Proposed Rule 1118.1
Non-Refinery Flares

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Southern California Alliance of Publicly Owned Treatment Works

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SCAP
SOUTHERN CALIFORNIA ALLIANCE OF PUBLICLY OWNED TREATMENT WORKS
BRINGING WATER FULL CIRCLE
REUSE WASTE TREATMENT

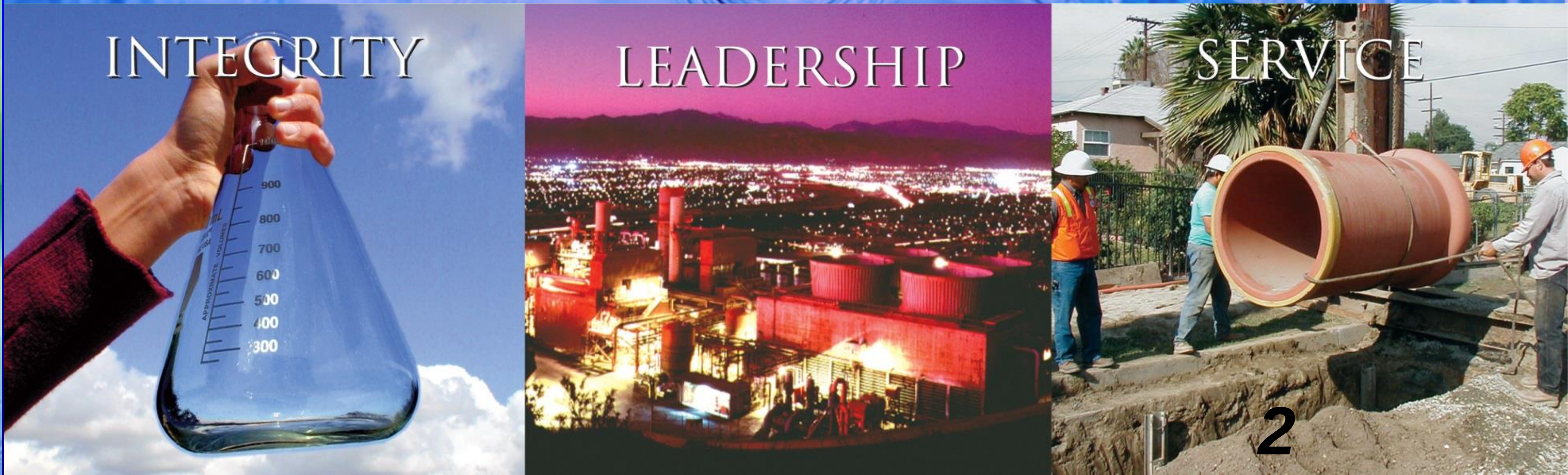
Mission Statement

MISSION

SANITATION DISTRICTS OF LOS ANGELES COUNTY

To protect public health and the environment through innovative and cost-effective wastewater and solid waste management and, in doing so, convert waste into resources such as recycled water, energy, and recycled materials.

SANITATION DISTRICTS OF LOS ANGELES COUNTY



Presentation Outline

- What is Biogas?
- Productive Uses of Biogas
- Economic Challenge - Low Cost of Power
- Types of Biogas Flares
- Low NOx Emission vs Standard Flare
- Hypothetical Case Study
- Cost Effectiveness
- Observations
- Recommendations

