Proprietary deep learning model

METHANESCAN

Our satellite data analytics reveal:

Methane intensity of top 25 producers is rising – not declining



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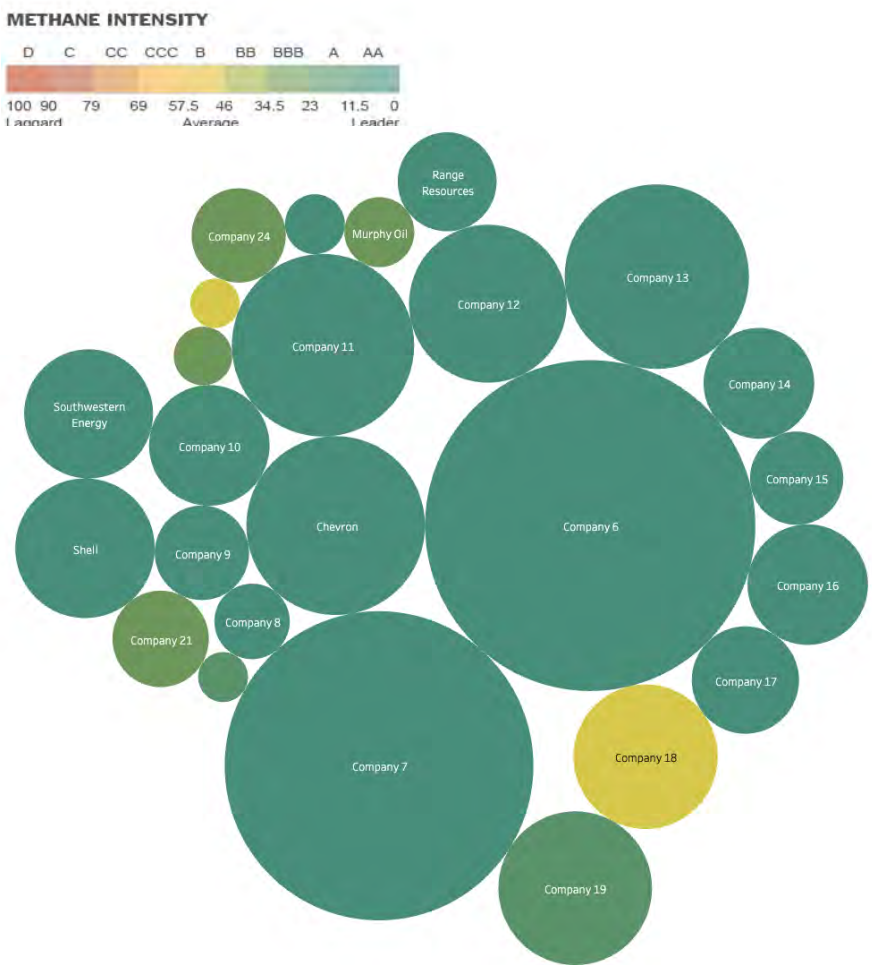
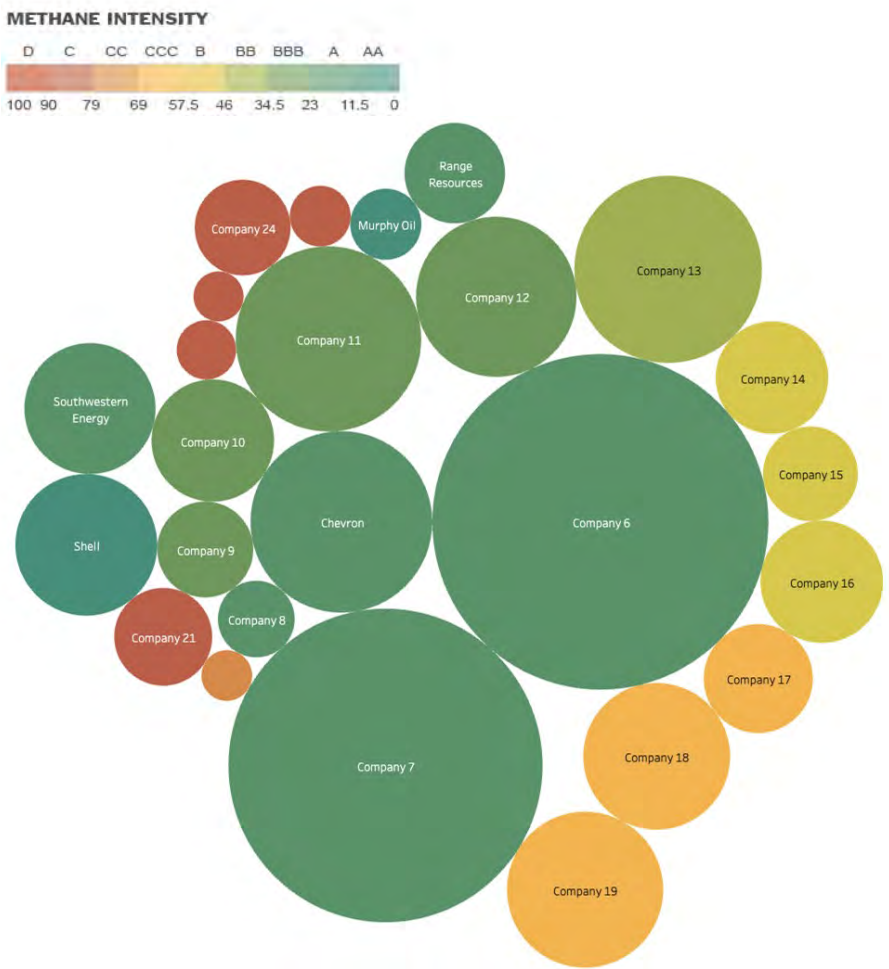
Self-reported methane emission intensity of the Top 25 US producers is relatively low



