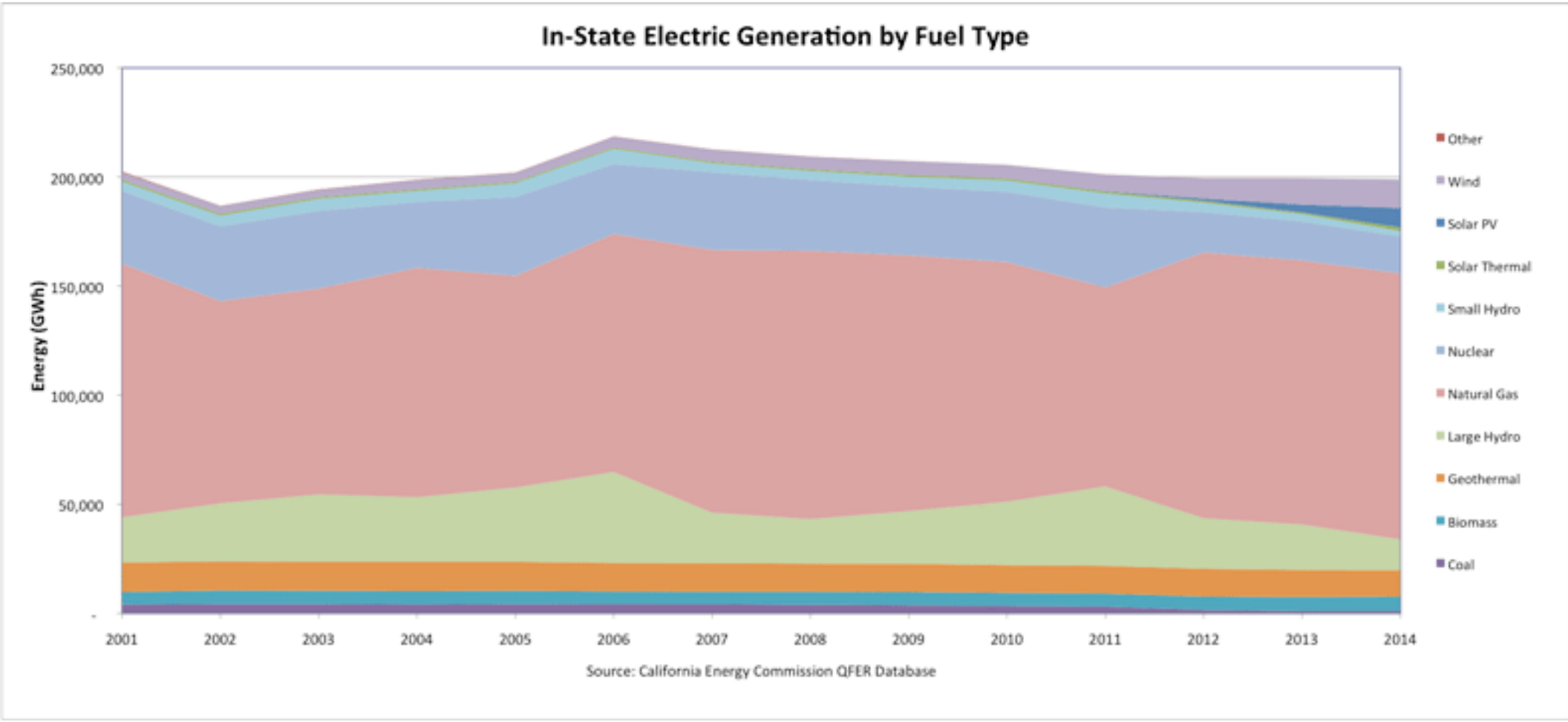
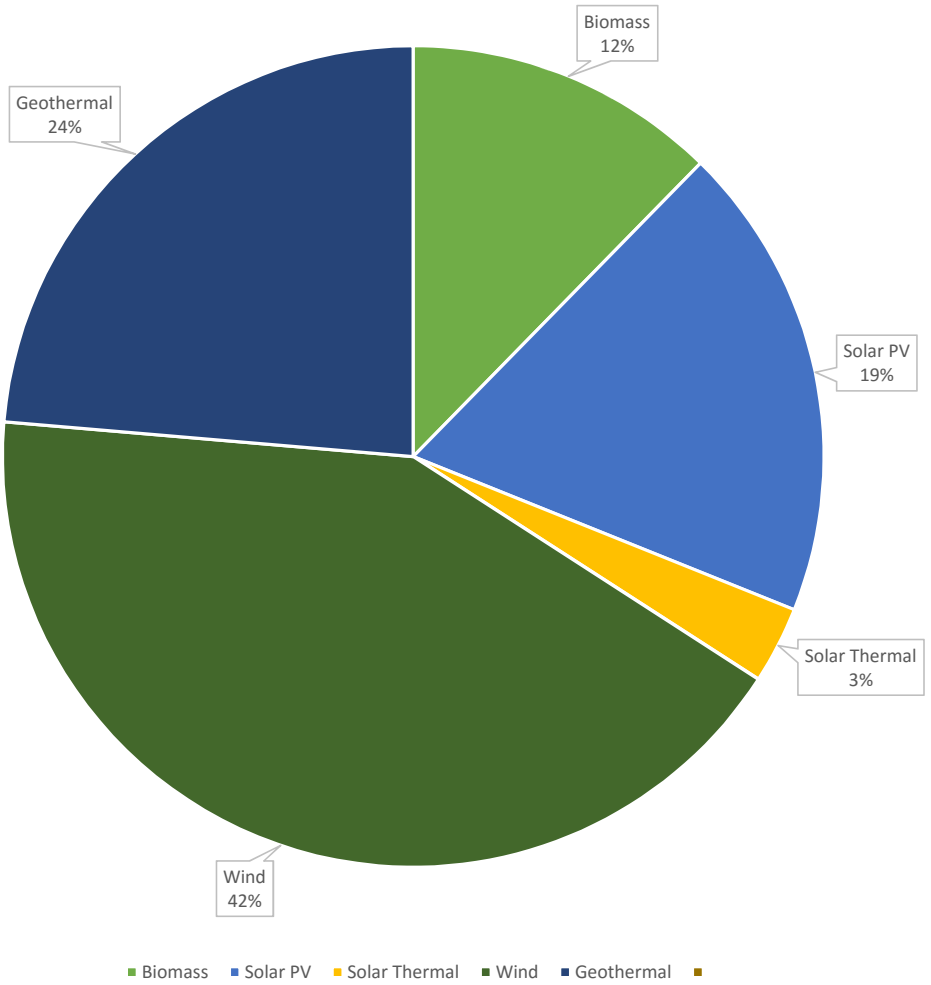