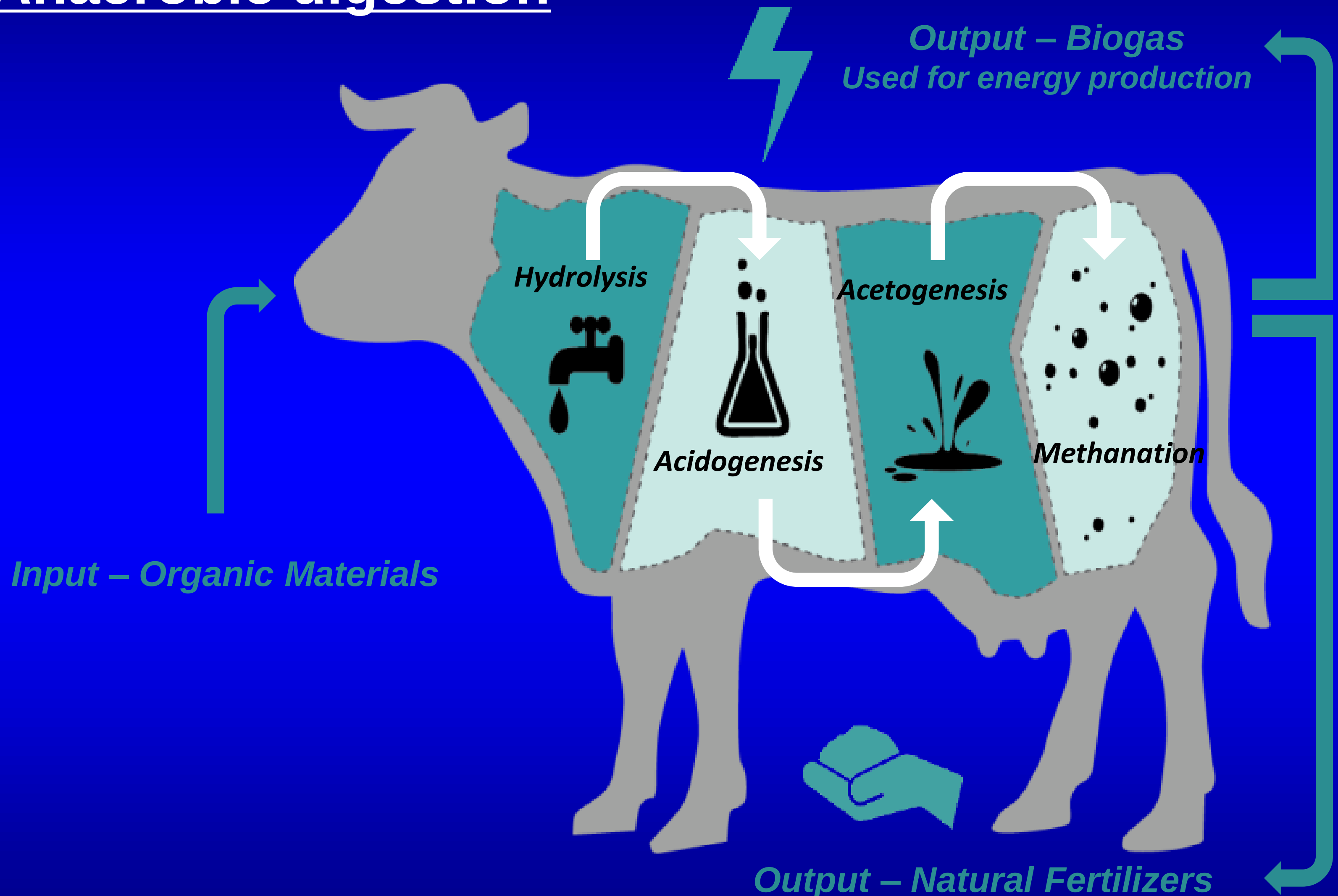
What is Biogas?

- Wastewater Treatment
  - Wastewater treatment plants employ anaerobic digesters to break down sewage sludge and eliminate pathogens in wastewater
- Municipal Solid Waste Landfill
  - Landfills contain garbage and serve to prevent contamination between the waste and the surrounding environment. Within landfills anaerobic bacteria decompose organic waste to produce biogas

Wastewater Treatment Plants and Landfills provide an essential public service

What is Biogas?

