

Regulatory Barriers to the Utilization of Conversion Technologies in California

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Executive Summary

This paper focuses on the historical legislative and administrative policies that have inhibited the introduction of municipal solid waste (MSW) conversion technology projects in the state of California, and addresses the reforms that may be required to facilitate the use of non-combustion thermal technologies, i.e. pyrolysis and gasification, in the production of synthesis gas (syngas) and its derivatives, including biofuels, chemicals, upgraded pipeline natural gas and other biobased products. It does not address such other challenges facing the industry as siting, project finance or the need for long-term feedstock commitments and off-take agreements.

California Assembly Bill AB 341, passed in 2011, required CalRecycle, the state's integrated waste management agency, to adopt regulations for mandatory commercial recycling and to pursue a new statewide goal of 75% recycling, to be achieved by 2020 through source reduction, recycling, and composting. Then, acknowledging that this goal could never be met, the legislature in 2016, passed SB 1383, establishing targets that required CalRecycle to achieve a 50% reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 and a 75% reduction by 2025. The first of these goals was missed by a mile.

Neither this legislation nor any of CalRecycle's subsequent planning documents have ever mentioned Conversion Technologies (CTs) as playing any role in achieving this goal, which was missed by a mile.

Under CalRecycle's current policies, which ignore conversion technologies as a viable addition to their programs for waste disposal, meeting a statewide recycling goal of 75% by 2025 also appears to be an absolute impossibility. CalRecycle has not published a recycling figure since 2019, when it stood at 37%, down from 50% in 2014, and during the past five years, the trend of MSW generation has been consistently upward, and the trend for the state's recycling rate has been downward.

In September 2014, Governor Brown signed AB 1594 mandating that, beginning in January 2020, the use of green waste as alternative daily cover no longer constituted diversion through recycling and instead is now considered disposal in terms of measuring a jurisdiction's 50% per capita disposal rate. Further, AB 350, the Clean Energy and

Pollution Reduction Act, mandated the State to obtain 50% of its power from Renewable Energy by 2030.

The law granted CalRecycle the regulatory authority required to achieve its organic waste disposal reduction targets and established an additional target that not less than 20% of currently disposed edible food be recovered for human consumption by 2025. The final regulations regarding this legislation have placed burdensome financial and performance responsibilities on local communities and jurisdictions, and although they acknowledge the potential of other technologies in addressing these targets, they place CalRecycle in the position of overseeing which technologies will be approved and how they will be implemented.

Cities and counties, as well as private waste management companies throughout the state, are now seeking strategies that will allow them to find alternative uses for the disposal of their wastes that will enable them to meet their landfill diversion mandates. However, the legislative bureaucratic opposition to non-combustion thermal technologies remains entrenched. It is supported by stakeholders who believe that source reduction, re-use and traditional recycling are the only legitimate pathways to zero waste and that the introduction of conversion technologies will make it easier for the public to generate waste--and that is a bad thing.

CalRecycle has consistently ignored the potential of energy recovery from waste as an extension of its traditional policy of “reduce, recycle, re-use.” This dated and limited interpretation of statute remains protected by key legislative staff members, who have discouraged legislation designed to address these issues.

As mentioned previously, during the five years from 2014 through 2019 (the most recent period for which CalRecycle has reported), the state’s recycling rate declined from 50% to 37%, the lowest rate since the statewide 75% recycling goal was established in 2011. Over this same period, the volume of post-recycled MSW being wastefully placed in landfills increased from 31 million tons annually to 42.4 million tons.

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

* As reported by the landfills for IWM Fee assessment

In 2019 disposal was 42.4 million tons, an increase of 3.3 million tons, or more than 8%, over 2018. This chart shown above is a tacit admission that CalRecycle’s current policies are not achieving their legislated mandates.

Legislation authorizing diversion credit for non-combustion thermal technologies, i.e. the pyrolysis or gasification of organic materials, otherwise headed for landfills, and recycling credit for the process would assist public jurisdictions in a) finding alternatives to waste disposal, b) providing RNG for transportation and other consumer uses, and c) making their organics available for the production of biofuels and renewable power. Theoretically, the approximately 42 million tons of solid waste now being placed in landfills annually could have been used as feedstocks for the production of more than 1.6 billion gallons of renewable biofuels.

Further, in 2018, China implemented a ban of all recyclable material imports, compounding the problem.

