

## DOCKETED

<b>Docket Number:</b>	16-IEPR-02
<b>Project Title:</b>	Natural Gas
<b>TN #:</b>	211767
<b>Document Title:</b>	Presentation - Methane Research Initiatives and Needs
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<b>Organization:</b>	California Air Resources Board
<b>Submitter Role:</b>	Public Agency
<b>Submission Date:</b>	6/9/2016 12:46:40 PM
<b>Docketed Date:</b>	6/9/2016

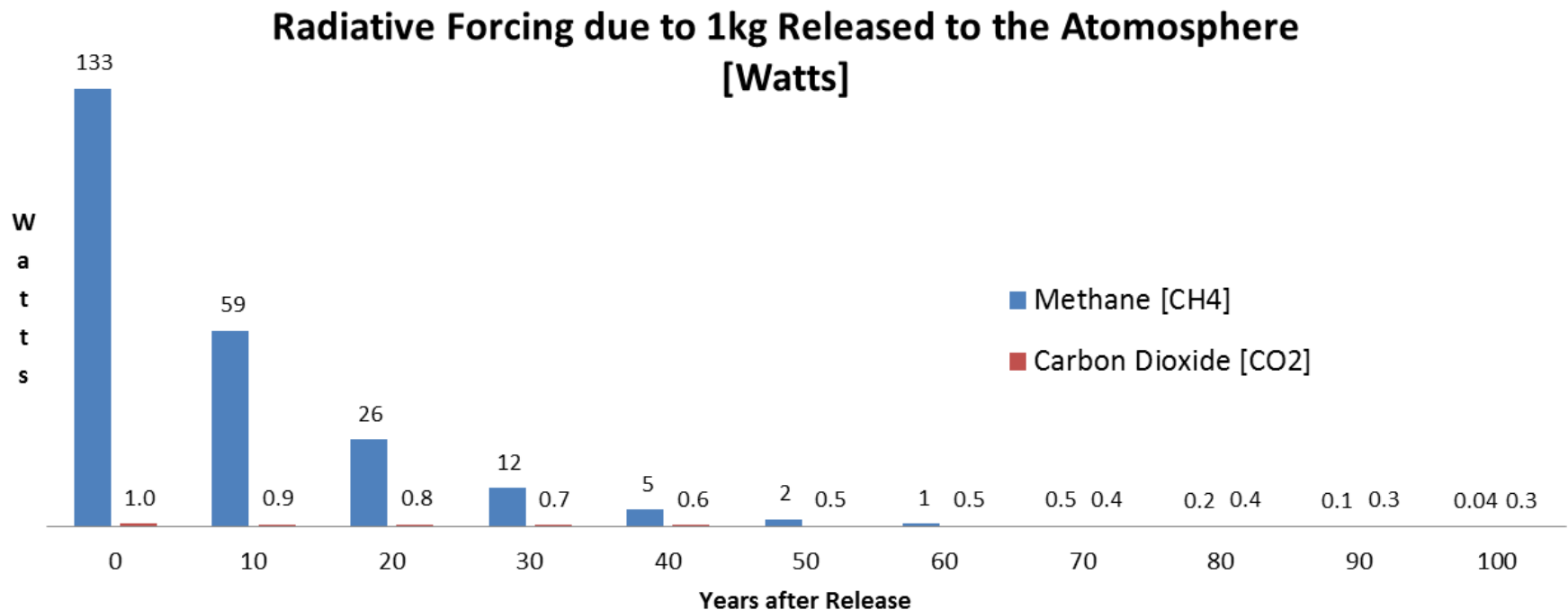
# Methane Research Initiatives and Needs



