THE SOUTHERN CALIFORNIA CONVERSION TECHNOLOGY PROJECT

"Converting waste into renewable resources"

www.SoCalConversion.org

The County of Los Angeles has been a consistent supporter of the development of conversion technologies. Development of in-County, commercial scale conversion technology facilities is a key element in the County's strategy for assuring long-term disposal capacity to meet the needs of over 10 million residents and thousands of businesses county-wide.

What are conversion technologies?

- Conversion technologies are thermal, chemical, mechanical, and/or biological processes capable of converting post-recycled residual solid waste into useful products and chemicals, green fuels like ethanol and biodiesel, and clean, renewable energy.
- More than 130 commercial facilities, processing a wide variety of wastestreams, operate in Europe and Asia as a safe and clean alternative to traditional waste management practices such as landfilling or waste-to-energy. Jurisdictions throughout the United States are considering these technologies because of their demonstrated benefits.
- The benefits of these technologies include 1) diversification of solid waste management options, 2) job creation, 3) biofuel and energy production, and 4) environmental benefits such as reduced GHG emissions from reduced truck traffic and landfill avoidance.

What is the Southern California Conversion Technology Project?

The project, spearheaded by the County of Los Angeles, promotes the development of fully operational conversion technology facilities. The goal of the project is to develop one or more projects within the County to demonstrate the technical, environmental and economic benefits of conversion technologies, and to forge permitting and legislative pathways for future commercial projects.

Conversion Technology Q&A:

Conversion Technologies Manage Waste That Would Otherwise Go To Landfills

Question: Should Conversion technologies be viewed as a solution to California's landfill problems?

Answer: Together with source reduction, recycling, and composting; conversion technologies are a critical component of the solid waste hierarchy and can help local jurisdictions divert materials from landfill disposal.

Question: Why should we change California's existing solid waste management system?

Answer: California's landfills are rapidly approaching capacity which necessitates the exporting of waste to remote locations and increases pressure to expand and build new landfills.

Puente Hills Landfill, California's largest landfill (located in Los Angeles County) closes in 2013[i]. As California's population increases (an additional 10 million by 2020) and disposal capacity in many jurisdictions is reduced, local governments will have to ship their solid waste hundreds of miles to dispose of it or expand capacity at urban landfills. Conversion technologies are an environmentally preferable local solid waste management solution.[ii]

Question: We've made great strides in recycling, shouldn't we continue to rely on the "3 Rs" to reduce our dependence on landfill disposal?

Answer: The California Integrated Waste Management Act requires municipalities to divert 50 percent of solid waste from landfill disposal or "transformation"[iii]. AB 341 (2011, Chesbro) updates this by declaring that it is California's policy goal that not less than 75% of solid waste generated be source reduced, recycled or composted by 2020.

However, after 22 years the state has not been able to significantly reduce the total volume of waste it is putting into landfills[iv]. With California's population continuing to grow, municipalities cannot continue to meet the State's waste diversion mandate, much less achieve "zero waste," relying on just reducing, recycling[v] and composting[vi].

Question: What are some of the specific benefits of conversion technologies versus continuing to dispose residual solid waste in landfills?

Answer: Space requirements are substantially greater for a landfill than a conversion technology facility. Small-scale conversion technology units need no more than one acre of land to operate on compared to hundreds of acres consumed by a typical landfill.

Conversion technologies are a more efficient way of producing domestic renewable energy than landfills, and they produce far fewer greenhouse gases and air pollution[vii].

The State of California requires extensive post-closure maintenance for landfills, including monitoring the site for gas and leachate for up to 30 years after the closure date of the landfill. Conversion technology facilities do not require post-closure maintenance after the facility closes.

Sources and Additional Information

[i] The Puente Hills landfill has been a key component of Los Angeles County's solid waste management infrastructure, providing up to one-third of the waste disposal capacity in the County.

[ii] Wastes now going to Puente Hills Landfill may have to be shipped over 200 miles to alternative landfill sites.

[iii] PRC 41780 (1989).

