Waste-to-Energy CARB Draft

September 2018

- The current draft regulation does not treat the waste management sector consistently: the lower GHG option of WTE (**recognized by CARB & CalRecycle, see below**) is capped, but landfills are not.

	GHG Emissions Reduction (-) from WTE Relative to Landfills
CalRecycle (2012)	-0.07 to -0.24 t CO_2e / ton MSW
CARB (2014)*	-0.16 to -0.45 t CO_2e / ton MSW

* Incudes energy and metals GHG benefits

- CARB's September 2018 proposal still imposes estimated costs of $62 million from 2018-2030 on two facilities.
- CA's 2 WTE facilities manage 2% of the amount of MSW that landfills manage – WTE facilities have no leverage in the market to raise prices.
- CARB's 2018 proposal states, "provides equitable treatment of facilities in the waste-to-energy sector." [ISOR, p.56] **This has never been the issue for WTE facilities in CA.**
- Earlier board resolutions called for equity in the *waste management* sector. Yet, landfills are exempt from the cap until at least 2025.

	Cap & Trade Cost, 2018 – 2030 (million 2018 $)		
	No Allowances	CARB 2017 Proposal	CARB 2018 Proposal
Long Beach	$56 M	$47 M	$39 M
Stanislaus	$37 M	$30 M	$23 M
Total WTE	**$93 M**	**$77 M**	**$62 M**
Landfill	**$0**	**$0**	**$0**

- The risk to CA's WTE facilities is real: the Commerce Refuse-to-Energy Facility (CREF), permanently closed on June 26, 2018 citing the cost of continuing to operate. All of the waste is now going to landfills and generating addition GHG emissions.
- CARB studied WTE specifically as part of the 1st Update to the Climate Change Scoping Plan.

  Add MSW Thermal Facilities into Cap-and-Trade in 2015

  Another approach is to add MSW Thermal facilities to the Cap-and-Trade program in 2015, while leaving other Waste Sector sources out. Under this approach, MSW Thermal plants would have an incentive to reduce their GHG emissions over time through control of input feedstock and other techniques. However, a challenge with implementing this approach is that MSW Thermal plants have a modest potential to reduce their GHG emissions. Over time, they may have to purchase more emissions credits, making them increasingly less competitive compared to traditional landfills. ***This approach would likely result in more GHG emissions if it results in an increase in MSW going to landfills.***

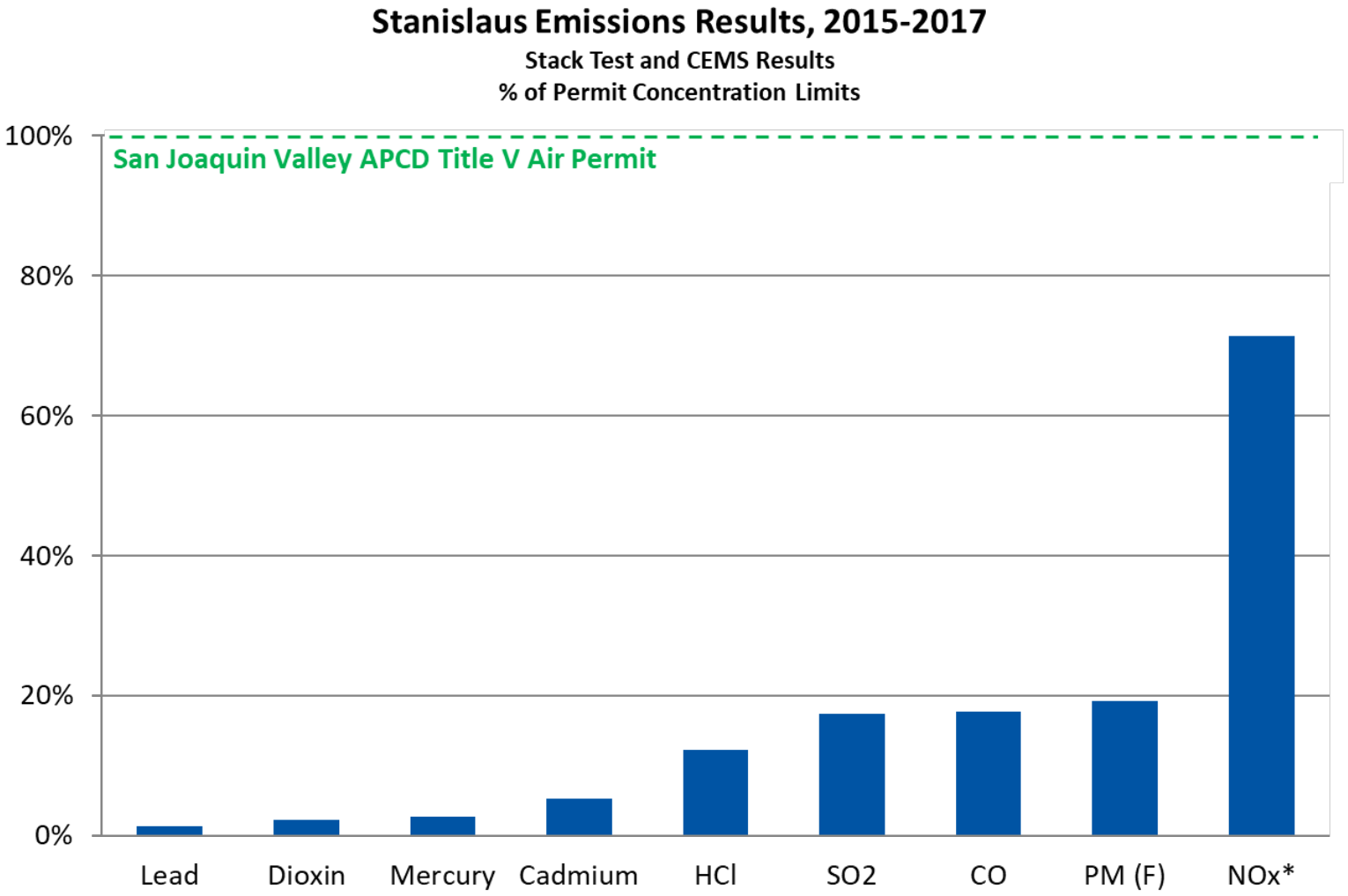
  Remove MSW Thermal Facilities from Cap-and-Trade post-2015

  Under this option, MSW Thermal facilities would be removed from the Cap-and-Trade Regulation for the foreseeable future. ***This approach would put MSW Thermal facilities on a level playing field within the Waste Sector, where none of the methods of handling MSW would be subject to the Cap-and-Trade Regulation.***

  Add MSW Thermal Facilities and Other Waste Sector Sources to Cap-and-Trade in 2015

  Under this approach, MSW Thermal facilities and other options for handling waste (such as landfills) would be subject to the Cap-and-Trade Regulation. ***This would provide a level playing field for power generation and potentially avoid increases in waste disposal at landfills from a reduction in combustion of MSW.***

Emissions Performance Relative to Permit – Stanislaus



PM (F) = filterable particulate

* 24-hr NOx limit of 165 ppmdv @ 12% CO2, below federal emission guidelines of 205 ppmdv

COVANTA
Powering Today. Protecting Tomorrow.

