



# ARB-OEHHA

## AB 1900 Activities and Recommendations to the CPUC

“Challenges to Procuring Biomethane in California”  
California Energy Commission Workshop  
May 31, 2013

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# Overview

- AB 1900
- ARB-OEHHA Process
- Constituents in Biogas
- Exposure Scenarios and Constituents of Concern
- Recommended Health Protective Levels
- Recommended Risk Management Approach
  - Monitoring, Reporting, Recordkeeping
- Next Steps

# AB 1900

- Requires CPUC to adopt standards by Dec 31, 2013 for biomethane injected into the common carrier pipeline that:
  - (1) protect public health
  - (2) ensure pipeline integrity and safety
- ARB to propose health based standards for constituents of concern in biomethane by May 15, 2013
  - ARB proposed health-based standards as required on May 15
  - ARB also provided recommendations on monitoring, testing, reporting, and recordkeeping requirements
  - Recommendations on ARB's website at: <http://www.arb.ca.gov/energy/biogas/biogas.htm>



# AB 1900

## Breakdown of ARB-OEHHA Tasks

- Compile list of constituents of concern in biogas (OEHHA)
- Determine health protective levels for constituents (OEHHA)
- Identify realistic exposure scenarios (ARB)
- Determine appropriate concentrations of constituents (ARB)
- Identify reasonable monitoring, testing, reporting, and recordkeeping requirements (ARB)
- Due May 15, 2013, with updates at least every five years



# Focus

- Biogas generated from larger sources with greatest potential for injection into the pipeline
  - Landfills, dairies, and POTW's (sewage treatment)
- Analyzed available data from both raw biogas and biomethane (upgraded biogas)
- Primary focus on directly emitted emissions
- Can address additional sources of biogas in AB 1900-mandated updates



## List of Constituents

- Identified approximately 270 chemicals and chemical groups in biogas
  - All are at trace levels—total Non-Methane Organic Carbon (NMOC) ~ 0.1% of gas
- Many of these are likely biologic or chemical degradation products of biological materials
- Primary sources of data: Gas Technology Institute, LA County and Orange County Sanitation Districts, U.K. Landfill Study, and U.S. EPA

# Identification of Health Values

- OEHHA used four main sources of toxicity data and risk values for risk evaluation:
  - OEHHA Reference Exposure Levels (RELs) for non-carcinogens, and Cancer Slope Factors for carcinogens
  - U.S. EPA Reference Concentrations and Cancer Slope Factors
  - ATSDR Minimal Risk Levels (MRLs)
  - Worker protection values from OSHA, NIOSH, or ACGIH
- Developed several screening values based on surrogate chemicals
- Identified risk-screening values for ~180 constituents, and defined surrogate screening values for ~25 additional chemicals and groups



# Exposure Scenarios Evaluated

- **Four Exposure Scenarios**
  - Two Residential
    - Leak in a home
    - Stovetop pre-ignition phase
  - Two Worker
    - Losses at a biogas production facility
    - Utility worker service calls
- **Four Gas Streams**
  - Natural Gas, POTWs, Landfills, Dairy
- **Conservative Assumptions**
  - Assumed 100% biogas/biomethane in the pipeline
  - Used highest measured concentrations for constituents



## Constituents of Concern

- CoCs were identified based on these risk-thresholds:
  - Residential: A noncancer hazard quotient (HQ) greater than 0.01 or 1 in a million for cancer risks
  - Worker: 0.3 for HQs and 30 in a million for cancer risks

# List of Constituents of Concern in Biogas/Biomethane

- Arsenic\*
- Vinyl Chloride\*
- p-Dichlorobenzene\*
- N-Nitroso-di-n-propylamine\*
- Ethylbenzene\*
- Hydrogen sulfide
- Antimony
- Alkyl thiols (mercaptans)
- Methacrolein
- Toluene
- Copper
- Lead

\* Denotes the chemical is a carcinogen, constituents without \* included due to chronic HQ

# Biogas Source Specific Constituents of Concern

Constituent	Landfill	POTW	Dairy
Antimony	X		
Arsenic	X		
Copper	X		
p-Dichlorobenzene	X	X	
Ethylbenzene	X	X	X
Hydrogen Sulfide	X	X	X
Lead	X		
Methacrolein	X		
n-Nitroso-di-n-propylamine	X		X
Mercaptans (alkyl thiols)	X	X	X
Toluene	X	X	X
Vinyl Chloride	X	X	