American biogas Council
Anaergia
Breaking Barriers to Sustainability
BioCNG
CALIFORNIA BIOENERGY
CATERPILLAR®
CASA
CERF
Clean Energy Renewable Fuels
CLEAN FUEL PARTNERS
The ClimateTrust
Financing Innovation and Inspiring Action
CLOVER FLAT
RESOURCE RECOVERY PARK
CR&R
EISENMANN
California Refuse Recycling Council
Bioenergy Association of California
EAST BAY MUNICIPAL UTILITY DISTRICT
The Grant Farm
Las Gallinas
VALLEY SANITARY DISTRICT
City of FRESNO
gna
GLADSTEIN, NEANDROSS & ASSOCIATES
HARVEST™
IRVINE RANCH WATER DISTRICT
Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT
JRM &A
ARCHITECTS ENGINEERS PLANNERS
Since 1951 REDUCE REUSE RECYCLE MRWMD
Service, Stewardship and Sustainability
PHOENIX ENERGY™
COUNTY OF LOS ANGELES PUBLIC WORKS
Public Services That Works
Placer County
AIR POLLUTION CONTROL DISTRICT
Sea Hold
STRATEGIC BUSINESS DEVELOPMENT
ReFuel™
BY ATLAS DISPOSAL
SalinasValleyRecycles.org
SALINAS VALLEY SOLID WASTE AUTHORITY
CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY
Environmental Services
tss consultants
Recology
WASTE ZERO
SMUD®
StopWaste
at home • at work • at school
SIERRA ENERGY
STOEL RIVES LLP
ATTORNEYS AT LAW
SANITATION DISTRICTS OF LOS ANGELES COUNTY
WCH
WESTHOFF, CONE & HOLMSTEDT
VVWRA
THE WATERSHED CENTER
HAYFORK, CALIFORNIA
Wastewater
CAPITAL MANAGEMENT
WESTBIOFUELS
WESTERN ENERGY SYSTEMS
Power Systems Specialists
ZeroWaste™
ENERGY, LLC.
Recovery and Energy with Zero Waste