[iv] In 1989 when California passed its mandate for 50 percent recycling, the state landfilled 40 million tons of waste. In 2008, recycling advocates claimed a 58 percent recycling rate at the same time the state was still landfilling 40 million tons of waste. During the next 25 years, following the status quo, the state's population is expected to grow by 10 million people and place an additional one billion tons of municipal solid waste into landfills. In October 2010, the County of Los Angeles characterized conversion technology facilities as a viable and necessary alternative to landfilling wastes: "The County envisions one or more commercial conversion technology facilities…being developed throughout the County as a means to provide long-term solid waste management capacity, to reduce dependence on landfills, and to stabilize waste disposal rates." Board Motion of April 20, 2010, Item No.44 Conversion Technologies in Los Angeles County Preliminary Siting Assessment." At p 14.

[v] According to the U.S. International Trade Commission, scrap metal and waste paper are among the largest exports of materials by tonnage from the U.S., with the vast majority of this material being shipped to China and other Pacific Rim countries. Rather than creating American jobs and enhancing the environment, these materials are processed under environmentally questionable conditions in other countries, where investigative reports have exposed terrible working conditions for workers processing the recyclables. In addition, it is simply not economically feasible to recycle many waste materials, as a result these materials are sent to landfills or incinerators.

[vi] According to the California Integrated Waste Management Board (now Cal Recycle) composting emits VOCs. VOCs react with NOx and sunlight to create ground-level ozone. Local Air Districts are under pressure to reduce criteria pollutants stemming from composting.

[vii] According to the California Integrated Waste Management Board (now CalRecycle): "The landfill scenarios without gas collection and utilization had the highest net energy consumption. Even the best-case scenario (with gas collection and energy recovery) was significantly higher in energy consumption than the conversion technology scenario." New and Emerging Conversion Technologies, Report to the Legislature (2007) at P 61; also see, Los Angeles County Integrated Waste Management Task Force, "Conversion Technologies: An Opportunity to Enhance our Environment", May 12, 2011: "Conversion technologies are an effective and environmentally preferable alternative to landfilling."

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Conversion Technology Q&A:

Conversion Technologies are not Incinerators

Question: Are conversion technologies another form of incineration, so called "incinerators in disguise"?

Answer: Incineration is literally the burning (combustion) of organic substances contained in waste materials in an oxygen-rich environment where the waste material combusts and produces heat and carbon dioxide, along with a variety of other pollutants including dioxins, furans, NOx and SOx.[i]

Conversion technologies (including gasification, pyrolysis, anaerobic digestion and other processes[ii]), unlike incinerators[iii], do not burn waste. They are **non-combustion** thermal, mechanical, and biological processes that convert post-recycled residuals (materials that would otherwise be sent to landfills) into green fuels like ethanol and biodiesel, clean renewable energy and other marketable products.

Question: Are conversion technologies, capable of effectively controlling the release of air pollutants?

Answer: Modern incinerators, also called transformation or waste to energy facilities when they create electricity, employ the most advanced pollution control devices and have substantially reduced their air emissions compared to just decades ago when they were first developed in large numbers.

However, unlike incineration, conversion technologies provide an intermediate gas clean-up step as part of the process, thereby allowing for a variety of air pollution control technologies that result in even cleaner emissions, in addition to a variety of products such as biofuels and chemicals which cannot be produced by an incinerator.

Additionally, conversion technology designs ensure significant emission reductions below applicable Air District standards.[iv]

Question: What are the benefits of conversion technologies over incineration?

Answer: Advanced thermal conversion technologies have several potential benefits over waste incineration[v], including lower environmental impacts, higher electrical conversion efficiencies, and greater compatibility with recycling[vi].

The volume of output gases as well as ash residual from a gasifier or a pyrolysis reactor is much smaller per ton of feedstock processed than from an incineration process.

Sources and Additional Information

[i] While incineration could successfully burn off any combustible elements, it must do so at extremely high and costly temperatures. Incineration cannot control the release of dioxins, furans, NOx, SOx and other pollutants without considerable expense and difficulty due to the intrinsic inefficient furnace design, inconsistent furnace temperatures, and failure to recirculate gases into the burner's high temperature zone.

[ii] Conversion technologies can be classified into three broad categories: thermochemical, biochemical, and secondary manufacturing (utilization of the mixed solid waste stream as raw materials in the manufacture of new products). Biochemical conversion technologies include anaerobic digestion, aerobic conversion and fermentation.

[iii] In distinguishing between combustion and non-combustion technologies, combustion is the thermal destruction, in an oxygen rich environment, of solid waste for the generation of heat and subsequent energy production; flame temperatures ranging from between 1500F to 3000F.

