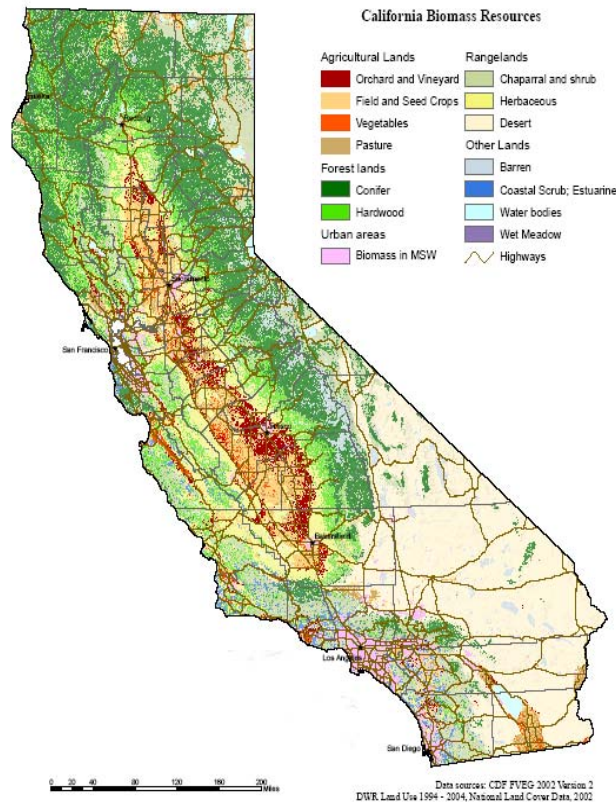


Sustainable Use of Biomass from Municipal Solid Waste

California Biomass Collaborative
May 13, 2009

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Director, Sustainability Program
California Integrated Waste Management Board

