Methane Emissions

from

Unconventional Oil & Gas Production

Queensland coal seam gas (CSG) fields

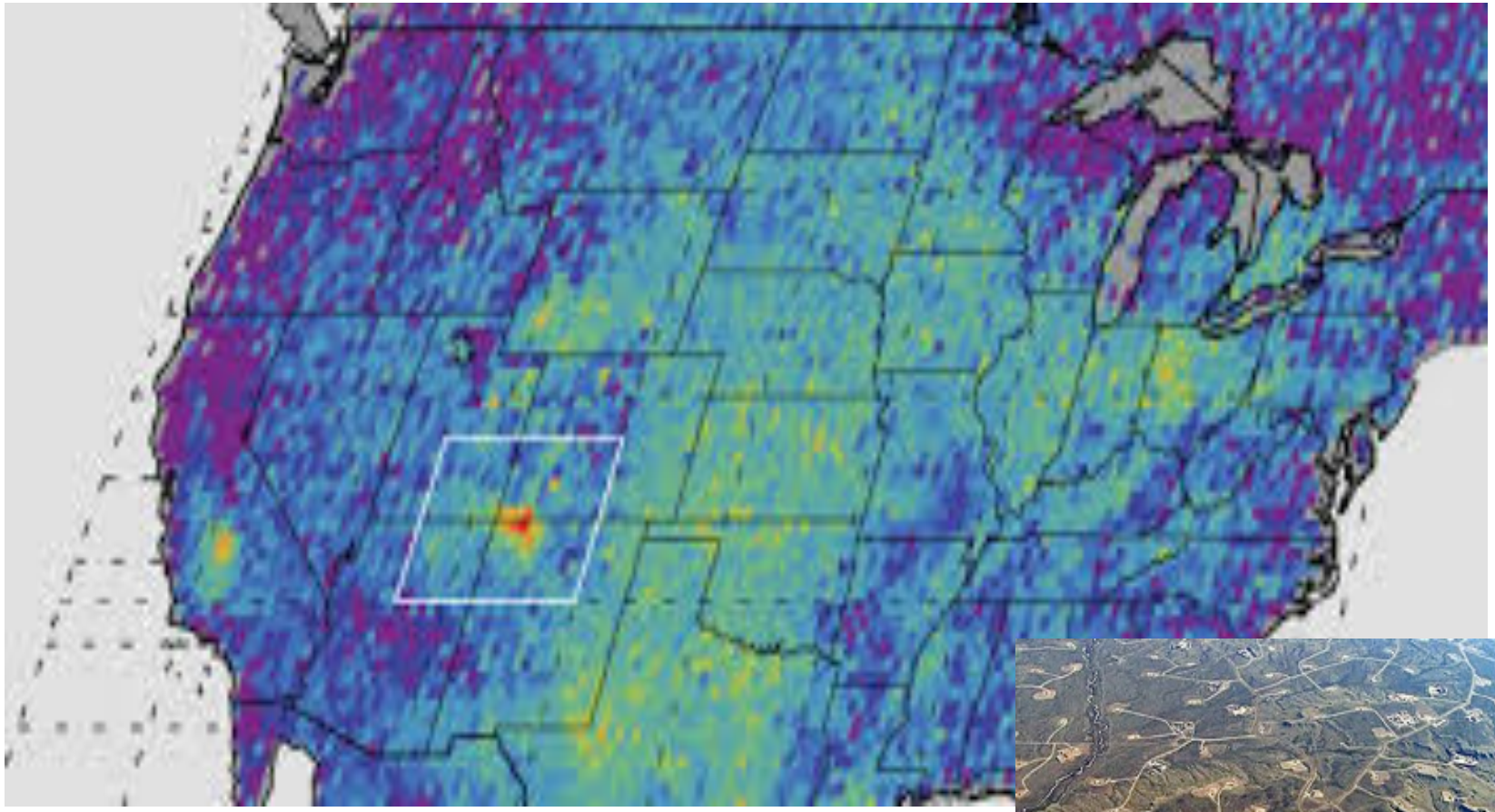
before… | **after… 150 wells**

40,000 wells planned. | **So multiply this…. 300 times.**

California gas storage methane leak…
…wipes out California climate change efforts.

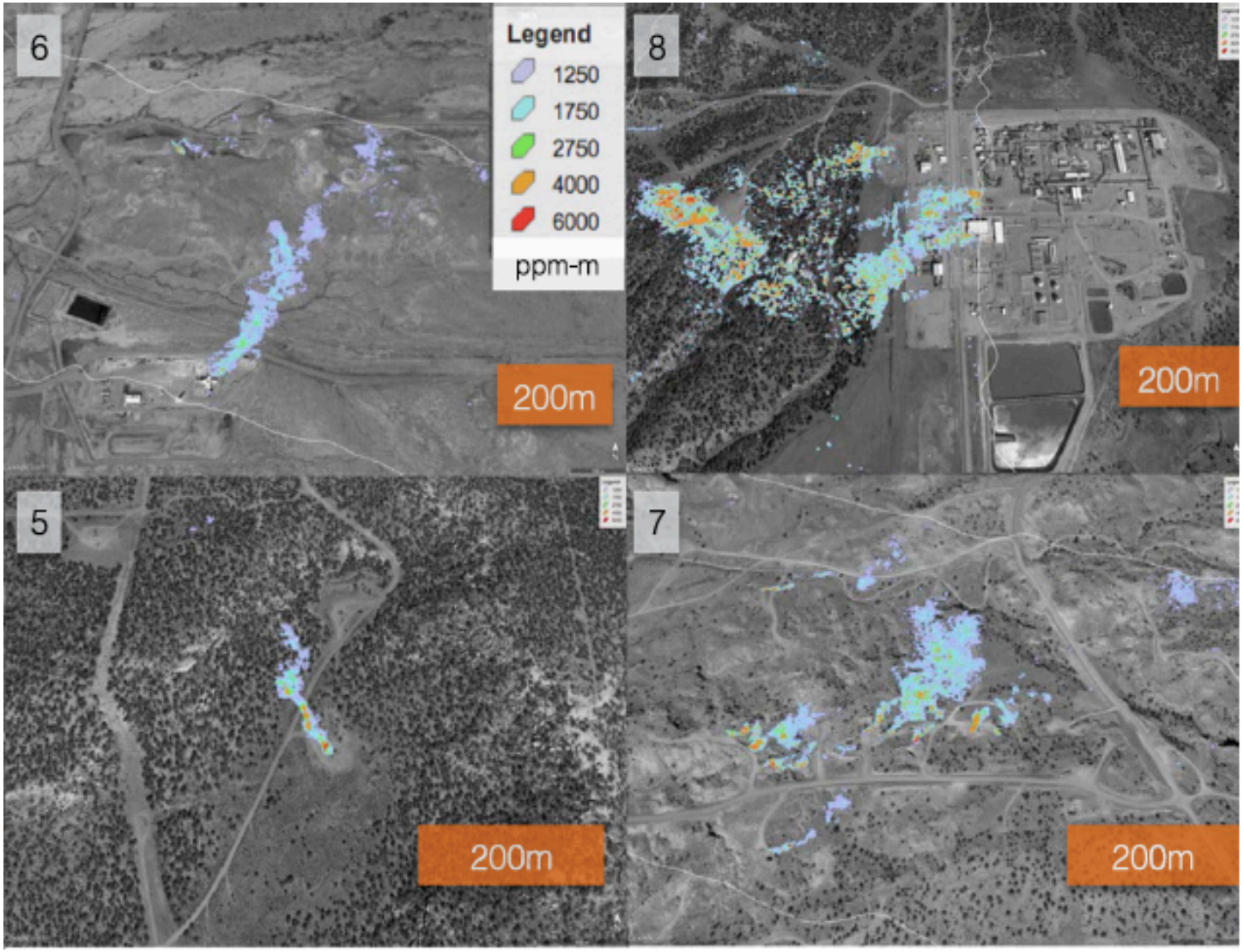
Global warming potential of methane

	Global Warning Potential GWP	Basis
20 years	86 times CO2	5th Assessment report (2013)
100 years	34 times CO2	5th Assessment report (2013)
Currently used in National Inventory reporting to the UNFCCC	25 times CO2	4th IPCC Assessment report (2007)