In-State Electric Generation by Fuel Type
250,000
200,000
150,000
100,000
50,000
-
Energy (GWh)
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Other
Wind
Solar PV
Solar Thermal
Small Hydro
Nuclear
Natural Gas
Large Hydro
Geothermal
Biomass
Coal
Source: California Energy Commission QFER Database

Renewable Energy Production in California - 2014



Why Biogas ?

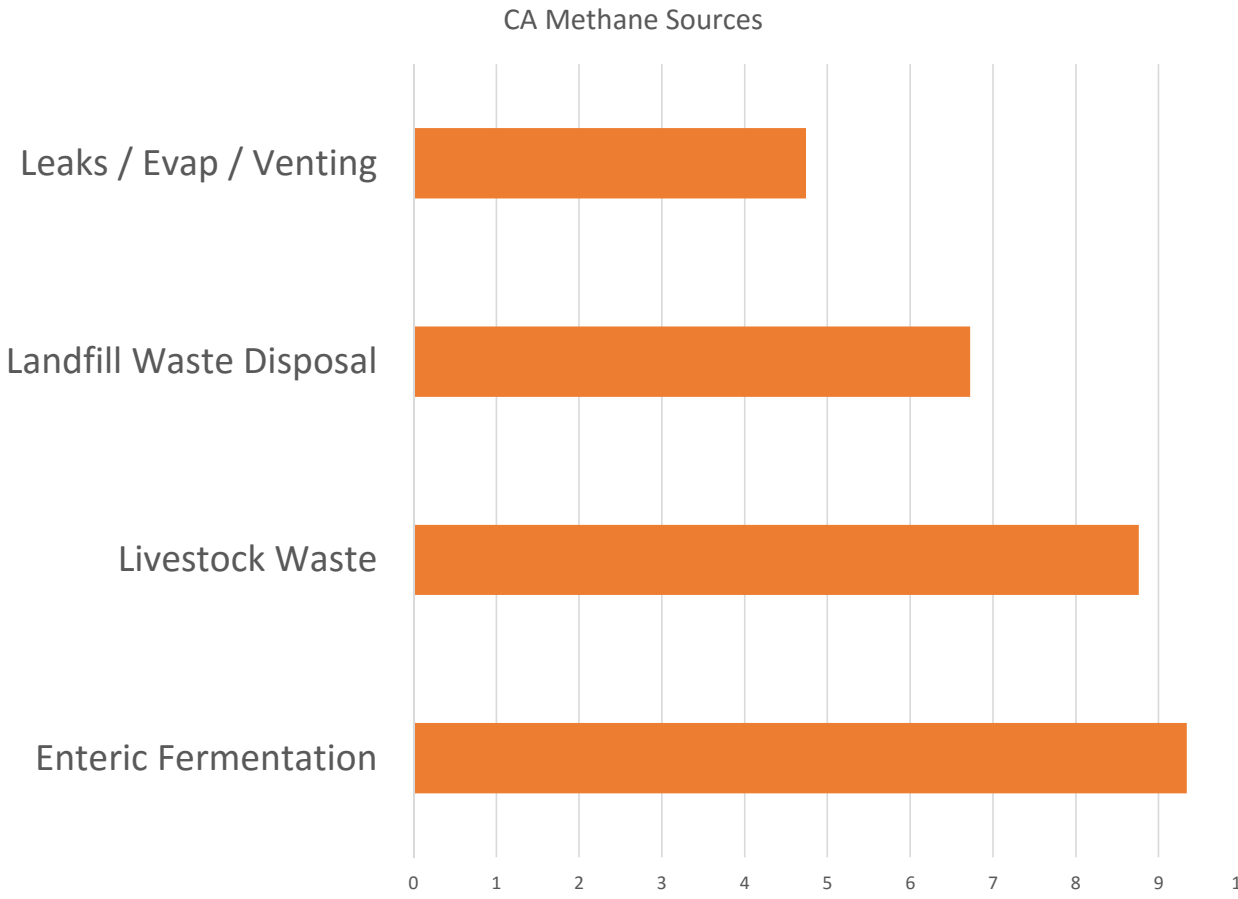
- Generate Renewable Energy and Low Carbon Fuels
- Produce Jobs and Economic Development
- Improve Agricultural Productivity
- Reduce:
  - ✓GHG emissions and SLCP's
  - ✓Air and water pollution
  - ✓Petroleum and natural gas use
  - ✓Landfilling
  - ✓Catastrophic Wildfires