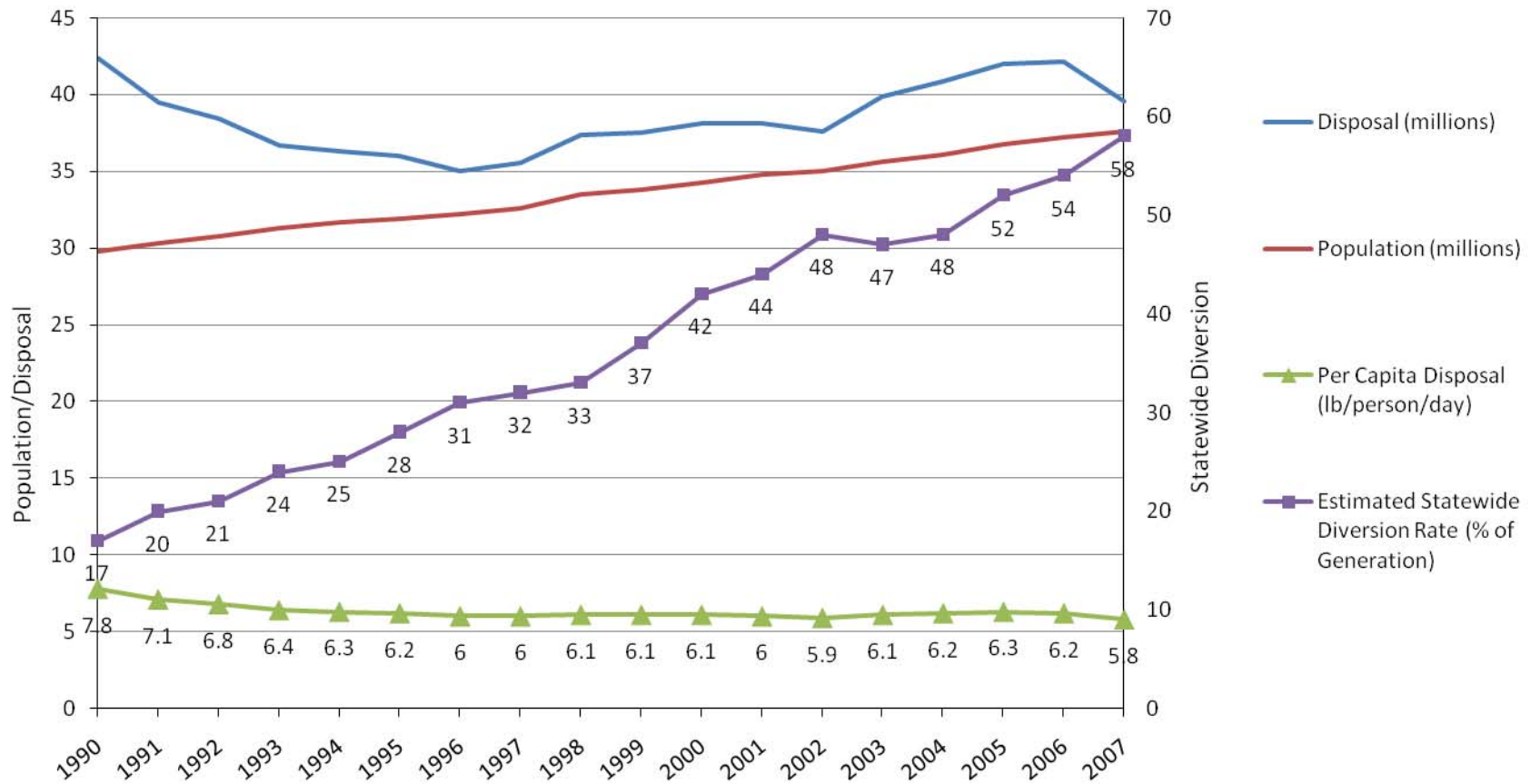
Biomass Resources in California



- Gross resources 80 million bone dry tons annually
- Main resources: ag, forestry, solid waste
 - Forestry in northern and central mountains
 - Agriculture in Central Valley
 - Waste in Los Angeles and San Francisco Bay Area

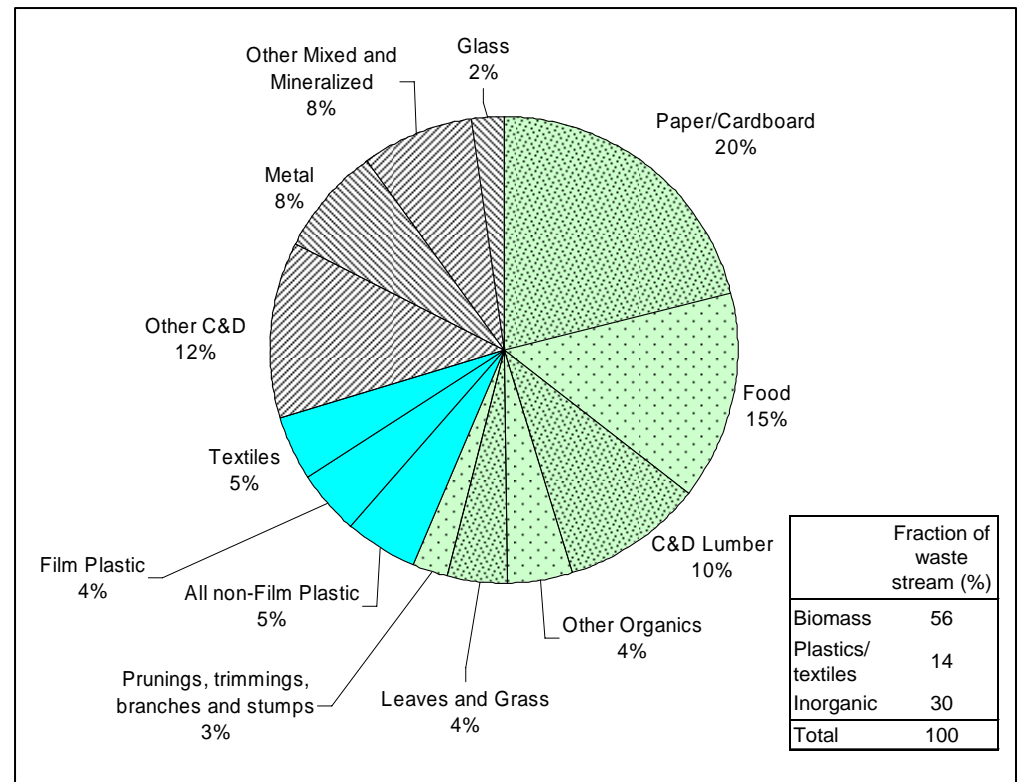
Source: California Biomass Collaborative

Disposal Vs Diversion



Waste Stream Characterization

- 40 Million tons disposed
- 70% Carbon-based organics
- 30% compostable organics
- 20% paper
- 15% food



CIWMB Organics Roadmap

- Strategic directive: 50% reduction of organics in waste stream by 2020
- Need additional capacity to process 15 million tons per year
- Plus capacity for ~3 million tons per year may be needed depending on ADC policy

Major Challenges

- Infrastructure Siting
- Statutory and Regulatory
- Funding/Incentives

Siting and Capacity Issues

- Siting facilities difficult
- No requirement in Siting Elements for processing capacity information
- NIMBY by local groups
- No direct CIWMB involvement at local level

Statutory and Regulatory Issues

- Statutory definitions re: gasification and transformation
- Inconsistencies and/or contradictory goals across regulatory agencies, inability to consider tradeoffs
- CIWMB regulations
 - full permit for accepting food waste
 - Anaerobic digestion

Cross-Agency/Media Issues

- Air Quality Regulations
 - South Coast AQMD
 - San Joaquin Valley APCD
 - Mojave Desert AQMD
 - Bay Area AQMD
- Water Quality Regulations
 - San Diego RWQCB Conditional Waiver
 - Draft General Order under development that can be used as statewide WDR template

Why Worry About Composting Emissions?