**Methane Emissions from California's Natural Gas  
System: Challenges and Solutions  
Sacramento June 6-7, 2016**

# Why the concern with Methane?

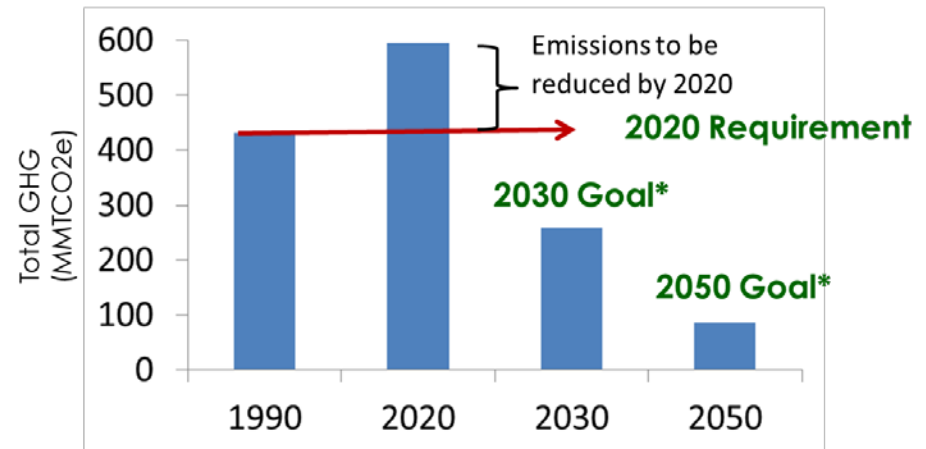
- Often emitted with other VOCs that are toxic or participate in photochemistry (ozone formation)
- Is a potent greenhouse gas
  - 100 year GWP = 28, 20 year GWP = 84



## • State Climate and Methane Reductions

### GHGs

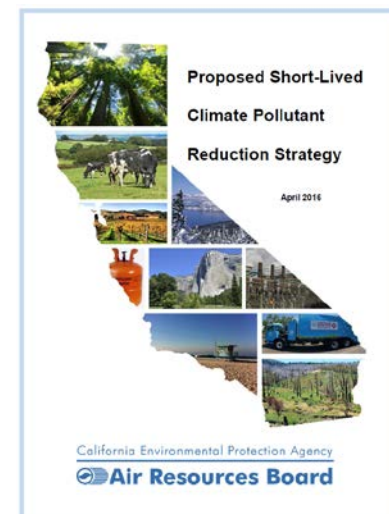
- Reduce GHGs to 1990 levels by 2020 (AB32)
- Executive Orders for 2030 and 2050



\* Executive Orders B-30-15 and S-3-05

### Methane

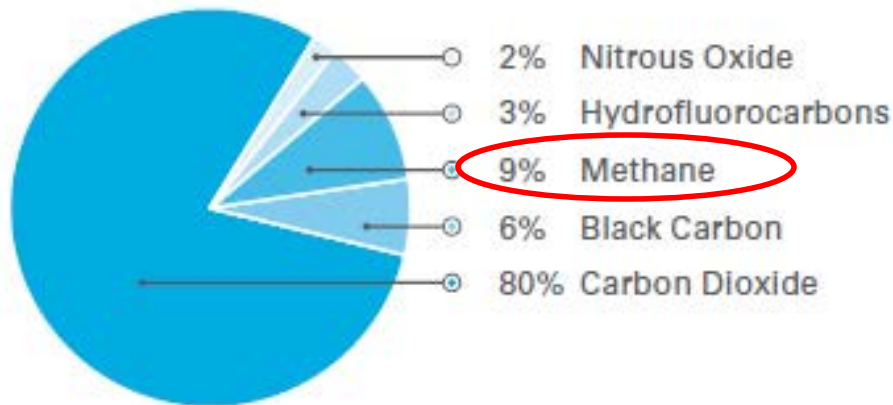
- Plan for reductions in Short Lived Climate Pollutants (SB605)
- Goal of reducing methane by 40% by 2030