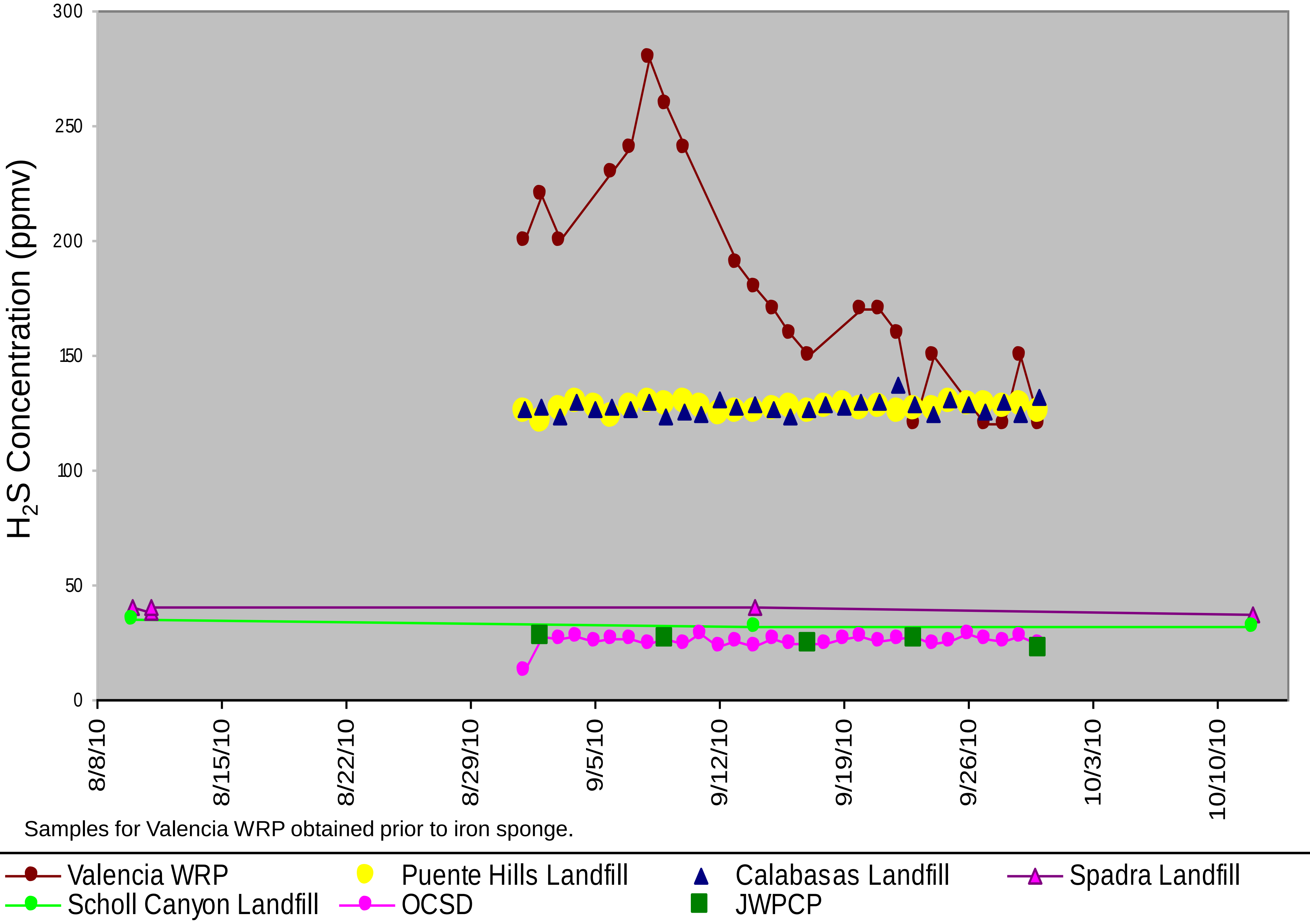
Anaerobic digestion



What is Biogas?
Differences Between Digester Gas and Landfill Gas

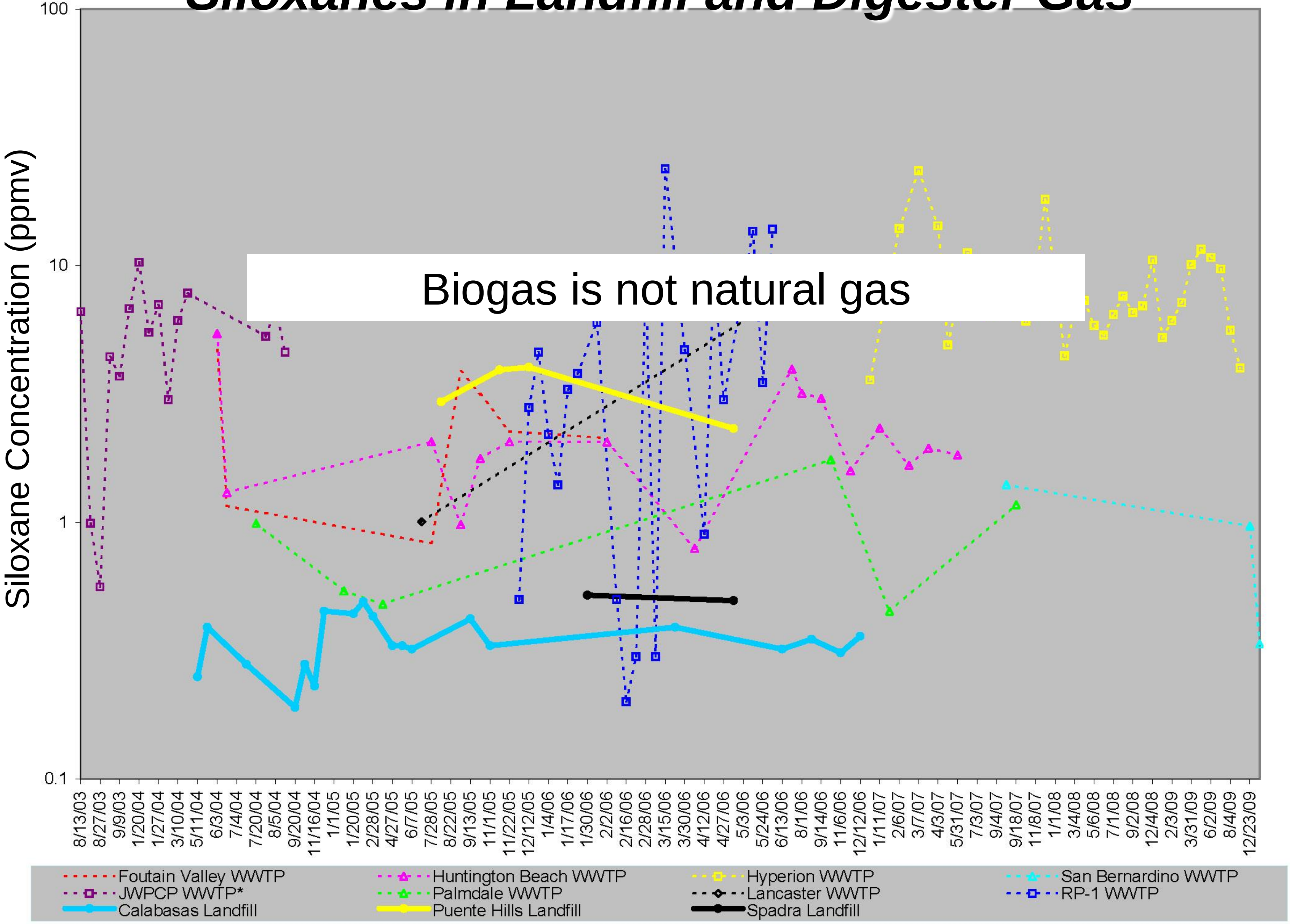
	Digester Gas	Landfill Gas
Methane %	55-65	10-60
Leakage	Enclosed system	Lots of effort to control
Siloxanes	Can vary daily or hourly	Steady over months or years
Oxygen and nitrogen	Trace levels	Can be % levels
Trace hydrocarbons	Lower than lfg	ppb levels
Sulfur content	10-200 ppm	10-2000 ppm
Time to digest	Weeks	Decades

Hydrogen Sulfide in Landfill and Digester Gas



Samples for Valencia WRP obtained prior to iron sponge.

Siloxanes in Landfill and Digester Gas



* - JWPCP WWTP samples were obtained after chilling to 60ºF.