- Composting emits some VOCs
- Some VOCs react with NO_x and sunlight to create ground-level ozone
- Criteria pollutant under federal Clean Air Act due to human health impacts
- Local air districts must reduce criteria pollutants

Modesto Study Conclusions

- 70-80% of VOCs emitted during first 2 weeks.
- 70-85% of VOC emissions vent through ridgetop
- 15% food waste roughly doubled VOC emissions compared to greenwaste
- “Pseudo-biofilter” compost cap reduced VOC emissions up to 75% for first two weeks.

Water Quality Regulations

- Salinity concerns
- Proposals by regional Water Boards to regulate composting under different regional waivers
- Or in some cases might have to meet landfill-level permitting requirements under Title 27
- Draft General Order being developed by SWRCB that can be used as statewide template

CIWMB Efforts re: Water Quality

- Working with SWRCB staff on statewide waiver
- Compost Best Management Practices
- Caltrans Compost Specifications
- Demo project on erosion control on fire-ravaged lands

Funding/Incentives

- Landfilling and ADC less expensive alternative to composting, AD, etc.
 - Material handling costs much higher for composters than for landfills
 - Composters can't charge much more than landfills or risk losing materials
- Lack of financing for expanding capacity
- Increased regulatory/permitting costs

Current Composting/Biomass Infrastructure

- Composting and Chip & Grind Facilities
 - Approx. 200 facilities produce an estimated 5 million cubic yards of compost and mulch per year
- Biomass Facilities
 - About 5 million bone dry tons of biomass annually

Benefits of Compost Use

- Outlet for farming and food processing by-products
- Displaces ag burning
- Reduces water use and pumping
- Improves soil tilth, biology
- Foundation of organic ag production
- Supplants use of synthetic N fertilizers and pesticides with high embodied energy

Compost & Climate Change

- AB 32: reduce GHG 25% by 2020; plan adopted December 2008
- GHG emissions from organic materials management
 - Landfill methane capture
 - Composting can reduce methane emissions from landfills and N₂O emissions from ag
 - Anaerobic digestion

Conversion Technologies

- Non-combustion technologies that can use post-recycled and/or post-consumer solid waste for production of alternative fuels, energy, and industrial chemicals
 - Gasification
 - Pyrolysis
 - Anaerobic digestion
 - Fermentation

CT Major Categories

Biochemical Processes

Anaerobic Digestion

- Bacteria breaks down feedstock
- No oxygen

Fermentation

- Also anaerobic process
- Microbes used to produce ethanol

Technology	Primary Product	Secondary Product	Residue
Anaerobic Digestion	Biogas	Heat, Electricity, Fuels, Soil Amendment	Lignin, inorganics
Fermentation	Ethanol		Lignin, inorganics

