MSW and Agricultural Waste

On Differing California Regulatory Pathways

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California Bioresources Alliance Symposium

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Thermal waste conversion technologies can assist in California's quest for zero waste, reducing dependence on landfills and fulfilling the state's goals for renewable energy.

And yet, for more than two decades, state policy has ignored, indeed discouraged, their use in the production of biofuels and other products from municipal solid waste.

Existing California Statute

- The state’s statutory definition of gasification is universally acknowledged to be scientifically inaccurate.
- The definition requires the entire manufacturing process, including the bioenergy production step, to have zero emissions.
- In statute, conversion technologies, including low temperature technologies, remain generally equated with incineration.
- MSW, when used to produce renewable energy, does not qualify as landfill diversion.

During the Past Ten Years

- The legislature mandated the 75% recycling of organics by 2020, 100% by 2025.
- Diversion credit is no longer allowed for green waste when used as alternate daily cover *landfills*.
- Source separated organics collection services must be provided to all residents and businesses by 2022.
- All local governments in California will be required to divert edible food waste from landfills, whether by turning it into compost or processing it by anaerobic digestion, also by 2022.
- 50% of the state's power must be renewable by 2025.

The major waste management companies, waste haulers and public jurisdictions are scrambling to find new sources for the disposal of their wastes.

CalRecycle's Policies are Not Meeting the Need

- To reach the state's goal of 75% organics diversion from landfills by 2020 (100% by 2025) would have required the state to reduce by 24 million tons the volume of waste it places in landfills. Through recycling methods alone, this was impossible.

- From the more than 45 million tons of post-recycled solid waste now being placed in landfills each year, conversion technologies theoretically could produce at least 1.75 billion gallons of LCFS-compliant biofuels.

How has the state been doing by relying upon the traditional hierarchy of waste reduction, re-use and recycling alone?

California's Historic Recycling Rate

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Millions of Tons of MSW Landfilled*									
30.2	29.9	29.4	30.3	31.0	33.1	34.8	37.5	39.1	42.4
Annual Recycling Rate									
49%	49%	50%	50%	50%	47%	44%	42%	40%	37%

* As reported by the landfills for IWM Fee assessment

Thermal technologies are an essential element in any effort to achieve an improved recycling rate, to interdict and make productive use of solid waste before it is placed in landfills and to produce fuels, chemicals and biomethane for renewable power production.

California law (PRC 40180) defines recycling, as *“the process of collecting, sorting, cleansing, treating, and reconstituting of materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products, which meet the quality standards necessary to be used in the marketplace*.”

Compare this with the statute in New York:

"When granting a beneficial use determination, the department shall determine, on a case-by-case basis, the precise point at which the solid waste under review ***ceases to be solid waste****. Unless otherwise determined for the particular solid waste under review, that point occurs when it is used in a manufacturing process to make a product or used as an effective substitute for a commercial product or used as a fuel for energy recovery."*

• No Legislative Relief

- In the implementation of its mandates and other programs, CalRecycle has virtually ignored the potential for using recyclables as raw materials for the production of new products–such as biofuels or renewable natural gas.
- Since its founding in 2004, the BioEnergy Producers Association has sponsored four legislative packages that would have made possible the use of conversion technologies in the treatment of MSW in California.
- All four were rejected by the legislature, the last in 2010.
- The legislation that has passed during the past decade has made it even more difficult to develop thermal MSW-to-biofuels projects in the state.

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1516 Ninth Street Sacramento, California 95814
Main website: www.energy.ca.gov

AIR RESOURCES BOARD
1001 I Street Sacramento, California 95814
Main website: www.arb.ca.gov

DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY
801 K Street, Sacramento, California 95814
Main website: www.calrecycle.ca.gov

April 15, 2010

The Honorable Joe Simitian
Chair, Senate Committee on Environmental Quality
State Capitol Building, Room 2205
Sacramento, CA 95814

Subject: Support for AB 222 Regarding Energy from Biogenic Waste

Dear Senator Simitian:

As members of the Bioenergy Interagency Working Group, the California Energy Commission, CalRecycle, and the California Air Resources Board, we write in support of AB 222. Enactment of AB 222 would assist California in meeting State renewable energy and low carbon fuel goals.