# California GHG Inventory

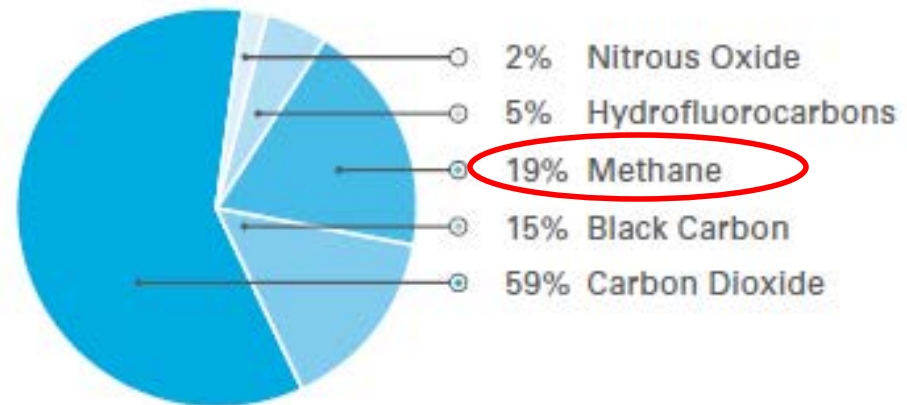
Carbon Dioxide Equivalent Climate Pollutant Emissions for 2010  
in California Using (a) 100-year and (b) 20-year Horizon GWPs

2010 (a)



Using 100 yr GWP

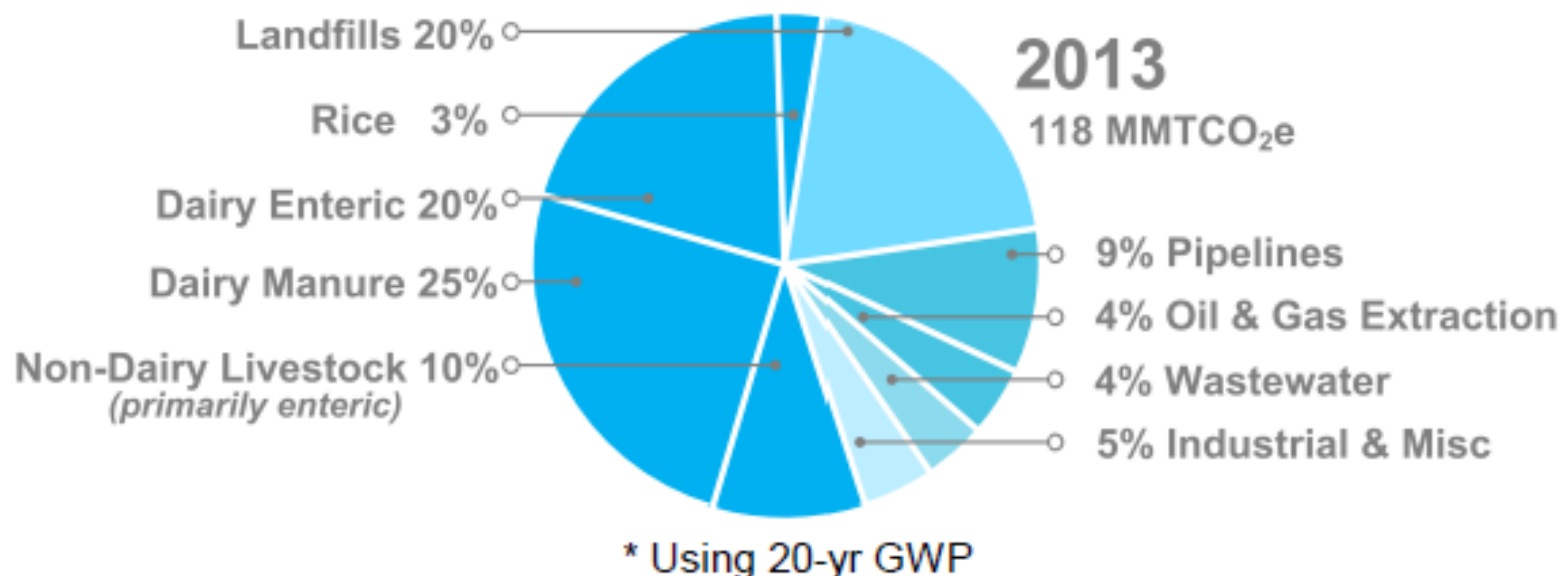
2010 (b)