Operating Facilities

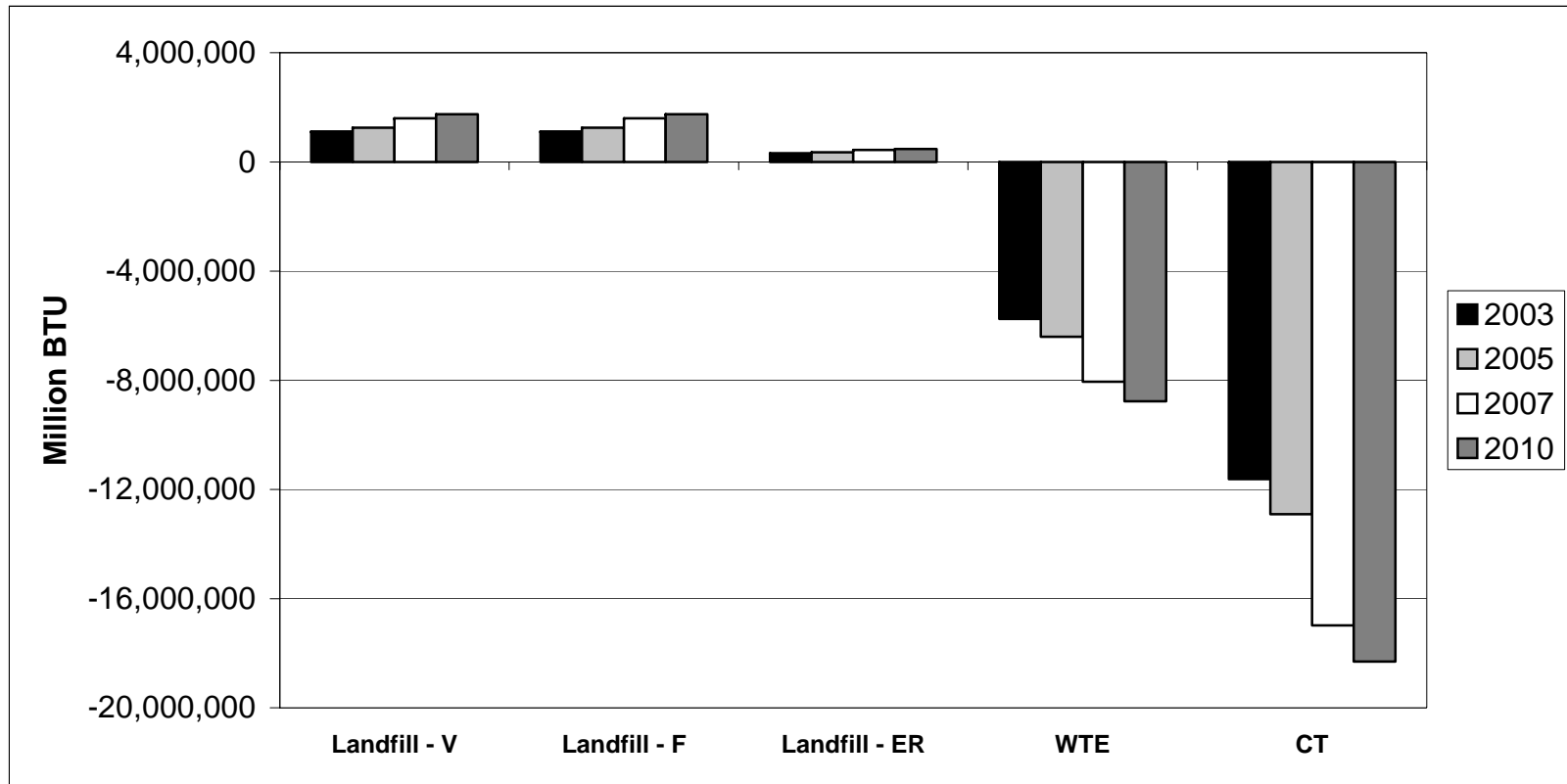
Biochemical

- Predominantly anaerobic digestion in Europe
- Installed capacity in 2000 = 1.1 million TPY
- Installed capacity in 2004 = 2.8 million TPY
- 250% increase