Company-reported methane emission intensity of Top 25 Listed US Energy Producers. Data as of March 31, 2022

Observed methane intensity is much higher than reported



Satellite Observed methane emission intensity of Top 25 Listed U.S. Energy Producers. Observed intensities can be considered a minimum estimate based on high-confidence attribution of emissions from active onshore wells. Last 12 months as of March 31, 2023.

Our satellite data analytics reveal:

Most oil & gas producers significantly underreport their methane emissions

Satellite-Observed Methane Intensity of Top 25 US Listed Oil & Gas Producers

Satellite-observed methane emission intensity of Top 25 Listed US Energy Producers compared to Self Reported methane emission intensity. Observed intensities can be considered a minimum estimate based on high-confidence attribution of emissions from active onshore wells. Last 12 months as of March 31, 2023. Sorted by Observed (0=best, Best 5 are named).

	OBSERVED	SELF REPORTED	REPORTING GAP	UNDERREPORTING FACTOR	METHANE FEE ($MM)
Murphy Oil	5	32	-27	0	0
Shell	6	6	0	1	0
Southwestern Energy	12	8	4	2	0
Range Resources	12	2	10	7	0
Chevron	15	7	8	2	0
Company 6	17	4	13	4	0
Company 7	18	1	17	16	0
Company 8	21	9	12	2	1
Company 9	23	4	19	6	3
Company 10	25	9	16	3	8
Company 11	27	7	20	4	25
Company 12	33	6	27	5	36
Company 13	37	3	34	13	66
Company 14	51	6	45	8	43
Company 15	53	7	46	8	33
Company 16	55	8	47	7	58
Company 17	70	3	67	20	65
Company 18	73	49	24	1	126
Company 19	74	12	62	6	145
Company 20	82	22	60	4	18
Company 21	90	28	62	3	74
Company 22	93	27	66	4	29
Company 23	100	52	48	4	50
Company 24	100	28	72	12	325
Company 25	100	7	93	34	88

Elevated Exposure to Litigation for Greenwashing & Erroneous Disclosures

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METHANESCAN

IRA is game changer for methane

Beginning January 1st, with stringent new reporting requirements taking effect January 2025

- Imposes fee on excessive methane emissions for the first time
- As mandated by IRA, the EPA will require empirical data for reported emissions
- Business as usual in terms of methane leakage and emissions in the US will change