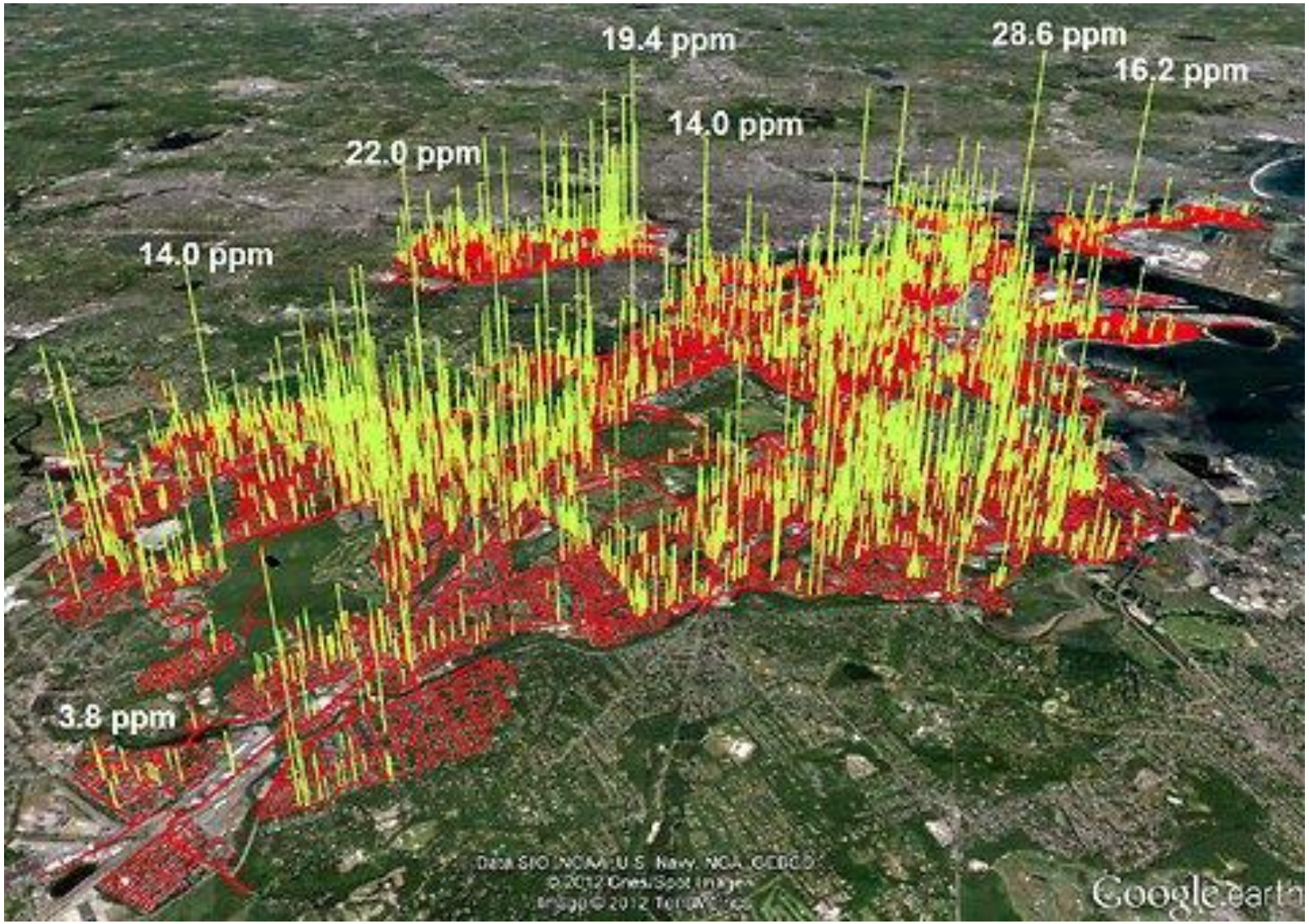


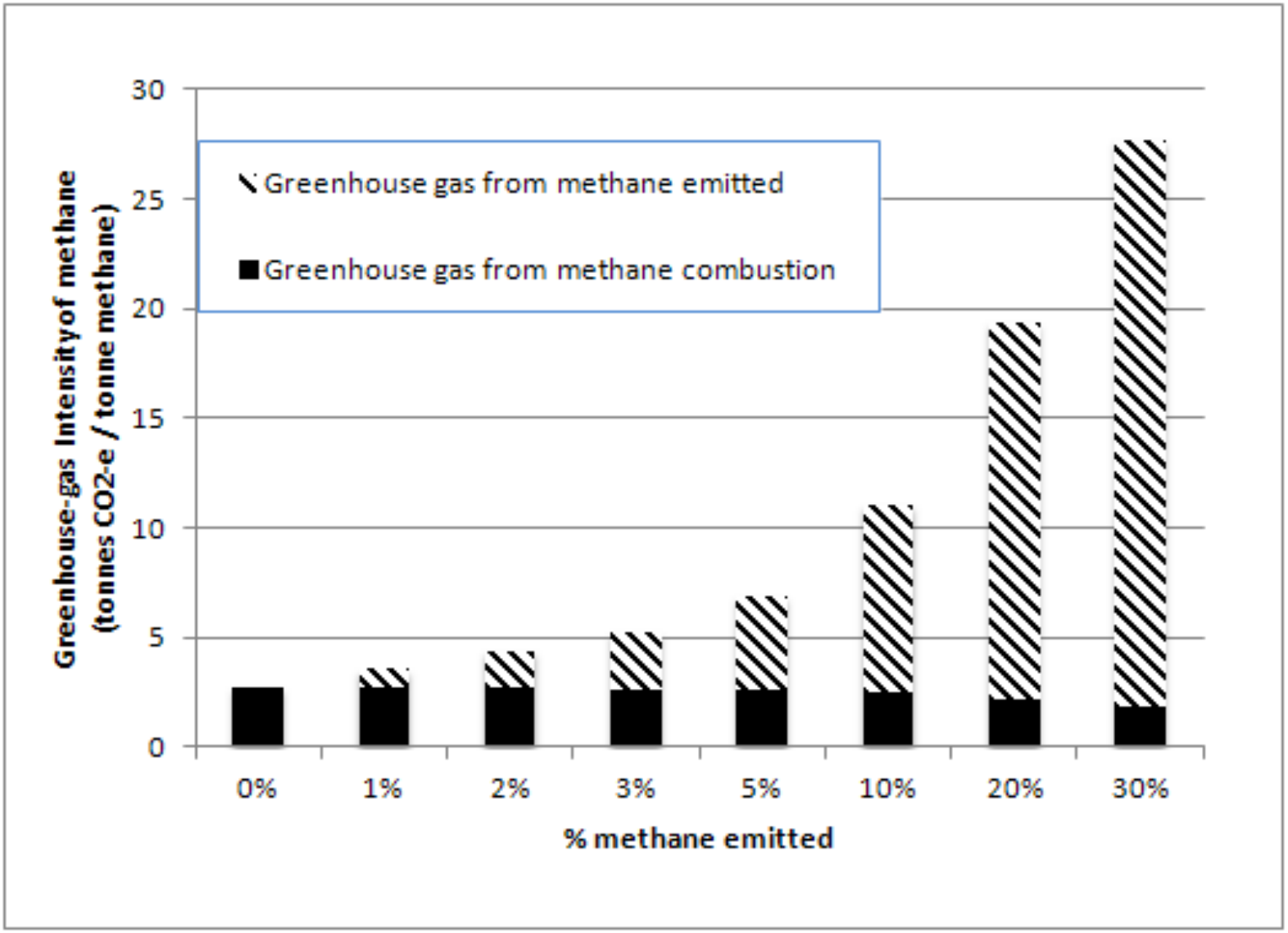
U.S. methane “hot spot” seen from space over world’s largest coal seam gas producing region

Methane emissions measured by airplane in US oil & gas fields.