[iv] Conversion technologies operating in the U.S., Japan and Europe significantly meet or exceed air pollution standards for: PM, HCL, NOx, SOx, Hg and Dioxins/furans (ng/N-M3); see, University of California Davis and University of California Riverside, "Performance and Environmental Impact Evaluation of Alternative Waste Conversion Technologies in California" (2004); also see, Report on Worldwide Emissions Assessment of Thermal Conversion Technologies (2009) pp 8-30; University of California Riverside, "Evaluation of Emissions from Thermal Conversion Technologies Processing Municipal Solid Waste and Biomass" (2009).

[v] The volume of output gases from a gasifier or pyrolysis reactor is much smaller per ton of feedstock processed than an equivalent incineration process. While these output gases may be eventually combusted, the conversion/ process provides an intermediate step where gas cleanup can occur as opposed to mass burn incineration which is limited by application of pollution control equipment to the fully combusted exhaust only; gasification and pyrolysis produce intermediate synthesis gases composed of lower molecular weight species such as natural gas, which are cleaner to combust than raw MSW.

[vi] Center for the Analysis & Dissemination of Demonstrated Energy Technologies (CADDET) and the International Energy Agency (IEA) report (1998); also see, California Integrated Waste Management Board, New and Emerging Technologies Report to the Legislature (2007), p 66.

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Conversion Technology Q&A:

Conversion Technologies Complement Recycling

Question: Would conversion technologies hurt recycling?

Answer: Most conversion technology facilities are equipped with a highly specialized sorting system that removes recyclables *prior* to the conversion process[i]. Projects currently being developed in California are proposing to only handle post-MRF waste material that would otherwise be disposed in landfills, not separated recyclables.

Question: What type of materials do conversion technologies process? Do they require a constant feed of materials that could otherwise be recycled?

Answer: Conversion technologies have flexibility in the volume of waste they process, and can process a variety of feedstocks including medical waste, tires, biosolids, purpose grown energy crops, forest thinnings, and crop residues. Conversion technologies can manage materials that are not easily recyclable.[ii]

Homogenous feedstocks enhance the efficiencies of conversion technologies, therefore conversion technologies are designed to maximize the removal of materials that are not able to be converted; they should be viewed as complimentary to recycling[iii].

Question: Aren't waste reduction, recycling, and composting enough to divert materials from landfills?

Answer: Recycling alone will not solve California's waste management problems; even with a claimed recycling rate of 58 percent (12 percent of which is green waste placed in landfills for daily cover), California disposes between 35.5 and 43 million tons of post-MRF residuals annually[iv].

The nations that recover the greatest amount of energy from solid wastes are also the nations with the highest recycling rates[v].

Sources and Additional Information

[i] Conversion technologies require "up-front" sorting and/or preprocessing of post MRF residuals which would necessarily extract recyclable materials prior to thermal conversion.

[ii] Not all solid waste currently disposed can be recycled or composted. Contaminated organic materials, higher number plastics, and other materials, which cannot be recycled or processed in an economically feasible way are ideal feedstock for conversion technologies. Inorganic materials including glass, metals, and aggregate can reduce the efficiency of conversion technology operations; they have no value for conversion technologies thereby creating an incentive to separate and recover those materials for recycling prior to the conversion process.

[iii] According to a study prepared by the CIWMB (now CalRecycle) in 2007, certain materials such as glass and metals will reduce the efficiency of conversion technology operations: "There is a projected net positive impact on glass, metal, and plastic recycling…using mixed solid waste as feedstock, preprocessing results in removal of 7 to 8 percent of feedstock for recycling at gasification facilities and 12 to 13 percent of feedstock for recycling at acid hydrolysis facilities. This increase in recycling is related to conversion technology preprocessing operations". California Integrated Waste Management Board, *New and Emerging Conversion Technologies Report to the Legislature* (2007) at pp 74-75.

