
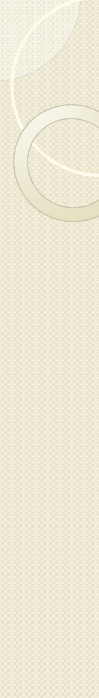


ARB-OEHHA Status Report on AB 1900 Efforts



Presentation to the CPUC
Initial Workshop for
Rulemaking 13-02-008
March 27, 2013

1



Overview

- AB 1900
- ARB-OEHHA Process
- Progress to Date
 - List of Constituents and Health Values
 - Risk Evaluation
 - Risk Evaluation "101"
 - Exposure Scenarios and Preliminary Findings
 - Identification of Constituents of Concern
 - Health Protective Levels for Constituents of Concern
- Next Steps

2

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
 - In consultation with OEHHA, DTSC, CalRecycle, and Cal-EPA
 - ARB is also to provide recommendations on monitoring, testing, reporting, and recordkeeping requirements
 - CPUC to give “due deference” to ARB recommendations

3

AB 1900

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

4

Process

- ARB-OEHHA develops recommended health based standards
 - Informal public process
 - Relying on existing sources of data
- CPUC to adopt standards through their regulatory process
 - CPUC give due deference to ARB/OEHHA recommendations
- Anticipate two public workshops under the CPUC process (includes today's meeting)

5

ARB-OEHHA Informal Public Process

- Established Website
 - www.arb.ca.gov/energy/biogas/biogas.htm
- List Serve
 - Sign up at http://www.arb.ca.gov/listserv/listserv_ind.php?listname=biogas
- Posted update on activities December 2012
 - Invite stakeholders to provide pertinent information
- Meet with interested parties upon request
- Coordinate with other State agencies

6

Focus

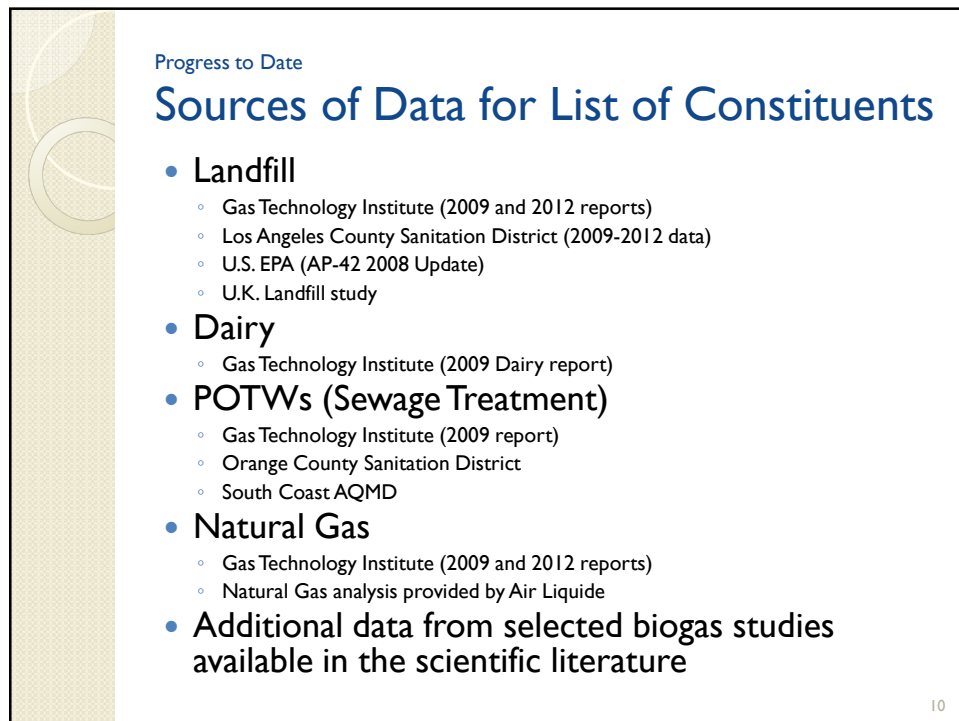
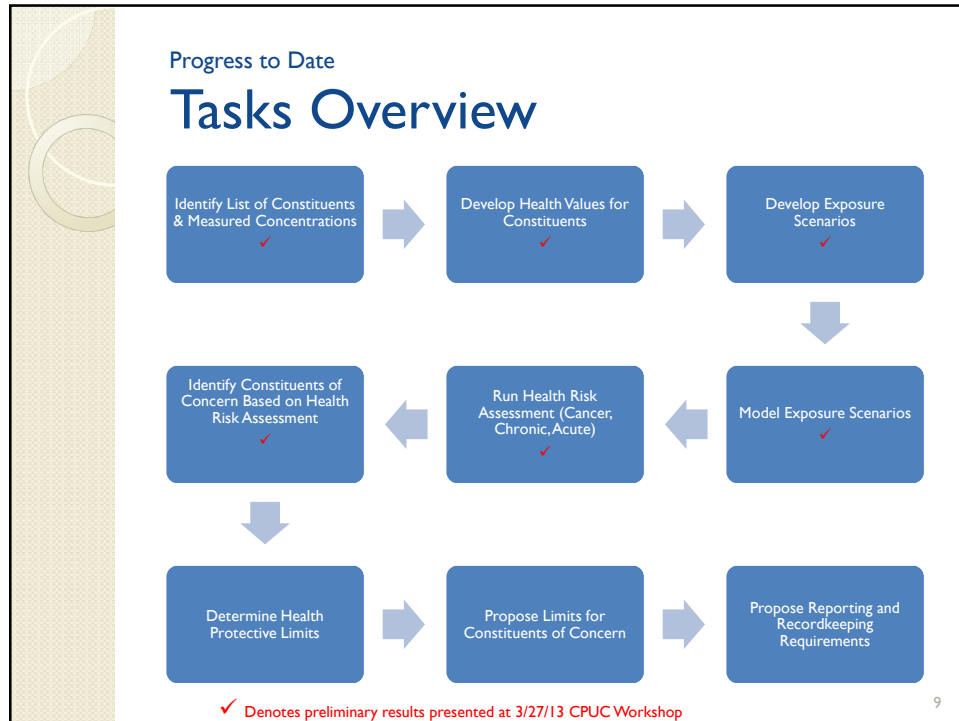
- Biogas generated from larger sources with greatest potential for injection into the pipeline
 - Landfills, dairies, and POTW's (sewage treatment)
- Analyzing available data from both raw biogas and biomethane (treated biogas)
 - Primary focus on directly emitted emissions, GTI studies primary source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