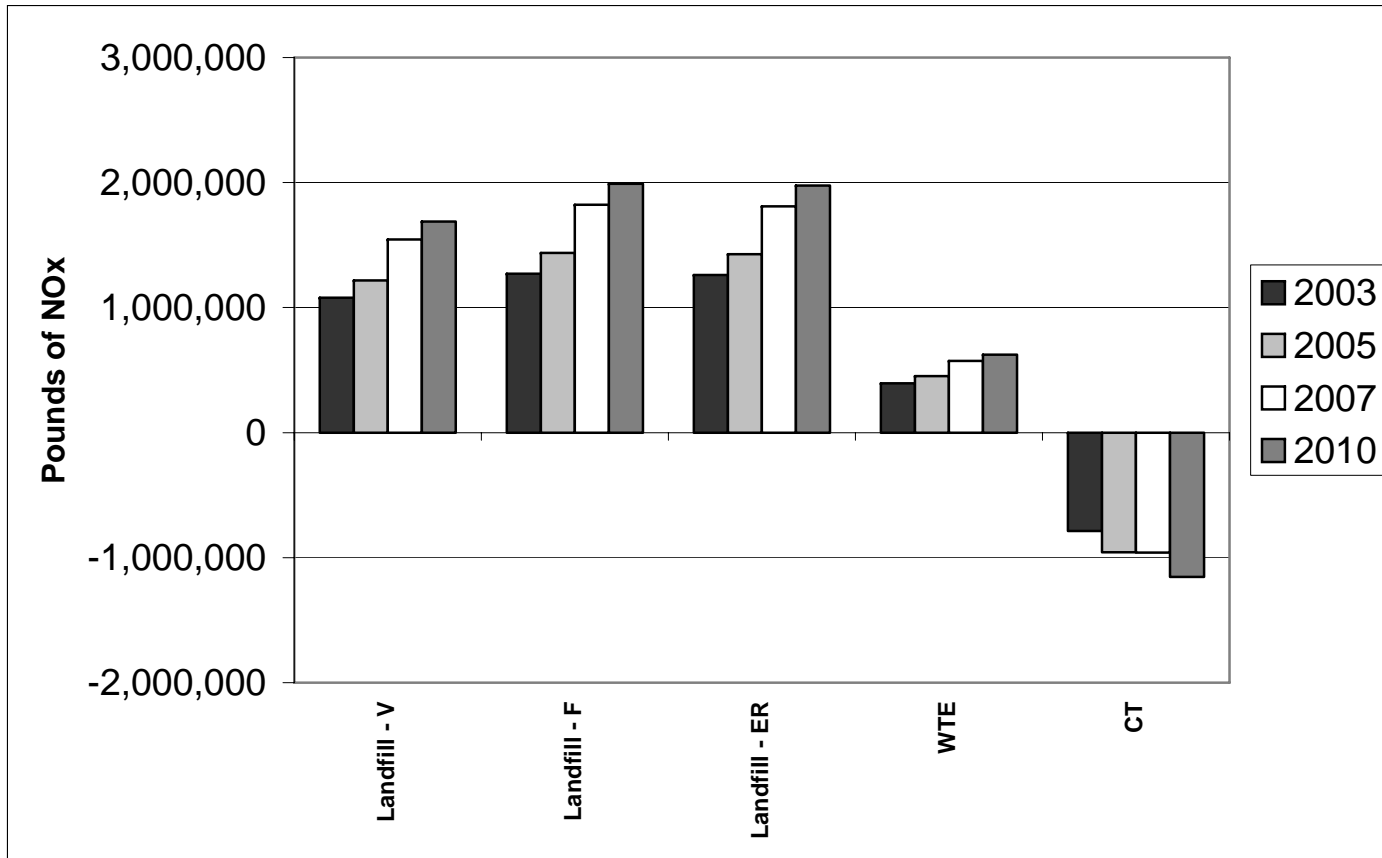
Thermal

- Gasification and Incineration in Japan

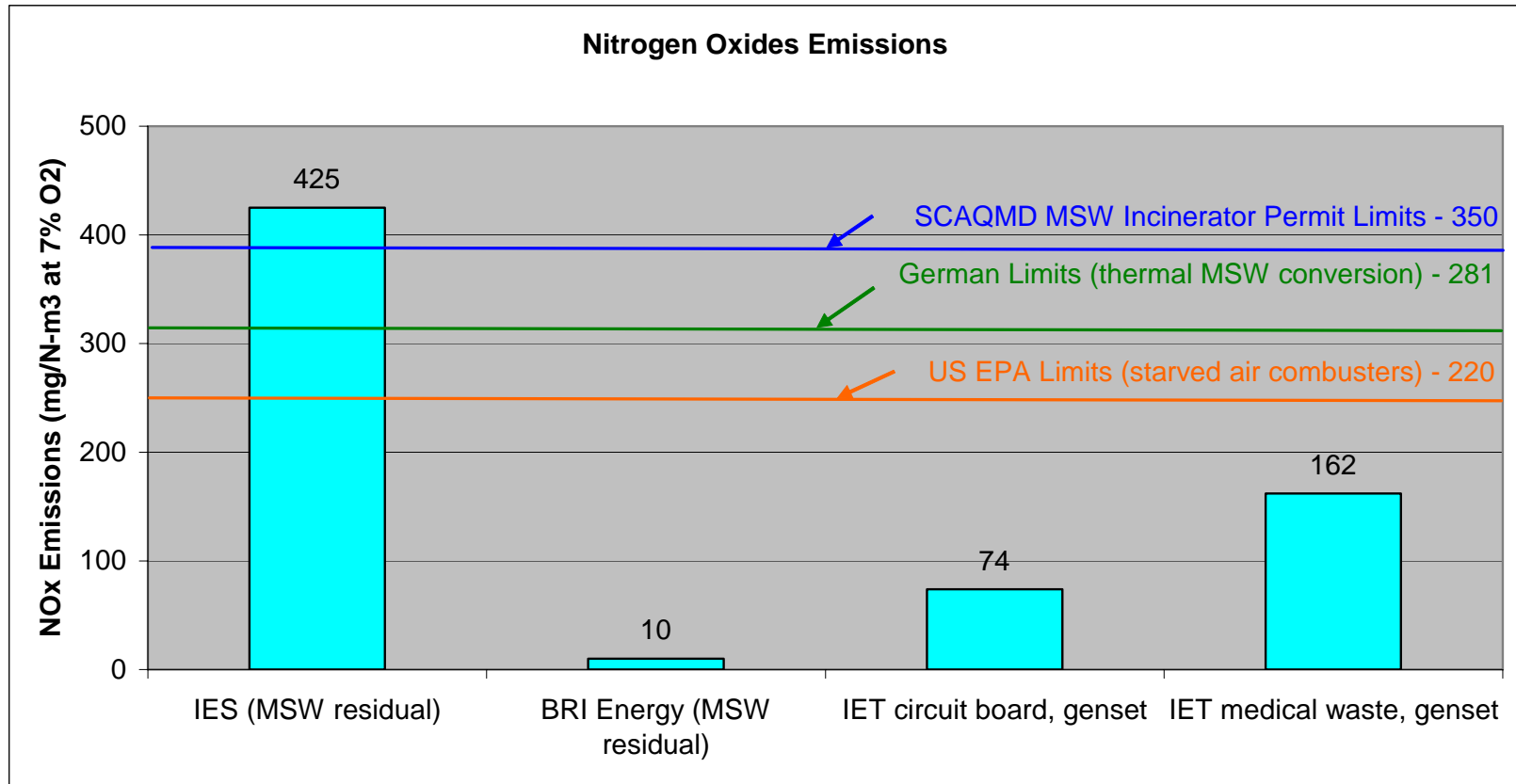
Annual Net Energy Consumption L.A. Basin



