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MethaneSAT: What You Need to Know

A Q&A for Investors

Andrew Howell CFA, Environmental Defense Fund
ahowell@edf.org

Fiona Liao, MethaneSAT LLC

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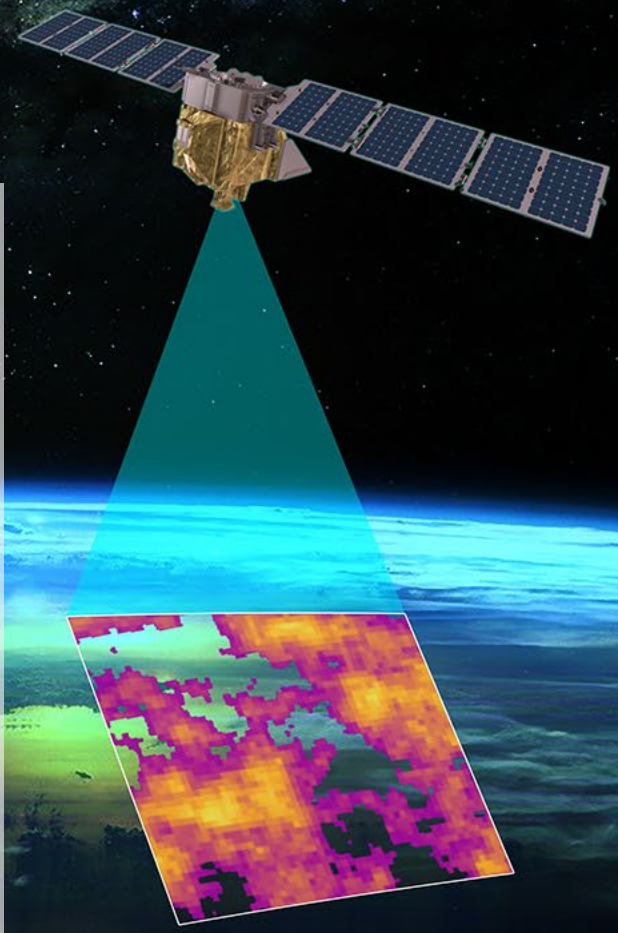
Contents



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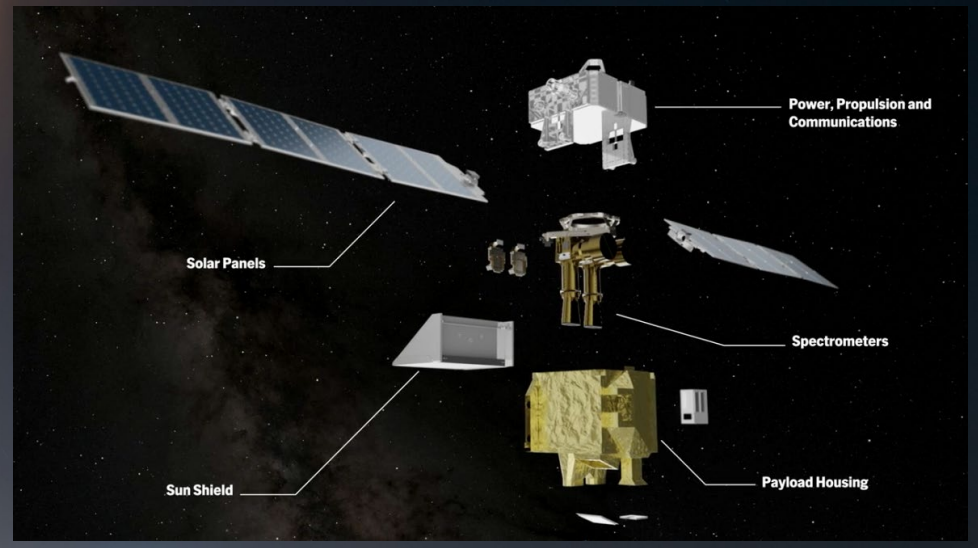
1. What is MethaneSAT?

MethaneSAT is an imaging satellite launched in March 2024 to measure methane emissions. MethaneSAT will track methane emission rates and locations globally and show how those emissions are changing over time.

Built by Ball Aerospace and implementing a Saturn-class bus by Blue Canyon Technologies, MethaneSAT was carried by a SpaceX Falcon 9 launch vehicle.