# OEHHA Recommended Health Protective Levels for Constituents of Concern

Constituent	OEHHA Health Protective Levels (mg/m <sup>3</sup> )	OEHHA Health Protective Levels (ppm)
Vinyl Chloride*	0.84	0.33
Dichlorobenzenes (as p-Dichlorobenzene)*	5.7	0.95
n-Nitroso-di-n-propylamine*	0.033	0.0062
Ethylbenzene*	26	6.0
Arsenic*	0.019	0.0062
Hydrogen Sulfide**	30	22
Antimony**	0.60	0.12
Methacrolein**	1.10	0.38
Toluene**	900	240
Alkyl thiols (mercaptans)**	N/A	12
Copper**	0.060	0.023
Lead**	0.075	0.0089

Residential risk at one chance per million or Chronic HQ at 0.1

\*Potential Cancer risk

\*\*Chronic Non-cancer risk

The non-cancer health protective levels were constrained by the chronic HI



# Risk Management Recommendation

- Relies on ARB and OEHHA's exposure modeling and risk analysis
- Similar to approach in ARB's Risk Management Guidelines for New and Modified Sources of Toxic Air Pollutants
  - Integrate risk levels into risk management decisions
  - Identify trigger levels and lower and upper action levels
  - Consider cancer and non-cancer risks
  - Ensure potential health risks are avoided

# Recommended Cancer and Non-cancer Risk Levels and Actions

Risk Management Approach	Potential Cancer Risk (chances/10 <sup>6</sup> )	Non-cancer total hazard index (HI)	Action/Monitoring Frequency
Below Trigger Level	<1 <sup>a</sup>	<0.1 <sup>a</sup>	Annual Testing
Trigger Level (OEHHA Health Protective Level)	≥1 <sup>a</sup>	≥0.1 <sup>a</sup>	Quarterly Testing
Lower Action Level (LAL)	≥10 <sup>b</sup>	≥1 <sup>b</sup>	Quarterly Testing, Shut-off if 3 <sup>rd</sup> test above LAL <sup>c</sup>
Upper Action Level	≥25 <sup>b</sup>	≥5 <sup>b</sup>	Immediate Shut-off

a For any single constituent. Approach modified HI from 1993 ARB Guidance from 0.2 to 0.1.

b Sum of all constituents of concern exceeding trigger level. Approach modified upper action level from 1993 ARB Guidance from 100 chances/million and HI of 10, to 25 chances/ million and HI of 5.

c Within a 12 month period.



## Available Data Indicate Biomethane Can Be Safely Injected into the Pipeline

- Most all constituents of concern found to be below the trigger level
- All below the lower action level
- Injection of biomethane does not present additional health risk as compared to natural gas

# Monitoring Recommendation

- Monitor for constituents based on sources of biogas
  - 12 for landfill, 6 for POTW's, 5 for dairy
  - In general-annual monitoring for any CoC that is below trigger level, quarterly for any CoC above trigger level\*

\* H<sub>2</sub>S to be monitored continuously if of concern

Constituent	Landfill	POTW	Dairy
Antimony	X		
Arsenic	X		
Copper	X		
p-Dichlorobenzene	X	X	
Ethylbenzene	X	X	X
Hydrogen Sulfide	X	X	X
Lead	X		
Methacrolein	X		
n-Nitroso-di-n-propylamine	X		X
Mercaptans (alkyl thiols)	X	X	X
Toluene	X	X	X
Vinyl Chloride	X	X	



# Recommendation for Pre-injection Start-up Testing

- Conduct tests for the constituents of concern for biogas source
- Two pre-injection tests over 2-4 weeks
- Utility and biogas producer agree on an approach to monitor performance of biogas treatment system
  - Natural gas tariffs may be good surrogate for demonstrating biogas treatment system is functioning properly
- If all constituents of concern for that biogas source below LAL then can inject into pipeline