At the time when SB 1383 was passed, CalRecycle said that, “In order for California to reach its statewide recycling goal of 75% by 2020, the state would have to reduce, recycle, or compost an additional 23 million tons of material currently going to landfills every year. That is based on an estimated 80 million tons of solid waste generated in 2020.” 2020 has come and gone and more than half of this year’s solid waste is still being landfilled.

The revenue base for biofuels and RNG involves renewable fuel incentives such as RINs and California’s Low Carbon Fuel Standard (LCFS) credit, making this one of the most practical and potentially profitable alternatives to the landfilling of organic wastes. Common sense demands that legislative and regulatory reform be addressed. The table on the following page captures the major issues inhibiting the implementation of conversion technologies in California.

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Problem	Issue	Proposed Solution
Definition of Recycling	CTs do not qualify under current statute. For well over a decade, CalRecycle policy has not taken into account their potential contribution to the recycling process.	Revise language in PRC 40180 to read that reconstituting post-recycled solid waste as a biofuels or other products qualifies as (or meets the definition of) "recycling." Institute policies that comply with the definition of recycling in that section.
Definition of Gasification	The definition is scientifically inaccurate. It discourages CT developers from attempting to operate in California.	Amend or delete definition of gasification in PRC 40117. Acknowledge its rightful place in the waste management hierarchy.
Diversion Credits	Waste Gasification presently does not qualify as diversion from landfilling.	Revise the definitions in PRC 40121, 40192 (b) and elsewhere to remove the classification of waste conversion as disposal.
Statutory Roadblocks	CalRecycle does not acknowledge gasification as having a role in achieving its AB 341 goal of 75% recycling. Policy should establish standards of performance, rather than regulating technologies by type.	Pursue corrective legislation to provide equal treatment for conversion technologies, and to ease the permitting for these projects, as has been done for composting and anaerobic digestion.

Background

In 2011, California's legislature set new goals for solid waste management. AB 341 required CalRecycle to adopt regulations for mandatory commercial recycling and to pursue a new statewide goal of 75% recycling, to be achieved by 2020 through source reduction, recycling, and composting.

In 2019, the last year for which the state's recycling rate has been reported, California landfilled or exported for landfill 42.3 million tons. To calculate California's recycling rate, CalRecycle added to that 6.3 million tons of "disposal-related" materials, bringing total disposal to 48.6 million tons. With California's population at 39.7 million residents and using AB 341's measurement system, this results in a per resident disposal rate of 6.7 pounds/resident/day. As early as 2015, when the state's recycling rate declined to 42%, down from 47%, it became clear that achieving 75% recycling by 2020 was impossible. Until 2015, the state's recycling rate had remained essentially unchanged at approximately 50% since 2010.

New Technologies, New Policies

CalRecycle must formally recognize the potential, not only of composting, anaerobic digestion and landfill biogas as legitimate sources of renewable natural gas production,

but gasification and pyrolysis, as well. However, when applied to municipal solid waste (MSW) for the production of power, liquid fuels or renewable natural gas (RNG), these technologies do not count as recycling.

Another driver for the conversion of MSW to RNG is SB 350, the Clean Energy and Pollution Reduction Act of 2015, signed into law by the Governor on October 7, 2015. Its provisions include a mandate for utilities to produce 50% percent of the state's power from renewable energy by 2030.

For Southern California Gas Company, 50% means 50 billion cubic feet of RNG per year. Its plan to achieve this level of production includes 14 gasification facilities capable of producing 42,000 SCFM of RNG from municipal solid waste.

A further incentive for the introduction of conversion technologies is SB 32, signed by the Governor in September 2016, which establishes a California greenhouse gas reduction target of reducing GHG emissions to 1990 levels by 2020 - a reduction of approximately 30%, and then an 80% reduction below 1990 levels by 2050. This is the most aggressive GHG reduction benchmark enacted by any government in North America.

It should be noted that, to date, the prior legislative campaigns on behalf of CTs, all of which have been unsuccessful, have focused on creating an acceptable regulatory environment for the production of power and/or biofuels, chemicals or biobased products. The state's current environmental mandates establish the need to use conversion technologies for the production of renewable natural gas, as well.