[iv] It is unrealistic to believe that the post-recycled fraction of municipal solid waste that is being placed in California's landfills can be significantly reduced through source reduction, traditional recycling and composting alone. In 1989, the state was landfilling 40 million tons of municipal waste per year. In 2008, even with a claimed recycling rate of 58 percent, California was landfilling between 35.5 and 43 million tons of MSW. The state's population is expected to grow by nearly 10 million people over the next 25 years adding another 800 million tons of post recycled material to landfills. "There is widespread agreement that the continued land disposal of waste in not a viable option in the state." University of California Riverside, *Evaluation of Emissions from Thermal Conversion Technologies Processing Municipal Solid Waste and Biomass* (2009); also see California Senate Environmental Quality Committee staff evaluation of policy concerns over Assembly Bill 222: "It is a fact that the greatest majority of all materials that are financially feasible for recycling are currently being removed from the waste stream. [Even including commercial and multi-family recycling], [i]t would be functionally and economically impossible to achieve "zero waste" by relying on the existing waste hierarchy in California, and the state would end up landfilling another billion or so tons of post-recycled municipal waste …"

[v] Brandes, Power Point, Chief Energy Recovery Branch, Office of Resource Conservation and Recovery, U.S. EPA (2009) at P 9.

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Conversion Technology Q&A:

Conversion Technologies Produce Green Energy

Question: Do conversion technologies produce "green" renewable energy?

Answer: Conversion technologies produce fuels[i] and electricity[ii] from a renewable supply of post-recycled materials that would otherwise be landfilled.[iii]

The United States Environmental Protection Agency (USEPA) and the State of California, among many other states that have renewable energy programs, have all classified municipal solid waste as a renewable resource.[iv]

Electrical energy produced by conversion technologies offsets electrical energy produced (from fossil fuels) in the utility sector.

Question: What are some of the benefits of energy production from conversion technologies?

Answer: The United States is in the midst of an energy crisis characterized by dependence on foreign oil[v] and environmental degradation from fossil fuel extraction and emissions[vi].

Renewable energy from conversion technologies is reliable, base load power[vii]. Facilities are also typically developed near large urban areas where the waste stream is located, eliminating the need for new electric transmission lines to be built in remote areas.

Neither California nor the U.S. can reach energy independence just relying on solar, wind, geothermal and small hydro electric sources[viii].

Projections show there would be a large net energy savings from conversion technologies as compared to alternative waste management scenarios. These estimates range from two times lower net energy consumption when compared to the Waste to Energy scenario to 11 times lower than landfilling without energy recovery scenarios.

Materials recovered from conversion technologies preprocessing steps and sent for recycling offset the extraction of virgin resources and production of virgin materials, which reduces energy consumption in addition to other environmental benefits.

Sources and Additional Information

[i] Fuels (and chemicals) are produced from the synthesis gas derived from gasification and pyrolysis of feedstocks: storable gas, liquid and chemicals. The secondary processing of synthesis gas can produce a range of liquid fuels (and chemicals) including methanol, dimethyl ether (DME), Fischer-Tropsch diesel fuel, hydrogen, ethanol, ethylene or substitute natural gas. (see, California Integrated Waste Management Board (now CalRecycle) "New and Emerging Conversion Technologies, Report to the Legislature" (2007) pp39-41. For example, Riceland Foods, Inc. Stuttgart, Arkansas gasifies 600 tons-per-day of rice hulls to produce a substitute natural gas, which in turn, fuels the production of 150,000 pph of steam and 12.8 MW of electricity.

[ii] Thermochemical conversion technology facilities that generate electricity are basically a combination materials recovery facility processing center and electrical generating facility that utilizes solid waste as the primary fuel instead of natural gas, oil, and/or coal to produce energy. The "refinery' produces the fuel, and the "utility' portion generates the electrical energy.

[iii] The majority of materials in the waste stream are biogenic organic materials (renewable materials generated from plant or animal sources), with the remaining materials being inorganic materials that can be recycled through the conversion process, and unrecyclable plastics that have no market value and are either converted to a fuel or pass through the conversion system unchanged. All of these materials are currently sent to landfills where they either take up valuable space or decompose and generate methane and other emissions that may be released to the atmosphere or leach into the groundwater table.