Using 20 yr GWP

# Methane by Source in California

**Figure 6: California 2013 Methane Emission Sources\***





# Broad Goals

- Improve understanding of emissions
  - Inform our inventories
  - Provide California specific emission factors
  - Provide emission factors for sectors that are poorly understood
- Find opportunities for emission reductions
  - High emitters
  - Unknown or under-represented sources



# ARB Research Efforts

- Methane monitoring network since 2010
- Ambient measurements have consistently suggested methane inventory to be underestimated by approximately 50%
- Work continues to improve the network and the utility of the modeling

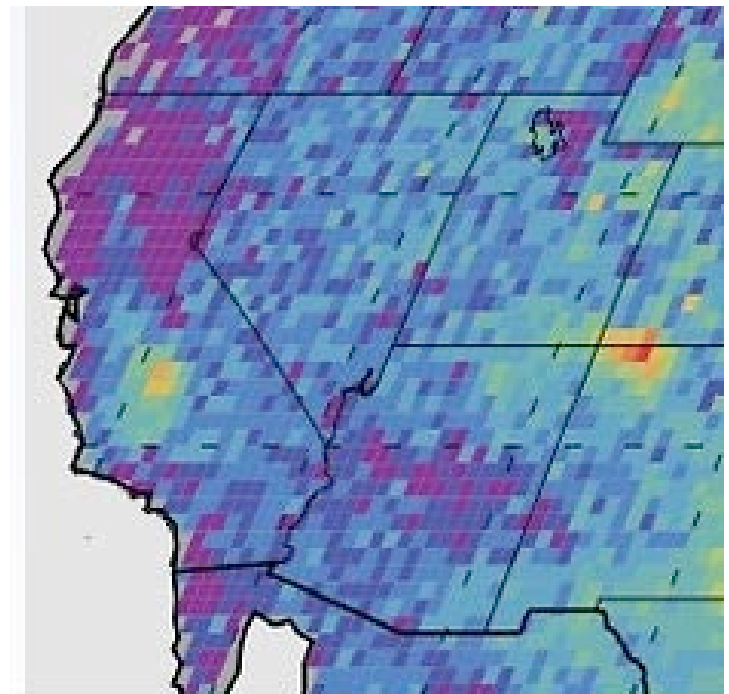
## GHG Monitoring Stations





- AB1496 – Methane Emissions
- Undertake monitoring and measurements of high emission methane "hot spots"
- Life-cycle greenhouse gas emissions analysis of natural gas produced and imported into California.
- Update relevant policies and programs to incorporate new information
- Review and assess the atmospheric reactivity of methane as a precursor to the formation of photochemical oxidant.