Since 2006, the Bioenergy Interagency Working Group has advocated in its Bioenergy Action Plan to "*Amend existing law to revise existing technology definitions and establish new ones, where needed. In particular, review the definitions of gasification, transformation, fermentation, pyrolysis, and manufacturing. Such statutory clarification would enable the utilization of biomass residues through combustion or non-combustion technology.*" (Bioenergy Action Plan, July 2006, p.9).

AB 222 would allow new non-incineration technologies to be used in the production of renewable biofuels and electricity from biogenic material diverted from California's landfills. It would achieve this by removing current statutory restrictions that require thermal conversion projects to have zero emissions, a standard required of no other energy generation technology or manufacturing process in the State and one that effectively precludes any municipal solid waste (MSW) conversion technologies from qualifying for California's Renewables Portfolio Standard (RPS).

AB 222 would make it easier for electricity produced from the biogenic waste stream to qualify as renewable electricity under California's RPS. Increasing access to biogenic waste creates another option, thereby enhancing California's ability to meet its ambitious RPS goals while complementing the State's diverse portfolio of renewable energy resources including wind, solar, geothermal, and biomass.

As long ago as 2010,
The California Air Resources Board

stated that its #1 solution for meeting the GHG reduction goals of California's Low Carbon Fuel Standard was to *"increase use of biofuels from waste materials."*

To meet its LCFS goals, *eleven years ago,* ARB projected the need for *24 new commercial scale advanced biofuels facilities in California by 2020*.

No high temperature MSW-driven biofuels project has yet been constructed in the state.

Potential New California Biorefineries to Meet 2020 Goals

- **24 new potential commercial scale biofuel facilities projected in CA by 2020**
  - **18 New Cellulosic Ethanol plants**
  - **6 New Biodiesel/Renewable Diesel plants**

What has been going on elsewhere in the United States?

To begin, biorefineries capable of producing a total of 1.6 billion gallons of renewable diesel from organic feedstocks are now in development or construction, intending to export this fuel to California to take advantage of the LCFS.

Fulcrum BIOENERGY

Fulcrum has commissioned its Sierra BioFuels Plant located in Storey County, Nevada, approximately 20 miles east of Reno. It will process approximately 175,000 tons of MSW feedstock annually, creating 11 million gallons per year of renewable synthetic crude oil, or “syncrude,” that will be processed into sustainable aircraft fuel.

Fulcrum has constructed and is operating its own MRF -- the Sierra Feedstock Procession Facility -- which is located adjacent to Waste Management’s Lockwood Regional Landfill, one of the largest landfills in the Western U.S. The location is in close proximity to the Sierra Biorefinery to maximize supply chain logistics and reduce transportation costs.

The plant’s municipal solid waste feedstocks will in part be trucked across the border from California. The participating jurisdictions in California will receive credit for landfill diversion, whereas they would not if the fuel were being used to produce biofuels in California.

Brightmark is commercializing a Plastics Renewal facility, located in Ashley, Indiana, that will divert from disposal 100,000 tons of plastic waste each year and use pyrolysis to convert these feedstocks into 18 million gallons of ultra-low sulfur diesel fuel and naphtha blendstocks, and six million gallons of wax.

Brightmark also owns and operates 23 renewable natural gas projects across the United States, all of which were launched over the past three years.

It is developing a facility in Macon, Georgia that will divert 400,000 tons of plastic waste each year from landfills and incinerators and convert it into 64 million gallons of ultra-low sulfur diesel fuel and naphtha blenstocks, and 20 million gallons of wax.

BRIGHTMARK
REIMAGINE WASTE

The Chesapeake Integrated BioEnergy Complex

The nation's first fully integrated eco-industrial park dedicated to the complete processing, recycling and re-use of all of the elements of the municipal solid waste stream. 95% of the incoming MSW will be productively recovered or reused.

