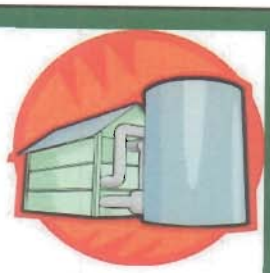
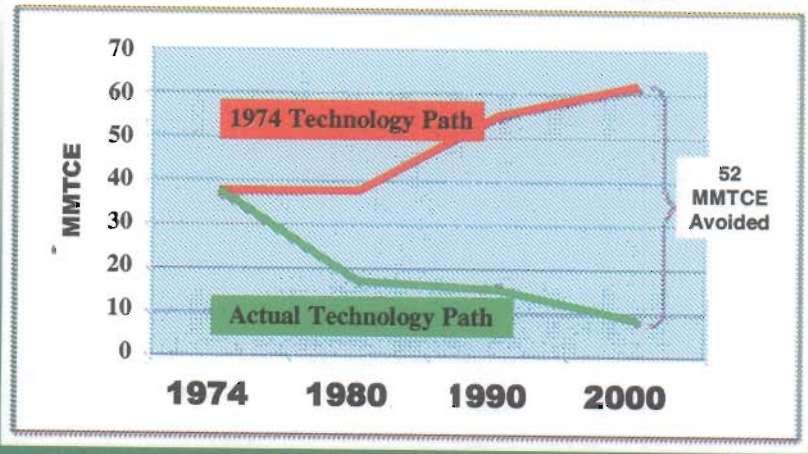


Market Barriers and Regulatory Hurdles to Sustainable Use of Biomass from Municipal Solid Waste

Chuck White
Director of Regulatory Affairs -- WM West
Public Meeting on California's Bioenergy Action Plan
Sacramento – June 11, 2007

DOCKET
06-BAP-1
DATE JUN 11 2007
RECD. JUN 12 2007

Overall GHG Reductions for Solid Waste Management – All Sources



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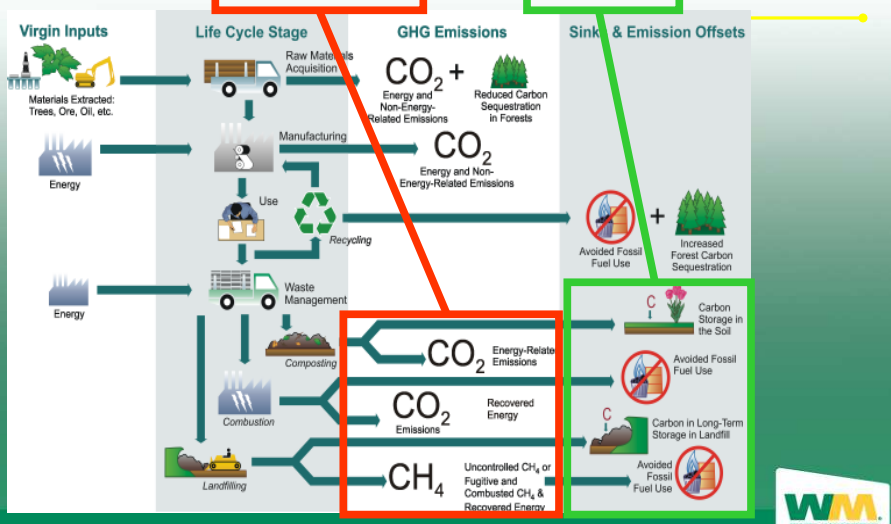
A Lifecycle Analysis of GHG Sources and Sinks



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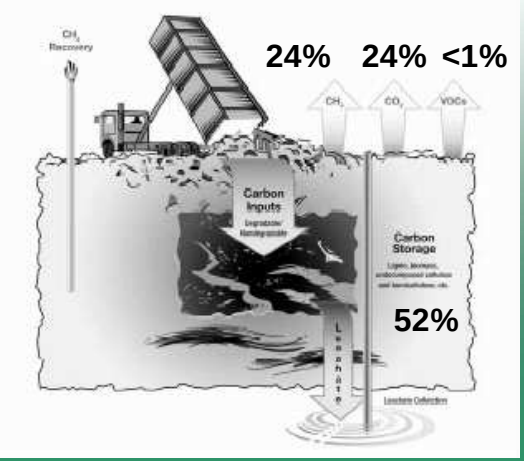
Ideal Solid Waste Landfill Carbon Balance