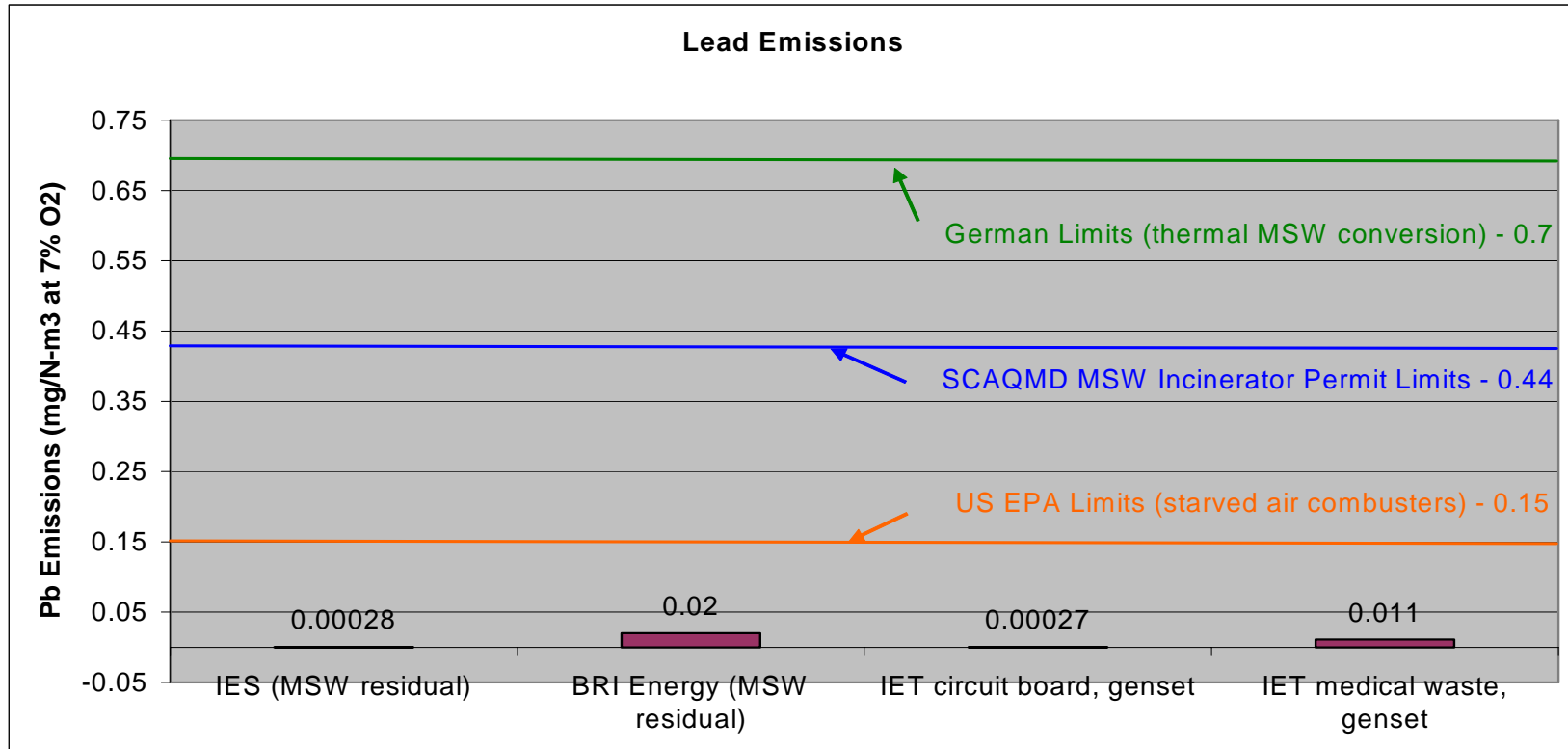
Annual Net NOx Emissions L.A Basin



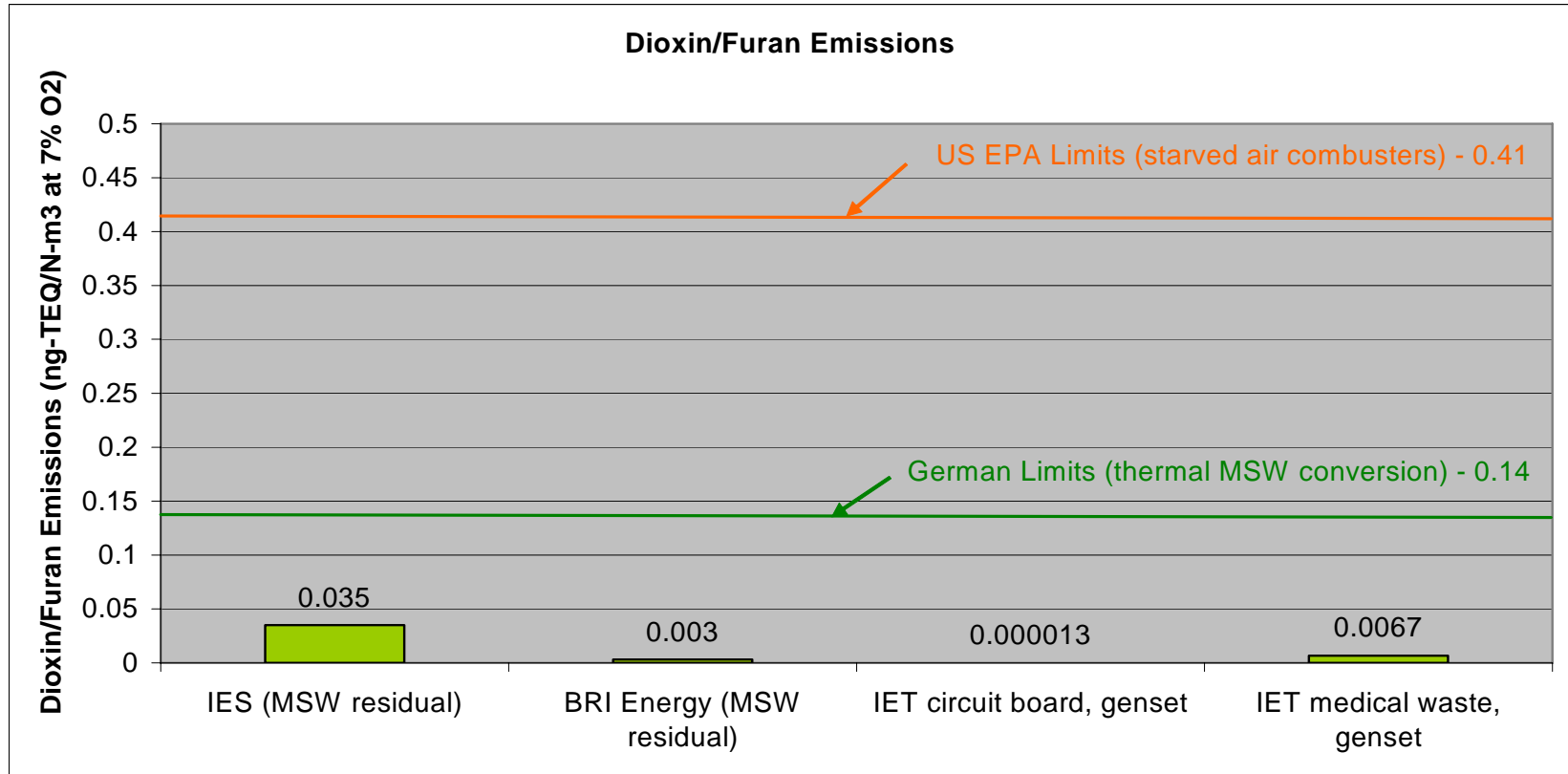
Emissions Results - NOx



