

Pepper Production in Central Coast

March 2010



Increasing renewable energy and reducing greenhouse gasses demands breakthrough innovation

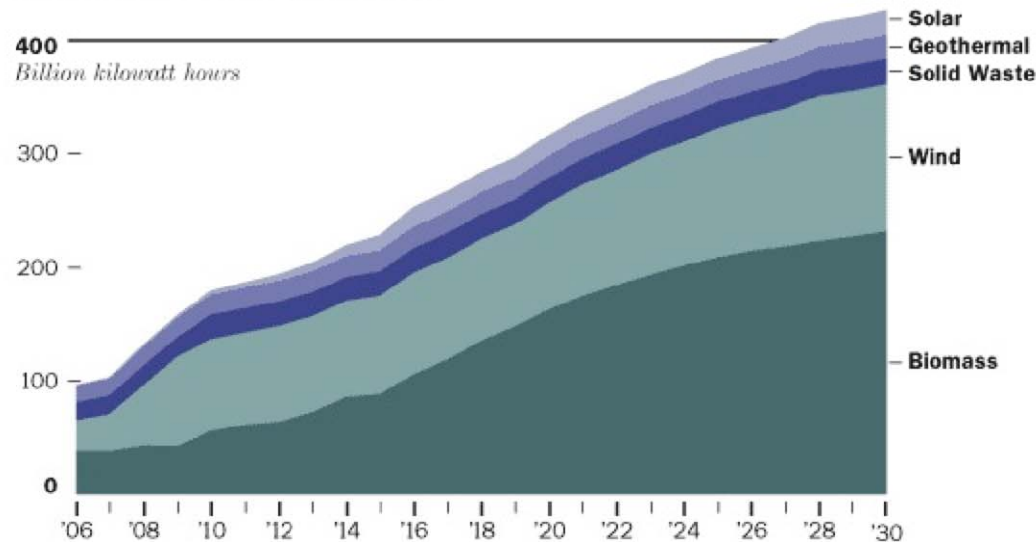
Biomass is currently the leading source of renewable energy

- Biomass is expected to outperform all other sources in the coming decades
- Wind and solar combined do not equal the megawatt output biomass
- Does not include agriculture specifically designed for energy generation

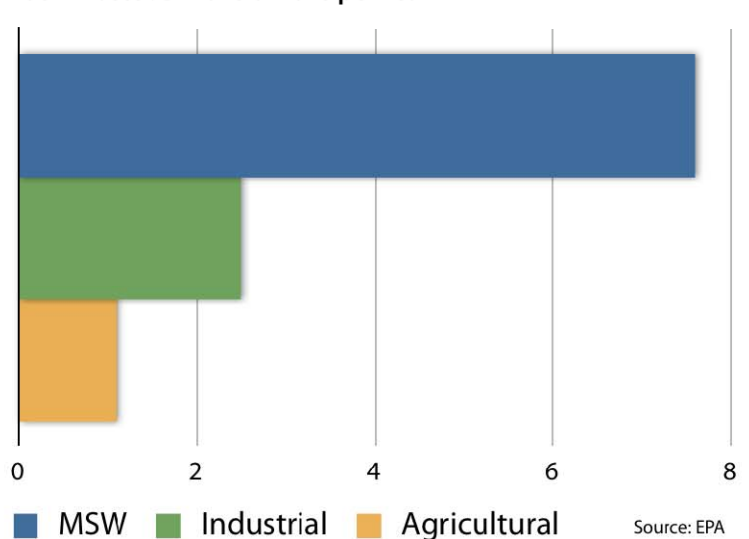
Waste biomass is a leading source of toxic and greenhouse gasses

- In the USA the average person produces 4.5 lbs. of waste daily
- Methane has 21 times the heat-shielding effect of CO₂
- Industrial, Residential, Agricultural
- Contains energy and raw materials

RENEWABLE POWER GENERATION Source: DOE / EIA



USA Waste : Billions of Tons per Year



California Ag Waste

The Problem

Annually California produces:

- 5,000,000 tons of manure
- 28,000 tons of dead animals
- 14,000,000 tons of crop residues
- 4,000,000 pesticide containers
- 4,000,000 bags of fertilizer
- 2,000,000 tons of food processing waste
- 1,000,000+ tons of non-recyclable plastic waste
- Approx. 10,000,000 additional tons associated with farming.