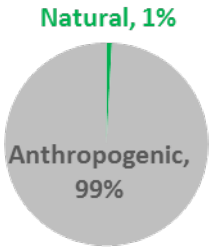
Long Beach Air Emissions Inventory Comparison

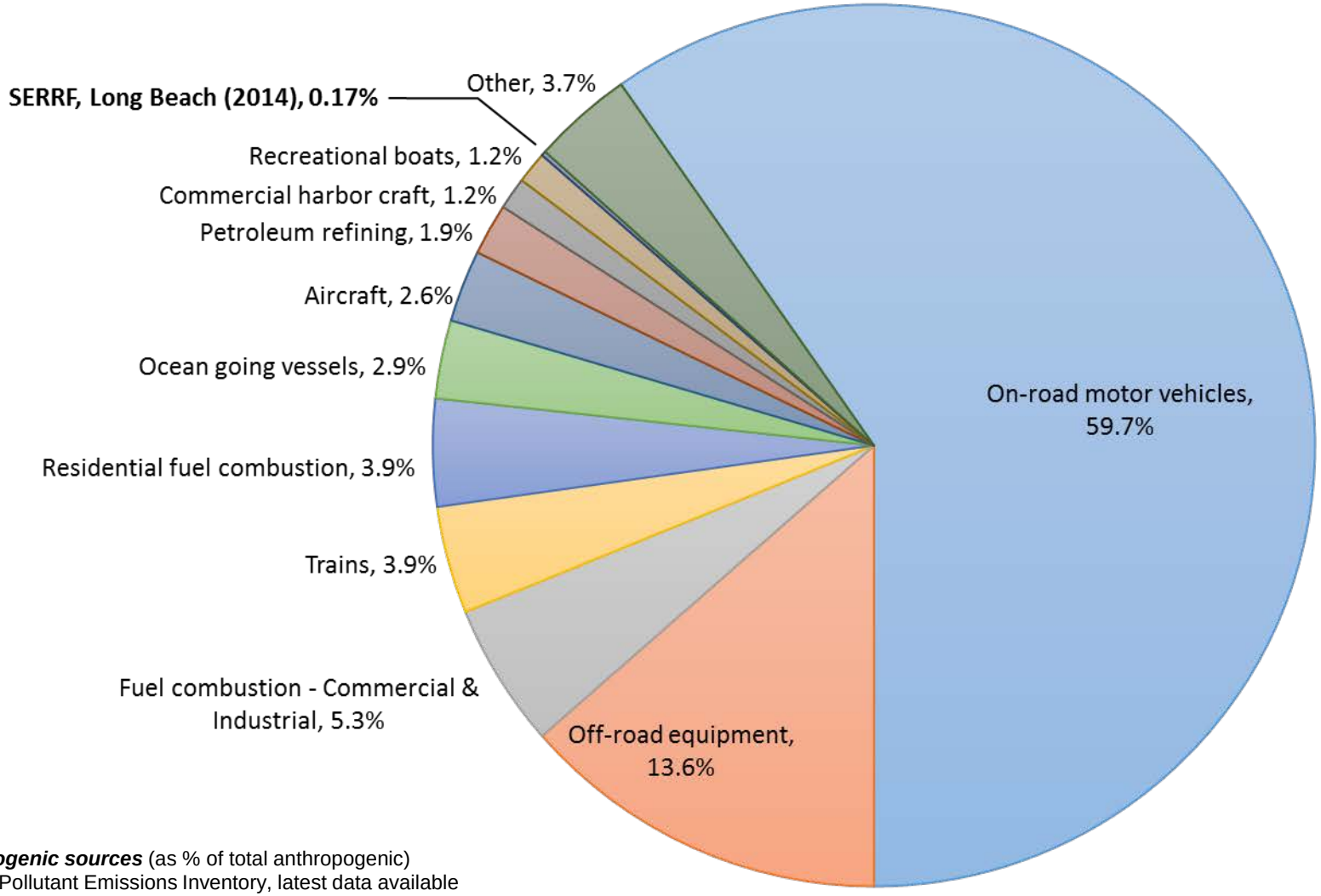
	Long Beach WTE Emissions, % of South Coast Air Basin	Long Beach WTE Emissions, % of L.A. County
Total Organic Gases	0.0080%	0.015%
Reactive Organic Gases	0.0040%	0.0065%
Carbon Monoxide	0.0062%	0.010%
Nitrogen Oxides	0.17%	0.24%
Sulfur Oxides	0.45%	0.49%
Total Particulate Matter (PM)	0.048%	0.071%
Total PM, <10µm (PM10)	0.021%	0.032%

Note: Air basin and county inventories are anthropogenic emissions only, excludes natural sources

Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

South Coast AQMD NOx Emissions

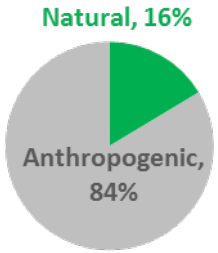


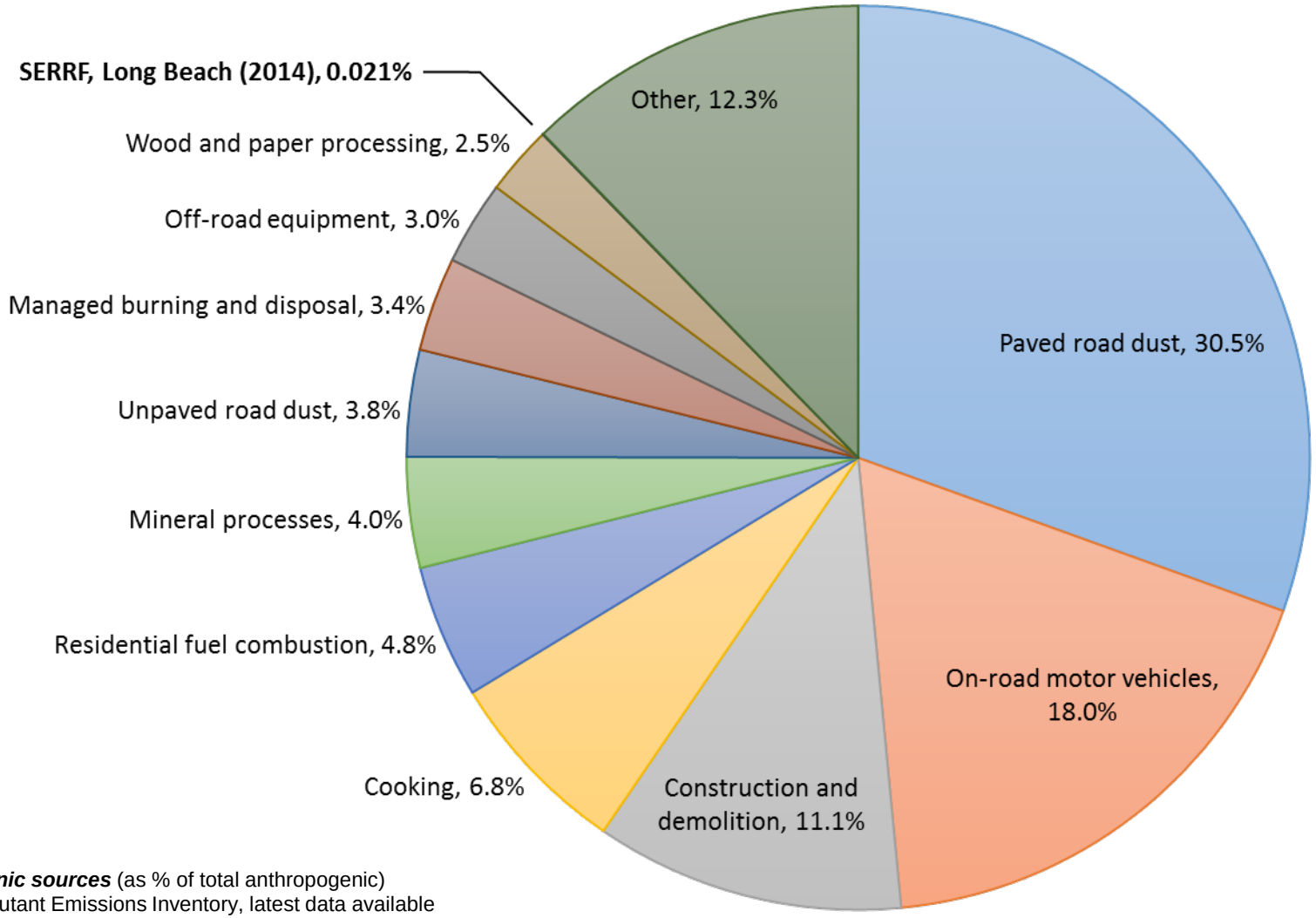


Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

South Coast AQMD PM-10 Emissions

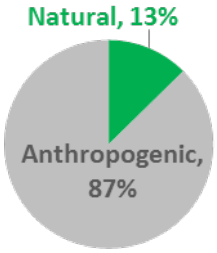


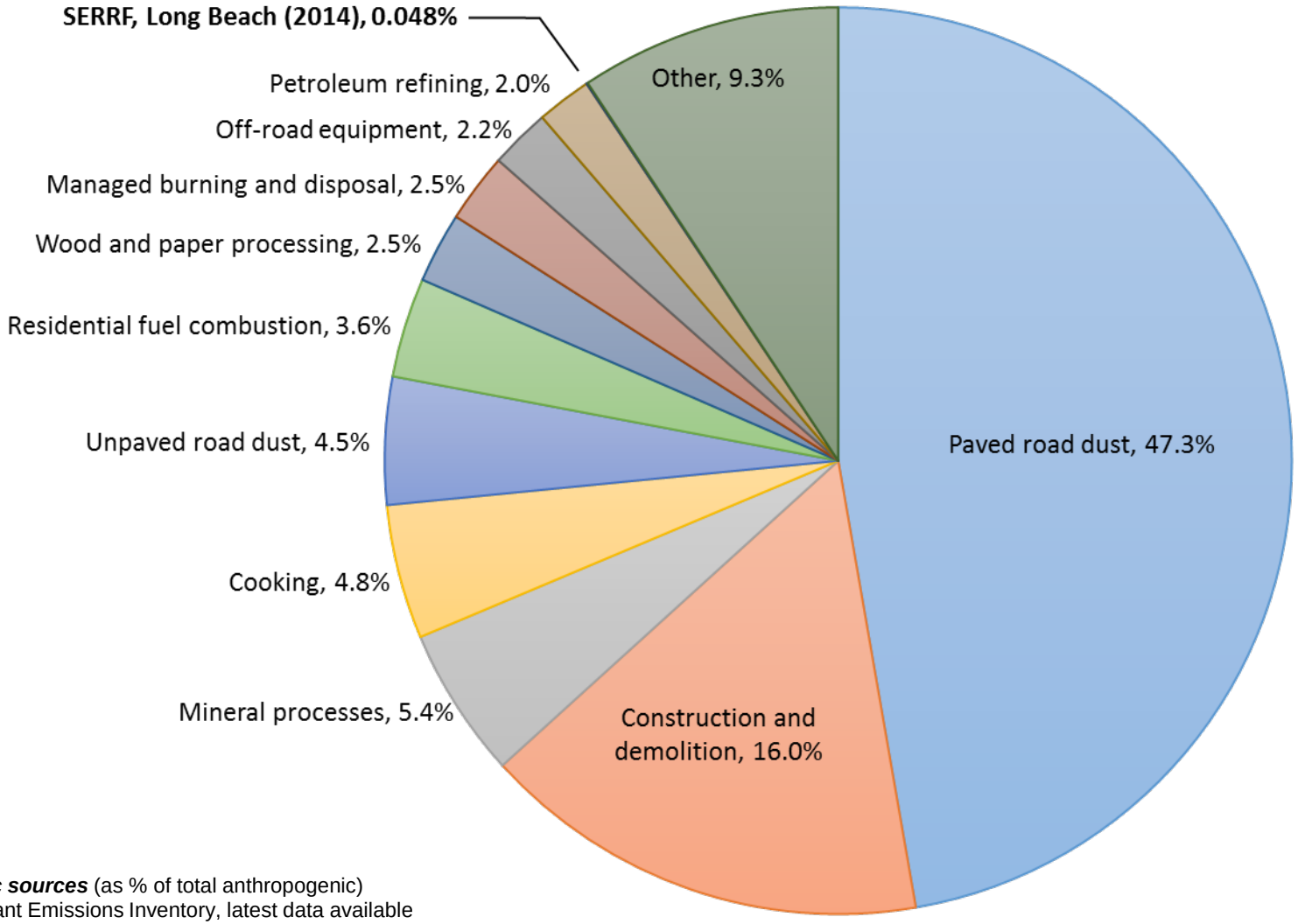


Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

South Coast AQMD PM Emissions

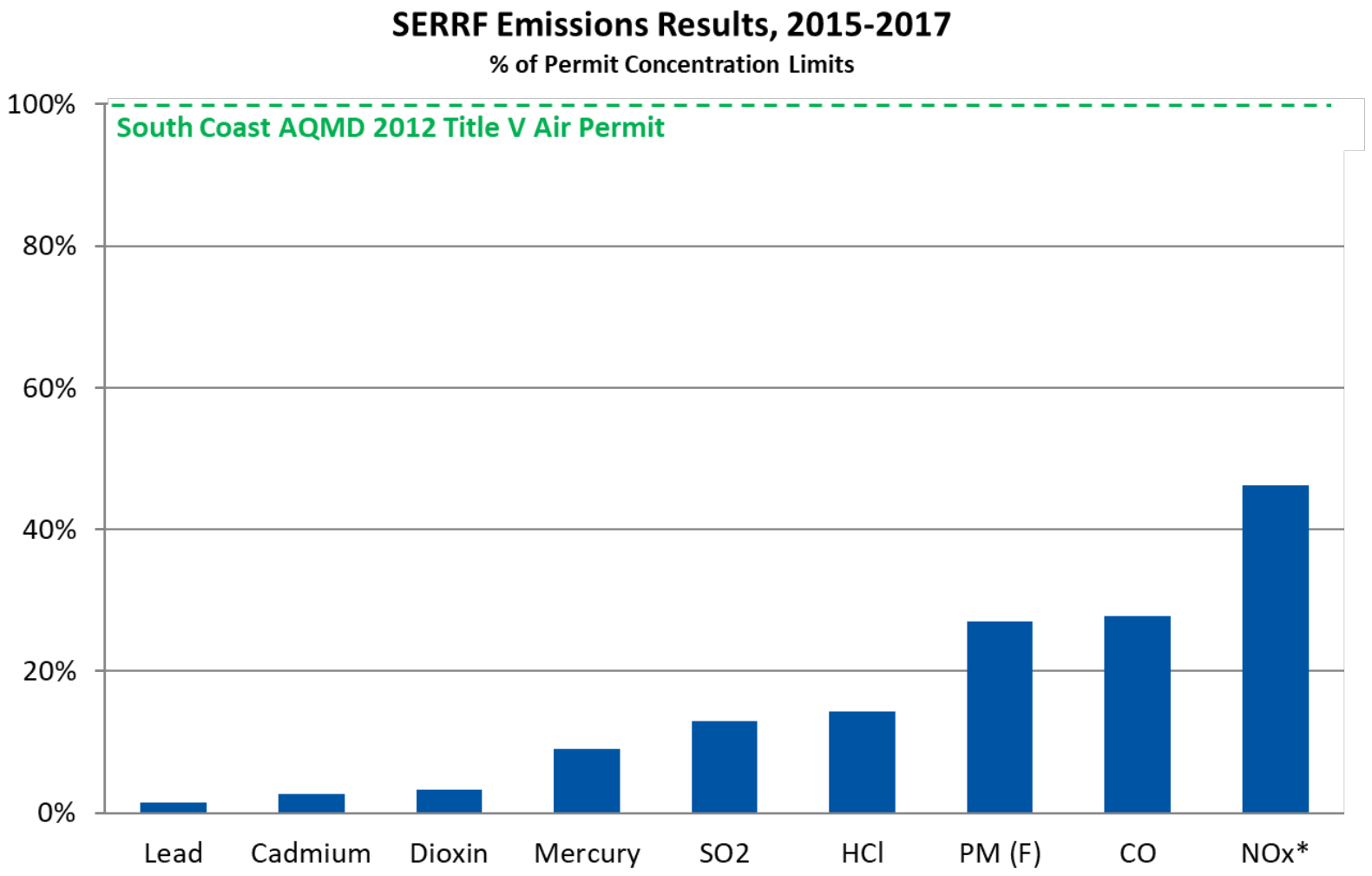




Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

Emissions Performance Relative to Permit – Long Beach



PM (F) = filterable particulate