MethaneSAT will be in a sun-synchronous polar orbit with an altitude of 590 km and a period of 95 minutes. It will have up to 20 ground station contacts/day using the KSATlite network with 5 primary sites.

After an initial period of commissioning and calibration, MethaneSAT will provide regularly updated data on oil and gas methane emissions to the public, starting in early 2025.



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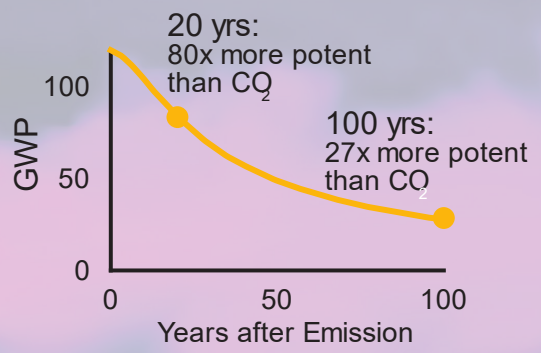
2. Why is MethaneSAT needed?

Oil and gas companies are under increasing scrutiny for their management of methane – a greenhouse gas that is 80 times more potent than CO2 over 20 years. In addition to its harmful climate impacts, methane emissions cause health-damaging air pollution and waste a valuable energy source.

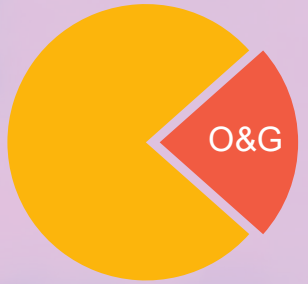
Growing pressure from regulators, energy buyers, finance, and other stakeholders to reduce methane emissions reflects the IPCC's finding that there is no plausible pathway to limit temperature rise to 1.5°C without deep reductions in methane emissions.

Methane poses regulatory, financial, and reputational risk to oil and gas companies. Finance increasingly sees methane management as a component of valuing oil and gas assets.

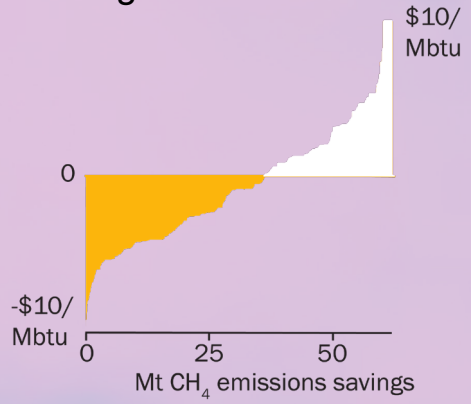
1. The climate impact of methane emissions is sometimes underestimated.



2. Oil & gas is one of the largest anthropogenic methane sources.



3. 45% of O&G methane emissions can be abated at negative cost.



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3. How is MethaneSAT relevant for the financial sector?

Methane management is increasingly being factored into the valuation of oil and gas assets, and buyers may consider emissions data for regulatory and business purposes, making emissions a material component of business activity.

MethaneSAT data will make it easier to track producers' methane emissions performance against legal and voluntary targets and their peers.

Finance
- Manage risk associated with excess methane emissions
- Identify opportunities associated with better methane performance
- Conduct company benchmarking
- Hold companies accountable during engagements

Operators
- Integrate this data with other emissions monitoring
- Prioritize where to deploy leak detection and repair efforts
- Monitor facilities that are remote, unmanned, or operated by joint venture partners

Regulators
- Identify regional emissions, problematic infrastructure, and estimation errors to inform regulatory requirements
- Compare data to operator reports
- Improve on existing datasets
- Track progress against emission reduction goals