Disposal Issues:

- Bacteria & Micro-Organisms become health concerns.
- Rising level of nitrogen and phosphates in soil and ground water.
- Burn days are being limited considerably due to green house gas emissions.
- Rising fuel costs making waste removal more expensive.
- Limits to the amount of material which can be composted.



Waste Processing Technologies

The Solutions

Disposal Method

Landfill

Anaerobic Digestion

Gasification

Pro

- Traditionally inexpensive
- Well established infrastructure
- Supports compost, mulch and fertilizer production

- Efficient disposal of organics
- Potential for energy generation
- May lend itself to the development of liquid fuels
- Limited use in California Dairy industry
- Proven technology

- Suitable for any form of waste
- Cheap method for disposal and energy generation
- May lend itself to development of liquid fuels
- 50+ new projects being permitted in California
- Proven with green waste

Con

- Rising fuel costs will make more expensive
- Will only accept limited amount of green waste
- Limited to specific streams
- Largest contributor to green house gas emissions in the United States

- Expensive starting at \$17M
- Increased methane production
- Limited to approximately 65% of waste material
- Hasn't been thoroughly tested on solid waste materials

- More difficult to permit
- Limited to large scale operations to date
- Little legislation in support or against gasification.

adaptiveARC provides breakthrough gasification technology

Complex materials break down to basic elements when gasified

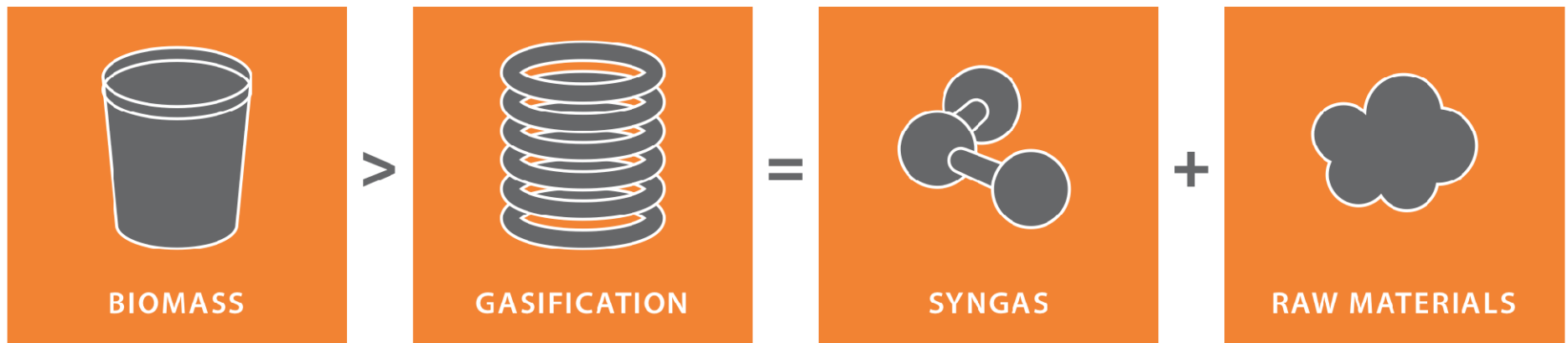
- The primary output is a synthetic natural gas that can be converted to clean energy
- Residual solids are commercial
- Feedstocks : solid, liquid and gasses
- Transforms an environmental liability into a multiple-income-stream asset

Incineration and gasification are very different:

- incineration creates exhaust
- gasification creates fuel

Unlike solar and wind we actually reverse environmental damage.

- Landfills and incinerators are a leading source of pollution
- We can recycle nearly 100% of the waste and provide 10+% of the electricity for any community on the planet



Competitive landscape

State of the art : plasma arc gasification

Pros:

