



California Biogas Policy and Incentives

- History of bioenergy in California
- What is Driving New Projects
- Biogas Potential



First Generation Bioenergy in California

- First generation built in 1970s and 1980s
- ~ 40 large biomass facilities
- ~ 15 dairy digesters
- 1,000 MW of bioenergy at peak
- More than half of first generation now closed



Governor Schwarzenegger

- Issued Executive Order calling for 20% bioenergy under state's RPS
- Called for increased biofuels and a “hydrogen highway”
- SB 1505 (2006) requires 1/3 of hydrogen from renewable sources
- Issued CA's first “Bioenergy Action Plan”



What is Driving Biogas Development in California Now

- Renewable Energy
- Climate Change
- Wildfires
- Air pollution
- Waste Reduction
- Local energy /
energy reliability



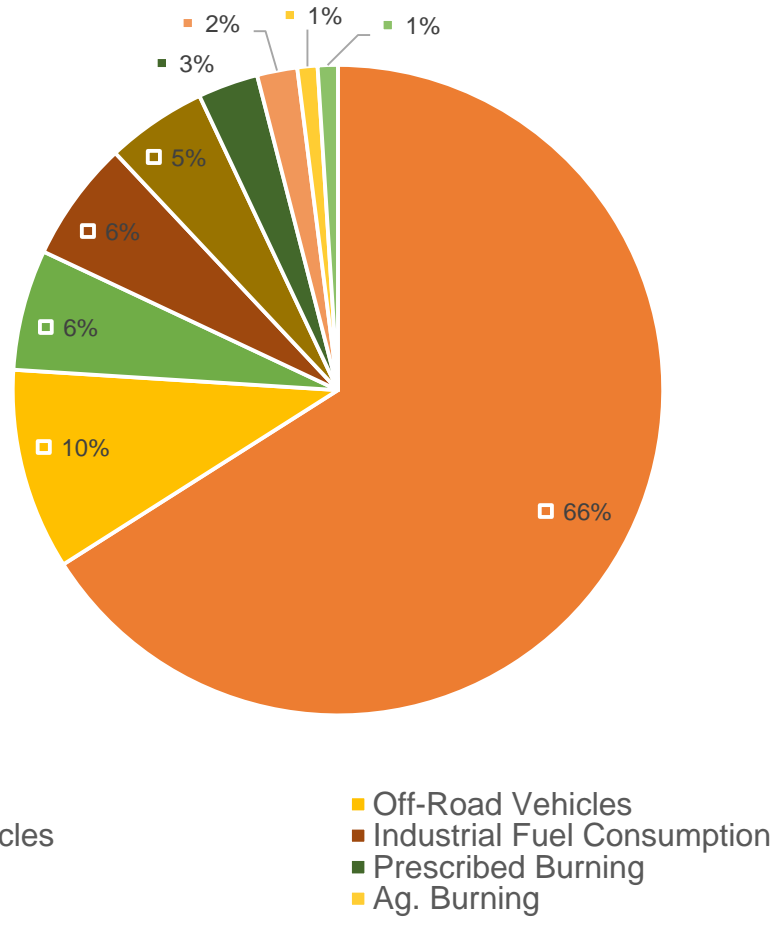


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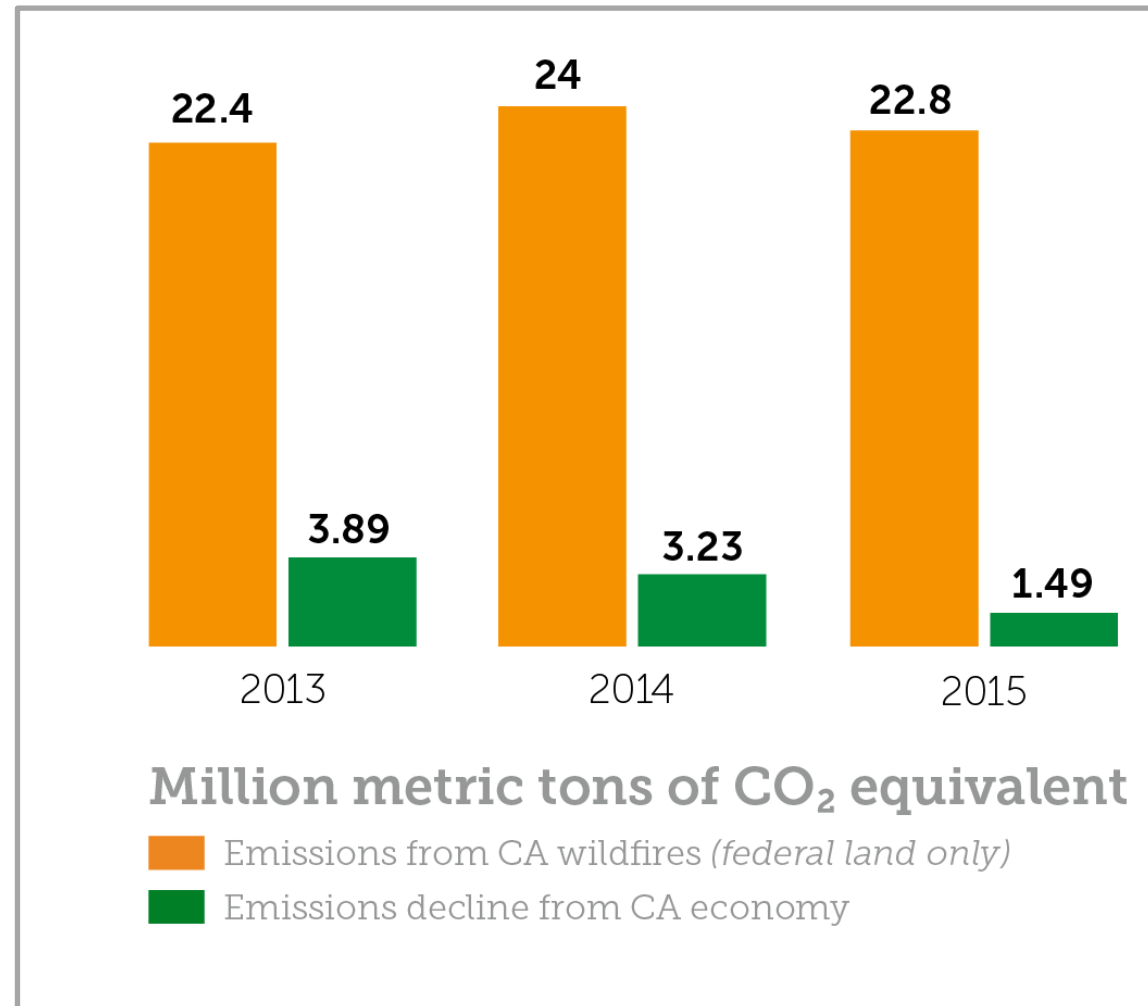
Black Carbon Emissions in CA