[iv] The issue of whether municipal solid waste counts as a source of renewable energy was settled upon final clarification of the USEPA rules published in the Federal Register (Feb 4,2010, RFS2), the biogenic portion of post-recycled MSW qualify as "renewable biomass" for the purpose of meeting the federal mandate for the production of advanced biofuels. Also see, Executive Order (October 5, 2009): "renewable energy means energy produced by solar, wind, biomass, landfill gas, ocean…geothermal, *municipal solid waste*, or new hydroelectric generation…"

[v] The world is rapidly running out of oil. In 2000 global production was 76 million barrels per day (MBD). By 2020, demand is forecast to reach 112 MBD, an increase of 47%. However, additions to proven reserves have virtually stopped and it is clear that pumping at present rates is unsustainable. Estimates of the date of "peak global production" vary with some experts saying that it has already occurred (New Scientist Magazine placed peak year production in 2004). In any event, with current demands exacerbated by growing fossil fuel economies in China and India oil will become an increasingly unstable source of energy within the next 50 years. See, Council on Foreign Relations National Security Consequences of U.S. Oil Dependency, Report of Independent task Force # 59 (2006).

[vi] According to the USEPA: "Rising average temperatures are already affecting the environment… Changes include shrinking of glaciers, thawing of permafrost, later freezing and earlier ice-break up…shifts in plant and animal ranges and earlier flowering of trees…Global temperatures are expected to continue to rise as human activities continue to add carbon dioxide, methane, nitrous oxide, and other greenhouse gases to the atmosphere…Most of the United States is expected to experience an increase in average temperature." USEPA Global Research Program (2008); also see the Intergovernmental Panel on Climate Change (2007).

[vii] Renewable energy generated from solar and from wind technologies are not "firm power" because the power cannot be generated on a 24-hour basis. The generation of energy from the conversion of solid waste is the generation of firm power that can cover the base load needs of communities consistent with a distributed power generation approach.

[viii] According to the Lawrence Livermore National Laboratories, https://flowcharts.llnl.gov, only 3.8% of our energy consumption comes from non-biomass renewable sources, with biomass contributing an additional 4.4%. As energy usage continues to climb it is imperative to increase the use of biomass as a renewable energy source to meet energy demands and reduce dependence on foreign energy. [viii] Supra. Note i, "New and Emerging Conversion Technologies" (2007).

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PUBLIC WORKS

Conversion Technology Q&A:

Conversion Technologies Reduce Greenhouse Gases and Air Pollution

Question: Do conversion technologies increase air pollution or greenhouse gas (GHG) emissions?

Answer: Conversion technologies *reduce* GHG emissions in multiple ways[i]: diverting waste from landfills where GHG emissions would be generated; reducing diesel trucking of waste; and displacing fossil fuels used for transportation and energy production.

On a net basis, conversion technologies result in cleaner air by offsetting higher emissions from other sources, such as coal power plants or petroleum extraction, refining and combustion[ii].

Question: Will conversion technologies be able to meet California's stringent air emission limits?

Answer: Independently verified emissions test results show that thermochemical conversion technologies are able to meet existing local, state, federal and international emissions regulations[iii].

Worldwide analysis shows gasification and pyrolysis facilities currently in operation meet each of their respective air quality emission mandates required by the U.S. Environmental Protection Agency (USEPA), the European Union and Japan.

Conversion technologies in operation have been shown to reduce dioxin and furan emissions to miniscule amounts that are dramatically below the USEPA limit[iv].

Question: Are conversion technologies cleaner than landfilling or incineration?

Answer: Many studies, including independent studies completed by leading universities and State agencies, have determined that conversion technologies have lower air emissions compared to both incineration and landfilling. This includes lower emissions of methane, CO_2, and other greenhouse gas emissions[v] as well as lower emissions of criteria air pollutants such as NOx[vi] and SOx[vii].

Conversion technologies would also significantly reduce emissions from fossil fuel trucks, mostly diesel, transporting wastes to landfills[viii].

Sources and Additional Information

[i] Conversion technologies reduce transportation emissions resulting from long distance shipping of waste, eliminate methane production from waste that would otherwise be landfilled, and displace the use of fossil fuels by net energy (fuel and electricity) produced by conversion technologies. Supra. note 2, Integrated Waste Management Board Report to the Legislature (2007).

[ii] "From an environmental perspective, the production of fuels and chemicals from materials that would otherwise be landfilled can provide environmental benefits by displacing the extraction of non-renewable petroleum resources such as crude oil and natural gas." California Integrated Waste Management Board (now CalRecycle) *New and Emerging Conversion Technologies, Report to the Legislature* (2007) p 60. Report also includes additional references to net reduction of air emissions from the use of conversion technologies compared to other solid waste management options..