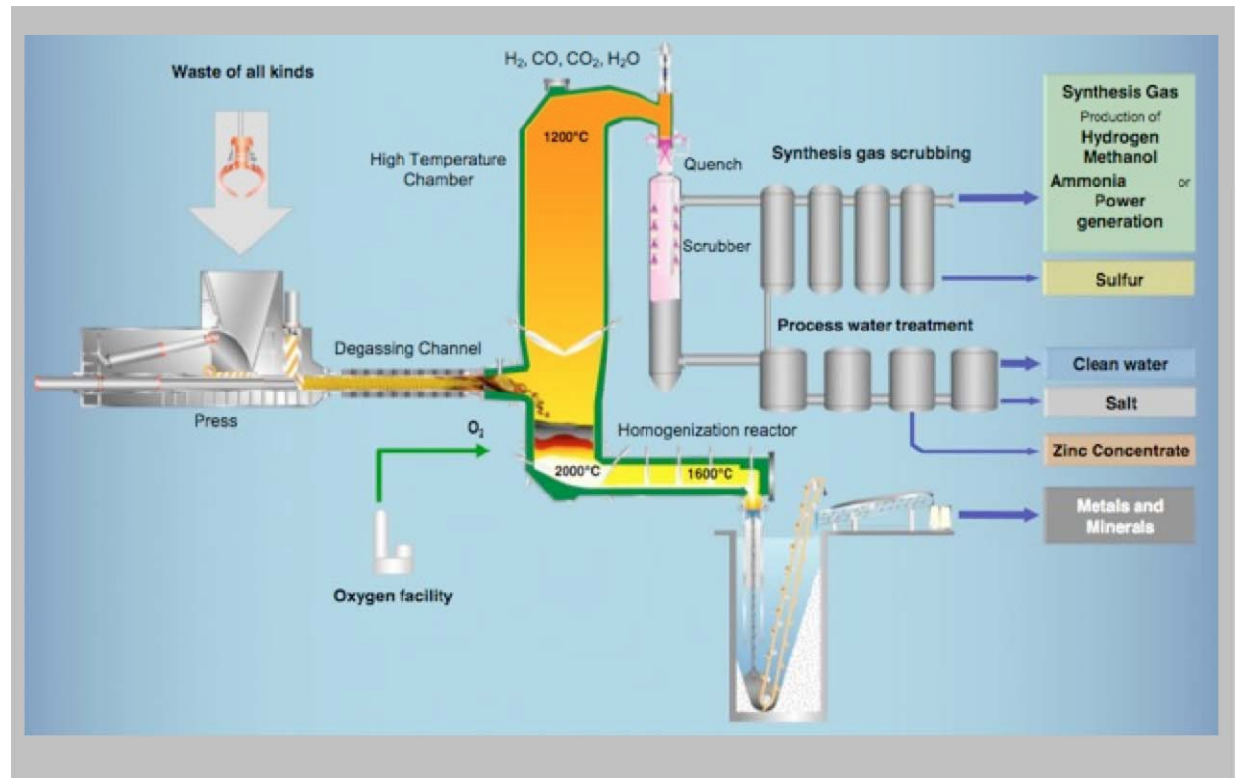
- Cleanest to date
- High-energy syngas
- Commercial solids

Cons:

- Expensive
- Requires large scale
- Thermal-only process

2 types of plasma arc developers

- Torch makers
- Torch buyers

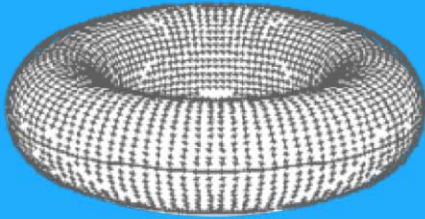


Plasma arc gasification	Clean / expensive
Pyrolysis / Gasification	Clean / limited
Mass burn incineration	Dirty / proven

Cool plasma gasification

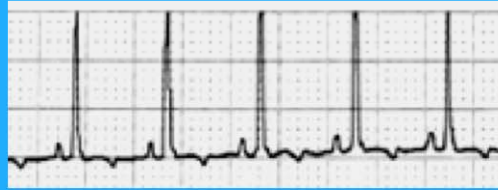
7th generation technology changes the game

Plasma field



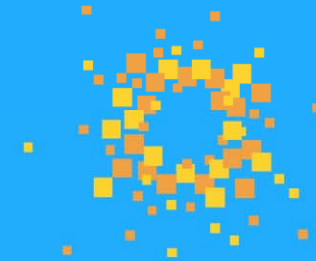
Dissolution directly in plasma field occurs at atomic level at temperatures too cool to vaporize heavy metals.

Plasma pulses



Pulsed energy accelerates dissolution process, eliminates sour gasses and toxic salts.