*Kort et al 2014  
(2003-2009 SCIAMACHY data)*



Methane hotspots in Southwest USA

# NASA/JPL Airborne Survey

Expected to start June 2016

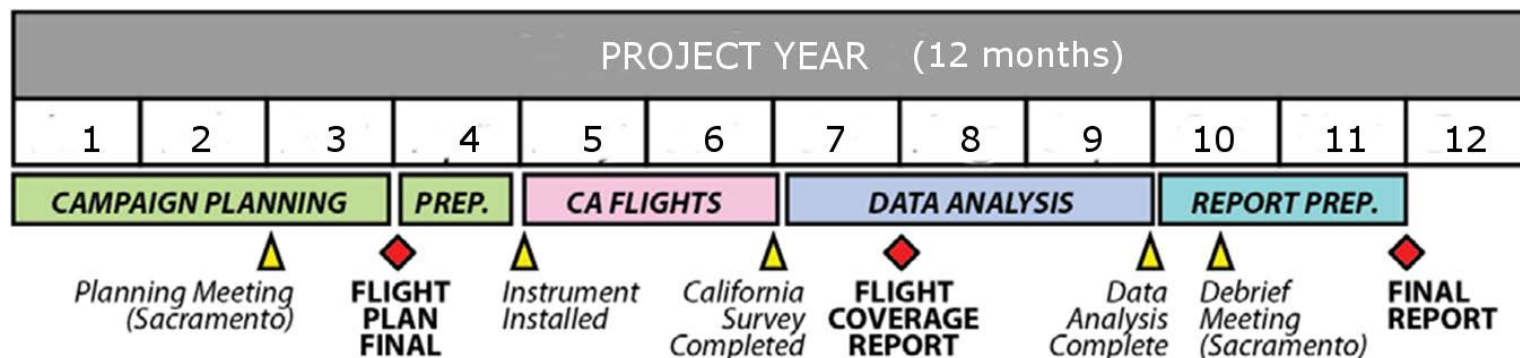


Area	Flight Hours
1	45
2	8
3	4
4	46
5	41
6	41
<b>TOTAL</b>	<b>185</b>

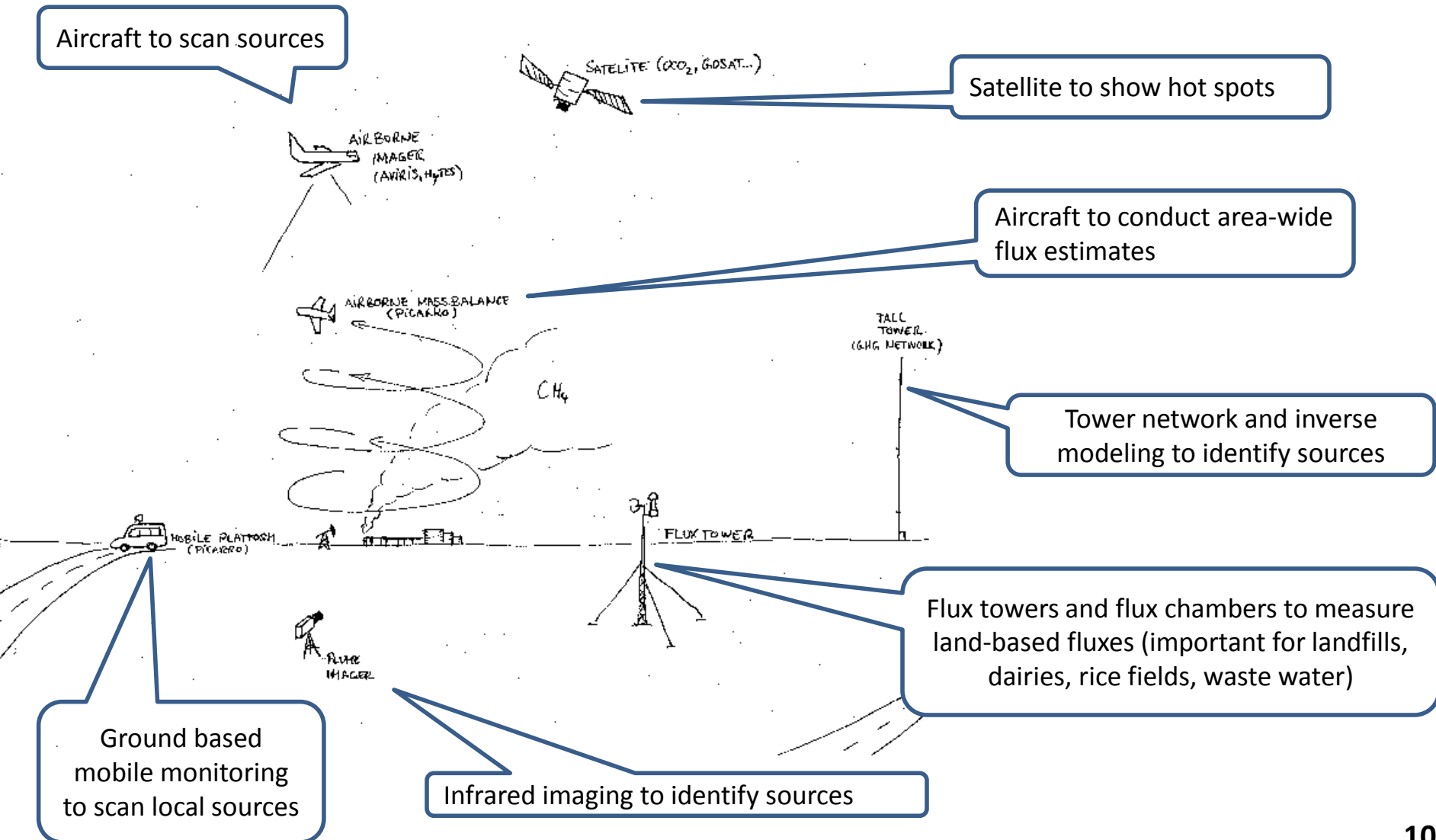
NOTE: Area 1 is over the entire LA area, making flying difficult due to Air Traffic. Altitudes over 12,000 feet MSL will be considered.