[iii] "Today there are advanced air pollution control strategies and equipment that were not available ten years ago. It is obvious from the results that emissions control of thermochemical conversion processes is no longer a technical barrier." *University of California Riverside, Evaluation of Emissions from Thermal Conversion Technologies Processing Municipal Solid Waste and Biomass* (2009) p 37.

[iv] The low levels of oxygen present in pyrolysis and gasification processes inhibit the formation of dioxins and furans. See *University of California Riverside Report* (2009) Ibid, page 8; also see, California Integrated Waste Management Board (CIWMB, now CalRecycle), *New and Emerging Conversion Technologies Report to the Legislature* (2007). P 9: "A July 2004 technical report published by JFE Group of Japan reports the results of a study in which MSW was processed at a gasification facility in Chiba City, Japan. The concentration of dioxins in the synthetic gas was approximately 1,000 times less than the 0.1 ng-TEQ/Nm3 standard set by Japan's Ministry of Environment".

[v] The bacterial decomposition of landfilled material produces significant quantities of landfill gas that can be captured by landfill gas extraction methods; *however*, there is not 100 percent capture of landfill gas. The methane emissions from landfills are particularly important, since methane is 21 times more potent as a greenhouse gas than carbon dioxide. Landfills represent the second largest source of anthropogenic methane emissions. By contrast, thermal facilities are designed to produce a fuel gas or synthesis gas that may contain methane. In addition, thermal facilities are designed for 100 percent capture of the produced gas, including methane.

[vi] NOx emissions are largely the result of fuel combustion processes. Likewise, NOx emission offsets can result from the displacement of combustion activities, mainly fuels and electrical energy production. In a Life Cycle Analysis undertaken by the CIWMB the Board concluded: "the conversion technology scenario showed the lowest net levels of NOx emissions and resulted in a significant net NOx emissions avoidance… [as] a result of significant offsets of NOx emissions associated with the production of energy and recovery and the recycling of materials, coupled with the low amount on NOx emissions from the gasification plants…The land fill scenarios showed the highest levels of NOx emissions. The WTE scenarios showed about one-half to one-third of the NOx emission returned by the landfill scenarios." See, CIWMB New and Emerging Conversion Technologies supra. note 2 at p 61.

[vii] SOx emissions tested against the USEPA standard of 85.7 were found to be significantly lower: Bosung, Korea (OE Gasification) 18.7; Romoland, (pyrolysis/syngas boiler) CA 0.44; Richland, WA (Plasma Arc Gasification) ;Fayetteville, AK (gasification/biosynthesis); Gangjin, Korea (OE Gasification) 37.5; Heanam, Korea (OE Gasification) 37.5.

[viii] Puente Hills Landfill, California's largest landfill (located in Los Angeles County) closes in 2013. Wastes now going to Puente Hills Landfill may have to be shipped over 200 miles to alternative landfill sites. As California's population increases (an additional 10 million by 2020) and disposal capacity in many jurisdictions is reduced, local governments will have to ship their solid waste hundreds of miles to dispose of it or expand capacity at urban landfills.

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Conversion Technology Q&A:

Reliable and Operating Around the World

Question: Aren't conversion technologies still experimental and unproven?

Answer: Conversion technologies are not experimental; they are operating in 28 countries including: Australia, Europe, Japan, South Korea, South Africa and the United States. Several facilities have been operating commercially for well over a decade.

Question: What types of technologies are in operation around the world?

Answer: By the end of 2010, over 200 anaerobic digesters were processing nearly 6 million tons per year of biosolids and municipal solid waste in Europe. It is estimated that European capacity will increase to 9 million tons per year by 2015[i].

Since 2005, integrated facilities have become more common in Europe. Anaerobic digesters are used to process the wet component of the wastestream, while composting is used to process the digestate and the dry fraction of the wastestream[ii].

Zeus Global Gasification Database is tracking more than 300 existing gasification facilities worldwide. The United States Department of Energy found that world gasification capacity has grown to 56,000 megawatts thermal (MWth) of syngas output (roughly equivalent to 29,000 MWe) from 144 major operating plants that employ 427 gasifiers[iii].

Thermochemical conversion technologies are technically viable options for the conversion of waste streams, including post-recycled residuals[iv].

Gasification technology plants processing non-hazardous waste streams are already operating in the U.S., all reducing GHG emissions and operating below allowable air pollution standards[v].