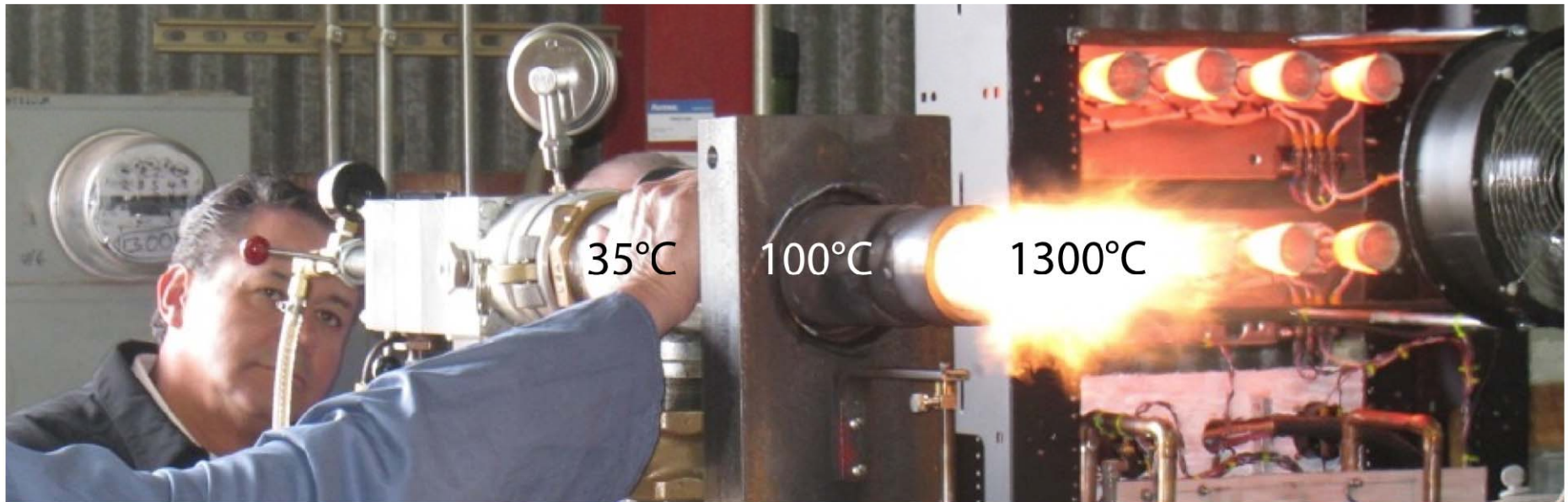
UV light detoxification



Accelerates breakdown of ash and residual gas toxins with little energy loss.

Cool plasma gasification	Clean / profitable
Plasma arc gasification	Clean / expensive
Pyrolysis / Gasification	Clean / limited
Mass burn incineration	Dirty / proven

Cool plasma advantage



Breakthrough Plasma Arc Science

- Tunable heating zone
- 5+ year lifetime
- Low power requirement: < 5% overall consumption
- Operates on multiple gas medias including: landfill gas, CO₂, methane, syngas, etc.

Patents: 6 approved / 7 provisional. With gasifier over 24 inventions protected by integrated IP strategy

Portable

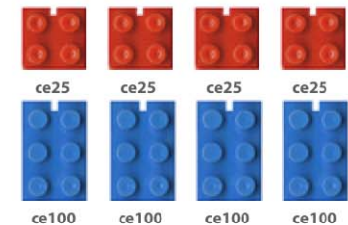
- All unit fit on standard conex containers. Easy to ship worldwide. Permanently temporary.

