

SANITATION DISTRICTS OF LOS ANGELES COUNTY





WHY BIOENERGY?

- Climate Change
- Air Quality
- Landfill reduction
- Renewable power
- Low carbon fuel
- Local energy supplies
- Community resilience

Climate Priorities

IPCC: We have 12 years left to reduce climate pollution or face catastrophic changes

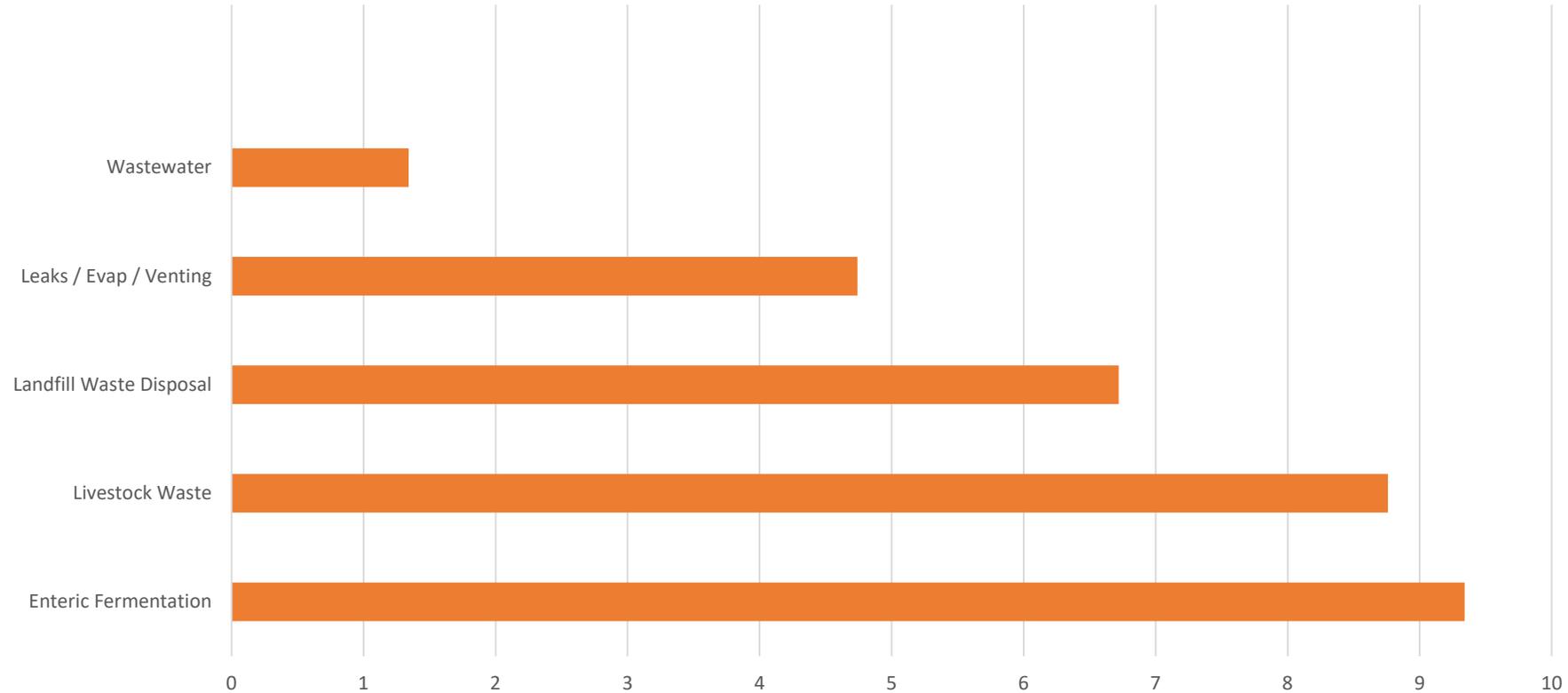
ARB: SLCP Reduction and carbon sequestration are the only way to immediately reverse climate change and its impacts

SLCP's are much more damaging than CO₂

Organic
Waste and
Methane

- Methane = 72x more damage to climate than CO₂
- Organic Waste = 4 of 5 biggest sources in CA