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For the top 25 US producers alone, we estimate a total of almost $5B in fines over 3 years and almost $20B over 10 years

Assuming business as usual

Estimated 2024-26 Methane Fees – Reported vs. Satellite-Observed Emissions Intensity

COMPANY INFORMATION	REPORTED	OBSERVED	DIFFERENCE
Company 21	$33,984,000	$297,823,702	$263,839,702
Company 15	$0	$131,617,507	$131,617,507
Company 25	$0	$353,823,205	$353,823,205
Company 22	$10,231,034	$114,415,569	$104,184,535
Company 11	$0	$99,234,751	$99,234,751
Chevron	$0	$0	$0
Company 9	$0	$13,458,848	$13,458,848
Company 19	$0	$579,983,864	$579,983,864
Company 16	$0	$230,446,302	$230,446,302
Company 12	$0	$143,848,175	$143,848,175
Company 17	$0	$260,784,235	$260,784,235
Company 24	$32,502,857	$1,299,980,488	$1,267,477,631
Company 13	$0	$263,320,199	$263,320,199
Company 23	$35,780,962	$201,742,836	$165,961,874
Company 6	$0	$0	$0
Company 20	$2,289,757	$70,666,507	$68,376,750
Company 10	$0	$31,588,374	$31,588,374
Murphy Oil	$26,904,016	$0	-$26,904,016
Company 8	$0	$3,516,866	$3,516,866
Company 18	$276,536,424	$505,581,754	$229,045,329
Company 14	$0	$172,645,432	$172,645,432
Company 7	$0	$0	$0
Range Resources	$0	$0	$0
Shell	$0	$0	$0
Southwestern Energy	$0	$0	$0
	$418,229,051	$4,774,478,612	$4,356,249,561

Source: Geofinancial Analytics | Fall 2023 (Data as of March 31, 2022)

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METHANESCAN

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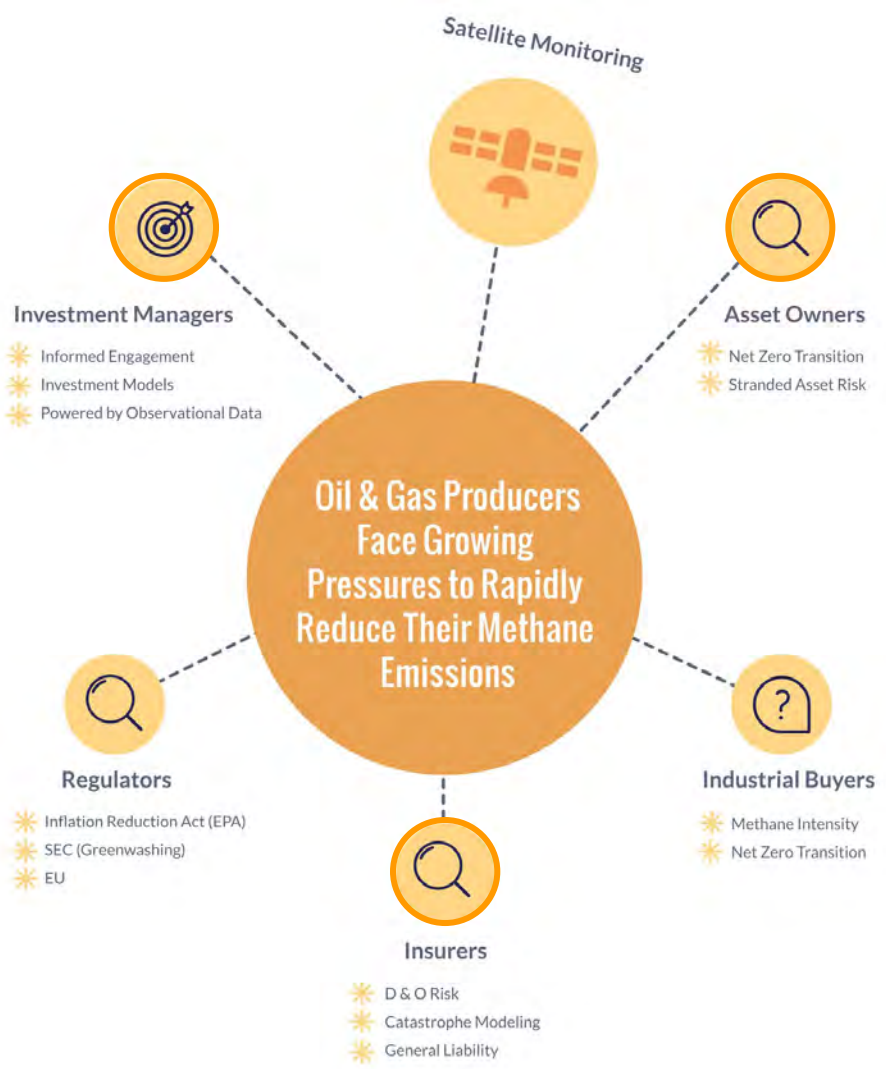
Greenwashing is material risk in world of mass tort litigation and heightened SEC/EPA/EU scrutiny