Sources and Additional Information

[i] "Anaerobic Digestion of MSW in Europe", BioCycle, February 2010, Vol 51, No 2, p.24

[ii] "Anaerobic Digestion of MSW in Europe

[iii] An additional ten plants involving an additional 34 gasifiers of syngas capacity were expected to become operational in 2010, involving another 17,000 MWth of syngas capacity, an increase of 30 percent.

[iv] Conversion technologies have been well established in Europe and Asia for more than 20 years, and have been an integral part of meeting their recycling mandates, landfill phase-out mandates and greenhouse gas reductions. See, University of California Riverside, "Performance and Environmental Impact Evaluation of Alternative Waste Conversion Technologies in California" (2004); peer reviewed, RTI International, Life Cycle and Market Impact Assessment of Non-combustion Waste Conversion Technologies.

[v] In 2007, Intrinergy began producing green electricity and thermal energy (steam) from a Mississippi paper mill reducing the mill's carbon dioxide emissions by 20,000 tons per year. Its on-site energy unit provides up to 50,000 lbs/hour of process steam to fuel the mill's operations. PM, CO and NOx were measured significantly below allowable standards. In 2007, Nexterra Energy completed a gasification system that converts wood residues. The GHG reductions were estimated to be more than 22,000 tons per year. The plant provides 60,000 lbs/hour high pressure steam for district heating and power for the University of South Carolina. PM, CO, NOx and SO_2 were measured significantly below allowable limits. Prime Energy has developed a number of state-of-art biomass gasification facilities at several U.S. locations: St Joseph Missouri, Stuttgart, Arkansas, and Dalton, Georgia. These facilities are producing: ethanol, a substitute for natural gas, and steam energy. They are diverting waste from landfills, providing renewable energy and meeting all allowable air emission standards.

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Conversion Technology Q&A:

Why Clarity is Needed in California Regulations Regarding Conversion Technologies

Question: What does the California Public Resources Code (PRC) say about conversion technologies?

Answer: Existing California statutes and regulations offer an assortment of definitions and requirements regarding conversion technologies. Rather than being based in science, the definitions are capricious and inconsistent, with some conversion technologies defined as incineration, others defined as composting, one technology (gasification) defined incorrectly, and many technologies simply undefined, creating uncertainty for permitting and making it challenging to obtain financing for new projects.

Development of the most promising and cutting edge technologies in California has been stifled because of inconsistent and scientifically inaccurate definitions.

Question: Do inaccurate definitions create barriers to siting, permitting, constructing or operating conversion technologies in California? Can't developers build projects anyway?

Answer: California cannot develop a viable solid waste management infrastructure relying on scientifically inaccurate statutory definitions. For example, PRC Section 40117 is scientifically incorrect[i] and actually describes pyrolysis. This same incorrect definition is repeated in PRC 25741. In essence, this definition prohibits gasification technologies from using air or oxygen in the process, a restriction that serves no environmental benefit[ii] and unnecessarily prevents good technologies from being permitted.

Question: Won't correcting these definitions result in watering down California's environmental protections?

Answer: Correcting the inaccuracies in PRC 40117 and 25741 should not eliminate existing environmental protections, such as the requirement for sorting and/or preprocessing of residual materials prior to the conversion process in order to maximize the amount of recyclable materials extracted from the wastestream.

Question: Aren't these regulatory requirements for conversion technologies equivalent to requirements for other renewable energy processes?

Answer: No other technology or process is required to have zero emissions, including other technologies eligible for California's Renewable Portfolio Standard (RPS).[iii] Under current statutes, many conversion technologies are required to follow a more rigorous

permitting process than required for the siting, permitting and construction of a major solid waste landfill, making it unnecessarily cumbersome to develop new projects.

Question: Will it be difficult to correct these definitions?

Answer: There is strong support in Sacramento to correctly redefine gasification and other conversion technologies. Letters of support were signed by nine California legislators and the Chair of the California Air Resources Board (CARB), Vice Chair of the CEC and Acting Director of CalRecycle supporting such changes. In the 2009/2010 legislative session, AB 222, a bill proposing to correct many of these definitional issues, enjoyed strong bi-partisan support and was approved by several committees in the Senate and Assembly as well as the Assembly floor, but failed to pass a key vote in a Senate Committee.

In the meantime, State agencies have no choice but to evaluate technologies and make rulings on a case by case basis[iv], which discourages investment in California.