Landfill Carbon:

- **24% as CH4**
- **24% as CO2**
- **52% Storage (Lignins, Undecomposed Cellulose, and Hemi-cellulose)**

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California Landfill Gas Control

- **Landfills: Potential Significant Source of Methane**
- **But -- Landfill Gas Control for >20 years**
  - ***95% of CA WIP has active gas control***
- **< 50% of collected LFG converted to energy**
  - ***High cost***
  - ***Regulatory Barriers***
- **Historical Focus on NMOCs <u>not</u> Methane**
- **Increased Scrutiny and Control of Methane**
  - ***CEC Study to Better Estimate Fugitive LF Emissions***
  - ***Possible Legislation to Increase Control***
  - ***Regulatory Interest to Minimize emissions***
- **BioReactor Landfill Technology**

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Barriers to LFGTE Development

- **Criteria Pollutant Emission Standards**
  - ***BACT for NOx and CO***
  - ***But not all LFG the same (Siloxanes, H_2S, VOCs)***
  - ***More Flexibility, Recognition of GHG benefits***
- **Expense compared to Flares – Contaminants**
- **Offsets – Generally for NOx**
  - ***Inconsistent application***
  - ***Offset Cost is Prohibitive***
- **Continuous Emissions Monitoring**
  - ***Cost Prohibitive – Need PEMS***
- **Grid Interconnections – not always available**
- **Low Power Revenues -- $0.05/kw-hr**

What about Diversion Credit for LFGTE?

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Challenges to Landfill Methane Recovery & Use

- **2006: 20 new WM LFGTE projects**
  - ***None* in California**
  - ***30 in 2007 – None in California***
- **Criteria Pollutant Emission Standards**
  - ***SCAQMD Rule 1110.2 Amendments***
    - All new equipment would have to meet natural gas emissions
    - By 2012 would have have to upgrade existing equipment
    - No Consideration of GHG emission benefits
  - ***Could lead to shut down of LFGTE project and a return to Flaring of LF gas – with no energy recovery and no GHG benefits !!***

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Are There Other Options for Landfill Gas?

GHG Regulatory Drivers

1. **LF Gas Collection – currently 95%+ of WIP**
2. **Flaring – Methane Destruction (95%+)**
3. **Internal Combustion Engines (40%)**
4. **Boilers or Turbines (5%)**
5. **BioReactor Landfill Technology**
6. **Refining LFG to Nat. Gas or Bio-diesel (0%)**
7. **Diversion of Organic Waste to Energy (Conversion Tech, Fuel?)**

NOx ?

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Conversion of Landfill Gas to Natural Gas

- **Opportunities:**
  - ***Current LNG CA Market: 70-80,000 gpd***
    - Projected growth to 500 – 600,000 gpd by 2015
  - ***Current LFG to LNG Potential: 300,000 gpd***
    - Could be as high as 800,000 gpd from all LFs
  - ***All of CA LNG is non-renewable fossil based***
- **Challenges to LFG to LNG Development:**
  - ***Contaminants & CO_2 Separation***
  - ***High Cost and High New Commercial Technology Risk***
  - ***Need for initial higher cost contingencies***

Landfill Diversion Credit?

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Conversion of Landfill Gas to Natural Gas

- **Altamont Landfill Project**
  - ***Waste Management and its partners:***
    - Linde/BOC – world's largest cryo-gas supplier
    - Gas Technology Institute – leading NG technology R&D group
  - ***Cryogenic Process: 13,000 gallons of LNG/day***
    - Displace 2.8 million gallons of diesel fuel per year
  - ***Potential CO_2 production – demand?***
  - ***Reduced NOx emissions at LF***
  - ***$12 million capital cost***
  - ***$3-4 million in incentives needed***

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Why Not Divert Organics from Landfills for Energy?

- **Landfill GHG Emissions**
  - **75% LFG Destruction: 0.20 MTCE/ton**
  - **90%+ LFG Capture: Neutral**
  - **90%+ LFGTE: - 0.10 MTCE/ton**
- **Compost: - 0.05 MTCE/ton**
- **Energy Conversion from Waste: > - 0.30 MTCE/ton**

Conclusion? Maximize Energy Recovery !!