Pilot studies suggest as many as 5,000 emitters in California will be identified



# Tiered observation system



# Extramural Research Efforts

- Characterize Physical and Chemical Properties of Manure in California Dairy Systems to Improve GHG Emission Estimates
- Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California's GHG Inventory
- Measure emission rates at Natural Gas Storage Facilities(CEC)

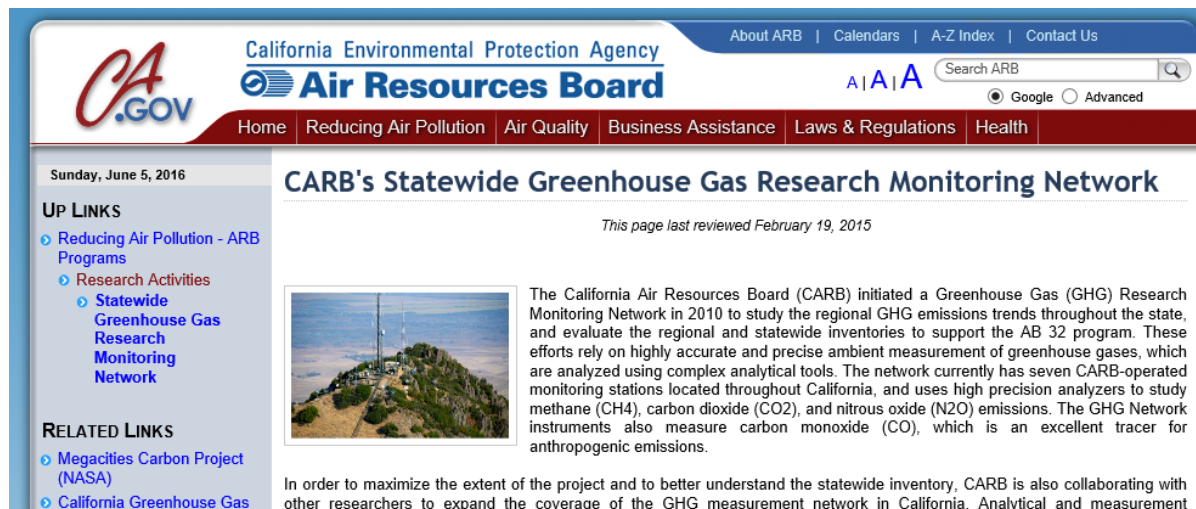
# Extramural Research Efforts

- Characterize emissions during well simulation and from percolation ponds
- Measurement of emission rates of pipelines in California
- Testing of natural gas meters in residential homes
- Comparison of methane measurement methods and their utility in oil and gas methane regulations
- Life cycle model for imported natural gas