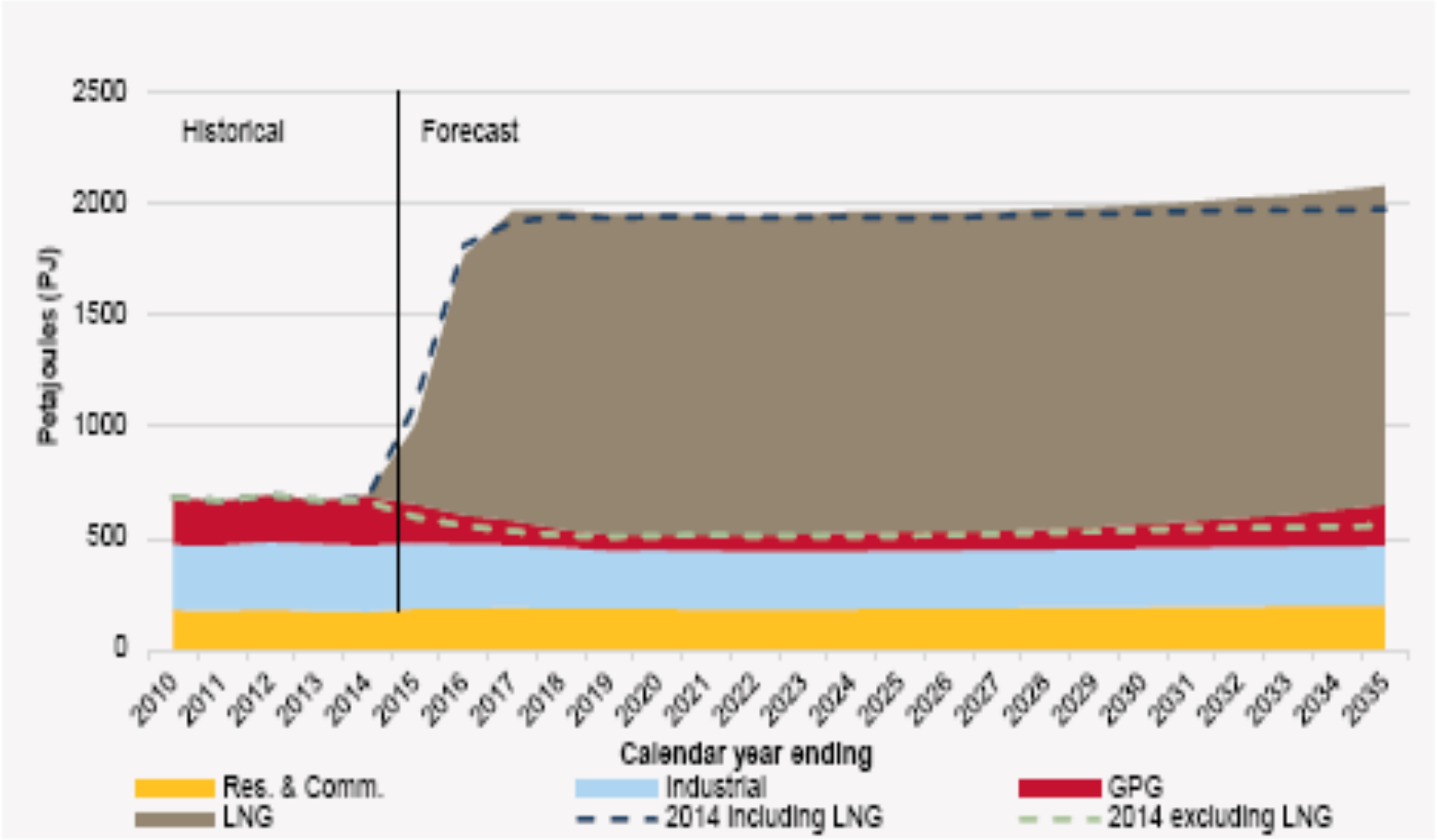


Thousands of gas leaks identified in the U.S. city of Boston

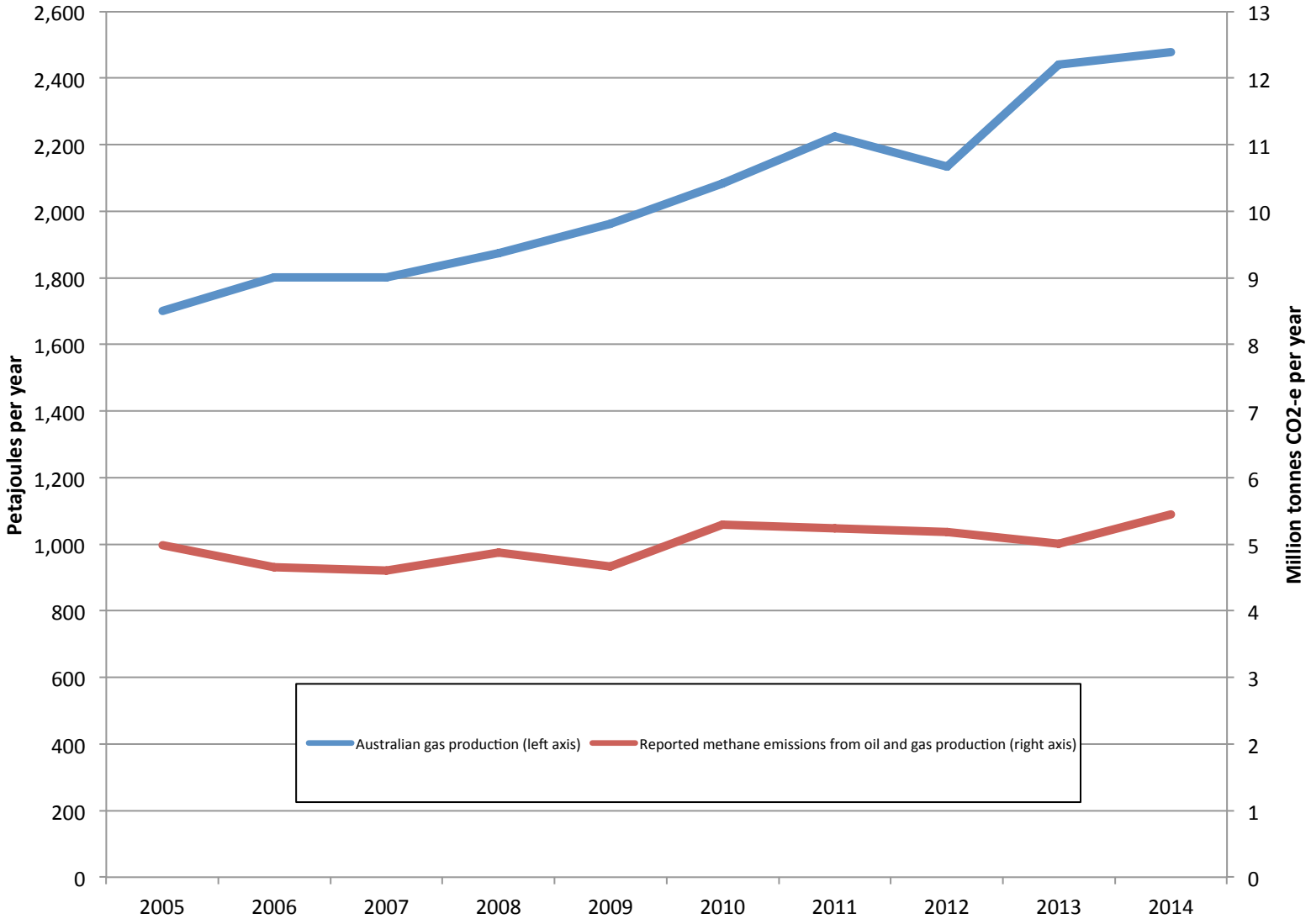




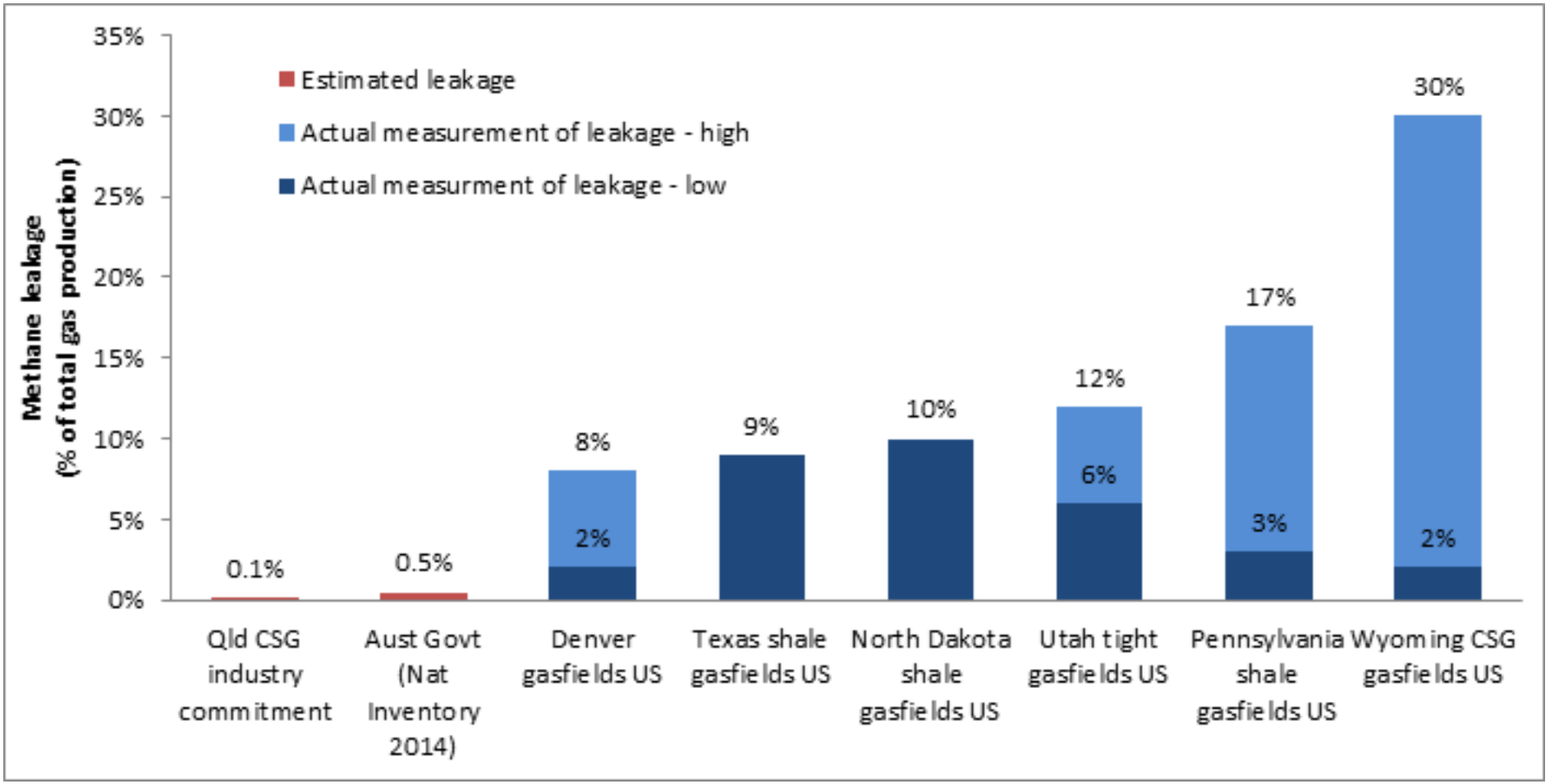
Methane greenhouse gas impact – burning it and/or release it?
Impact of emitting 3% is similar to burning the other 97%.



Eastern Australia gas production and forecast.
Production more than triples with expansion of CSG-LNG industry.



Australian gas production rises over the last 10 years (blue), while reported methane emissions do not (red).



Australia's reported methane emissions from oil and gas production (0.5%), vs findings in USA unconventional gas fields (2 to 30%).

Australian CSG production and processing emissions factor: 0.0058% of produced gas (US API 1994, for conventional gas).