* 24-hr NOx limit of 185 ppmdv @ 12% CO2, below federal emission guidelines of 205 ppmdv

COVANTA
Powering Today. Protecting Tomorrow.

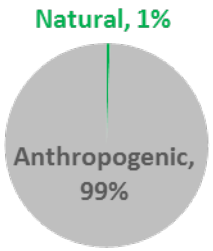
Stanislaus Air Emissions Inventory Comparison

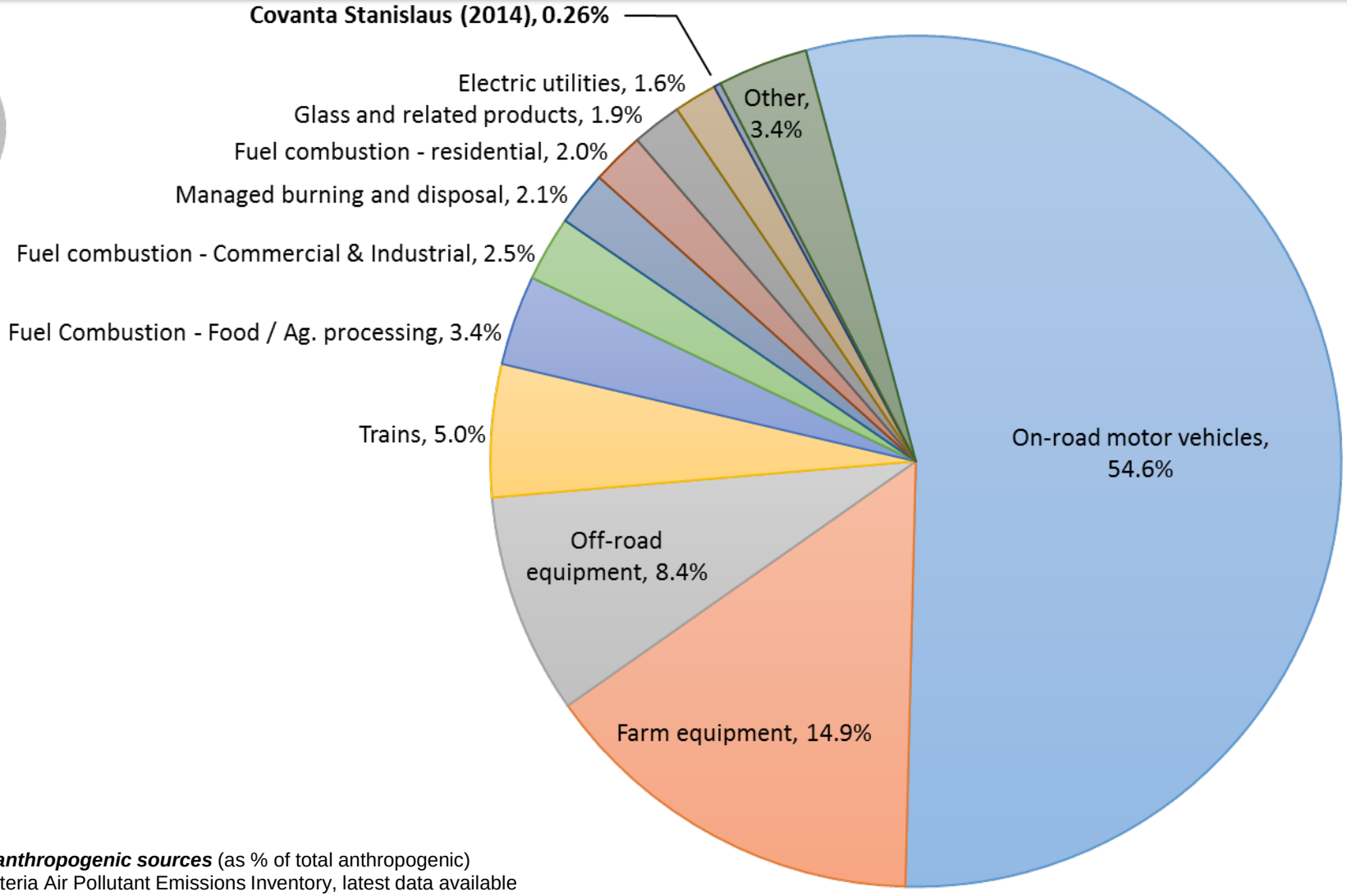
	Stanislaus WTE Emissions, % of San Joaquin Valley Air Basin	Stanislaus WTE Emissions, % of Stanislaus County
Total Organic Gases	0.00080%	0.0067%
Reactive Organic Gases	0.00067%	0.0060%
Carbon Monoxide	0.0068%	0.071%
Nitrogen Oxides	0.26%	2.8%
Sulfur Oxides	0.65%	8.1%
Total Particulate Matter (PM)	0.0070%	0.072%
Total PM, <10µm (PM10)	0.013%	0.14%