Ever since its first publication in 2006, California's BioEnergy Action Plan has included language directing CalRecycle "to work to promulgate changes to existing law to develop a regulatory framework for biomass waste conversion facilities, meeting environmental standards, that clearly distinguishes them from disposal, and provides clear permitting pathways for their development, as well as provides diversion credits to local jurisdictions for solid waste processed by these technologies." That plan remains as state policy.

Further, the state's Air Resources Board has long recognized that organic waste is one of the only feedstocks that, on a life-cycle basis, will meet the emissions reduction objectives of California's Low Carbon Fuel Standard. As early as 2010, its staff declared that 24 waste-to-biofuels facilities would be required in the state by 2020—18 plants that produce biofuels from waste products and six new biodiesel/renewable diesel plants—to assist in meeting the goals of this program. However, this goal has not even begun to be realized.

California's Definition of Recycling

California law defines recycling, PRC 40180, 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.”

Current regulatory practice ignores the concept of converting solid waste into raw material for use in the production of new products. Conversion technologies would be creating a raw material--synthesis gas--for use in the production of new products.

This is what the State of New York defines as the "cessation of waste". It can only occur once the step of reconstituting takes place, and it results in a flexible regulatory framework based upon standards of performance. Its statute reads: “*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.*” [6NYCRR360-1.15 (d) (3)].

“Recycling” is not simply the act of segregation, or the business of collection, or the sorting that occurs at the Materials Recovery Facility (MRF), or even the brokerage of those materials. It is a process--a pathway that transforms materials from waste into raw materials.

This involves changing the form or structure of something, whereas CalRecycle, in its AB 341 planning and other policy making, maintains that recycling constitutes only material segregation, collection, and sorting. Recycling programs that simply collect, sort, clean, and sell "recycled materials" are not performing recycling as defined in statute, but simply brokering goods as part of a larger, unregulated value chain.

California's Gasification Definition

For the past fifteen years, elements in the legislature have blocked all efforts to amend or remove from statute a definition of gasification that is universally acknowledged to be scientifically inaccurate, and which leaves developers vulnerable to spurious legal challenges and possible shutdown due to lack of compliance. Its key provisions read as follows:

40117. "Gasification" means a technology that uses a noncombustion thermal process to convert solid waste to a clean burning fuel for the purpose of generating electricity, and that, at minimum, meets all of the following criteria:

(a) The technology does not use air or oxygen in the conversion process, except ambient air to maintain temperature control.

(b) The technology produces no discharges of air contaminants or emissions, including greenhouse gases, as defined in subdivision (g) of Section 38505 of the Health and Safety Code.

(c) The technology produces no discharges to surface or groundwaters of the state.

(d) The technology produces no hazardous waste.

(e) To the maximum extent feasible, the technology removes all recyclable materials and marketable green waste compostable materials from the solid waste stream prior to the conversion process and the owner or operator of the facility certifies that those materials will be recycled or composted.

To summarize, the definition restricts the use of air or oxygen in the gasification process (a disqualifying element for most technologies), and requires the entire biorefining process, not simply the gasification step, have zero emissions. This is a physical impossibility and a standard that would shut down every power plant and petroleum refinery in the state, not to mention any gasification facilities.

It creates uncertainty as to whether individual conversion technologies, when processing MSW, will qualify for credit under the state's Renewable Portfolio Standard.

Statutory Roadblocks

Since 2005, due to the statutory and regulatory roadblocks faced by conversion technologies in the state, California-based companies have located an estimated \$1 billion in gasification-related renewable energy projects elsewhere.

The following are the main statutory roadblocks to the use of gasification in California.

1. For almost two decades, the legislature has refused to amend or remove from statute a scientifically inaccurate definition of gasification (PRC 40117). During this time, four comprehensive packages of corrective legislation sponsored by the BioEnergy Producers Association and dealing with this issue have been rejected by the legislature.
2. Further, a number of other statutory provisions prevent MSW gasification facilities from receiving credit as landfill diversion. This discourages jurisdictions from entering into long-term feedstock contracts with project developers, as such contracts would raise the possibility that, at some point, these jurisdictions could incur financial penalties for failing to meet their landfill diversion mandates.