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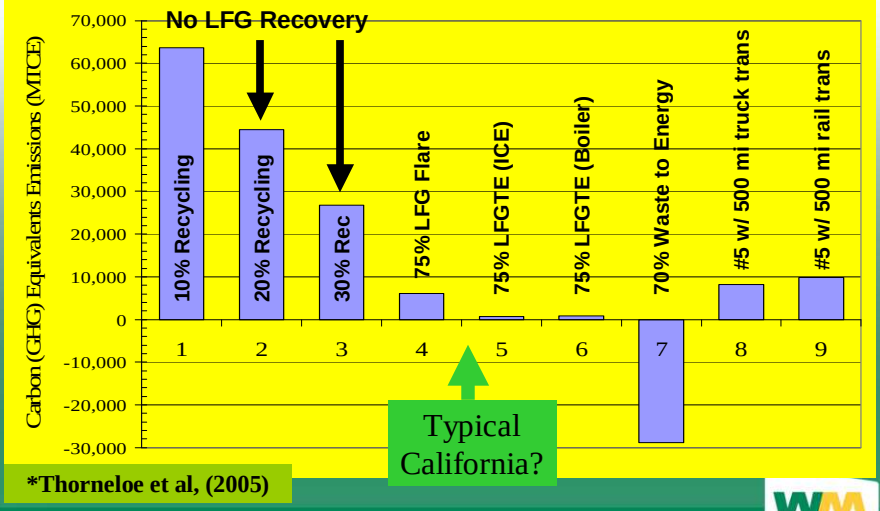
Net GHG Emissions – 750,000 pop. (Tons of Carbon Equivalents)



***Thorneloe et al, (2005)**

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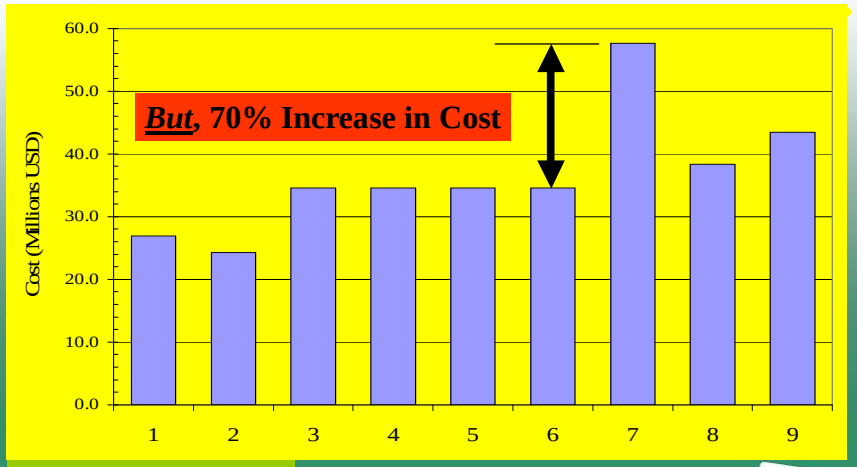
Net Annualized Costs



*Thorneloe et al, (2005)

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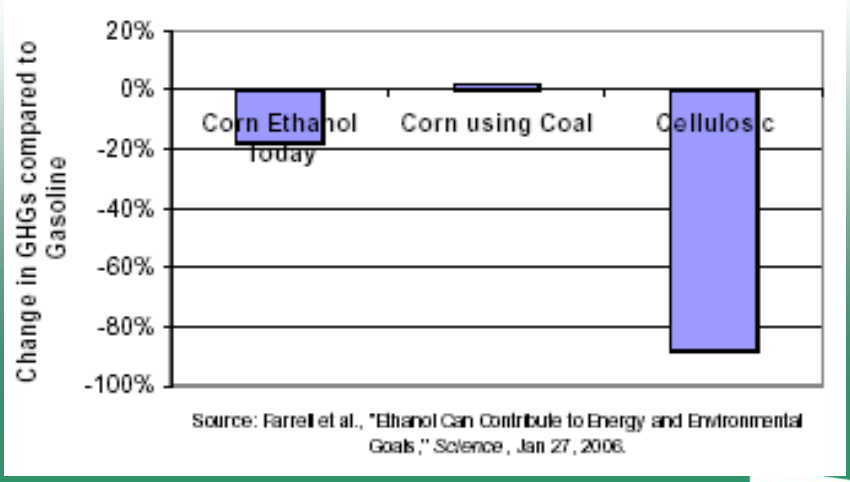
Relative GHG Emissions from Various Sources of Ethanol