CSIRO checked **wellpads only** in 2013/4 (43 sites).
Found emissions ranging up to from 0.0005% to 0.0102%.

Australian Government National Inventory Report

Table 3.42 Fugitive emission factors for natural gas

Inventory category	Operation /source	Emissions (t) / Output (kt)					
		CO_2	CH_4	NMVOC	N_2O	NO_x	CO
Venting		M	M	M	0	0	0
Flaring		2900	35	15	0.81	1.5	8.7
Natural Gas Production and processing	Fugitive emissions – general leaks		0.058	0.007	0	0	0

Source: APPEA 1998-2006 and E and P Forum 1994. M = directly measured emissions. (a): CSIRO 2014.

0.058 t/t factor from API 1994 (conventional oil and gas production).

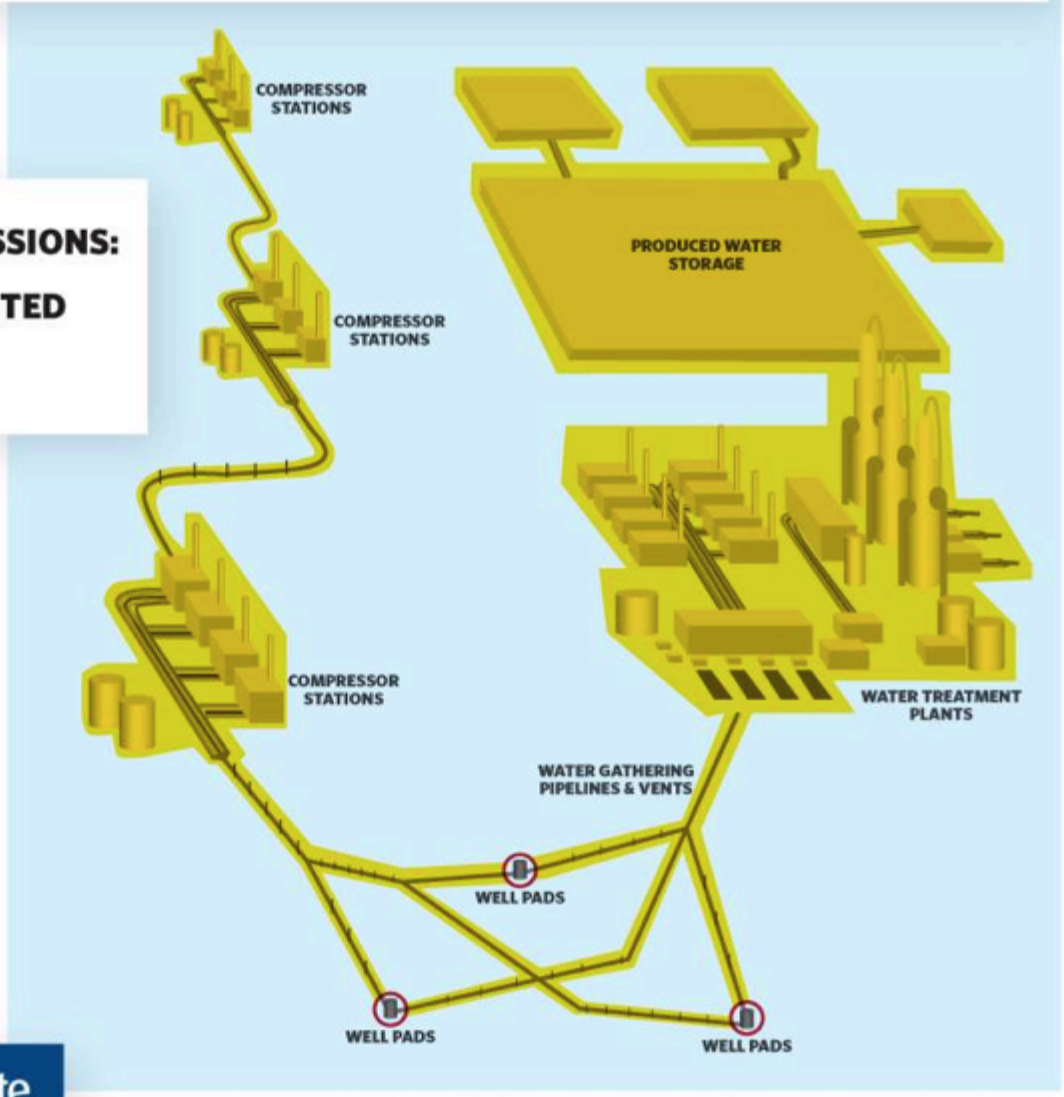
CSIRO checked well-pad equipment only (43 sites) .