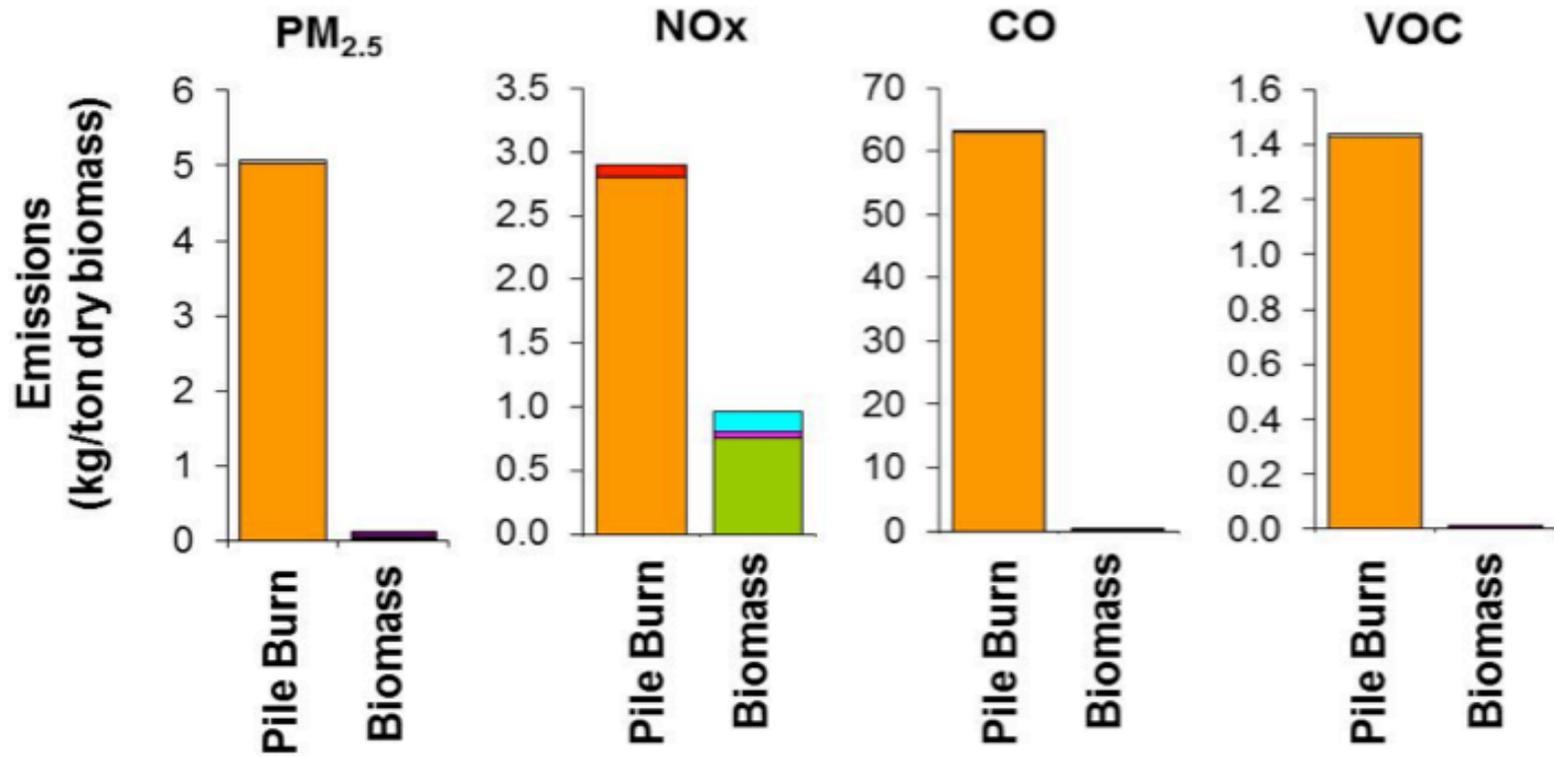
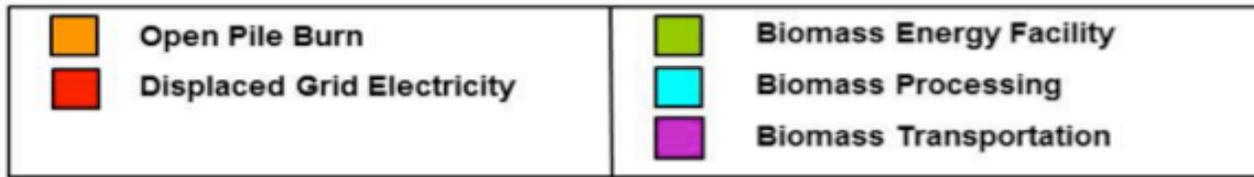
California's Top 5 Methane Sources