Question: What would be the benefits of revising the regulations regarding conversion technologies?

Answer: To date California's scientifically incorrect definition of gasification has delayed or deterred projects from being developed in California, resulting in a substantial loss of income and green jobs in our State[v].

Revising California's scientifically incorrect definition of gasification may prevent unnecessary and costly legal challenges[vi]. More importantly, revising the regulations would promote compliance with California's greenhouse gas reduction law (AB 32[vii]), renewable energy law[viii], and other progressive environmental goals and priorities.

Sources and Additional Information

[i] "Gasification" means a technology that uses a non-combustion thermal process to convert solid waste to a clean burning fuel for the purpose of generating electricity and at a 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 contaminates* or emissions including greenhouse gases…; (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…" PRC Section 40117.

[ii] Most thermal technologies that convert MSW to biofuels insert a small amount of oxygen into the gasification process for the purpose of improving the chemical conversion of organic waste materials to synthesis gas and/or biofuels.

[iii] Zero emissions are not a scientifically valid definition of gasification. The statute requires the technology to emit zero emissions, and it is unclear if this is from the entire energy production process (meaning not only zero from the disposal and destruction of waste, but zero from the biorefining process as well). No energy production technology can meet or has been required to meet a zero emissions standard. In 2008 the CEC testified that no such zero emission standards exists either in stature or in practicality and the "zero emissions" standard has no standing in the CEC's administrative policy regarding RPS.

[iv] On November 23, 2010, CalRecycle sent a legal opinion to Plasco Energy Group stating that Plasco's proposal to build a gasification conversion technology facility in California "appears to meet the definition of gasification set on in Public Resources Code 40117". In reaching this conclusion CalRecylce said: "The project…will use a non-combustion thermal process to convert solid waste to a clean burning fuel for the purposes of generating electricity; uses air/oxygen only to maintain ambient temperature; produces no air, water, or hazardous discharges in excess of standards…" In May 2011, the California Energy Commission (CEC) sent a corresponding letter to Plasco stating that its technology constitutes RPS eligible renewable energy and that it can count toward state recycling (diversion) targets. On March 9, 2011, a coalition of three senators (Cannella, Calderon, Padilla) and six Assembly members (Bradford, Buchanan, Conway, Fletcher, Fuentes, Ma) sent a letter to Secretary Laird expressing support for the Natural Resources Agency's support of Plasco Energy Group's proposed Salina Valley project stating: "As members of the California State Legislature, we feel it is critical that the Administration continue to support this innovative approach to resource management in California. Plasco's technology results in net reduction of greenhouse gas emissions and produces base load renewable power …not depend[ent] on additional transmission capacity."

[v] As a result of the inconsistencies in California law and the contention surrounding bioenergy development, California's bio-based technology companies have either located or moved out of the state resulting in up to a $1 billion loss of state income and the loss of new green jobs in California. For example, Fulcrum BioEnergy, a California company is now completing a $120 million US DOE loan guarantee with which it will construct a thermal conversion facility that will produce ethanol and electricity from solid waste in Nevada. BlueFire Renewables, another California company, is building a 19 million gallon/year cellulosic ethanol facility in Mississippi, relocating the facility and a $88 million US DOE loan guarantee from California due to the regulatory difficulties in developing projects in the State.

[vi] Under California Law, inconsistent statutes have to be reconciled. PRC 25741 and PRC 40117 are contradictory and mutually exclusive. Moreover, CARB's public transit bus fleet rule, adopted in 2000 creates a precedent for uniform standards being applied to different kinds of technologies. Under the rule California fleet operators have to choose between a "diesel path" and an "alternative path" for future urban bus procurements. Operators can choose either path provided: a NOx fleet average limit of 4.8g/bhp-hr is effective from 2002.10 for both diesel and alternative paths, and the total PM emission from the fleet must be reduced by 85% relative to the emissions in January 2002.

[vii] California's landmark greenhouse gas law requires a reduction in GHG emissions. The development of conversion technology facilities in California would aid municipalities and utilities in meeting the mandate – see the GHG emissions fact sheet for more information.

[viii] By law and Executive Order utilities are required to have 20 percent renewable energy in their portfolios by 2012 and 33 percent by 2020. Preventing the development of renewable energy from conversion technologies makes it far more challenging for utilities to meet these requirements.

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