Millions of other emission points ignored.

HOW TO HIDE UNCONVENTIONAL GAS EMISSIONS: DON'T COUNT THEM!

FUGITIVE EMISSIONS:

- **NOT COUNTED**
- **COUNTED**



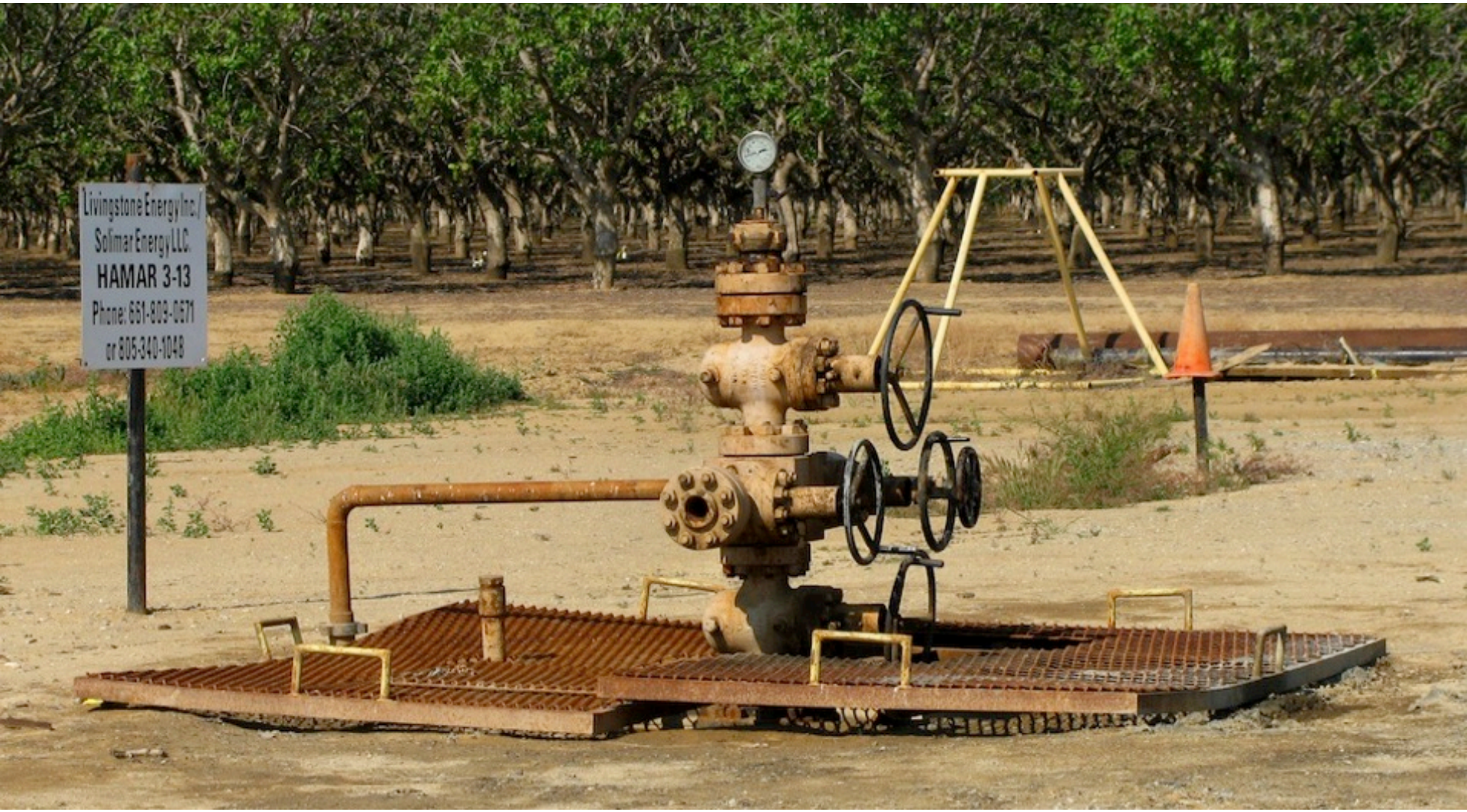
The Australia Institute
Research that matters.

Water and gas gathering lines:
0.0% methane emissions assumed by industry reporting

Gas and water treatment plants: 0.0% methane emissions assumed

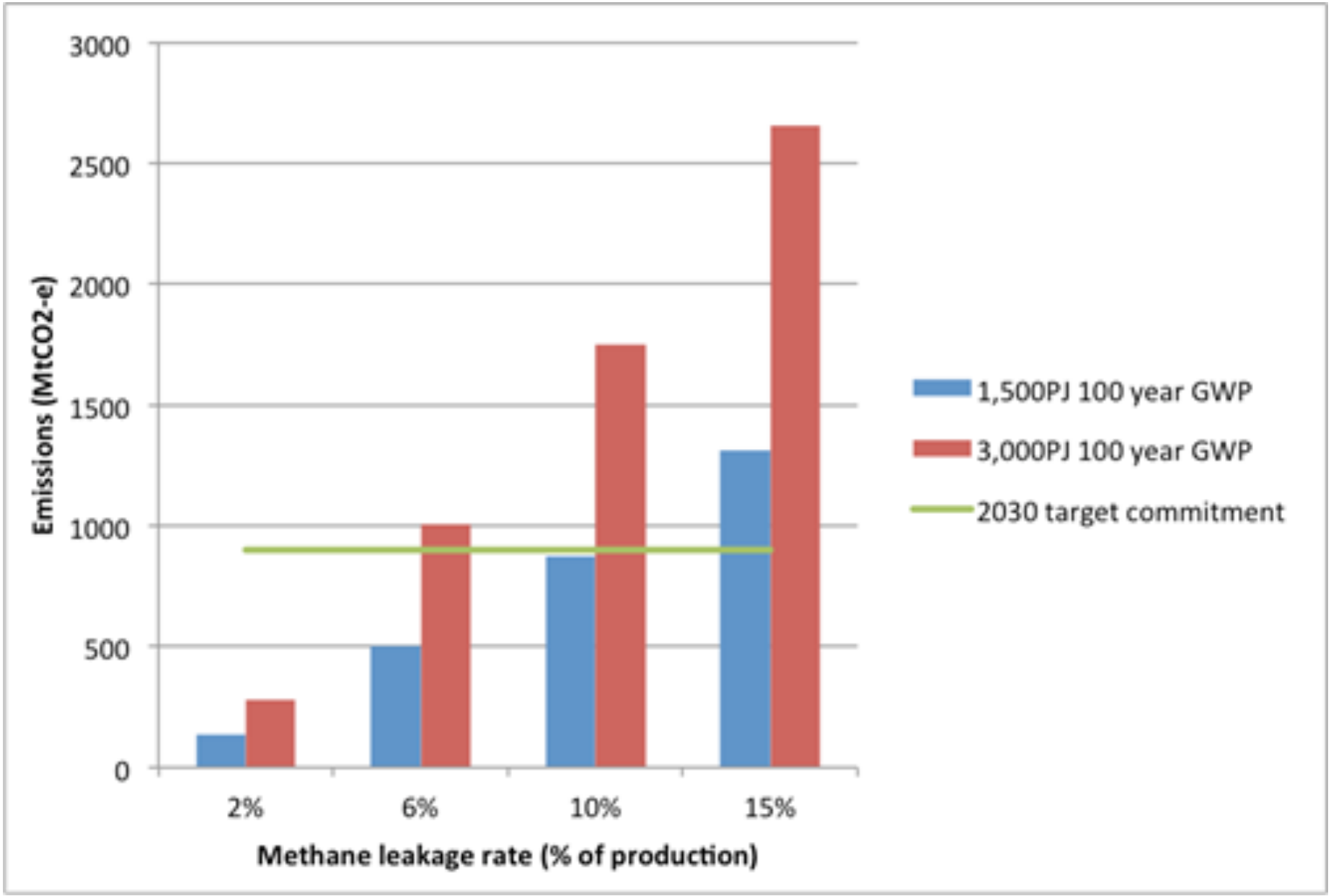
Compressor stations:
0.0% methane emissions assumed