Emission Results - Lead



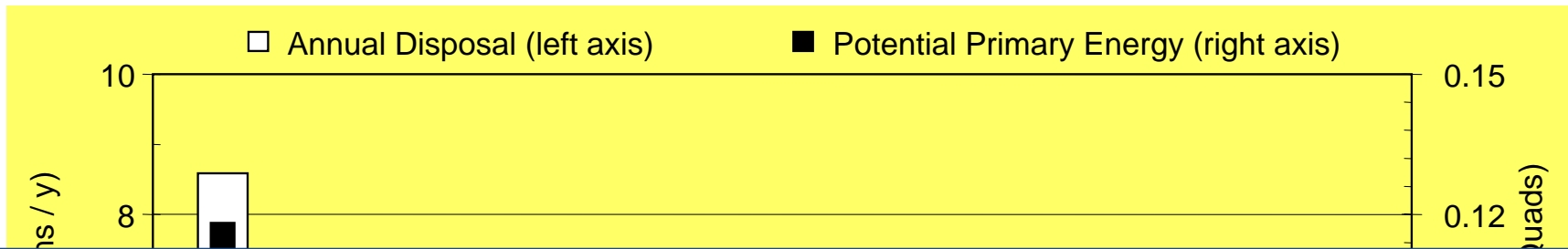
Emissions Results – Dioxins/Furans



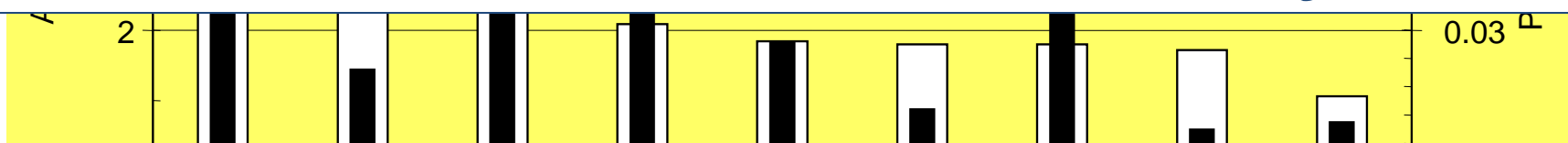
What Are Issues With CTs?