Among the technologies planned for the facility:

- A dedicated MRF recycling 2,450 wet tons of MSW per day (850,000 tons per year) currently being sent to landfill. The organic residuals being gasified as feedstock for biofuels production.
- All inorganics will be fed to a high temperature plasma assisted vitrifier, which will produce construction aggregate and 15 MW of power to assist in operating the facility.
- TRI Gasification and Velocys processing to production 27 million gallons of renewable diesel fuel and Fischer-Tropsch waxes annually.
- Only one truck per month going to landfill.

In today's regulatory environment, no one would attempt to build this facility in California.

However, in California, none of the repressive statutory and regulatory provisions that have discouraged the development of MSW waste conversion projects apply to single-stream cellulosic wastes.

Thus, technology providers and project developers have selected California's Central Valley and its vast sources of agricultural wastes for their entry to the California market.

A current survey indicates that renewable energy projects consuming approximately one million tons of agricultural feedstocks are currently announced or in development.

The Challenge

EPA: San Joaquin Valley is “home of the worst air quality in the country.”

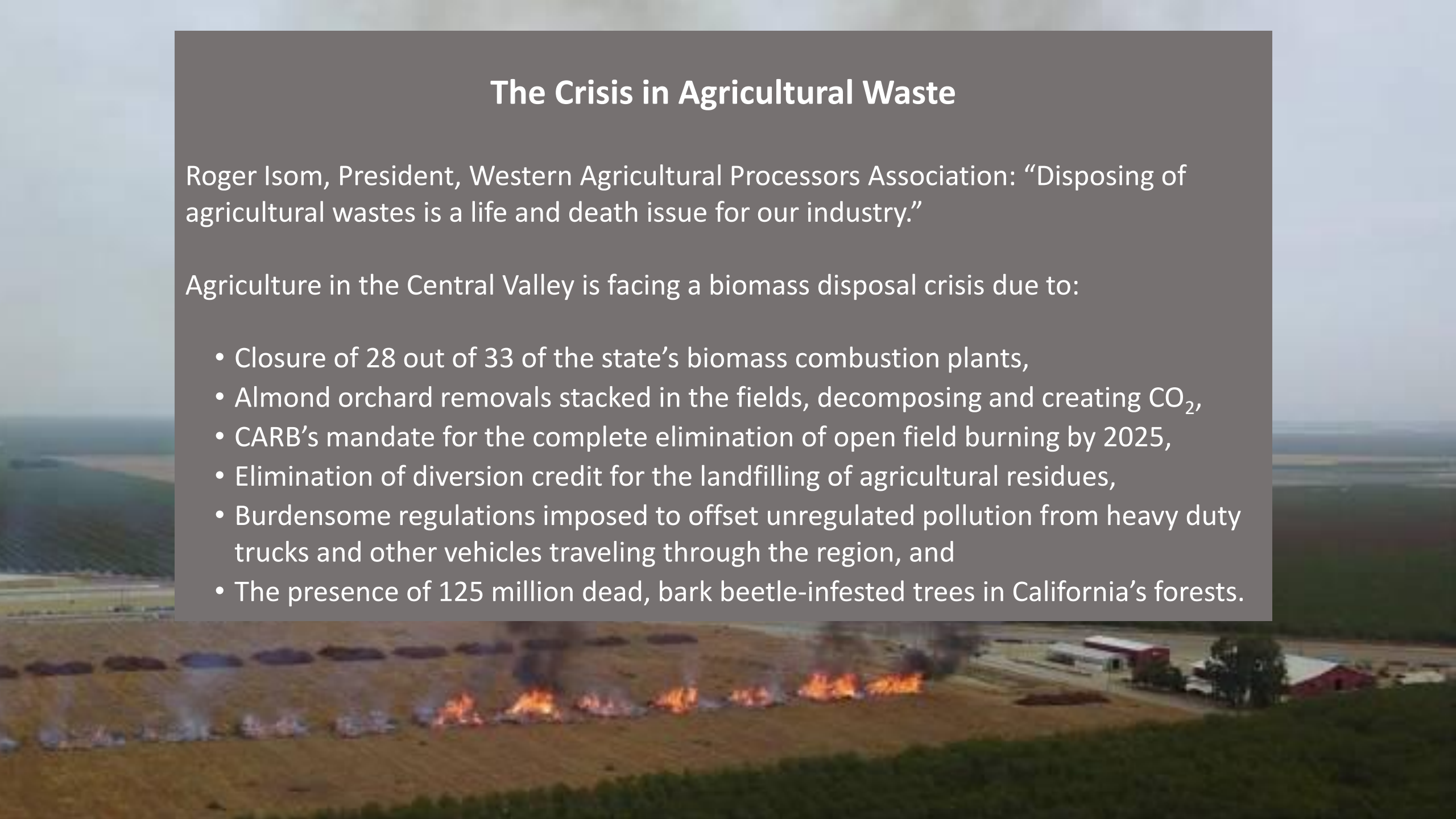
Has the nation’s four most polluted metropolitan areas by dangerous “spikes” in particulate matter (PM2.5):