Modular

- Units interchange from 25 to 250 tpd

Scalable

- Start at 25 tpd, grow to over 9,000



adaptiveARC : application examples



Small mobile energy unit



Toxic clean-up application



Oil refinery sludge waste application



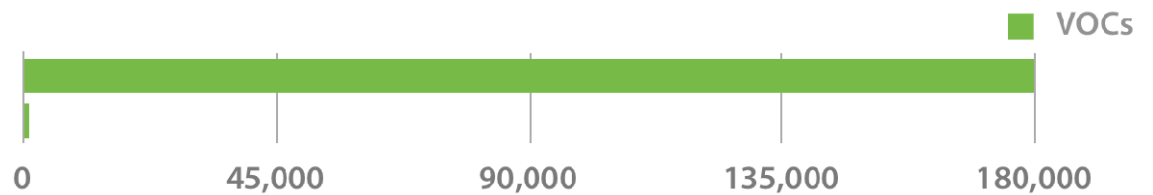
Large MSW landfill application

Remediation / Emissions Reduction

Complete elimination of water waste

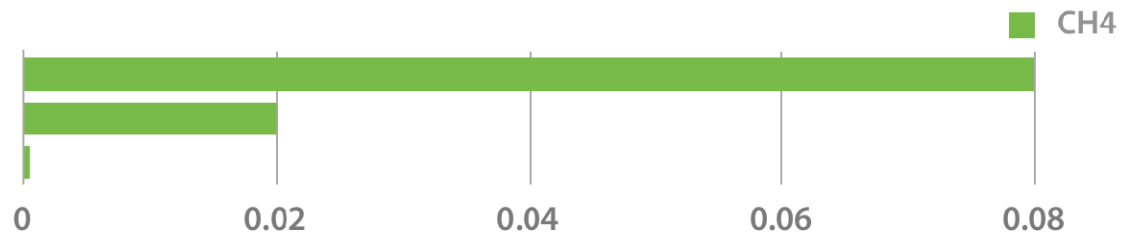
Volatile Organic Compounds (VOCs)

200 tpd untreated landfill
adaptiveARC



Methane (per ton over 30 years)

Untreated landfill
Methane-captured
adaptiveARC



Combustion Emissions

Emission	CA requirements	adaptiveARC	
NOx	1.100	0.431	g/bhp-hr
CO	3.000	0.023	g/bhp-hr
VOC / HC	0.600	0.009	g/bhp-hr
PM	-	0.002	g/bhp-hr
SO2	-	0.05	g/bhp-hr

Results from Monterrey, MX pilot plant

Standalone systems

ce25

Consumes 25 tons per day of any feedstock

- Biomass
- Municipal solid waste
- Construction and demolition
- Medical
- Toxic organic
- Sewage sludge

Produces 500 kw - 1.5 MW continuous

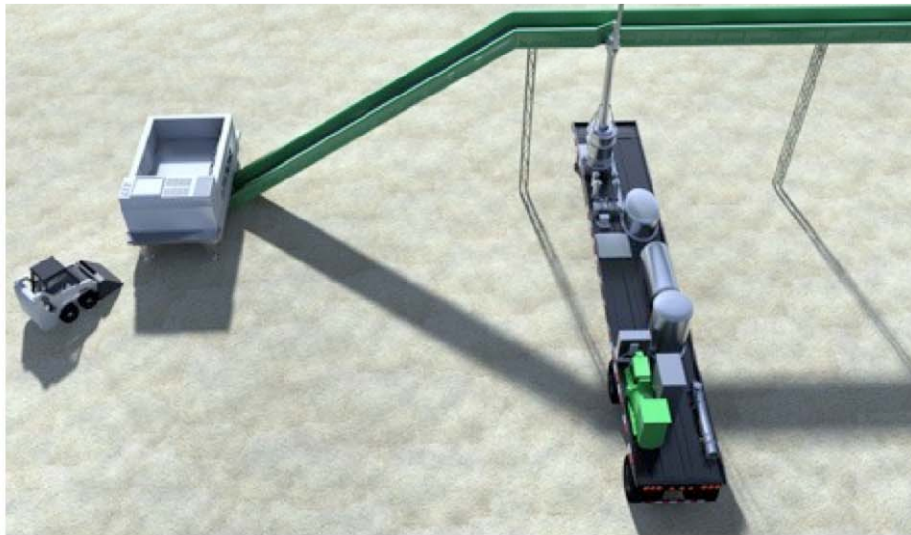
- 12 MWh - 36 MWh / day

Small footprint:

- Fits on a semi-trailer
- Crates and ships easily worldwide

Compelling economics

- BCAP qualified
- ROI < 5 years, 20-year lifetime



Visionary Partners



Syngas from high-carbon Megaflora™ trees

- Focus is on soil remediation, plant where nothing else can grow
- Each trees grows 1.5 tons in 3 years back from roots

Bravo Energy

Syngas from refinery sludge

- Dramatic reduction in emissions from producing coke
- Sequester and control heavy metals



HYDROCELL
TECHNOLOGIES IRELAND

Syngas from sewage sludge

- Non-thermal dewatering
- High-energy feedstock
- Sewage sludge is a global crisis



Syngas from 100% recycled MSW

- 25% residual organics processed with enzymes produce a high-nutrient fertilizer
- 15% of what comes through the gate is otherwise impossible to recycle

Thank You

Questions?

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