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Use Case
Investment Managers & Bankers

- Leverage shareholder power to effect change
  - Engagement
  - Shareholder resolutions and proxy voting
- Security selection
  - Overweight/underweight vs. blanket exclusion of the entire sector
- Inform merger and acquisition valuations
  - Methane intensity as key valuation metric of environmental performance, emerging risks, corporate governance


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Green
ESG & Investing

JPMorgan Touts Methane Curbs in Bid to Boost Climate Investment

- Spending on methane reduction promises economic, climate yield
- White paper may encourage lenders to boost methane cut efforts

By Jennifer A Dlouhy
November 15, 2023 at 3:30 AM PST

Company details

For informed engagement and valuations

Powered by Direct Satellite Observation

Elevated Risk for Erroneous Company Disclosures

OCTAN PETROLEUM

OBSERVED METHANE EMISSIONS INTENSITY via Direct Satellite Observation (July 2022 - June 2023)									Overall Score	1Yr Change %	Reporting Gap
									BBB	-19.6	21
	Active Wells		Inactive Wells		Well Status Unknown		Total Wells		Observed	Reported	
	# Observed	AvgEmissions	# Observed	AvgEmissions	# Observed	AvgEmissions	# Observed	AvgEmissions	Score	Score	
All Companies											
Well Statistics	360,720	8,050	538,498	8,801	436,544	10,216	1,335,762	9,039	53	16	
1 Year Change		-4.2%		-6.1%		-6.7%		-5.5%			
Octan Petroleum					All Assets						
Well Statistics	15,688	9,285	30,128	10,480	27,264	10,912	73,080	10,385	25	4	
1 Year Change		3.4%		-6.6%		-23.2%		-12.3%			
Octan Petroleum					Average Emissions by Region				1Yr Change	All Companies	
CAN_Alberta_Other	482	6,582	1,339	7,604	1,036	14,629	2,857	9,934	1.3%	8,363	
CAN_BC_Other			22	20,285	4	26,848	26	22,304	120.0%	15,709	
CAN_Duvernay	492	7,118	2,428	7,145	3,403	21,738	6,323	14,991	-12.5%	10,977	
CAN_East_Territories	5	15,882	961	36,819	196	28,281	1,162	35,286	-17.8%	15,210	
CAN_Montney	216	13,623	210	15,460	961	27,152	1,387	23,307	3.4%	11,723	
CAN_Oil_Sands	22	3,649	1,409	3,343	9,614	9,989	11,045	9,128	-44.8%	12,177	
CAN_Saskatchewan			1,577	20,977	70	6,621	1,647	20,367	-7.6%	11,742	
USA_Bakken	868	9,774	442	18,458	353	7,397	1,663	11,577	18.3%	11,728	
USA_Chattanooga	3,922	10,434	3,837	5,172	1,385	10,604	9,144	8,251	9.2%	8,493	
USA_EagleFord	3,931	10,684	7,259	11,034	6,012	6,306	17,202	9,302	5.6%	9,754	
USA_Illinois_Basin	14	10,441	357	8,126	52	12,723	423	8,768	-33.3%	4,299	
USA_Marcellus	266	5,497	903	8,197	485	7,002	1,654	7,413	-16.4%	8,251	
USA_Monterey			688	26,432	2	55,488	690	26,521	-35.6%	2,785	
USA_Permian	4,746	7,206	6,517	6,322	2,285	3,376	13,548	6,135	-6.8%	9,099	
USA_Uinta	724	12,209	2,179	16,183	1,392	9,201	4,295	13,191	-16.1%	8,039	
Rest_rest_world					14	39,476	14	39,476	21.0%	10,118	