7

Progress to Date



8



Progress to Date

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
- Scientific Literature: 13 additional constituents

11

Progress to Date

Identification of Health Values

- 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
 - Most protective value used, adjustments and safety factors applied
- Developed several screening values based on surrogate chemicals
- Defined several toxicologically similar chemical groups and provided screening values

12

Progress to Date

Health Values - Results

- Identified risk-screening values for ~180 constituents
- Defined surrogate screening values for ~25 additional chemicals and groups

13

Progress to Date

Risk Evaluation

- **Health Risk Assessment (HRA) “101”**
 - Use emissions and mathematical model to estimate exposure concentrations
 - Use OEHHA recommended health values and exposure assumptions to estimate:
 - **Potential Cancer Risk**
 - Evaluation of the potential for a chemical to cause cancer, expressed as number of excess cancers in a population of a million over a specified exposure duration
 - **Acute and Chronic Hazard Quotient**
 - The ratio between the exposure concentration and Reference Exposure Level for an individual compound

14

Progress to Date

Exposure Scenarios Evaluated

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

15

Progress to Date

Residential Exposure Scenario - Leak

- **Residential Leak Scenario**
 - Leak is 0.7% of the average household consumption
 - 0.003 m³/hour
 - Below smell detection level
 - Assume 1-year exposure
- **Indoor Box Model**
 - Home Air Exchange Rate – 0.54
 - Home Size – 1,700 ft²
 - Kitchen Size - 475 ft²
- **Draft Dilution Ratios**
 - Draft 24 Hour Dilution Value – 3.31×10^{-5}
 - Draft 1 Hour Max Dilution Value – 1.27×10^{-4}

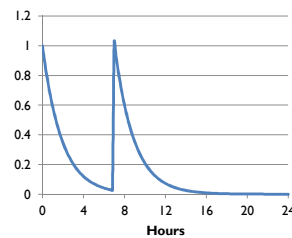


16

Progress to Date

Residential Exposure Scenario- Stovetop

- **Stovetop Pre-Ignition Phase**
 - 5 second pre-ignition phase
 - Two 2 hour cook periods per day (4 hours total)
 - Time decay analysis to determine emission factors
 - Assume 30-year exposure
- **Draft Dilution Ratios**
 - Draft 24 Hour Dilution Value – 5.21×10^{-6}
 - Draft 1 Hour Max Dilution Value – 4.81×10^{-5}
- **References**
 - EPA – Introduction to Indoor Air Modeling
 - Risk Assessment of Biogas Exposure in Kitchens (France/UK)