Biogas Cuts Climate Pollution

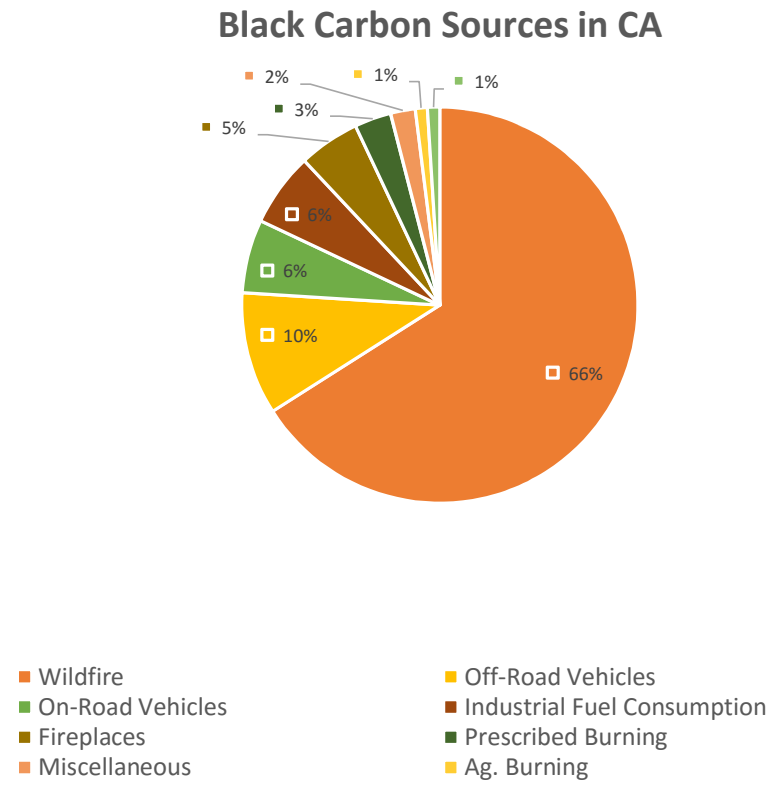
1. Reduce fossil fuel use
   - Natural gas = 25% of CA's greenhouse gas emissions
   - Petroleum use = biggest source of GHG emissions in CA
2. Reduce Methane from organic waste and Black Carbon from wildfire

Organic Waste and Methane

- Methane = 28-84 times more potent than CO_2
- Organic Waste = 3 of 4 biggest methane sources in CA