Actionable, Decision-Level Information for Corporate Dialogue – Updated Quarterly

Use Case
Insurers

- Reduce exposure to Director & Officer and general liabilities for erroneous disclosures and fines
- Differentially price premiums based on independent scientific “audit” of emissions
- Anticipate and avoid a major emerging risk for the energy sector

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D&O Underwriters May Be Worried About the Wrong Greenhouse Gas

August 30, 2023 by Adam Grossman, Mark Kriss and Graham Tibbets

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Insurer Chubb Demands Energy Producers Cut Methane Emissions for Coverage

Restrictions fall short of demands by climate activists

By Leslie Scism Follow and Rhiannon Hoyle Follow

Updated March 22, 2023 2:15 pm ET

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Use Case

Oil & Gas Producers

- Increase public and private market valuation
- Anticipate and potentially avoid fines for excessive emissions (IRA)
- Lower insurance costs and liabilities
- Leverage independent empirical evidence of sustainability leadership to improve investor relations
- Audit and sync public records of asset ownership
- Support internal or external audit procedures

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MethaneScan® Feature Summary

Methane intensity of top 100 listed energy producers worldwide vs. corporate disclosures

METHANESCAN

DATASET TYPE
Satellite, ESG

DATA FREQUENCY
Quarterly

DATA HISTORY
April 2018 –

DATA FORMAT
CSV via Web app

ENTITY MAPPING
Mapped to ISIN

Users
Investment Managers & Bankers
Insurers
Oil & Gas Producers
Net Zero Solution Providers

APPLICATIONS
Public Equity, Fixed Income, M&A, Insurance, Commodities (Energy), Utilities, Corporate Engagement

REGIONS
Global

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Summary

- Methane is by far the most potent greenhouse gas
- Innovations in satellite analytics and IRA are key driving forces in reducing emissions
- New rules on January 1st for oil & gas industry
- **#1 opportunity to avert catastrophic climate change**

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GEOFINANCIAL ANALYTICS FFI

About Us

Geofinancial Analytics

- Science-driven data provider
- Aim to accelerate clean energy transition by informing decisions and business practices with transparent, objective analysis using advanced geospatial technology & AI
- Proven elite team with deep scientific, technical and vertical market expertise

GEOFINANCIAL ANALYTICS FFI

Mark Kriss
CEO / Co-Founder

Successful serial tech entrepreneur and impact investor. Prior startups acquired by Dow Jones (financial analytics) and Cisco (network security). Thought leader on sustainability/climate risk metrics.

Jessica Hellmann, PhD
Chief Scientist / Co-Founder

International expert on climate adaptation & data science. Thought leader on solving grand environmental challenges. Director of Minnesota's world-renowned Institute on the Environment.

Karissa Pepin, PhD
Director, Analytics

Stanford-trained specialist in modeling Earth processes using remote sensing and ground-based geophysical data. Develops atmospheric models and algorithms.

Mustafiz Rahman, PhD
Director, Data Engineering & QA

Expert on mapping, modeling and monitoring physical environment using advanced remote sensing and geospatial tools. Extensive experience in oil and gas.

Tailong He, PhD
Technical Advisor

Expert on application of deep learning models and data assimilation in climate change, air quality and carbon cycle.

About Us

FFI Solutions

- Delivering research, analytics and consulting to enable energy transition and net zero investment strategies.
- Core expertise in carbon and energy transition research
- Experience as institutional allocators, fund managers, and researchers gives us real-world understanding of CIO and PM responsibilities

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CEO, FFI Holdings

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