LifeCycle Carbon Intensity of Fuels (grams CO₂e / MJ)

Diesel	102
Gasoline	100
Corn ethanol	34-75
Natural Gas	68
Fuel Cell (non-renewable hydrogen)	39
Electric vehicles (CA power grid)	31
Biodiesel	9 to 50
Landfill Biogas	11 to 40
Biogas from forest waste	14
Wastewater Biogas (large facilities)	8 - 30
Biogas from Diverted Food and Green Waste	-15 to -31
Dairy Biogas	- 276





Biomass Reduces:

- PM_{2.5} and black carbon by 99%
- Methane and other VOC's by 95-99%
- NO_x by 40-70%.

Putting Food / Agricultural Waste to Work



- Distributed scale gasification
- Walnut shells used to produce heat and power needed for shelling, drying and packaging the nuts
- Meets the most stringent NOx standards in the U.S.
- Gasification probably destroys PFAS chemicals – need research on this

Importance of Biogas to Replace Diesel

- Diesel trucks = largest source of air pollution in San Joaquin Valley and South Coast Air Districts
- Diesel causes ½ of smog and toxic air contaminants in SJV
- Near-zero emission trucks can cut NOx and TAC's 90-95%



Need to Put Organic Waste to Use

- SB 1383 (Lara, 2016) requires:
 - ✓ 40% reduction in methane emissions and anthropogenic black carbon
 - ✓ 75% reduction in organic landfill waste by 2025
(15 million tons of diverted organic waste / year)

Draft regs - <https://www.calrecycle.ca.gov/Laws/Rulemaking/SLCP/>



Bioenergy + Compost or Biochar = Greatest Benefits

- OR Department of Environmental Quality – Bioenergy + compost provides 3.5 times greater GHG reductions than compost alone