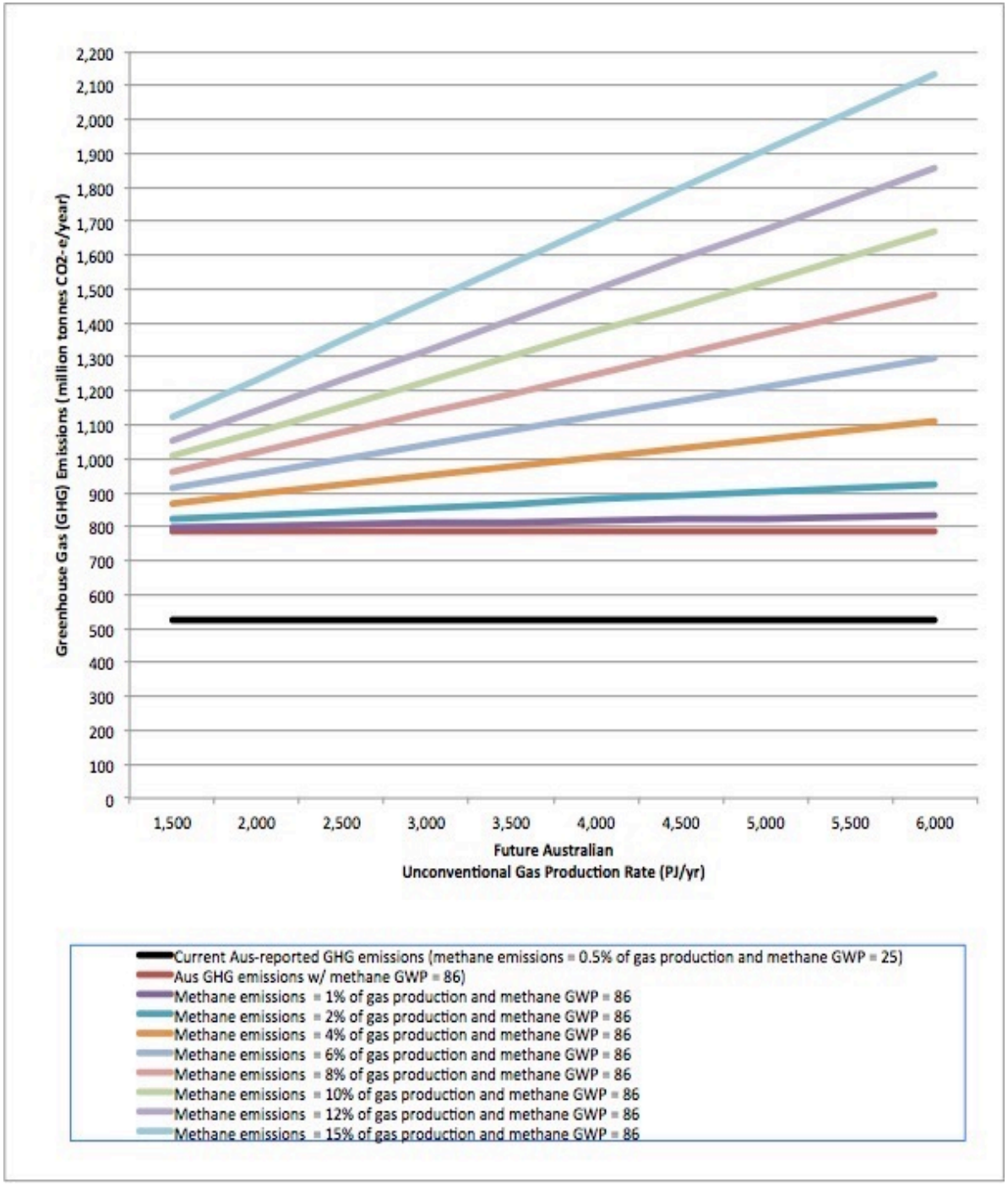
Decommissioned or abandoned wells: 0.0% methane emissions assumed



Migratory emissions:
0.0% methane emissions assumed

Methane emissions from unconventional oil and gas production could be larger than Australia's Paris reduction commitments



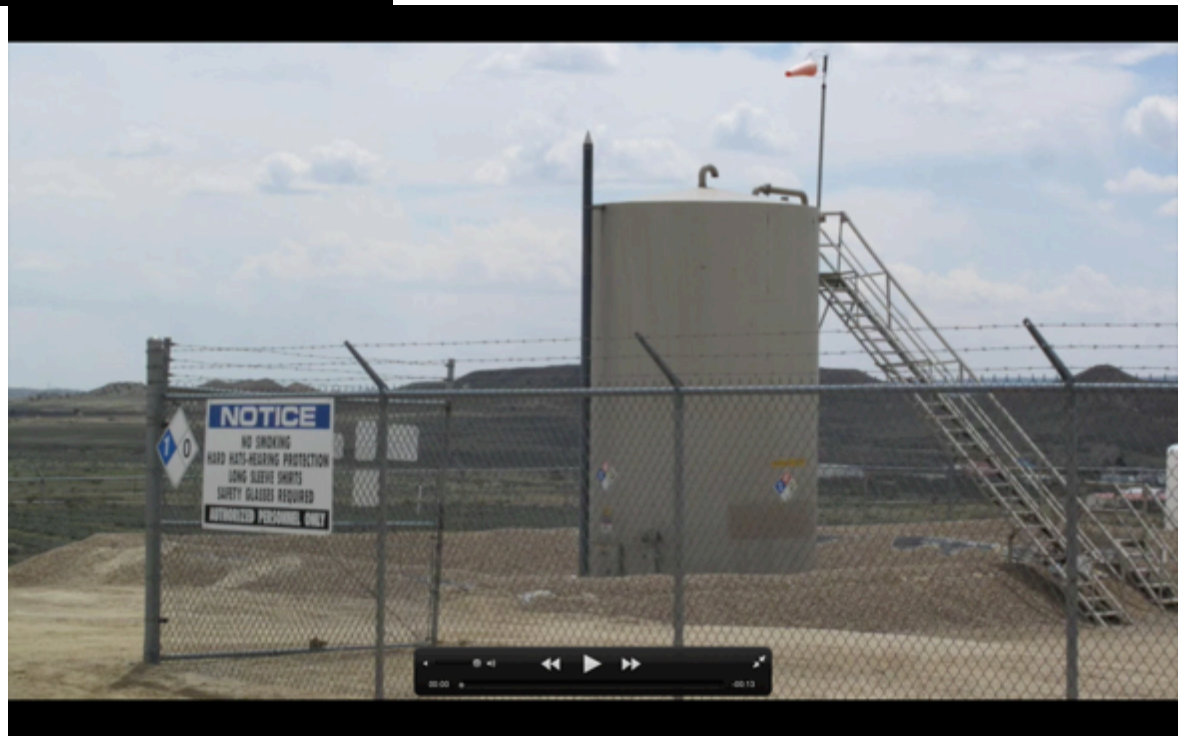


Scenarios:

Methane emissions from oil and gas production vs Aus total emissions (20- year global warming impact

Making the invisible… visible.