1. Bakersfield
2. Visalia-Porterville-Hanford
3. Fresno-Madera
4. Modesto-Merced

Primary man-made causes: Oil and gas drilling, diesel trucks on “99” and “5”, agricultural waste decomposition and open field burning.

PM2.5 and ozone are linked to heart disease, lung cancer, childhood asthma and other respiratory conditions.

26% of school-aged children have asthma, the highest asthma rate for children in the nation. Over 550,000 Valley residents have asthma. 105,000 of them are children.



The Crisis in Agricultural Waste

Roger Isom, President, Western Agricultural Processors Association: “Disposing of agricultural wastes is a life and death issue for our industry.”

Agriculture in the Central Valley is facing a biomass disposal crisis due to:

- Closure of 28 out of 33 of the state’s biomass combustion plants,
- Almond orchard removals stacked in the fields, decomposing and creating CO_2,
- CARB’s mandate for the complete elimination of open field burning by 2025,
- Elimination of diversion credit for the landfilling of agricultural residues,
- Burdensome regulations imposed to offset unregulated pollution from heavy duty trucks and other vehicles traveling through the region, and
- The presence of 125 million dead, bark beetle-infested trees in California’s forests.

AEMETIS

Using the Inentec gasification technology and other processes, Aemetis' Carbon Zero plant will convert waste wood to cellulosic hydrogen with a below zero carbon intensity, which will be combined with renewable oils and zero carbon intensity hydroelectric electricity to produce45 million gallons per year of sustainable aviation fuel and renewable diesel.

The plant will be located at the 142-acre Riverbank Industrial Complex, a former US Army ammunitions plant in Riverbank, California. Commercialization is expected in 2024.

To further reduce carbon intensity, the Aemetis Carbon Zero production process will capture and inject 200,000 metric tonnes per year of CO2 from the plant into a sequestration well at the site.

Aemetis has signed an offtake agreement with Delta Air Lines for 250 million gallons of blended fuel containing sustainable aviation fuel to be delivered over the 10 years.

San Joaquin Renewables has secured $165 million in funding from Cresta Fund Management and Silverpeak Energy Partners to develop and construct a biomass gasification-to-renewable natural gas project near McFarland.

Frontline BioEnergy is developing the project, which will gasify orchard removals and nut shells from San Joaquin Valley farms, and from the synthesis gas, produce RNG to be sold as transportation fuel.

The project will also sequester carbon dioxide in an EPA Class VI sequestration well located on the project site.

Yosemite Clean Energy has secured the site for its first carbon-negative green hydrogen and renewable natural gas production plant in Oroville.

The facility will use proven gasification technology from the University of Vienna that has been applied at industrial scale in Europe for 18 years. The Oroville plant will be its flagship duel-bed gasification application in North America, following more than 100,000 hours of commercial run-time in Europe, Japan and South Korea.

Yosemite will sustainably convert waste woody biomass into syngas, from which carbon negative green hydrogen and RNG will be produced.

The plant will produce an estimated 31,000 kg per day of RNG and 12,200 kg per day of green hydrogen. Groundbreaking scheduled for Q2 of 2022.

YOSEMITE
CLEAN ENERGY

Chevron Corporation, Schlumberger New Energy, Microsoft and Clean Energy Systems plans to develop a bioenergy with carbon capture and sequestration (BECCS) project designed to produce carbon negative power in Mendota on the site of a former biomass combustion plant.