17

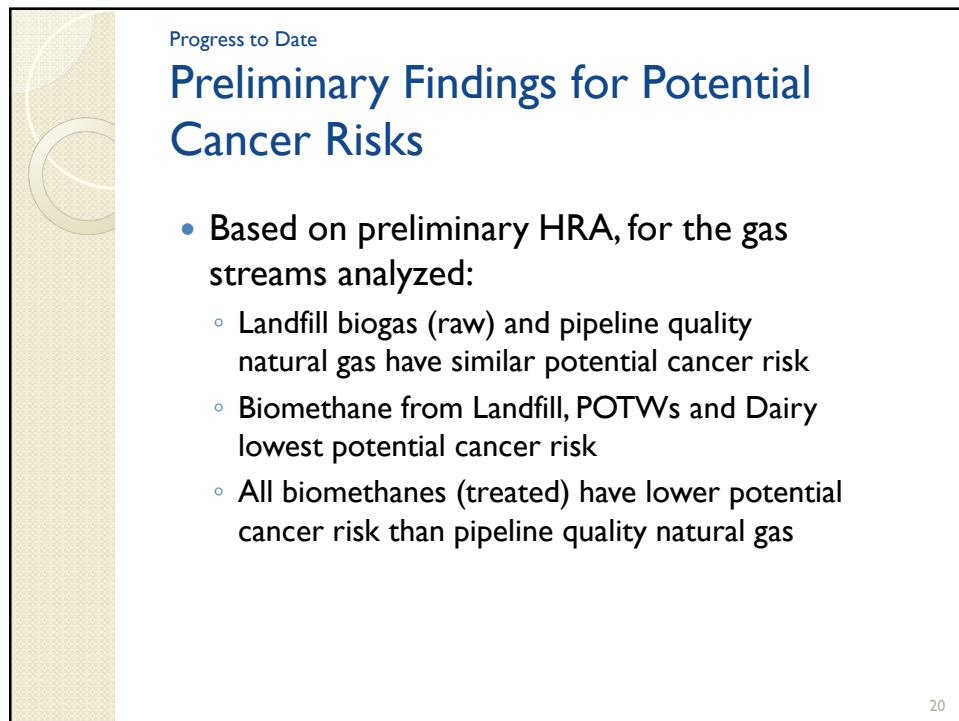
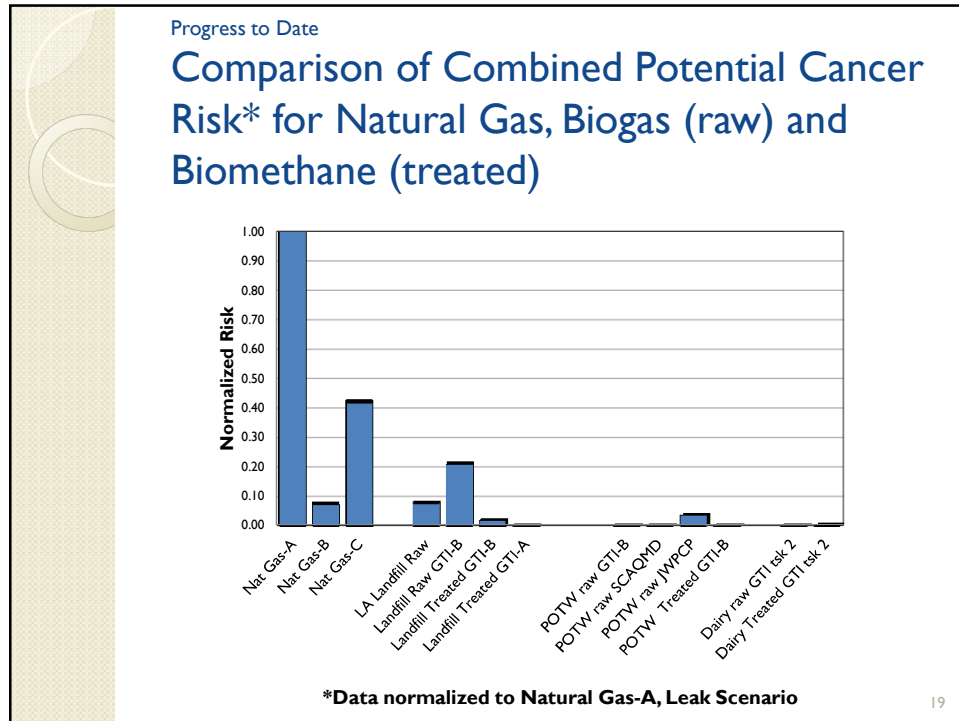
Progress to Date