- Concerns about technologies
 - Incinerators in disguise?
 - CTs will harm existing recycling infrastructure or are less efficient than recycling
- Permitting Issues
 - Solid waste facilities vs. manufacturing facilities
- Cost
- NIMBY

Waste Distribution (Mass/Energy)



67 million barrels of crude oil annually



1750 MW Electricity

Source: Rob Williams, California Biomass Collaborative

Renewable Portfolio Standard

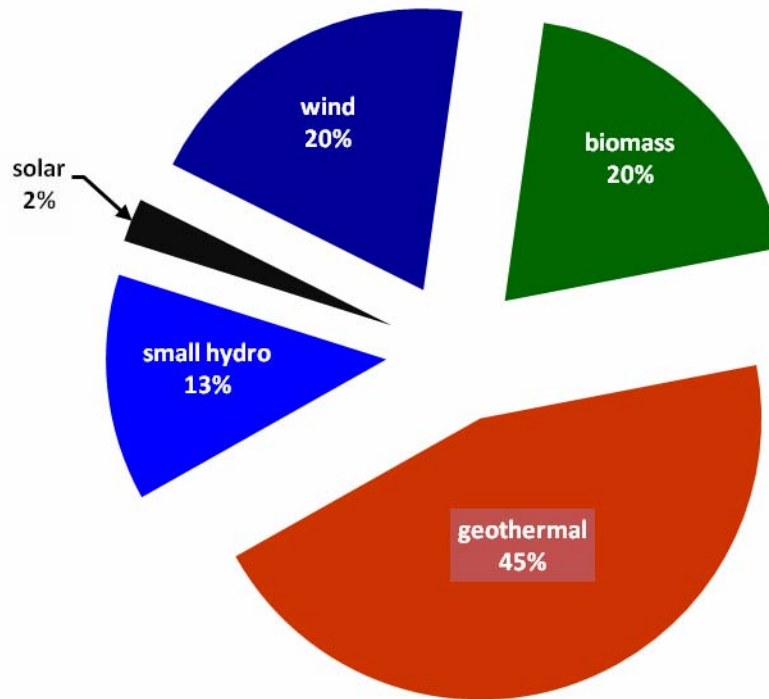
- 2002 - 20% renewable energy by 2017
- 2006 – 20% renewable energy by 2010
- Governor Executive Order - 33% by 2020
- 11.8% renewable energy -2007
- Governor Executive Order – S-06-06

Executive Order S-06-06

- Increase production and use of bioenergy, and biofuels from renewable resources
- In-state Production
 - 20 percent - 2010
 - 40 percent - 2020
 - 75 percent - 2050
- 20 percent renewable electricity from biomass

In-State Renewable Generation 2008

Renewable Energy Sources



Source: California Energy Commission

Low Carbon Fuel Standard

- Executive Order S-01-07
- LCFS as Early Action Measure for AB 32
- Reduce fuel carbon intensity – 10% by 2020
- Two pathways relative to organics
 - Landfill gas to energy/fuel
 - Anaerobic digestion

CEC AB 118 Transportation Fuels Investment Plan

- Co-fund 20 ethanol feedstock and project feasibility studies for new plants (\$3 million)
- Cost-share 2 new pilot plants using waste feedstocks (\$4 million)
- Cost-share 5 production plants using waste feedstocks (\$2 million)
- Co-fund development of 5 biomethane production plants (\$10 million)

AB 32 GHG Reduction Goals

- Increase Landfill Gas Capture – Early Action Measure
- Commercial Recycling
- Anaerobic Digestion

American Recovery and Reinvestment Act

- Loans/loan guarantees for renewable energy R&D
- Grants to LFG and WTE facilities
- Extends production tax credit for renewable energy production until 2014
- Allows new 30% investment tax credit (in lieu of PTC) for renewable energy facilities
- Provides 50% first year and 5-year accelerated depreciation
- Increases allocations of clean renewable energy bonds
- Modifies tax credit for carbon dioxide sequestration
- Allows new tax credit for qualifying advanced renewables

Selected CIWMB Activities

- Lifecycle/Economic Analysis of Organics
- Biofuels from Post-MRF Residuals Contract
- UCD Two-Stage Anaerobic Digestion Project
- Low Carbon Fuel Standard
- Programmatic EIR – Anaerobic Digestion
- L.A. CT projects
- AB 32 Measures
- VOC emissions studies (2)
- Infrastructure inventory and planning

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