The BECCS plant will annually convert approximately 200,000 tons of agricultural waste into a renewable synthesis gas that will be mixed with oxygen in a combustor to generate electricity. More than 99% of the carbon from the BECCS process is expected to be captured for permanent storage by injecting carbon dioxide (CO2) underground into nearby deep geologic formations.

The plant, when completed, is expected to remove about 300,000 tons of CO2 from the atmosphere annually, which is equivalent to the emissions from electricity use of more than 65,000 U.S. homes.

CLEAN ENERGY SYSTEMS

Microsoft

Schlumberger

Chevron

Fresno Renewable Energy Center

WEST COAST WASTE

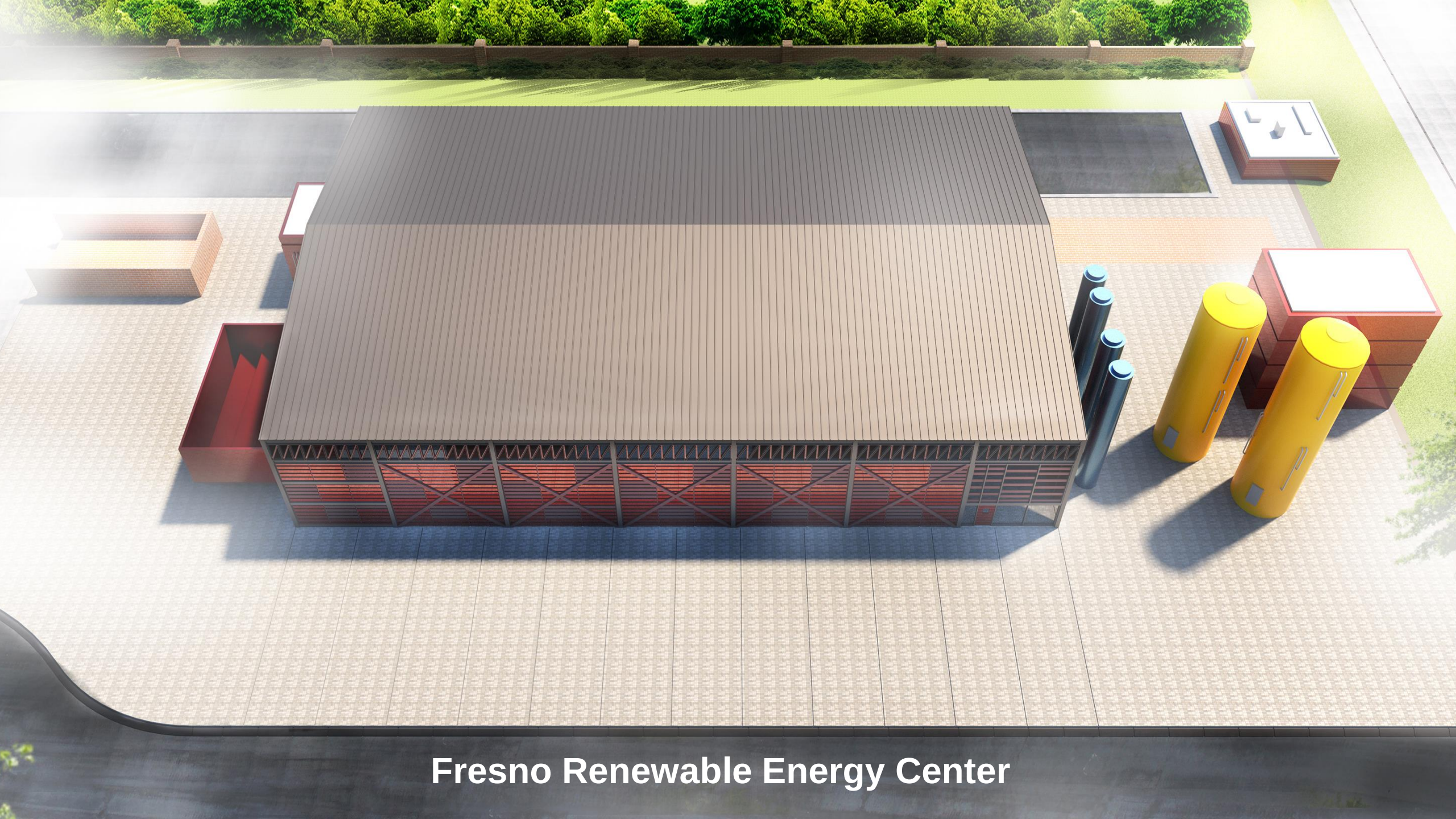
«Working for a Better tomorrow»