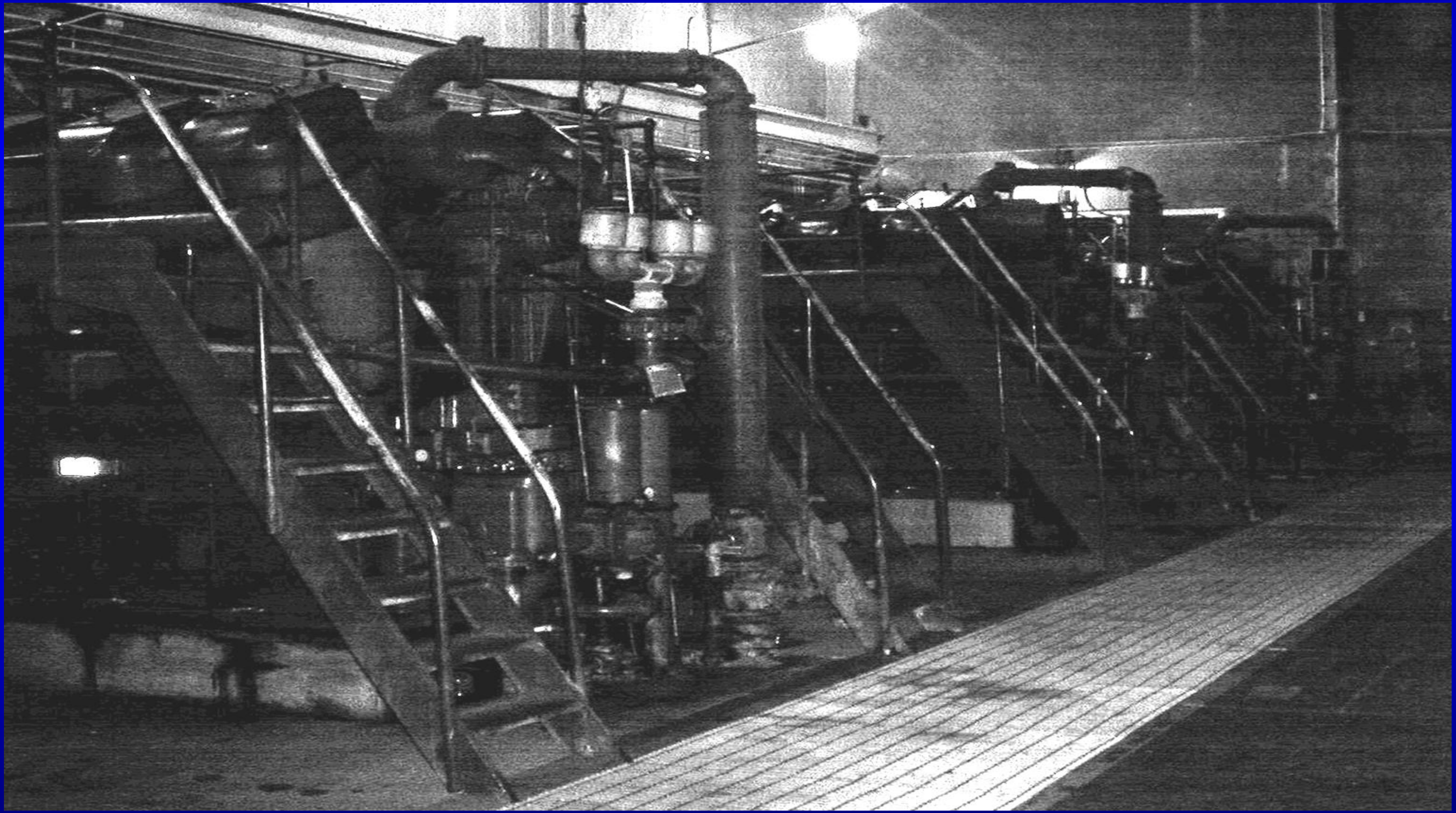
Productive Uses of Biogas

- Landfills and Wastewater Treatment Plants have pioneered productive uses of biogas

- Productive Uses
  - Engines
  - Boilers
  - Fuel Cells
  - Turbines / Microturbines
  - Pipeline Injection / Vehicle Fuel

- Example LACSD Projects

Early History: IC ENGINES 1938



The 1970's: Birth of the Landfill Gas-to-Energy Industry

The 1980's: Commercialization of the Industry

- Convergence of technologies and high power prices
- Developed 3 LFGTE Facilities
  - Puente Hills 50 MW
  - Palos Verdes 11 MW
  - Spadra 10 MW

The 2000's: Renewed Development

- Higher power prices
- New technologies
- Deregulated electricity market
- Districts developed three new power projects