AB 1126, for example, establishes a definition for what it calls “engineered municipal solid waste conversion,” a definition that makes no distinction between combustion and thermal conversion. It places conversion technologies under feedstock volume and content limitations that had been drafted to regulate the incineration of MSW in cement kilns. For purposes of AB 939 and AB 341 compliance, it codifies that MSW residuals, when used to produce syngas or such derivatives as RNG or biofuels, count as disposal, rather than recycling. It denies RPS credit to facilities that generate power from MSW-derived biogas, which this same feedstock would receive if it had been processed using anaerobic digestion.

The bill places Material Recovery Facilities (MRFs), when processing MSW feedstocks for use in CTs, under burdensome volume, content and reporting restrictions. It limits EMSW facilities to no more than 500 tons per day of feedstock (whereas landfills are allowed to accept up to 10,000 tons per day), restricting economies of scale, and limits feedstocks to no more than 25% moisture content and 25% noncombustible waste, when many CTs can handle 50% moisture content and higher.

3. As mentioned previously, SB 498, passed in late 2014, established a new definition for “Biomass Conversion”. Although a token first step in dealing with the regulatory roadblocks facing conversion technologies, the bill specifically precludes municipal solid waste as a qualifying feedstock, instead addressing such single stream wastes as agricultural crop residues, green waste and non-recyclable paper.

Policy Roadblocks

For almost a decade, CalRecycle has pursued a policy of solid waste management that is narrowly focused on source reduction, reuse and traditional recycling as its primary alternatives to landfilling, while collaborating with the legislature to pass such bills as AB 341, AB 1126 and SB 498, which have provisions that are either adverse to, or ignore to the use of, CTs in processing municipal solid waste.

Operational certainty for CTs depends upon the state creating clear permitting and regulatory pathways based upon standards of performance, subject to environmental standards consistent with its other solid waste processing or refinery operations, rather than attempting to define, categorize and regulate these technologies by type.

Lacking such a practical statutory and regulatory foothold, CT providers have been unwilling to risk time and capital in an attempt to permit these projects in the state.

In 2021, California-based Fulcrum BioEnergy will commission its first CT facility east of Reno, Nevada. Its related materials recovery facility is operational, and it is expected that the plant will annually produce 10.5 million gallons of synthetic renewable crude oil from

175,000 tons of post-recycled municipal solid waste. This “syncrude” will be upgraded for use as jet fuel.

In part, the facility will use feedstocks supplied by Waste Management and Waste Connections, Inc. Much of this will be solid waste trucked from El Dorado County through the Lake Tahoe region to Nevada. By shipping its waste for gasification in Nevada, El Dorado County will obtain credit for landfill diversion in California and increase the County's recycling rate, whereas if the facility was located in California, it would not. In Nevada, Fulcrum completed its initial permitting in Nevada in a matter of six months.

If any similar facility were produce electricity and sell it back into California, it would qualify as renewable under the California's RPS.

The Agricultural Waste Crisis

During the past decade 28 out of 33 biomass combustion facilities in California, which has benefited from premium rates for the power they produced, ceased operations when they could no longer compete with natural gas-powered facilities. This left the agricultural industry with very few alternatives for the disposal of their wastes, and the San Joaquin Valley Air Pollution Control District was forced to allow the increased use of open field burning. In February of 2021, the California Air Resources Board mandated the complete cessation of this practice by 2025.

As the State's repressive gasification definition and other regulations relating to MSW do not apply to single stream cellulosic wastes, there are now at least seven facilities in development in the San Joaquin Valley that will use gasification or pyrolysis for the production of biofuels or power from agricultural wastes.

Meanwhile, state government continues to focus its efforts on improving the regulatory environment for other organic waste treatment processes that, in total, cannot address the state's entire carbon-based waste stream.

For example, through regulatory decision-making alone, the state classified anaerobic digestion as composting, and as recycling rather than disposal, exempting these technologies from having to follow the same uncertain and time-consuming permitting pathways required of other CTs, enabling them to receive landfill diversion credit, and to qualify the power they produce for the Renewable Portfolio Standard (“RPS”).

AB 341, enacted in 2011, established a policy goal requiring the state to source reduce, recycle or compost 75% of its solid waste by 2020. The legislation does not so much as mention that CTs could play a role in this effort, nor has this alternative been addressed in any of CalRecycle's subsequent planning documents. In fact, since the passage of AB 341, the agency has collaborated with the legislature to enact four bills that favor anaerobic digestion (AD) and composting.