<https://www.oregon.gov/deq/FilterDocs/FoodWasteStudyReport.pdf>



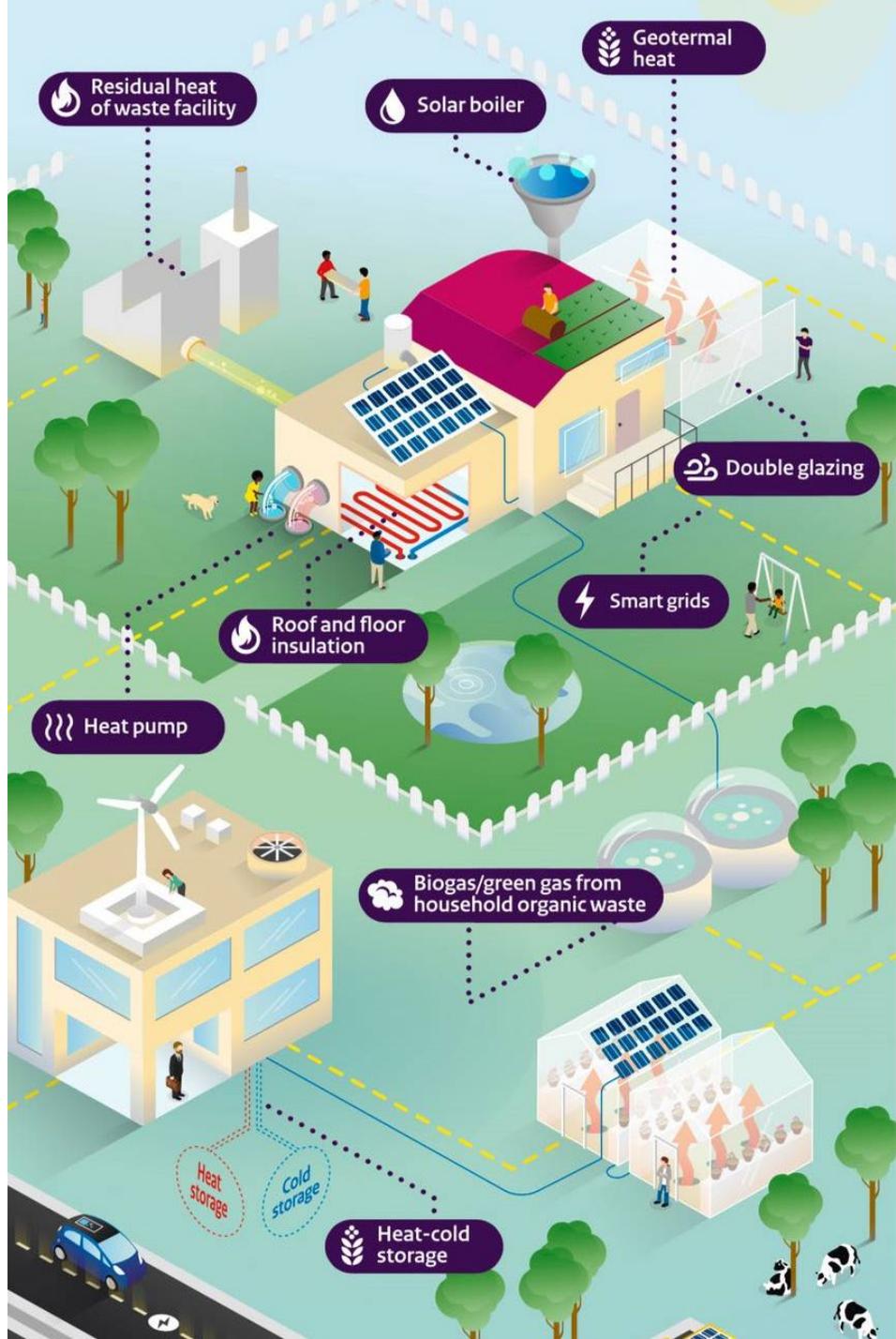
Importance of Bioenergy for Reliability

- NAS – Need bioenergy to get to 100% renewables
- Former DOE Secretary Moniz – Need bioenergy for reliability
- Bioenergy can provide flexible generation power, energy storage
- Bioenergy can provide locally energy supplies



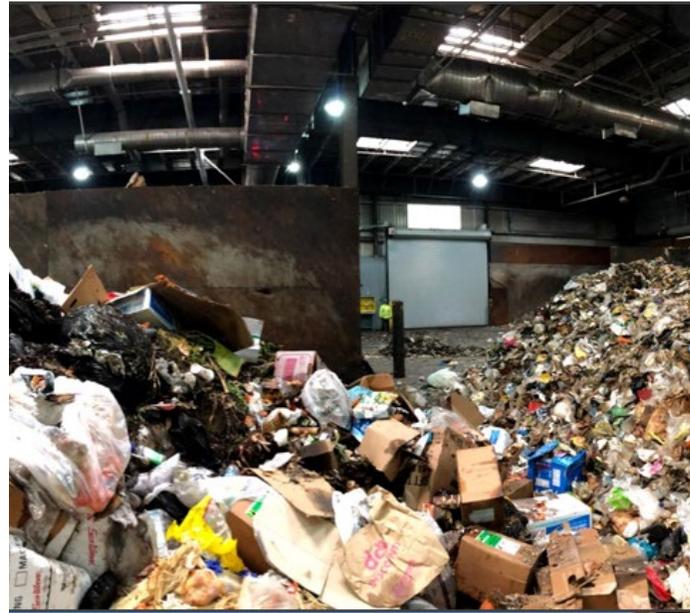


Biogas can Provide Locally Sourced,
Carbon Negative Generation and Storage















Next Steps – Research Needs

- How to maximize GHG/SLCP reductions from food/ag waste
- Emissions from compost versus bioenergy
- Can gasification eliminate PFAS chemicals
- Highest and best uses of biochar
- Technologies to eliminate bioenergy emissions
- Technologies to upgrade biogas (incl. CO₂ removal)

THANK YOU

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Bioenergy
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