Calabasas Landfill Microturbine Facility

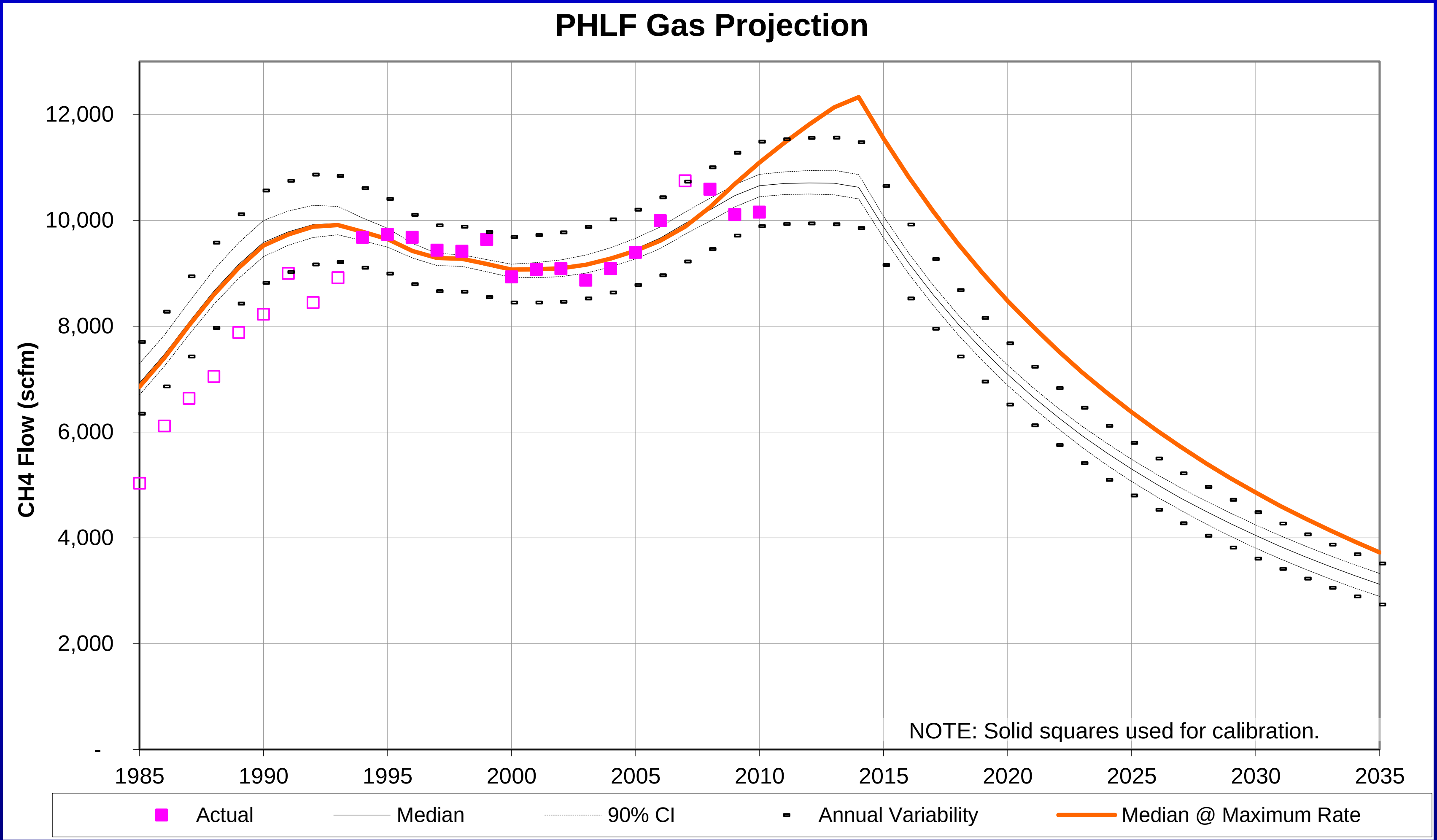
- Ten 30 kW Capstone microturbines
- Served on-site power needs from 2002-2008
- Low emissions technology demo

