California's Challenges

Waste Management

California continues to face a growing waste management challenge:

- In 2003, over 40 million tons of wastes were disposed in California – a two million ton increase over 1988 levels, even though 47% of the State's wastes are now recycled.
- Factors such as population and economic growth have effectively offset State and local recycling efforts. This trend is expected to continue.
- New landfills are increasingly difficult to site near urban centers. Use of distant landfills creates additional traffic, pollution, energy, and cost issues.
- There are no existing markets or beneficial uses for the bulk of post-recycled materials currently going to landfills.

Energy Demands

California will require 60,000 KW of new electric supplies, the equivalent of 100 new power plants, by 2030. On-road gasoline usage will increase from 15.5 billion gallons in 2004 to 19.8 billion gallons by 2023.

- The existing Renewable Portfolio Standard (RPS) sets a 20% goal for renewable power by 2017, while current proposals would accelerate RPS goals to 20% by 2010, and 30% by 2030.
- In 2003, biomass conversion accounted for only 2% of CA's electrical generating capacity.
- CA has enough available biomass to produce at least 3600 MW of power and more than two billion gallons of ethanol, turning CA into a net exporter of ethanol, rather than a 99% importer.

California's Opportunities

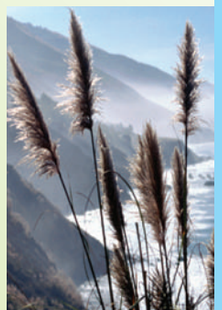
Zero Waste

- CTs can enhance existing glass, metal and plastics recycling by 7-13% through the pre-processing of incoming waste feedstocks.
- CTs can divert up to 80% of the post-recycled materials they receive and convert them to beneficial use.
- 50% of the available biomass resides in the municipal waste stream, 30% in the agriculture sector and 20% in forestry wastes. CTs can play a central role in developing this critical resource for CA.

California's Needed Initiatives for CT Industry Development

Several states are promulgating affirmative policies to catalyze the development of bioenergy and biobased industries. Key issues and incentives in CA include:

- Removal of statutory obstacles that equate CTs with disposal and deny eligibility for landfill diversion credit and renewable energy funding.
- Creation of a comprehensive bioenergy policy for the State that successfully integrates the program objectives and regulatory purviews of its environmental and economic development agencies.
- Creation of a streamlined integrated permitting process for renewable energy projects.
- Creation of market incentives for industry development, including Renewable Portfolio Standard (RPS), Renewable Fuels Standard (RFS), procurement, tax incentives, loan guarantees, and other financial tools.



California's Progress toward a Clean, Abundant Future

Scientific Data Support CT Benefits

Detailed CT life-cycle and market assessments were completed by the University of California and the Research Triangle Institute under contract with the CA Integrated Waste Management Board (CIWMB) in 2004. In addition, independently verified CT emissions data from commercial-scale facilities in Europe, Japan, and from U.S. demonstration facilities are now available. Among the principal findings are:

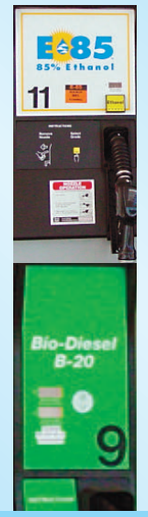
- The definitions of CTs in existing statute are scientifically inaccurate. CTs are distinct from landfills and incinerators—the existing PRC definition of "transformation" should be amended to exclude CTs, and be limited to mean the combustion or incineration of solid waste.
- CTs can complement the existing recycling infrastructure and have a positive impact on glass, metals, and plastics recycling.
- On a life-cycle basis, CTs are superior to recycling, composting, landfilling, and incineration in terms of energy balance, NOx emissions and carbon emissions.
- CTs operating in Europe and Japan have a successful track record in meeting stringent air quality standards.
- CT demonstration facilities operating on CA residual waste feedstocks have met or exceeded Federal and State emissions standard tests for air toxics and other criteria pollutants.
- CTs with the most advanced environmental controls would be able to meet regulatory requirements in CA.
- The existing PRC should be amended to allow diversion credit to be granted by the CIWMB on a discretionary basis in accordance with adopted CIWMB conditions (Resolution 2002-177).

Cleaner, Renewable Fuels for California

The CA Energy Commission's AB 2076 report has set goals for 20% non-petroleum fuel use by 2020 and 30% by 2030. Fuels produced from biomass conversion, such as ethanol, biodiesel, Fischer-Tropsch liquids, hydrogen and others will play an important role in reaching this goal, while offering a broad range of environmental benefits.

Why Ethanol?

- Ethanol is an octane enhancer and volume extender for gasoline. It reduces dependence on foreign petroleum.
- Ethanol reduces CO_2 emissions and is compatible with existing gasoline distribution systems. CA's current 5.7% blending of ethanol with gasoline reduces 4 Million tons of CO_2/yr.; 10% blending would reduce over 7 Million tons/yr.
- 10% ethanol blending would equal 50% of the 2020 goal for non-petroleum fuel use.
- There is enough biomass to produce 1/3 of CA's increased fuel needs by 2023
- When the "Hydrogen Highway" becomes a reality, hydrogen will be distributed to fueling stations in the form of ethanol.