Black Carbon Sources in CA



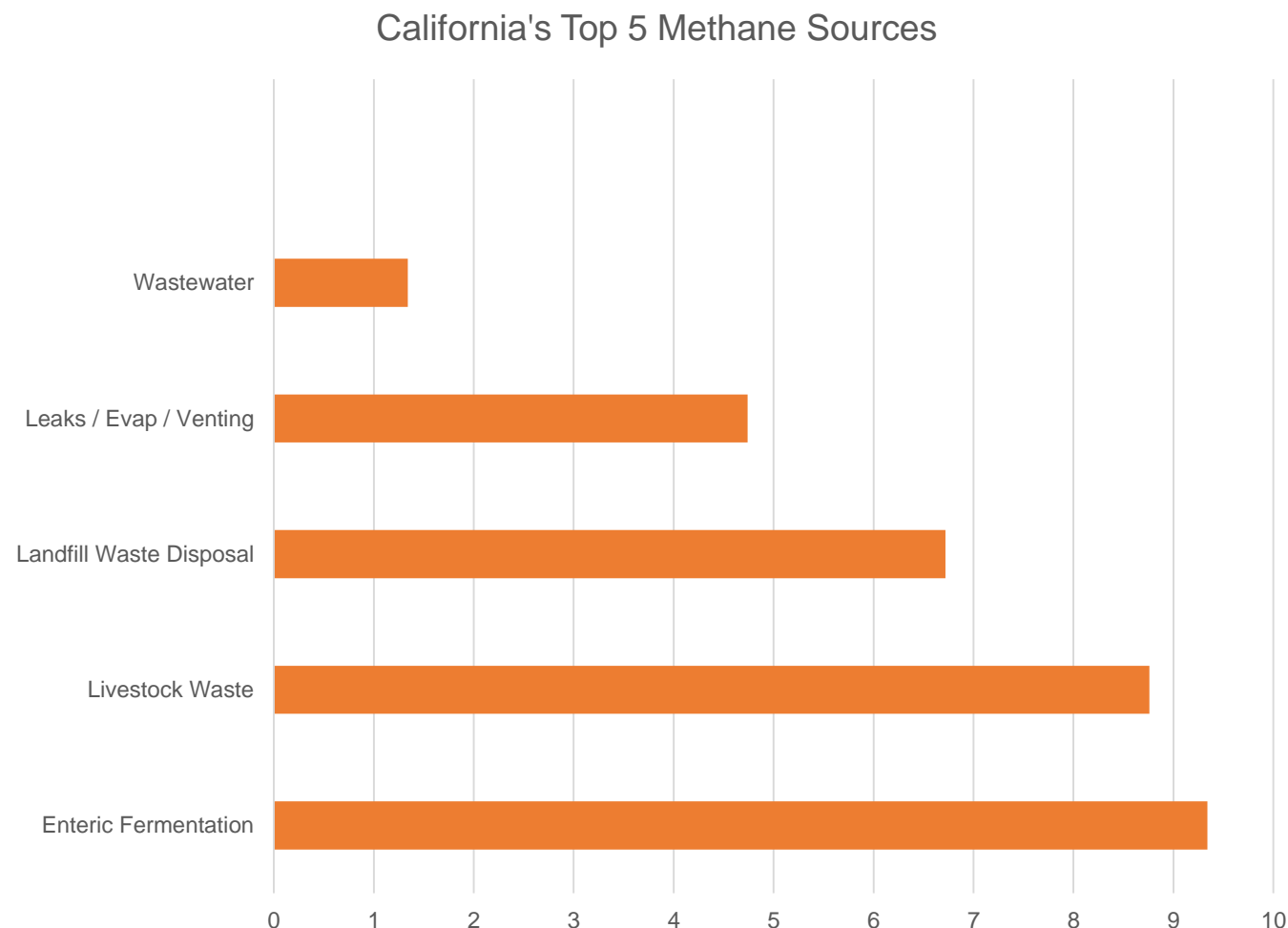
- Black carbon = 3,200 x more damaging than CO₂
- > 2/3 from wildfire
- Also causes air pollution, crop damage, rainfall disruption
- CA has 150 million dead trees

CA Wildfire Emissions Greatly Exceed GHG Reductions Across All Other Sectors



Methane Emissions in California

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



Organic Waste in California



- 500 + wastewater facilities
- 340 landfills
- 20 million tons of organic waste goes to landfills each year
- 1,6 million dairy cows