2010: Solar Mercury 50 Turbines at Calabasas
First Use on Biogas in California

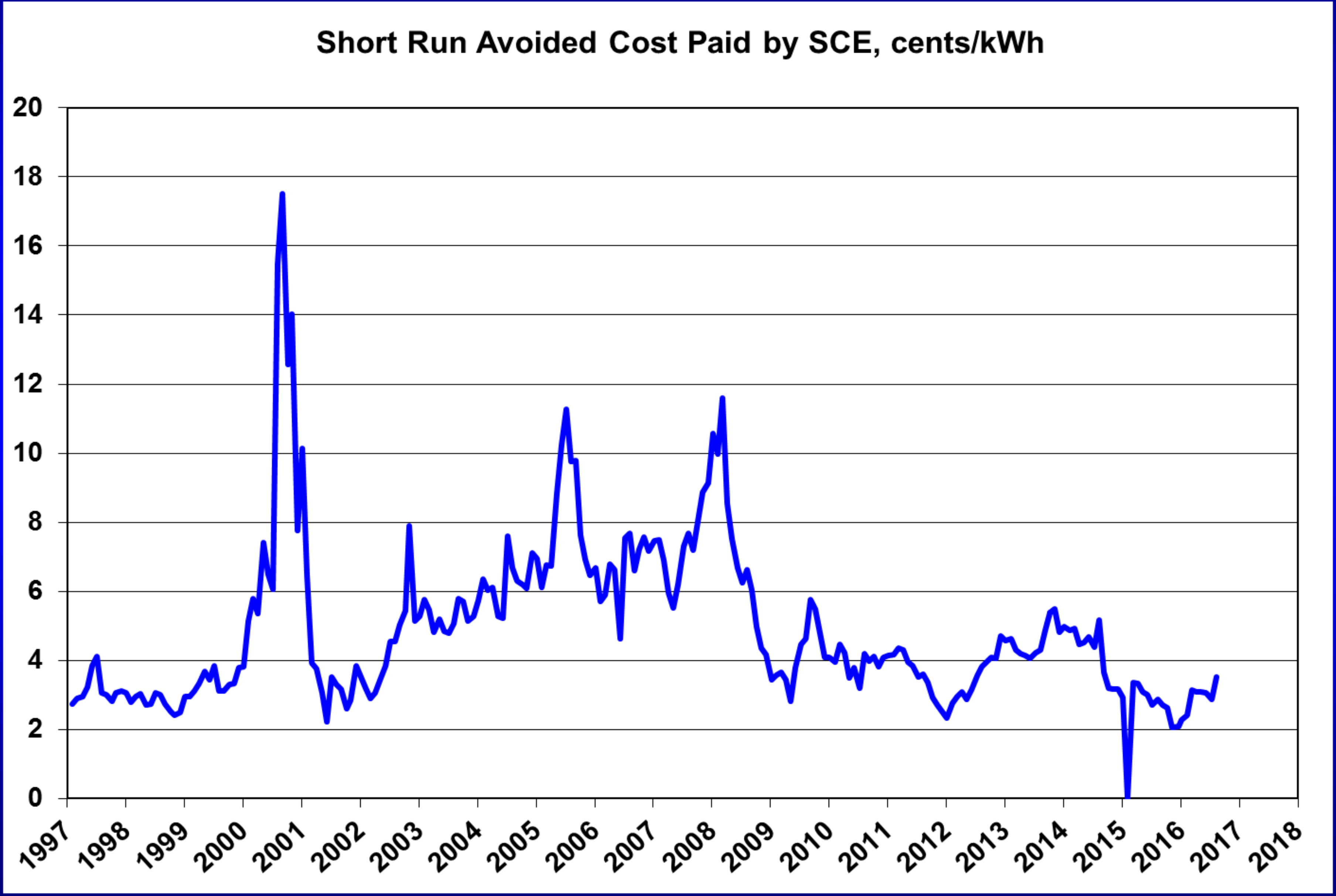
2014: Challenges

- Less landfill gas available
- Tighter emission regulations (higher cost of compliance)
- Lower power sales prices
- Reduced demand for renewable power