Biodiesel Reduces Emissions

- Biodiesel and biodiesel blends reduce particulates and the cancer-causing air toxics that ride on soot particles.
- B20 produces 15% less CO_2, and B100 78% less CO_2 than petroleum diesel.
- Biodiesel can be made from oil crops and from local waste fats, greases, and bio-oils.

Emission	B100	B20
Carbon Monoxide	-43.2%	-12.6%
Hydrocarbons	-56.3%	-11.0%
Particulates	-55.4%	-18.0%
Nitrogen oxides	+5.8%	+1.2%
Air toxics	-60%-90%	-12%-20%
Mutagenicity	-80%-90%	-20%

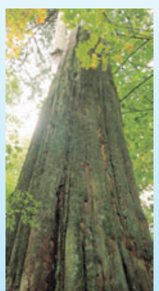
Benefits for Rural California

CTs present new opportunities for farmers and dairy-men, both in the management of wastes and in the development of new industries:

- CTs can **mitigate regulatory challenges** by turning waste materials, such as agricultural residues and manures, into products, such as distributed energy, ethanol, chemicals, and fertilizers.
- CT "biorefineries" present **new fuel and chemical markets** for existing crops and residues, and **new agribusiness opportunities** through the integration of dedicated energy crops.
- Biorefineries and biobased manufacturing provide **new avenues for rural economic development.**
- CTs help to create a **post-petroleum agricultural platform** through the use of environmentally benign biochemical alternatives and soil phytoremediation.

Benefits for Wildlife and Urban California

In addition to furthering the State's landfill diversion, air quality, energy, and agricultural goals, this new industrial platform will advance the following:



Forest Health & Wildfire Protection
Coupling forest thinning projects with biomass conversion can create a Statewide wildfire prevention strategy that reduces fire suppression costs and enhances renewable energy supplies.

Water Quality & Watershed Protection
Replacement of petrochemicals with bio-based chemicals and products can reduce harmful releases to waters of the State from agricultural and industrial operations. Preservation of forest integrity also reduces water quality impacts through erosion and runoff.

Urban Revitalization
Clean CT industries can serve as anchor facilities for urban eco-industrial parks.

Produced in conjunction with the
Alternative Technology Advisory Subcommittee
of the Los Angeles County
Integrated Waste Management Task Force.
www.lacountyiswmtf.org

The Alternative Technology Advisory Subcommittee is responsible for evaluating and promoting the development of conversion technologies to reduce dependence on landfills and incinerators.

BioEnergy Producers Association
www.BioEnergyProducers.org
November, 2005

California's Waste Conversion Technologies:

Ensuring an Environmentally Clean and Abundant Future

Converting California's biomass and plastic wastes into renewable fuel, green power, and chemical products

Extending Waste Recycling

California has made great progress over the past 15 years in conserving natural resources and reducing our dependence on landfills. Major accomplishments include:

- Establishment of statewide recycling goals & local planning requirements
- Development of an extensive recycling & composting infrastructure
- Increased removal of hazardous materials from the waste stream
- Establishment of advanced disposal fees and other manufacturer responsibility measures

More can be Recycled

However, most waste is not currently recycled. Together with plastics, biomass fractions of the waste stream constitute 75%-85% of the post-recycled materials disposed in CA landfills (see chart at right).

CA's Waste— What's Left after Recycling?

MATERIAL	TONS	%
Paper	8,445,989	21.0
Other Organics	12,166,452	30.2
Plastics	3,809,699	9.5
Construction & Demolition Wastes	8,732,074	21.7
Metal	3,115,357	7.7
Glass	934,926	2.3
Electronics	481,353	1.2
Special Waste	2,034,431	5.1
HHW	73,599	0.2
Mixed Residue	437,448	1.1
TOTALS	40,235,328	100.0

Source: *Overall Disposed Waste Stream by Material Type, 2003:* CA Integrated Waste Management Board, December, 2004.

Converting Leftover Waste

Conversion Technologies (CTs) refer to a diverse set of new non-combustion thermochemical and biochemical technologies capable of converting biomass and plastic wastes into marketable products (see chart at right).

CTs include:

- Gasification
- Pyrolysis
- Thermal Depolymerization
- Catalytic Cracking
- Hydrolysis/Fermentation

Conversion Technologies are safe

There are 130 CT facilities operating successfully in Europe and Japan. Existing data indicate that they can operate within stringent air quality standards for toxics and other pollutants. CT facilities will be required to meet all CA regulations

What Are CT Products?

Green Power and Heating
Electricity and heating through biomass-derived methane, syngas, steam, and bio-oils.

Renewable Fuels
California ethanol and biodiesel from biomass-derived synthesis gas, sugars and oils; Low sulfur diesel from waste plastics.

Green Chemicals
Non-toxic, degradable bio-chemicals for pesticides, fertilizers, acids, solvents, lubricants, polymers, inks, adhesives, sorbents, and other petroleum replacement products.