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BlueFire Basic Technology

- **Working with WM at El Sobrante LF**
- **Technology Category**
  - ***Concentrated Acid Hydrolysis***
    - No pretreatment required
    - Does not use enzymes
    - Proven concept in mid 1900s
- **Feedstocks**
  - ***Any cellulosic material – from agricultural residues to post-sorted urban waste.***
    - Flexibility in using mixed waste streams.

•Products
- ***Ethanol***
- ***Lignin***
- ***Gypsum***

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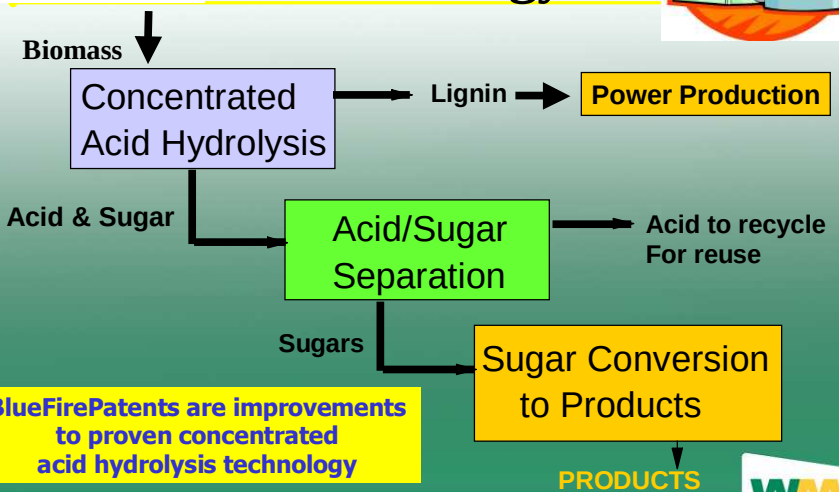
Proven Technology



BlueFirePatents are improvements to proven concentrated acid hydrolysis technology

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Cellulosic Ethanol Regulatory Constraints to Commercialization

Diversion Credit Essential !

- **"Does it count?"**
  - ***Municipalities faced with compliance with landfill diversion goals in California under AB939***
  - ***Limited credit allowed for* conversion facilities**
- **Redundant California Permitting Process**
  - ***Existing regulatory framework can be used to review potential environmental and public health and safety issues of ethanol biorefineries***
  - ***Should avoid redundancy***

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DOE Grant for El Sobrante Biorefinery

Amount -	**$40 million (40% cost share of total project costs)**
Location -	**Southern California Landfill**
Output -	**Approx 18.6 million gpy ethanol**
Feedstock -	**700 dry tpd green and wood waste**
Co-location-	**Landfill gas, electricity, infrastructure**
Timing -	**Engineering and permitting efforts started**
Construction -	**Q1/2 2008 subject to regulatory process**
Operation -	**Q4 2009**
Participants -	**Waste Management, Inc., Petro-Diamond (Mistubishi subsidiary), JGC Corporation, MECS (formerly Monsanto), Colmac Energy**

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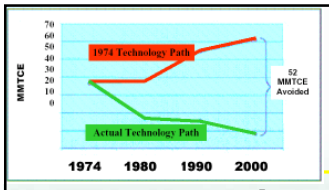

Summary

- Waste Industry has Excellent GHG & Energy History
- BioMass Waste Management Options Impact GHGs
  - *Landfill Gas, Capture, Energy and Carbon Storage*
  - *Direct conversion of energy from waste*
- Significant Barriers to Increased Landfill Gas Energy
  - *Cost and Criteria Pollutant controls are key*
  - *LFG to LNG reduces criteria pollutants with >> costs*
- LFG can be reduced by Waste Energy Conversion
  - *Best option for reducing GHGs from Organic Waste*
  - *Further increased cost*
- Redundant and Overlapping Agency Permitting is Barrier
- Absence of AB 939 Diversion Credit for Energy from Waste
- Uncertainty Over Future GHG Markets

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Questions?

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