Puente Hills Gas Projection



Economic Challenge - Low Cost of Power



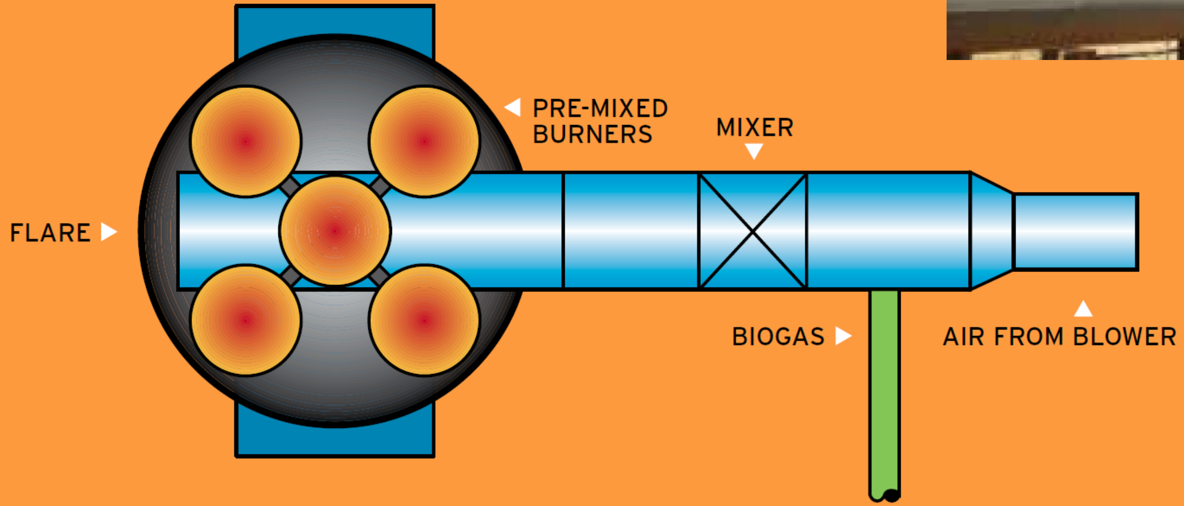
Types of Biogas Flares

- Prime (e.g., beneficial use not available)
- Standby (e.g., used when the beneficial use is unable to process biogas)
- Emergency
  - Not appropriate for must-manage biogas
- Landfills
  - Declining gas quality and quantity
  - Open vs closed
  - Regulated by Rule 1150.1
- Wastewater Treatment Plants
  - Variable gas generation based upon wastewater influent rates (e.g., day vs night, weekend vs. weekday)

Low Emission vs Standard Flare

- Low emissions achieved by premixing air/fuel
- Continuously monitor premixed gas to ensure proper operation (O2, CH4)
- Controlled by continuous gas monitor and variable speed combustion air fan
- Greater safety requirements to avoid pre-combustion
- Complex operation compared to standard flare requiring many more systems to be maintained
- More prone to shutdowns due to increased complexity
- More costly to operate and maintain

ZINK ZULE FLARE



Hypothetical Case Study

Replace 12 Wastewater Flares at the Joint Water Pollution Control Plant in Carson, CA

Hypothetical Case Study

- Replace existing flares with ZINK ZULE flares
- Cost for each 100–600 cfm flare: $250,000
- Conservative cost estimate, which excludes installation cost
- Most facilities would have higher costs
- Design must:
  - Manage all biogas in the event primary productive use fails
  - Allow for routine testing at low flows (i.e., avoid shutdowns of primary use)
  - Provide reliable management of biogas to avoid uncontrolled emissions

Project Cost-Effectiveness

Replace all 12 flares	Existing Flares	New BACT Flares
ACTUAL-throughput (scf/yr)	130,500,000	130,500,000
Lower Heating Value (BTU/scf)	640	640
NOx EF (lbs/MMBTU)	0.056	0.025
NOx Emissions (tpd)	0.0064	0.0029
Emission Reductions (tpd)	**0.0035**	
Equipment Cost*		$3,000,000
Annual Operating Costs	$36,000	**
Equipment Life (years)		20
Rate of Interest		4%
PVF		13.59
Present Value		$3,489,252
Cost-Effectiveness ($/ton of NOx Reduced)		**$134,766**

* - Equipment cost excludes blower and individual controls

** - BACT flare operating costs are actually >> than existing flares

Observations

- 2016 AQMP denotes CMB-03 cost-effectiveness < $20,000 per ton NOx
- Highest cost-effectiveness in the 2016 Ozone AQMP: CMB-01 $53,000 per ton NOx
- PR 1118.1 more costly than anticipated and inventory less than projected
- SCAP conducted a flare survey that confirms that most existing flares have an EF of about 0.06 lbs/MMBTU
- 56 wastewater flares converting to BACT will conservatively cost $14MM
- Wastewater inventory biased high due to LA City
- Emergency limit of 200 hours not feasible
- Proposed Rule 1118.1 concepts more stringent than Rule 1118

Recommendations

- Validate biogas flare inventory
- Determine a reasonable cost-effectiveness threshold prior to the development of rule language
- Rules can provide carrots rather than sticks
- Emergency flares provisions should not be included for must manage biogas
- Partner to eliminate technological, regulatory and economic barriers to the productive use of biogas

Questions?

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