USA / NASA: Methane emissions from gasfield tank (infrared camera detection)



Special infrared photography methods now available…
… to visualise methane gas emissions

VIDEO: The clean green image of coal-seam gas is under threat (The Business)

Infrared imaging of California gas storage methane leak…

USA:

8 sites emitting methane

No. 1: wellpad, smallest.

No. 8: gas processing plant, largest.

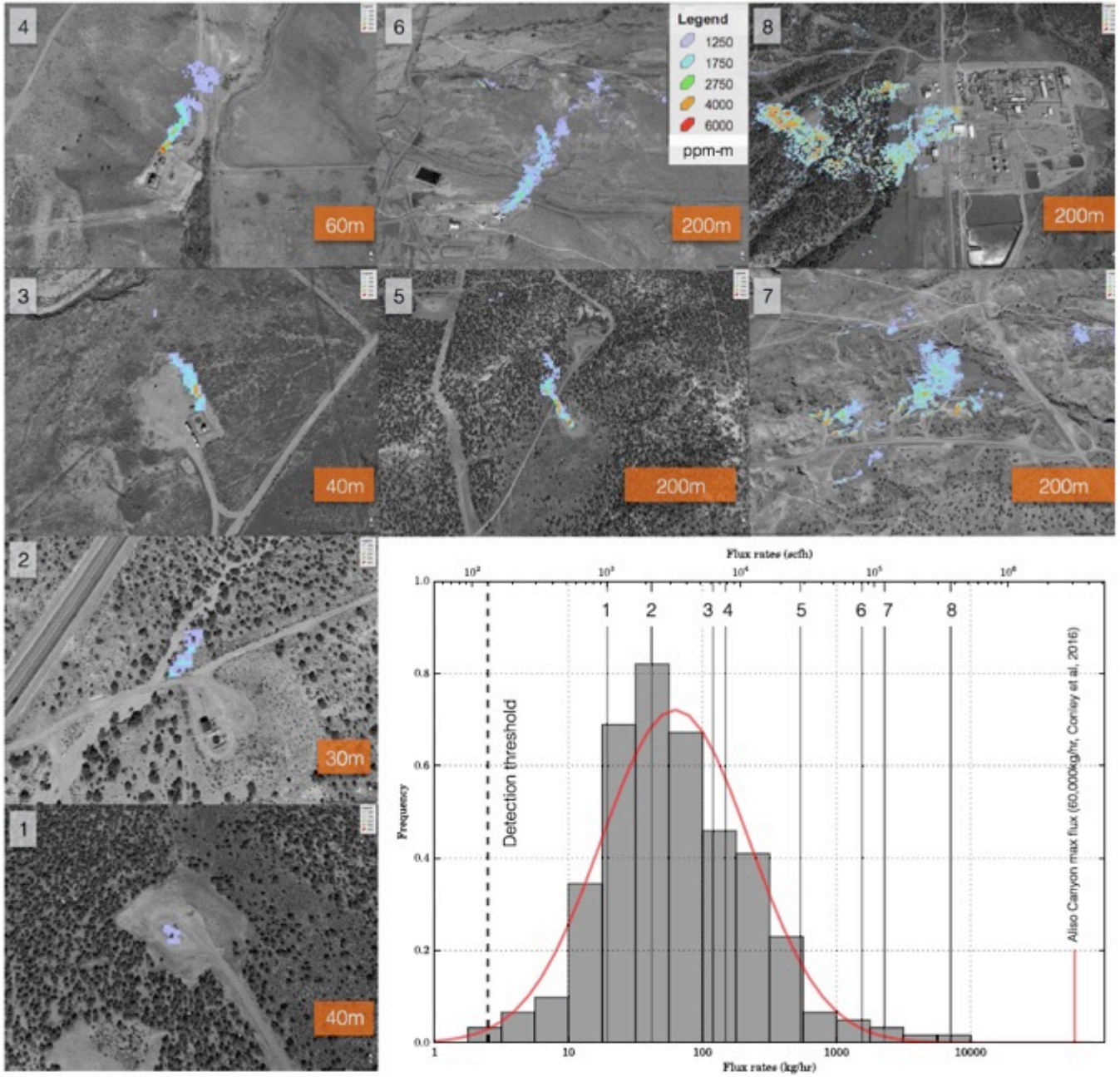


Fig. 4. Flux distribution of all 245 plumes observed by AVIRIS-NG with individual examples spanning the entire range of fluxes from low to high. Examples include well pads (*1* and *5*), a confirmed pipeline leak (*2*), storage tanks (*3* and *4*), gas processing facilities (*8*), a coal mine venting shaft (*6*), and a cluster of strong sources near a well completion site (*7*). The detection threshold is based on controlled release experiments performed at the Rocky Mountain Operating Test Facility in Wyoming (*8*). The fitted lognormal distribution has a mean of $10^{1.75}$ and a 1σ of 0.55. For comparison, the unique Aliso Canyon blowout is depicted as a red line, corresponding to a maximum flux rate of 60,000 kg/h.

SONGNEX 2015

Shale Oil and Natural Gas Nexus

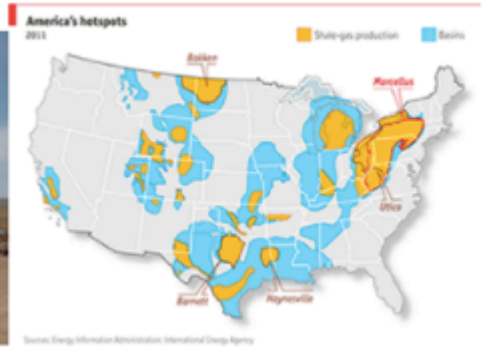
Studying the Atmospheric Effects of Changing Energy Use in the U.S. at the Nexus of Air Quality and Climate Change

Where: Western U.S.

When: March - May 2015

What: The primary goal of NOAA's field study is to quantify the emissions of trace gases and fine particles from several different tight oil and shale gas basins in the western U.S., and to study the chemical transformation of these emissions. The study will be focused on basins which represent a mixture of oil and gas production regions at various stages of development.