Note: Air basin and county inventories are anthropogenic emissions only, excludes natural sources

Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

San Joaquin Valley APCD NOx Emissions

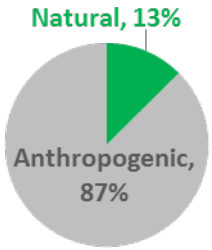


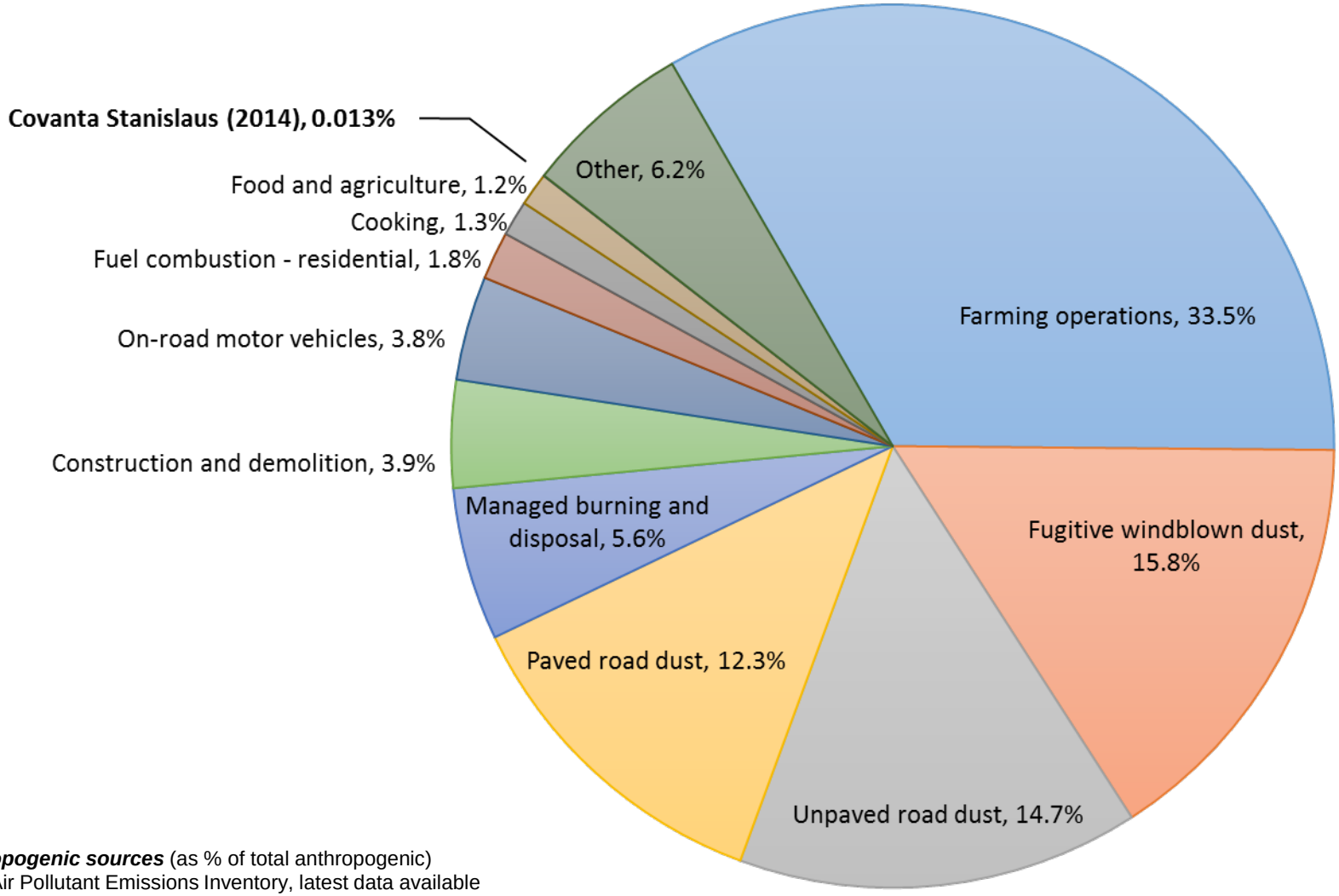


Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

San Joaquin Valley APCD PM-10 Emissions

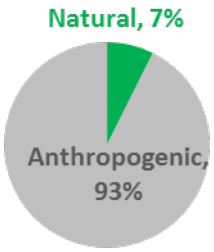


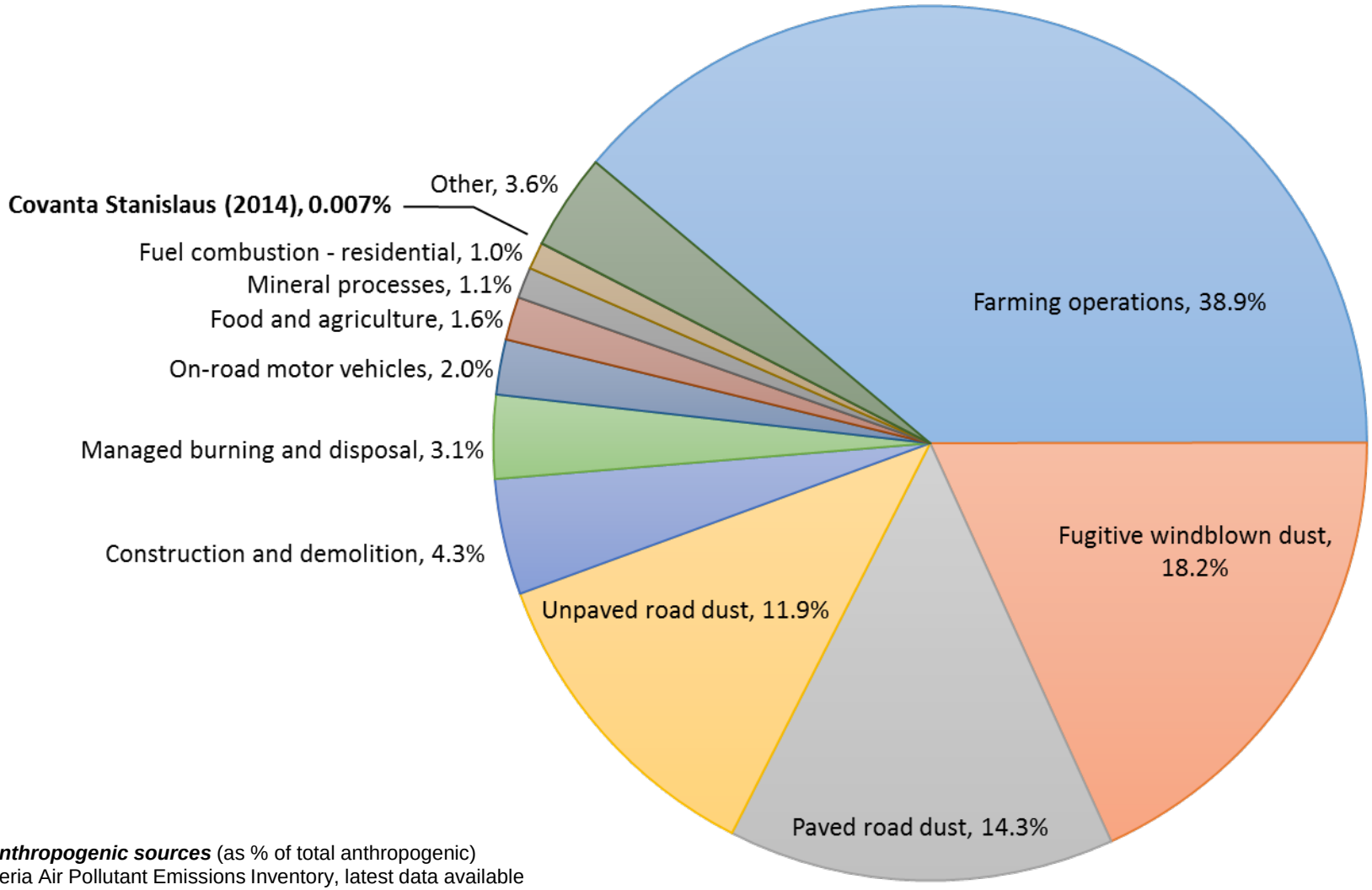


Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

San Joaquin Valley APCD PM Emissions





Detail shown for anthropogenic sources (as % of total anthropogenic)
Source: CARB Criteria Air Pollutant Emissions Inventory, latest data available (2014 for facility, 2012 for air basin and county)