Fresno Renewable Energy Center

- To be constructed at the company's headquarters, which has been operating as a recycling facility since 2001.
- The site is currently permitted for 1,500 tons of material per day.
- For the first time anywhere, it will combine an anaerobic digestion facility and an agricultural waste gasification-to-power plant on the same site.

WEST COAST WASTE

«Working for a Better tomorrow»

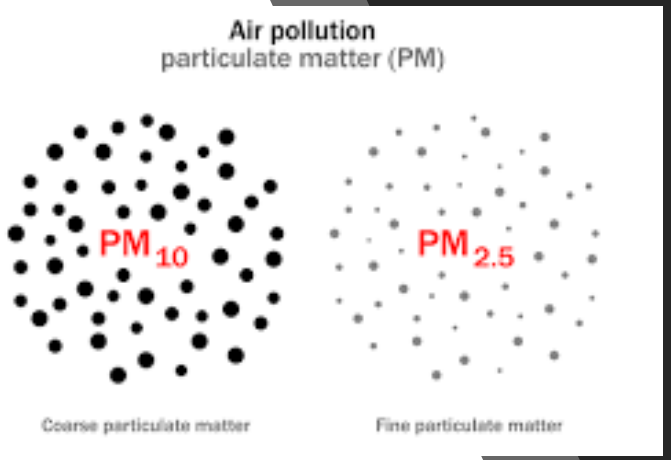


Fresno Renewable Energy Center

Fresno Renewable Energy Center

Gasification-to-Power Project Benefits

- Improves local air quality by removing more than 70 tons per year of airborne particulate matter from Fresno's ambient air.
- Produces 5 MW of renewable electrical power using a carbon negative process.
- The gasifier will consume more than 200 tons of agricultural and forest biomass per day and will gasify approximately 98% of its feedstocks. The residual material has commercial applications for use as concrete additives or simple civil applications.
- With the reduction in landfilling and the production in compostable materials, truck traffic will be reduced by 8 semi-trucks per day.
- Demonstrates a productive alternative to open field burning, which CARB has mandated for complete elimination by 2025.
- Provides construction and permanent jobs opportunities for the local community.



- The gasifier will purify ambient air by thermally destroying contaminants as the air passes through the gasifier's heating process. As a result, it will emit cleaner air than it takes in.
- The pollutants in Fresno's ambient air will be reduced by:
  - **29 tons per year of PM25**
  - **18 tons per year of PM10**
  - **23 tons per year of ozone**

Fresno Renewable Energy Center

Anaerobic Digestion Project Highlights

The project will:

- Annually produce 1,350,000 diesel equivalent gallons of renewable natural gas for pipeline injection, while processing 91,250 tons per year of green, dairy and food wastes.
- Annually produce 7 million gallons of clean water from green waste moisture reduction.
- In a circular process, provide its digestate for use by the gasification-to-power plant as a feedstock. That facility, in turn, will produce renewable power to operate the A.D. plant, reducing the CI score of the RNG it produces.
- With $3 million in financial assistance under a grant from the California Energy Commission, will commercialize the Verde pre-digestion technology.
  - Expanding the types of feedstocks that can be processed by A.D, including lignocellulosic biomass that previously has broken down poorly, if at all,
  - Increasing by up to 36% the output of renewable natural gas from A.D. facilities.

WEST COAST WASTE

- The West Coast Waste project will offer owners an alternative to open field burning, providing a productive outlet for the disposal of their vines and orchard removals.

The BioEnergy Producers Association

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