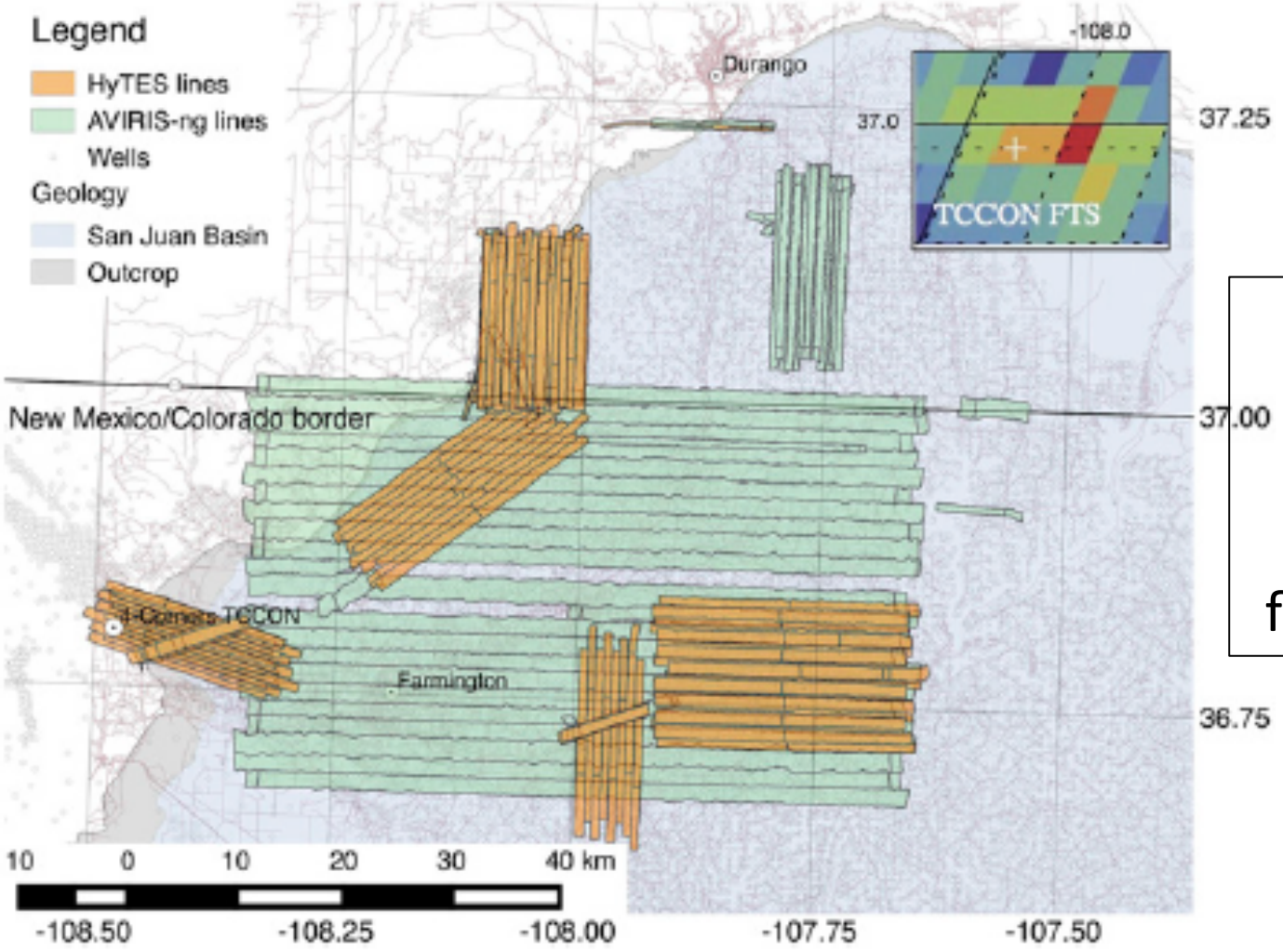
Who: Investigators in this project include researchers from several universities, industries, and governmental agencies. Participating institutions include the Cooperative Institute for Research in Environmental Sciences with the University of Colorado at Boulder.



Methane emission detection technologies

Measuring methane

Scientists aboard NOAA's Twin Otter aircraft will quantify methane emissions from the Four Corners region. (Sonja Wolter/CIRES)



Methane emission detection by aircraft fly-over (USA)

Fig. 1. Airborne Experiment overview of the Four Corners area. The ground projections of individual airborne imagery are shown for both instruments. (*Inset*) The previous SCIAMACHY enhancements (2).

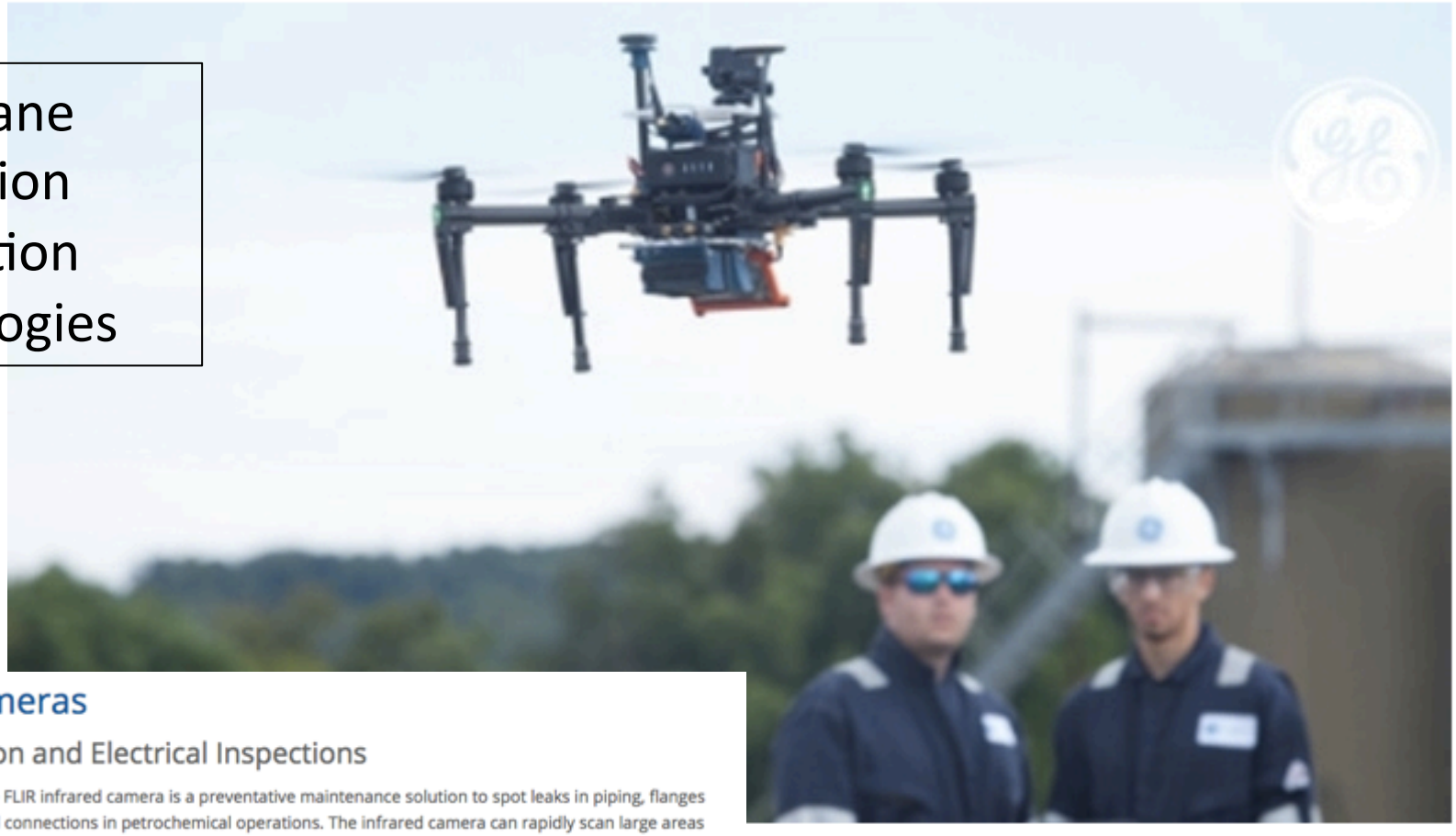
Raven, a helicopter drone being developed in part by GE at its new $125 million oil and gas technology center in Oklahoma City, is being tested to sniff for methane emissions at well sites.

What is in this article?:

GE Drones to Squeeze More Savings from the Oil Patch

Integrating Data

Methane emission detection technologies



FLIR Infrared Cameras

For Gas Leak Detection and Electrical Inspections

The FLIR infrared camera is a preventative maintenance solution to spot leaks in piping, flanges and connections in petrochemical operations. The infrared camera can rapidly scan large areas and pinpoint leaks in real time. It is ideal for monitoring plants that are difficult to reach with contact measurement tools.

Literally thousands of components can be scanned per shift without the need to interrupt the process. It reduces repair downtime and provides verification of the process. Above all it is exceptionally safe, allowing potentially dangerous leaks to be monitored from several meters away. FLIR will significantly improve your work safety, environmental and regulatory compliance, not to mention helping to improve the bottom line by finding leaks that essentially decrease profits. The new now embeds GPS data into the image allowing workers to pinpoint the location of the leak or hot spot.