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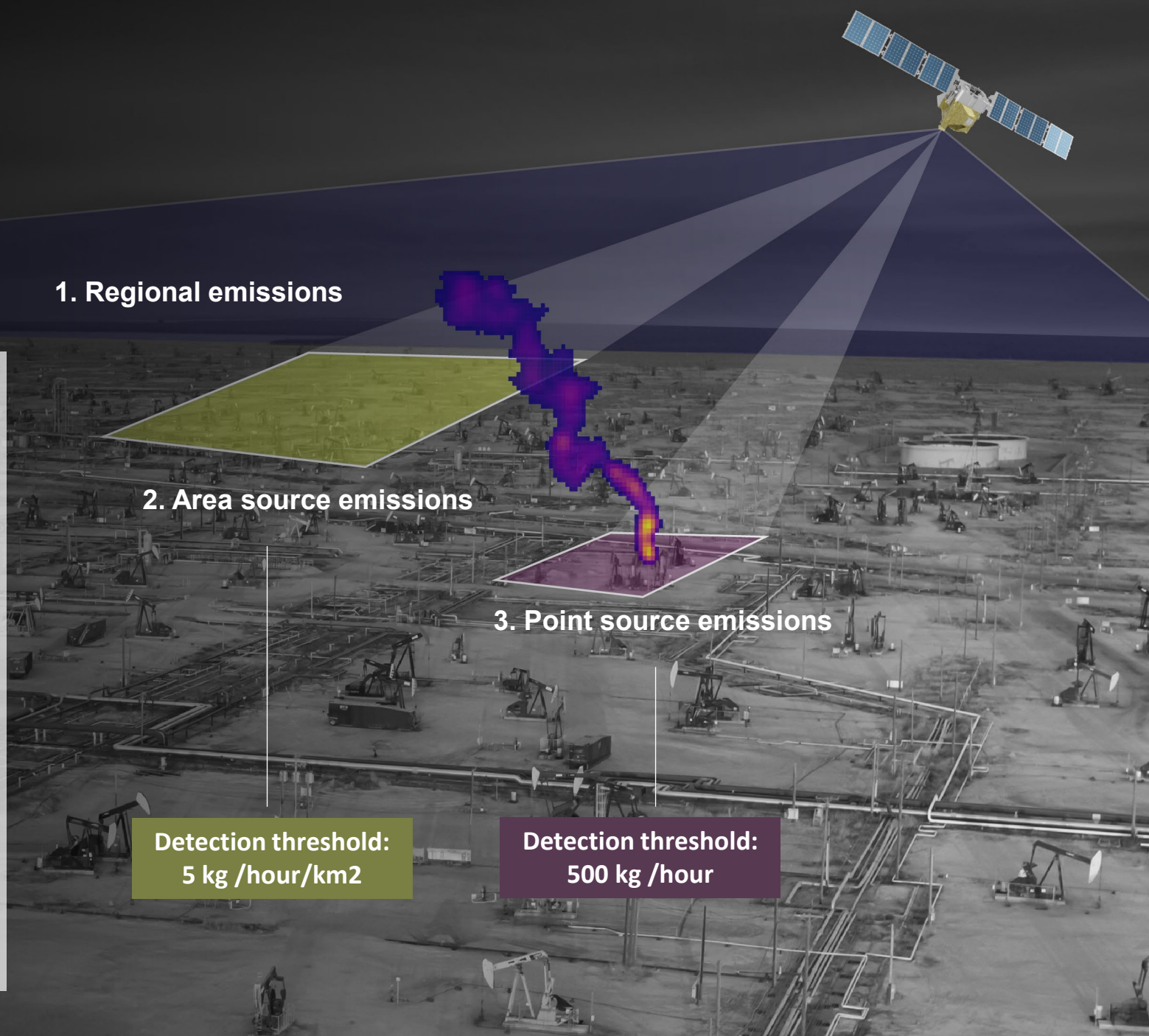
4. What emissions can MethaneSAT detect?

MethaneSAT's two short-wave infrared spectrometers have a native pixel resolution of 100 m x 400 m over a swath width of 200 km. This allows detection of methane levels of 3 parts per billion.

There are three detection levels:

1. **Total regional emissions** from individual O&G regions/countries/basins/subbasins, providing sector-wide emission quantification for the vast majority of global O&G production.
2. **Area source emissions**, aggregated from lower-emission diffuse sources within a ~1 km^2 resolution, with a detection threshold of 5 kg/hour/km^2.
3. **High-emitting point sources**, traceable to a single emissions source with a detection threshold of 500 kg/hour.