# Periodic Testing of Constituents of Concern

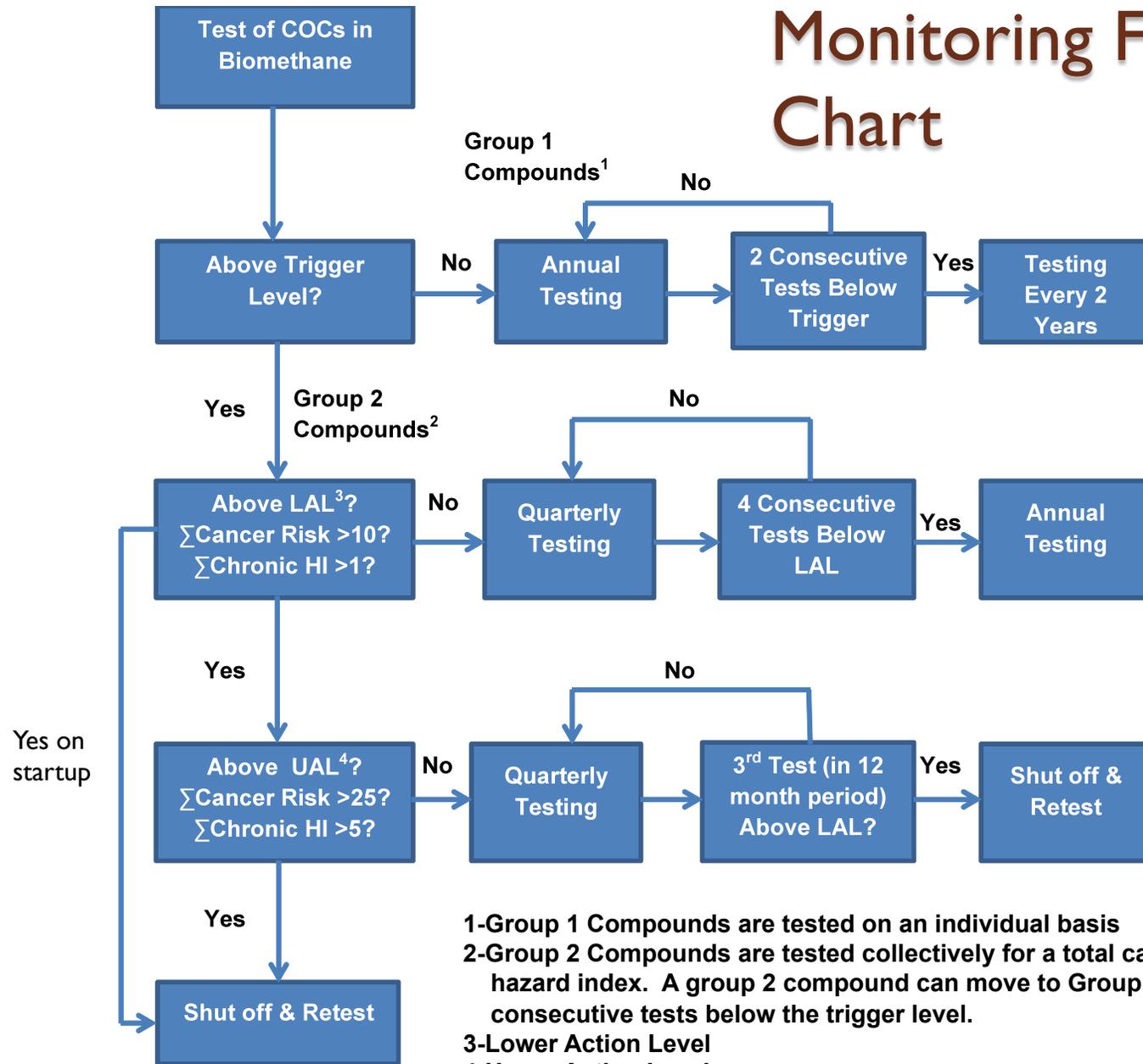
- Trigger level is applied to an individual constituent
- For individual CoC not detected or below the trigger level during pre-injection start-up
  - Require annual monitoring
  - After two consecutive annual tests below the trigger level, monitoring can transition to every other year.



# Periodic Testing of Constituents of Concern (cont)

- For CoC above the trigger level require quarterly monitoring
  - For an individual CoC
    - If 4 quarterly tests in 12 month period demonstrate CoC below trigger level, then constituent can go to annual testing
  - For group of CoC being monitored
    - LAL and UAL applied to combined risk for all CoC monitored
    - Shut-off if risk exceeds UAL, or LAL 3 times in 12 months
    - If 4 consecutive tests demonstrate risk below LAL, then CoC can go to annual testing
    - ARB to provide web-based tool to calculate total risks based on measured concentrations of CoC

# Monitoring Flow Chart





# Recommendations for Recordkeeping and Reporting

- Retain records of test results for 3 years
- Provide annual report to CPUC (and CPUC to provide to ARB and OEHHA)
  - All test data
  - Annual biomethane production rate
  - Monitoring parameters to ensure cleanup system operating effectively
  - Any shutdown event, reason and remedy
- If utility is testing entity, report to biomethane producer
  - Test results within 2 weeks, 24 hours for shutoff levels.
- If biomethane producer is testing entity, report to utility same information



## Next Steps

- Provide technical support to CPUC during their regulatory process
  - Integrate risk management strategy with pipeline safety requirements
  - Integrate recordkeeping and reporting requirements with current practices used to ensure pipeline safety requirements
  - Identify process for adding new biogas stream, adding/removing constituents of concern
- Evaluate areas for further investigations at the next AB 1900-mandated update