Potential Biogas Production in CA

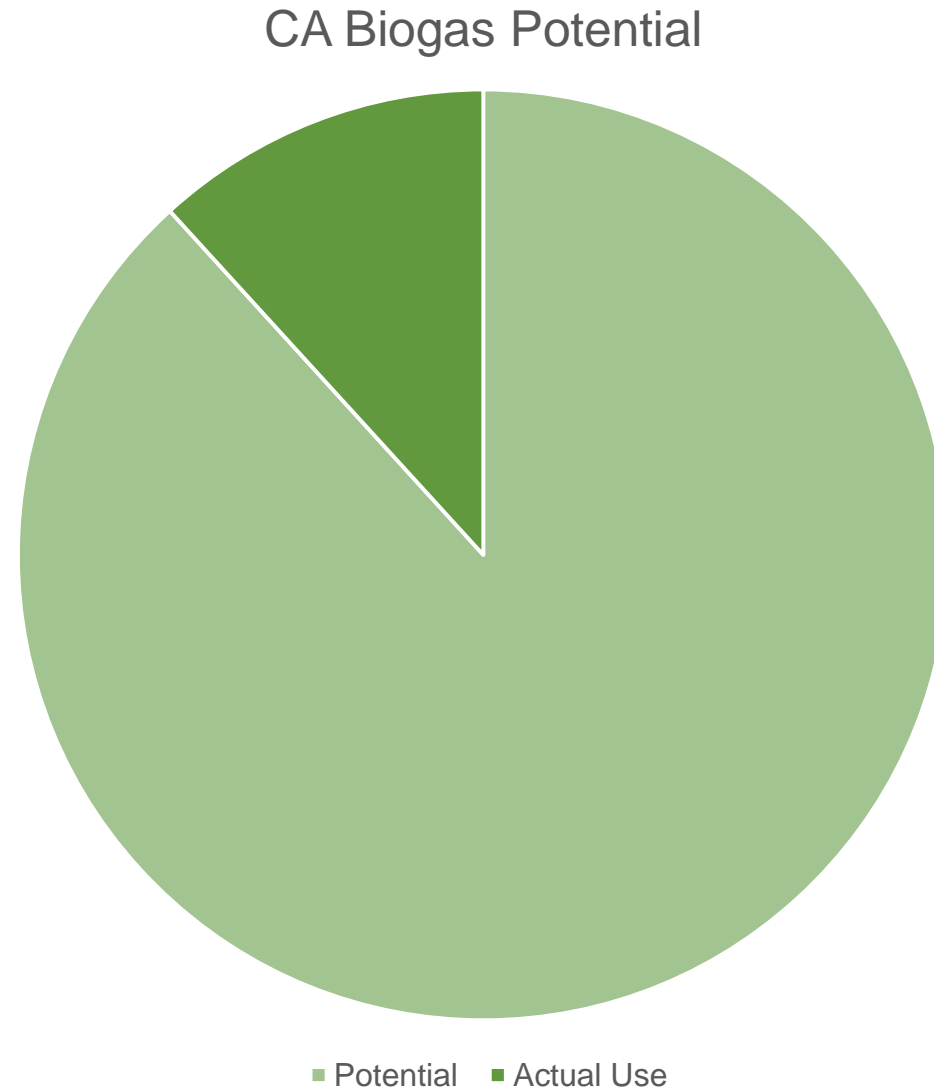
- 10 billion m³ biogas per year
 - = 5-6,000 MW of renewable power, or
 - = 11.36 Billion litres of low carbon fuels
 - **enough to replace 90% of diesel used in CA**



Feedstock	Amount Technically Available	Billion Cubic Feet Methane	Million Gasoline Gallon Equivalents	Million M³ Methane
Landfill Gas	106 BCF	53	457	1,501
Animal Manure	3.4 M BDT	19.5	168	552.4
Waste Water Treatment Gas	11.8 BCF	7.7	66	218
Fats, Oils and Greases	207,000 tons	1.9	16	53.8
Municipal Solid Waste (food, leaves, grass)	1.2 M BDT	12.7	109	360
Municipal Solid Waste lignocellulosic fraction)	6.7 BDT	65.9	568	1,867
Agricultural Residue (Lignocellulosic)	5.3 M BDT	51.8	446	1,467
Forestry and Forest Product Residue	14.2 M BDT	139	1,200	3,938
BIOGAS POTENTIAL		351	3,030	9,957

Source: Rob Williams and Stephen Kaffka, UC Davis, presentation to the California Energy Commission on January 30, 2017

How Much Biogas is CA Using Now?



New Facilities Needed in CA

- 100 to 200 new facilities for solid waste diversion
- 200 new dairy biogas facilities
- 100 new forest & agricultural waste facilities
- Expanded capacity at wastewater treatment facilities
- Beneficial use of landfill gas



Policies to Increase Biogas in California

Renewable Electricity

- 60% renewable electricity by 2030;
100% by 2045
- BioMAT requires 250 MW small bioenergy:
 - ✓ 110 MW from urban organic waste
 - ✓ 90 MW from dairy and agricultural waste
 - ✓ 50 MW from forest waste
- Price offered = \$127 - \$199 / MWh
- EPIC Program at CEC offers \$15 to \$35 million/year for bioenergy
- SoCal Edison issued RFI for biogas