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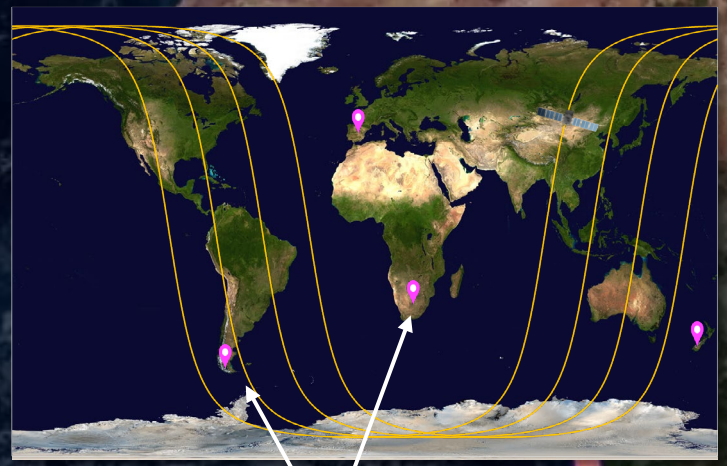
5. Where will MethaneSAT look for methane?

MethaneSAT will orbit the earth every 95 minutes, covering 30 targets a day, allowing it to revisit priority areas every 3-4 days. It will generate heatmaps of 1 km^2 areas across targets that are 200 km x 200 km.

Initially, MethaneSAT will focus on measuring methane from oil & gas installations. When fully operational, its coverage will exceed 80% of the world's oil and gas producing regions, comprising over 130 targets in 48 production basins.

MethaneSAT will additionally map agriculture regions on a limited basis.

Targets



Data transfer ground stations

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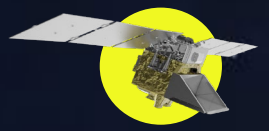
6. How does MethaneSAT differ from other methane satellites?

MethaneSAT is one of a growing group of methane-sensing satellites. Most are either **global mappers** (focusing on large scale regional mapping) or **local mappers** (focusing on point-source, facility-level attribution).

Uniquely, MethaneSAT is an **area mapper** that combines global coverage with the ability to identify point source emissions and spatially disaggregated area emissions.

	Swath (km)	Pixels (m)
 TROPOMI	2,600	7000 x 5500
 MethaneSAT	200	100 x 400
 GHGSat	12	30 x 30
 PRISMA	30	30 x 30
 Carbon Mapper	18	30 x 30

Global Mapping
Global and large-scale regions
Large point sources

Area Mapping
Area sources / point sources
Sector-wide quantification

Local Mapping
Point sources
Facility level attribution

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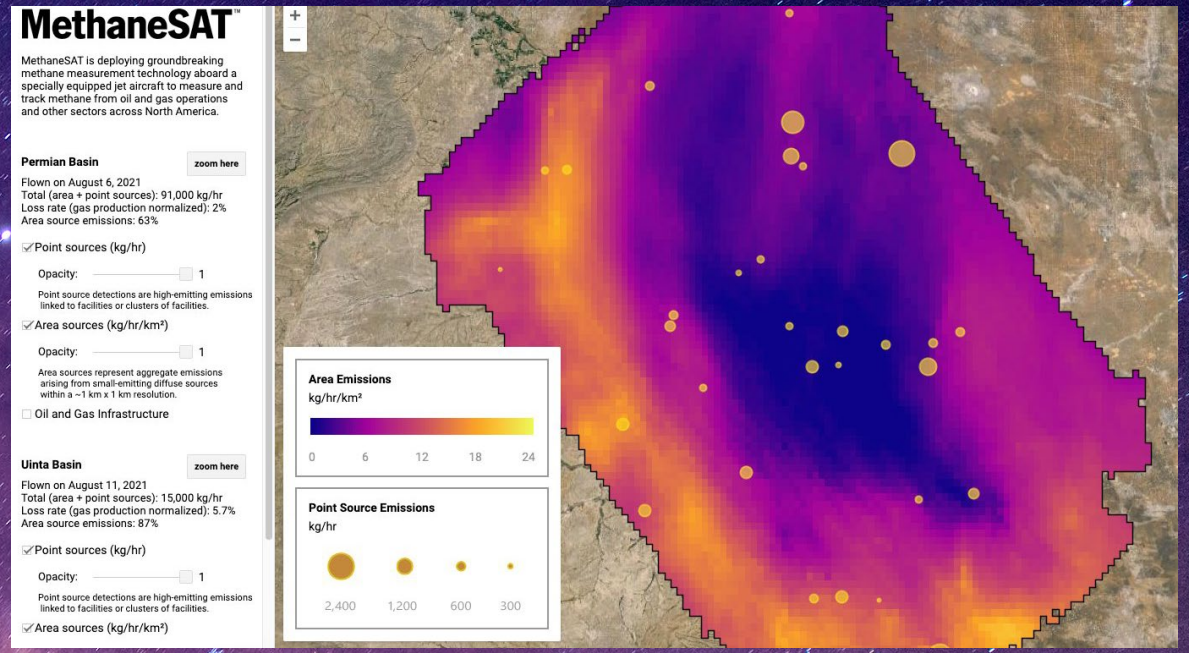
7. What data will MethaneSAT produce?