Composting facilities involve both emissions and odors, creating major challenges in facility siting. Two communities in Southern California have succeeded in shutting down these facilities due to odor problems. It is interesting to note that the state is currently landfilling more than 15 million tons of compostable organics each year.

Further, Los Angeles County does not currently have a single anaerobic digestion facility operating on a commercial basis. Preliminary estimates indicate that the County's jurisdictions would need 36 facilities, each with a processing capability of 250 tons-per-day, to meet the state's goals for anaerobic digestion.

In addition to setting an increased recycling goal, AB 341 creates other challenges for the state's cities and counties. For example, as of 2020, green waste no longer qualifies for diversion credit when used as alternate daily cover. Sacramento City and County landfill 80,000 tons of green waste each year, for which they formerly received diversion credit. Like cities and counties throughout the state, they are seeking strategies that will allow them to dispose of that tonnage while meeting their landfill diversion mandates. Legislation authorizing diversion credit for the gasification of these materials would address this problem.

All of these facts confirm the magnitude of the potential for creating renewable natural gas from organics before they are placed in landfills. In short, the renewable natural gas industry needs a reliable business environment that will support the permitting and operation of innovative new science-based waste recovery technologies in a free market economy.

CT Supportive Legislative History

AB 222, the most comprehensive CT initiative and the one to advance the farthest during the past decade, was a two-year bill sponsored by the BioEnergy Producers Association in 2009-2010. Its goals included the following:

- It would have removed from statute scientifically inaccurate definitions and repressive permitting pathways that have driven biobased technology providers and investment capital out of California.
- In particular, for regulatory purposes, it deleted from statute the scientifically inaccurate definition of gasification.
- In its place, it inserted the following definition of a biorefinery:

"Biorefinery" means a facility that uses a non-incineration thermal, chemical, biological, or mechanical conversion process, or a combination of those processes, to produce a clean burning fuel for the purposes of generating electricity or a renewable

fuel from either a solid waste feedstock or carbonaceous material not derived from fossil fuels. Carbonaceous materials include, but are not limited to, any of the following:

- (A) Dedicated energy crops.*
- (B) Agricultural crop residues.*
- (C) Bark, lawn, yard, and garden clippings.*
- (D) Leaves, silvicultural residue, and tree and brush pruning.*
- (E) Wood, wood chips, and wood waste.*
- (F) Nonrecyclable pulp or nonrecyclable paper materials.*
- (G) Waste fats, oils, and greases.”*

- The legislation also would have qualified the biogenic portion of solid waste as a feedstock under the RPS, and would have enabled jurisdictions to count solid waste diverted for processing by these technologies as landfill diversion.
- It stated that biorefineries could only handle solid waste materials that constituted residuals of recycling.
- AB 222 received letters of support from approximately 100 stakeholders statewide and was jointly endorsed in a letter signed by either the Chair or Acting Director the California Energy Commission, the Air Resources Board and CalRecycle, an unusual honor for California legislation.
- Despite intense opposition, the bill passed the Assembly Utilities & Commerce Committee (11-0), the Assembly itself (54-13) and the Senate Energy, Utilities and Communications Committee (6-1). It was ready for Senate floor passage and final signature by Governor Schwarzenegger when the Senate Environmental Quality Committee demanded to hear the bill, in connection with which its staff stripped the legislation of its RPS and landfill reduction provisions, and inserted amendments that would have created even more restrictive pathways for the implementation of conversion technologies in the state. The sponsors ultimately found themselves in the position of having to oppose their own legislation, and it was withdrawn from consideration.

Conclusion

During the past ten years, California has placed in landfills 337 million tons of post-recycled solid waste, one of the state’s most readily available and environmentally appropriate renewable feedstocks.

Theoretically, organic waste feedstocks could support the production of 1.6 billion gallons of biofuels in California, or an estimated 243.6 billion cubic feet of gas per year, more than 10% of California’s total use of natural gas.

The passage of SB 32 and other legislative and regulatory initiatives reinforced the need for legislation that would enable the use of gasification in the production of RNG, biofuels and other biobased products.

Existing federal and state incentives make possible a practical and potentially profitable alternative to the landfilling of organic wastes.

In summary, there is a new form of recycling emerging that supersedes California's approach – the pursuit of energy independence and a cleaner environment through the recycling of carbon. The process, also known as molecular recycling, is going to change the face of the waste industry, and how we think about recycling. It is a regulatory concept worth fighting for.

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