Other Energy Policies

- **Pipeline Access**
 - Pipeline biogas standards adopted in 2014
 - \$3 to \$5 million / project incentive for interconnection
 - Heating value changed from 990 to 970 BTU
- **33% Renewable Hydrogen Requirement**
- **FIT for Combined Heat and Power**
- **Low Carbon Fuel Standard**



SB 1383 – Short Lived Climate Pollutants



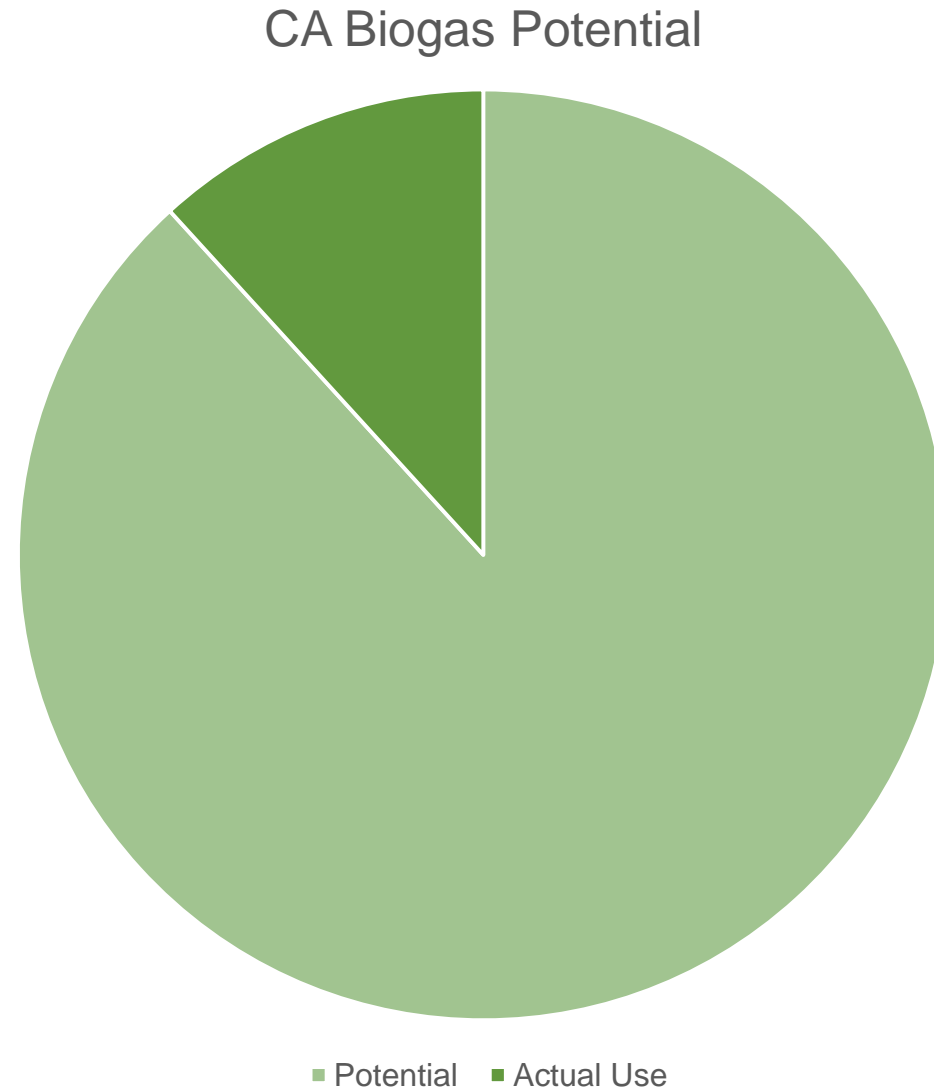
- Reduce methane emissions 40% by 2030
- Reduce organic landfill waste 75% by 2025
= 15 million tons / year
- Incentives for dairy biogas
 - Interconnection subsidy
 - Guarantee for environmental credits
- State agencies must adopt other policies and incentives

Climate Resilience / Energy Reliability

- More local energy supplies, distributed generation
- Need flexible generation / baseload power
- Biogas can provide energy storage



How Much Biogas is CA Using Now?



Vielen Dank !

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Bioenergy
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