COVANTA
Powering Today. Protecting Tomorrow.

Why Energy from Waste?

or

Landfill

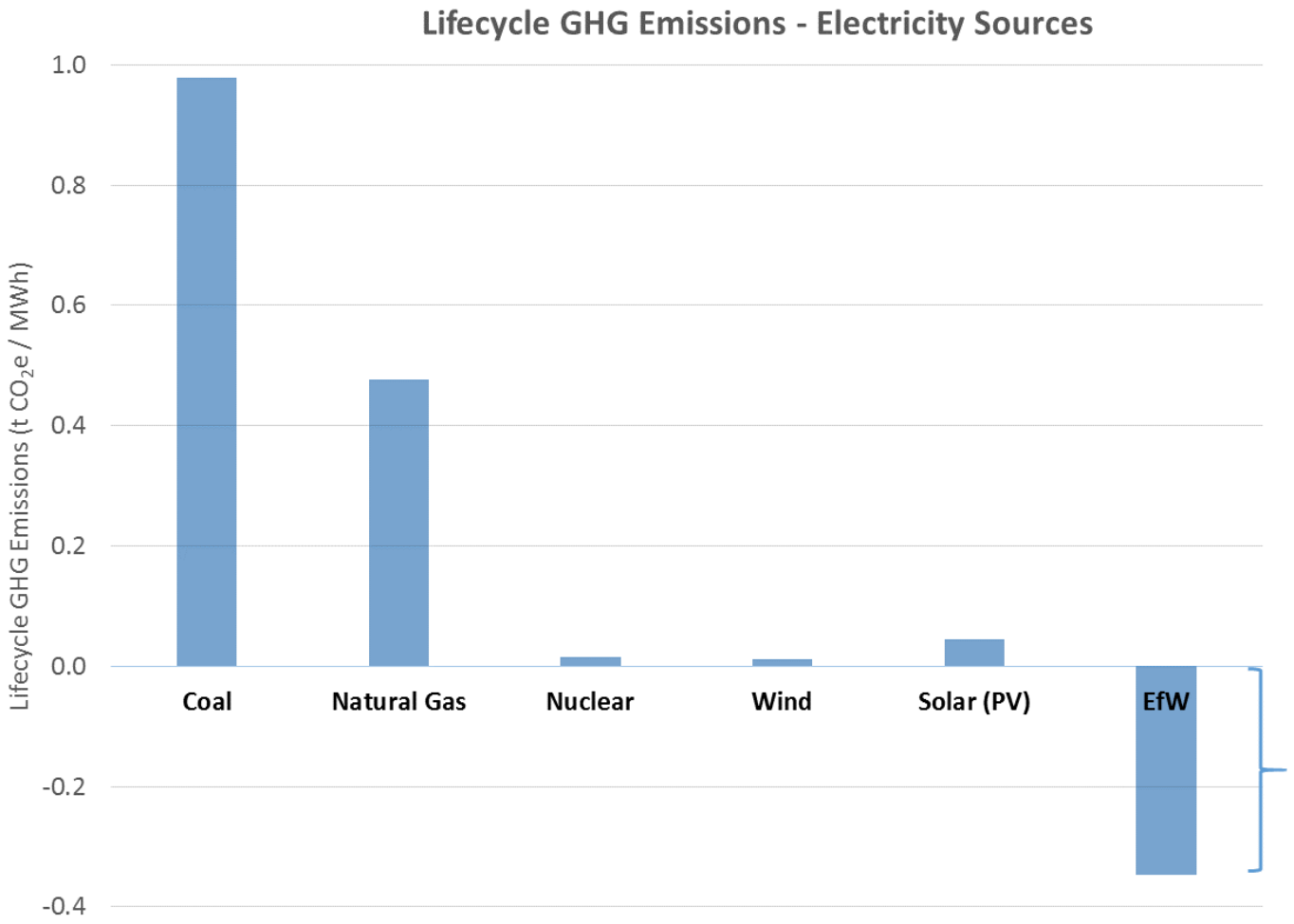
- *Landfills are a major source of man-made methane*
- *Methane is more than 30X more potent than Carbon Dioxide*
- *Leachate generation: ground water contamination*
- *Non sustainable use of land*
- *Energy generation from landfills:* ***65 kWh per ton of waste***

EfW

- *90% reduction of waste in volume*
- *Clean base load power generation*
- *Recovers metals for recycling*
- *Offsets on average one ton of carbon dioxide equivalent for each ton of waste processed*
- *Renewable energy generation from EfW:* ***550 kWh per ton of waste***

COVANTA
Powering Today. Protecting Tomorrow.