Worker Exposure Scenario – Biogas Facility

- **Production Facility Leak Scenario**
 - Leak is 0.1% of the average biogas production
 - 0.89 m³/hour
 - Below the smell detection level
 - Assume 25-year exposure
- **Indoor Box Model**
 - Production Facility Air Exchange Rate – 1.4
 - Biogas Production Facility Size – 2,500 ft²
 - Biogas Production 750,000 ft³ per day
- **Draft Dilution Values**
 - Draft 24 Hour and 1 Hour Max Dilution Value – 4.46×10^{-4}



18



Acute & Chronic Preliminary Findings*

- **Chronic Hazard Quotient**
 - 83 Constituents with Chronic RELs
 - 10 constituents with Chronic Hazard Quotient greater than 0.01 in biogas/biomethane
 - 13 constituents with Chronic Hazard Quotient greater than 0.01 in natural gas
- **Acute Hazard Quotient**
 - 43 Constituents with Acute RELs
 - 3 constituents with Acute Hazard Quotient greater than 0.01 in biogas/biomethane
 - 1 constituent with Acute Hazard Quotient greater than 0.01 in natural gas

* For the gas streams analyzed

21

Progress to Date

Process for Identifying Constituents of Concern (CoCs)

- CoCs identified on a per-chemical basis
- Calculated non-cancer Hazard Quotients (HQs) and cancer risks for chemicals and groups
 - Used the highest modeled concentration
 - Used OEHHA methodology for calculations of exposure and risk
 - Focused on health effects of inhalation exposures

22

Progress to Date

Process for Identifying Constituents of Concern (cont)

- Criteria for identification of CoC
 - For chemicals with quantified risks, CoCs are those with values greater than specified risk-thresholds
 - May add individual chemical, if judged to be of concern based on further evaluation
- CoC risk-thresholds for chemicals with quantified risks:
 - Residential: 0.01 for HQs and 1 in a million for cancer risks
 - Worker: 0.3 for HQs and 30 in a million for cancer risks

23

Progress to Date

Preliminary Results for Constituents of Concern

- Identified ~ 15 CoCs
 - All have quantified risk values
 - Are continuing to evaluate the data to further refine the list
 - Some may drop out after comparison with NG
- 13 of the CoCs were present in biogas (raw)
- 6 of the CoCs were present in biomethane (treated)

24

Progress to Date

Preliminary List of Constituents of Concern in Biogas/Biomethane

- Arsenic*
- Benzene*
- Vinyl Chloride*
- p-Dichlorobenzene*
- N-Nitroso-di-n-propylamine*
- Ethylbenzene*
- Hydrogen sulfide
- Antimony
- Methylmercaptan
- Methacrolein
- Toluene
- i-Propyl-mercaptan
- Copper
- Lead
- Manganese

* Denotes the chemical is a carcinogen

25

Progress to Date

Identifying Health Protective Levels for Constituents of Concern

- Once the CoC list is finalized, health protective concentrations will be identified.
- OEHHA intends to :
 - Use exposure and risk formulae to calculate health protective concentrations for CoCs with quantified risk values
 - Use expert judgment to determine appropriate recommendations for any CoC judged to be a concern based on additional evaluation

26

Next Steps

- Finalize CoC list and identify health protective concentrations (OEHHA)
- Identify reasonable monitoring, testing, reporting, and recordkeeping requirements (ARB)
- Meet with interested stakeholders upon request
- Prepare recommendations for 2nd CPUC Workshop
- Report of findings to CPUC
 - ARB-OEHHA to provide technical resources to CPUC during rulemaking
- On-going efforts to improve health and technical data for AB-1900 mandated updates

27

Contact Information

Staff	Agency	Email	Phone
Dr. Andy Salmon Chief, Air Toxicology and Risk Assessment Section	OEHHA	Andy.Salmon@oehha.ca.gov	(510) 622-3191
Paul Milkey Staff Air Pollution Specialist	ARB	pmilkey@arb.ca.gov	(916) 327-2957

- Website
 - <http://www.arb.ca.gov/energy/biogas/biogas.htm>

28