MethaneSAT data goes through a multi-step processing pipeline. This begins with the transmission of raw imaging data to ground centers, followed by calibration, geolocation, and mapping. The methane concentration data is processed with meteorological data to quantify emissions rates and identify sources.

Starting in early 2025, MethaneSAT emissions data will be available to view through an online portal. Researchers, nonprofits and academic institutions will also be able to use the data on Google Earth Engine for free. Licensing and pricing terms for commercial entities will be available at a later date.

Example of how data will be visualized in Google Earth Engine



Data Processing Pipeline

I. Data Calibration

Raw data from the spectrometer are corrected for light intensities

II. Methane Concentration

Data are processed to account for meteorological “noise” (cloud cover, aerosols, and reflectivity of the Earth’s surface). Methane concentrations are calculated.

III. Gridding and Geolocation

Data are remapped to geographical coordinates to produce maps of methane concentrations, including features such as oil and gas infrastructure.

IV. Methane Quantification

Concentration data is combined with meteorological data to develop maps of methane emissions rates in kg/hour. The emissions are integrated with facility information to attribute emissions to specific locations.

Data Delivery

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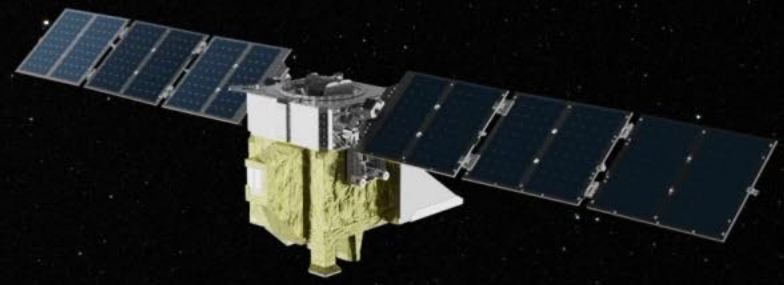
8. What are MethaneSAT's limitations?

In global basins with high operator density, attribution of emissions to specific operators, facilities, or processes will be challenging. If there are multiple operators within a 1 km^2 area, attributing emissions in that grid to a single operator may not be possible.

Other limits on emissions detection:

- No nighttime measurements
- Cloud cover and temporary weather conditions could impact detection capabilities
- Capability to detect methane over ocean or snow cover to be added in the future



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9. Who is behind MethaneSAT?

MethaneSAT is operated by MethaneSAT, LLC, a subsidiary of Environmental Defense Fund, and is philanthropically funded.

The platform was developed in partnership with Harvard University and the Smithsonian Astrophysical Observatory with support and collaboration from the New Zealand Space Agency.

Additional mission partners:

- Ball Aerospace
- Blue Canyon Technologies
- Google
- IO Aerospace
- Rocket Lab
- SpaceX

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10. Next steps for financial institutions

In the months ahead, MethaneSAT will begin producing data that will transform the financial sector's ability to assess oil and gas assets. Starting in early 2025, this data will be available to the public on MethaneSAT's free portal. Investors, lenders, insurers and other finance providers should prepare to leverage the greater transparency it will bring.

Steps financial institutions can take now:

- **Work internally with data teams** to build capacity to integrate and analyze this data
- **Engage with third party data vendors** to ensure incorporation of MethaneSAT data when available
- **Signal to companies in the oil and gas supply chain** that you are aware of this new data source and plan to use it. When engaging with oil and gas companies, **emphasize to management the importance of strong action on methane** in order to "be ready" for MethaneSAT
- Refer to EDF's climate insights hub and subscribe to our sustainable finance newsletter for updates on MethaneSAT data availability
- Refer to the MethaneSAT website and sign up for their updates

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Thank you

Additional resources:

- EDF Climate Insights Hub
- Climate Insights newsletter for the finance sector
- MethaneSAT website
- Plugging the Leaks: An Investor Guide to Oil and Gas Methane Risk