Wildfire and Black Carbon



- 900 – 3,200 x more potent than CO_2
- 66% comes from wildfire in CA
- Major source of air pollution, rainfall disruption, crop and forest damage

Biogas Reduces Air Pollution

- Biomethane can replace diesel in heavy-duty vehicles
- Cut NO_x and PM by up to 95%
- Reduce air pollution from wildfires and open field burning
- Reduce air, water and odor pollution from dairies
- Reduce air quality impacts from landfilling

Biogas Cuts Landfilling

- Organic waste = 2/3 of all landfill waste (22 million tons / year)
- Includes wood and construction debris, yard and green waste, food and food processing waste, agricultural waste, etc.

Improve Soils and Water Conservation

- Beneficial co-products = digestate, biosolids, biochar
- Co-products provide:
  - Carbon sequestration
  - Water conservation
  - Non-petroleum based fertilizers
  - Treatment for fire-ravaged lands

Create Jobs and Economic Development

- Biogas produced 2 to 6 times more jobs than natural gas
- Reduce gas imports
  - CA imports 91% of its gas supply
  - Costs CA $9 billion/year
- Produce jobs and economic development in every region, including disadvantaged and rural regions

Potential Biogas Production in CA

- Nearly 300 billion cubic feet of biogas per year
- 5 to 6,000 MW of power
  - Enough to power 2 to 3 million homes
- 2.4 Billion gallons of fuel
  - Enough to replace 3/4 of diesel used in CA vehicles

Carbon Intensity of Transportation Fuels (grams CO_2e / MJ)

Diesel	102
Gasoline	100
Biodiesel from Midwest soy beans	8
Corn ethanol	75 to 121
Natural Gas	68
Fuel Cell (non-renewable hydrogen)	39
Electric vehicles (CA power grid)	31
Biogas from Forest Waste	14
Landfill Biogas	11 to 30
Dairy Biogas	13
Wastewater Biogas (large facilities)	8
Biogas from Diverted Food and Green Waste	- 15 to -31

CA Biogas Potential by Waste Sector

Feedstock	Amount Technically Available	Billion Cubic Feet of Methane	Gasoline Gallon Equivalents
Agricultural Residue (Lignocellulosic)	5.4 M BDT	31.55	272 million
Animal Manure	3.4 M BDT	19.7	170 million
Fats, Oils and Greases	207,000 tons	6.5	56 million
Forestry and Forest Product Residue	14.2 M BDT	82.36	710 million
Landfill Gas	106 BCF	53	457 million
Municipal Solid Waste (food, leaves, grass)	1.7 M BDT	18.44	159 million
Municipal Solid Waste lignocellulosic fraction)	10.5 M BDT	60.9	525 million
Waste Water Treatment Gas	11.8 BCF	7.7	66 million
FUEL POTENTIAL		**280.15 BCF of Methane**	**2.415 Billion gge**

Policy Drivers

1) **Renewable Electricity**
   - 50% RPS
   - SB 1122 – 250 MW of bioenergy
2) **Organic Waste Diversion**
   - AB 1826 requires diversion of commercial organic waste by 2020
   - SLCP Plan – divert all organic waste from landfills by 2025
3) **Low Carbon Fuel Standard**
   - arb.ca.gov/fuels/lcfs/lcfs.htm
4) **Short-Lived Climate Pollutant Plan**
   - arb.ca.gov/cc/shortlived/shortlived.htm

Incentives for Biogas

- Electricity Program Investment Charge - $150 million / year (energy.ca.gov)
- Alternative fuels and clean vehicles - $100 million/year (energy.ca.gov)
- GGRF (cap and trade $$) - ???
- Pipeline interconnection for biogas - $40 million (cpuc.ca.gov)
- Tax credits

THANK YOU

Julia Levin, Executive Director

jlevin@bioenergyca.org

510-610-1733

www.bioenergyca.org

Bioenergy Association of California