Lifecycle GHG Comparison: Major Electricity Sources



EfW is a net GHG negative source of electricity when including avoided landfill CH_4 emissions

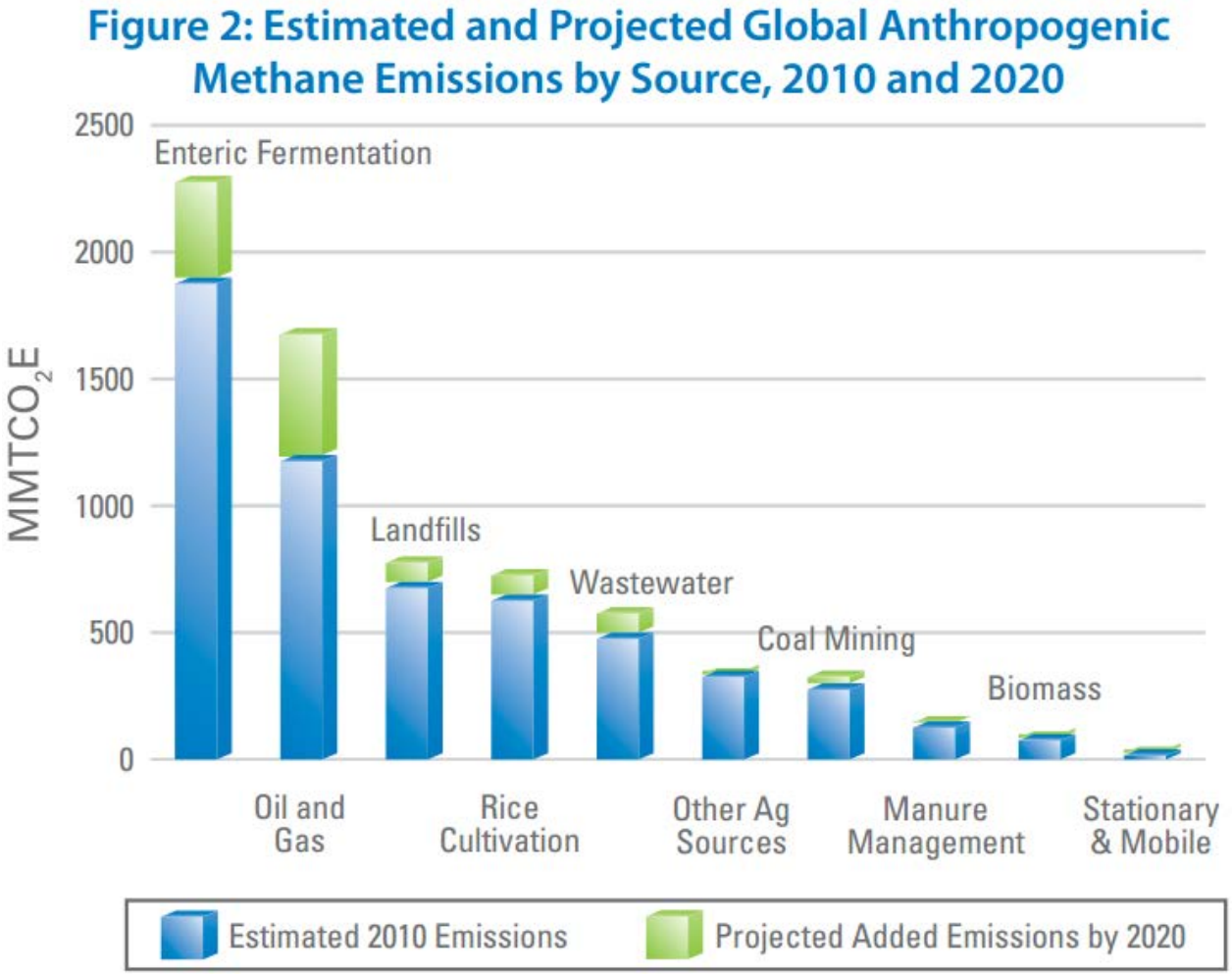
Sources: Sathaye *et al.* (2011) "Renewable Energy in the Context of Sustainable Development"; NREL Life Cycle Assessment Harmonization Results and Findings webpage, accessed 8/2015; U.S. EP, NC State University, RTI International (2014) MSW

COVANTA
Powering Today. Protecting Tomorrow.

GHG Benefits of EfW: International Recognition

- **U.S. EPA Clean Power Plan**
- **U.S. EPA Scientists:** "If the goal is greenhouse gas reduction, then WTE should be considered an option…"
- **European Environment Agency:** "As recycling and incineration with energy recovery are increasingly used, net greenhouse gas emissions from municipal waste management are expected to drop considerably by 2020"
- **IPCC:** WTE recognized as a "key GHG mitigation technology"
- **Rio UN Conference:** "We therefore commit to further reduce, reuse and recycle waste (3Rs), and to increase energy recovery from waste"
- **Davos World Economic Forum:** WTE included in the list of 10 low-carbon energy technologies
- **Clean Development Mechanism:** Over 40 EfW projects registered, combined annual GHG reduction of 5 million metric tons of CO2e per year

Landfills are the 3rd largest global source of CH_4

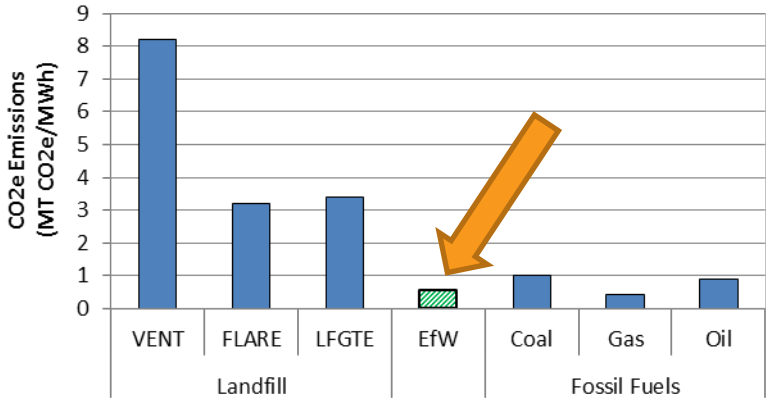


Source: Global Methane Initiative https://www.globalmethane.org/documents/analysis_fs_en.pdf

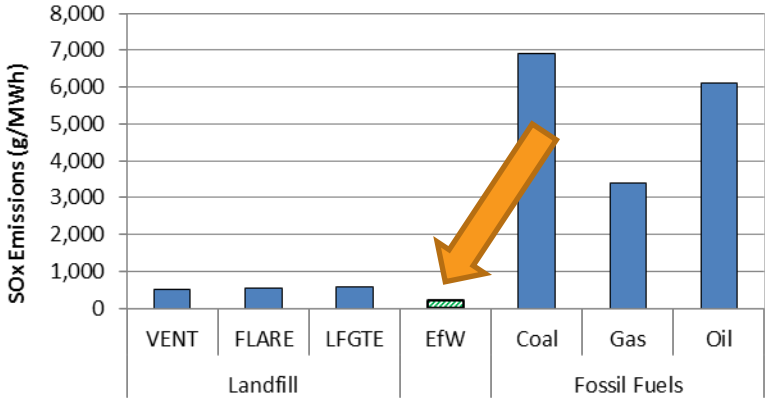
COVANTA
Powering Today. Protecting Tomorrow.