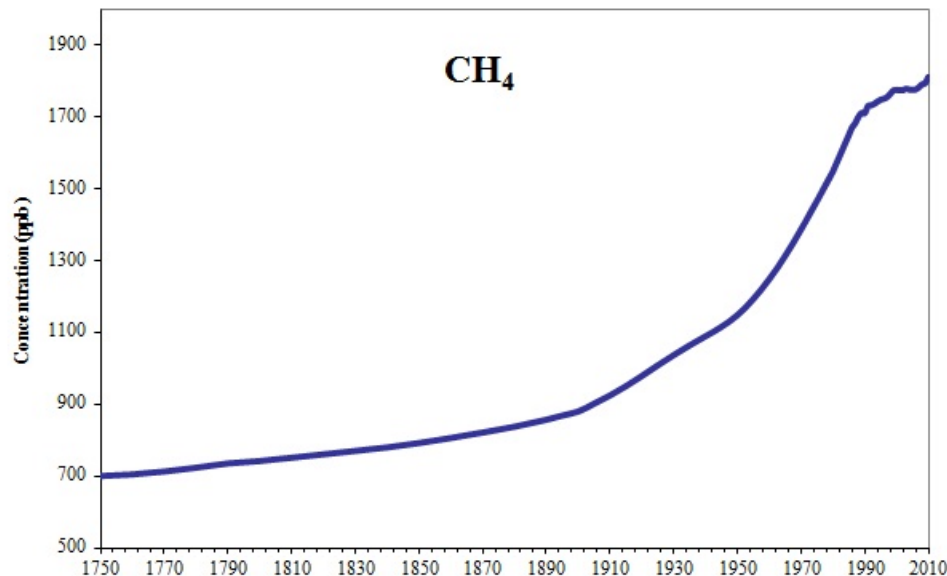
# Moving forward

- Expanded website with information and data from our research activities.



*Current GHG Network webpage which will be expanded to be a general methane portal*

- Methane receiving attention by both local and federal agencies
- Research efforts shedding new light on sources and solutions, but we are not done
- Appropriate policy and response is being developed



Outlook Web App | methane - Google Search

google.com/search?q=quites+on+unique+moments+in+time&biw=1920&bih=963&source=inn

Google methane

All News Images Books Shopping More Search tools

About 21,500,000 results (0.41 seconds)

**Methane - Wikipedia, the free encyclopedia**  
<https://en.wikipedia.org/wiki/Methane> - Wikipedia  
 Methane (US /ˈmeɪθən/ or UK /ˈmiːθən/) is a chemical compound with the chemical formula CH<sub>4</sub> (one atom of carbon and four atoms of hydrogen). It is the simplest alkane and the main component of natural gas.  
 History · Properties and bonding · Chemical reactions · Uses

**Methane Emissions | Climate Change | US EPA**  
<https://www.epa.gov/ch4.html> - United States Environmental Protection Agency  
 Methane (CH<sub>4</sub>) is the second most prevalent greenhouse gas emitted in the United States from human activities. In 2014, CH<sub>4</sub> accounted for about 10.6% of all...

**Methane: The other important greenhouse gas | Environmental ...**  
<https://www.edf.org/methane-other-important-greenhouse> - Environmental Defense Fund  
 Methane is the primary component of natural gas, a common fuel source. Why are we concerned about it? If methane is allowed to leak into the air before being used—from a leaky pipe, for instance—it absorbs the sun's heat, warming the atmosphere. For this reason, it's considered a greenhouse gas, like carbon dioxide.

**In the news**

**Scientists Seek a New Measure for Methane**  
 Scientific American - 2 days ago  
 Methane is a powerful greenhouse gas, and the way scientists account for its climate impact ...

**Why Loving Our Neighbor Means Cutting Methane Pollution**  
 Sojourners - 2 days ago

**Oregano may help save the planet by reducing methane emissions from cow farts ... Yeah, really**  
 NaturalNews.com - 2 days ago

**More news for methane**

**Chemical of the Week -- Methane**  
[schun.chem.wisc.edu/~methane-methane.html](http://schun.chem.wisc.edu/~methane-methane.html) - University of Wisconsin-Madison  
 METHANE. Methane is a colorless, odorless gas with a wide distribution in nature. It is the principal component of natural gas, a mixture containing about 75% ...

**Methane: Good Gas, Bad Gas - Pictures, More From National ...**

Windows Taskbar: 7m Cortana, Ask me anything