EPA Study: Lifecycle Energy Emissions

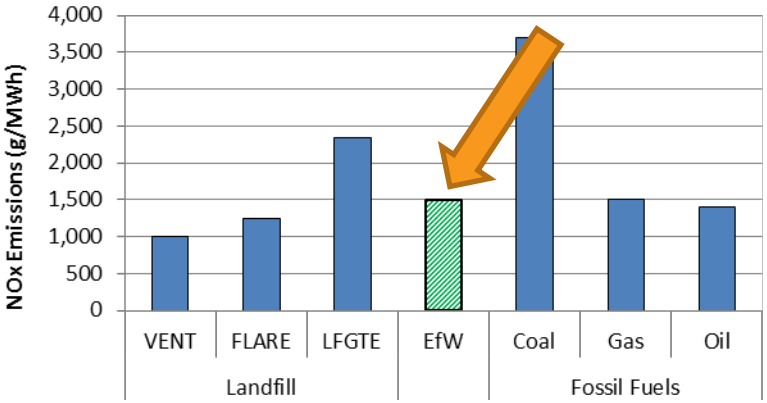
EfW is far below landfill gas to energy (LFGTE) in every category: CO_2, SO_x, NO_x, CO, PM



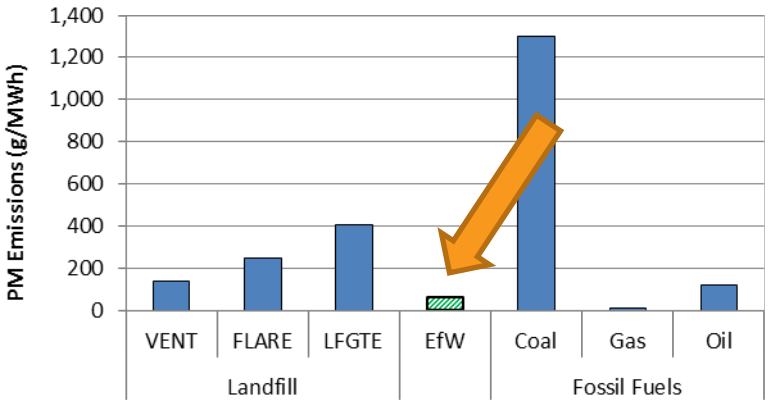
CO_2--EfW better than landfills, coal, oil, and on par with natural gas.



SO_2--EfW better than landfills, coal and oil.



NOx--EfW better than landfills & coal. On par with oil & natural gas.

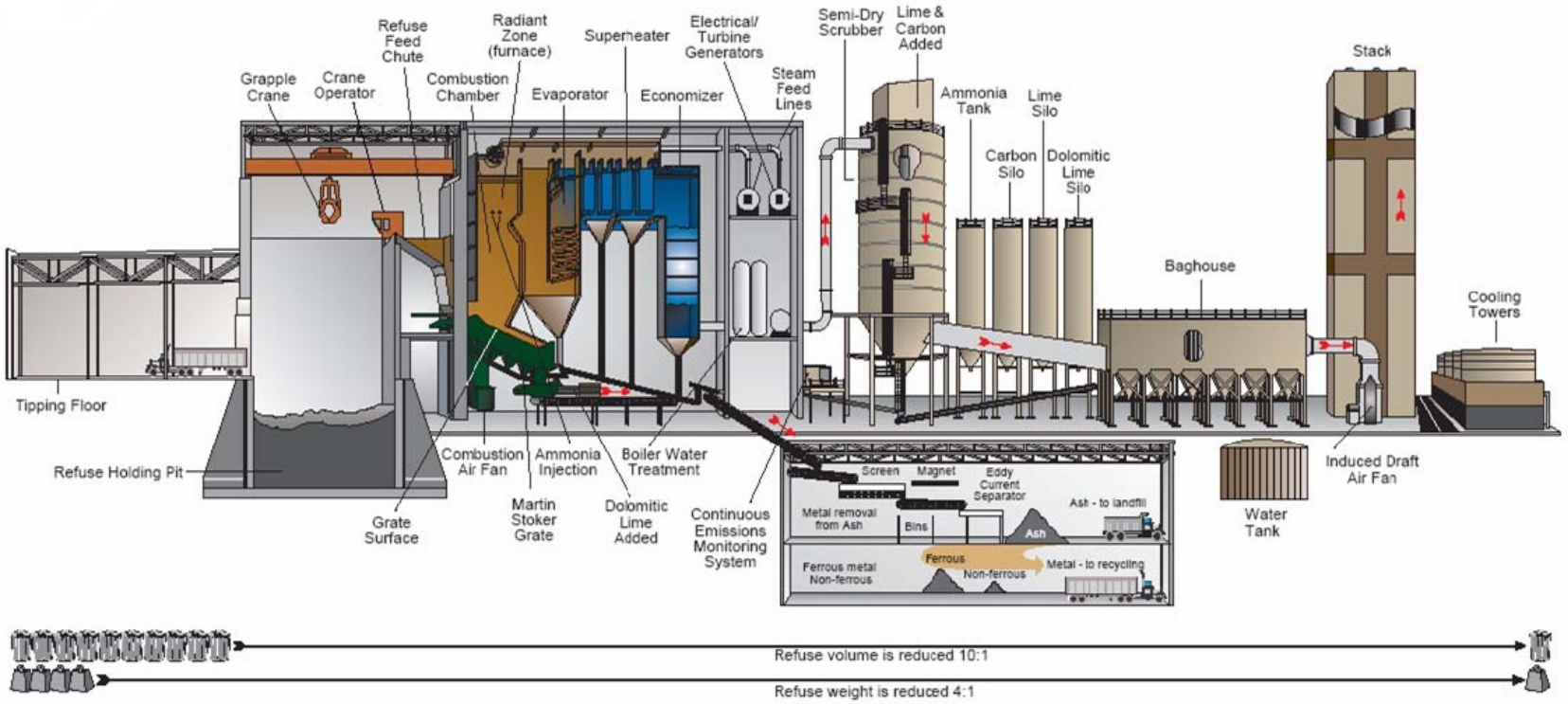


PM--EfW better than landfills, coal and oil.

Source: Kaplan,P.O., J. DeCarolis, S. Thorneloe, Is It Better To Burn or Bury Waste for Clean Electricity Generation?, *Environ. Sci. Technol.*, 2009, 43 (6), 1711-1717

COVANTA
Powering Today. Protecting Tomorrow.

EfW Process



COVANTA
Powering Today. Protecting Tomorrow.