

Marrying Anaerobic Digestion to a Composting Facility

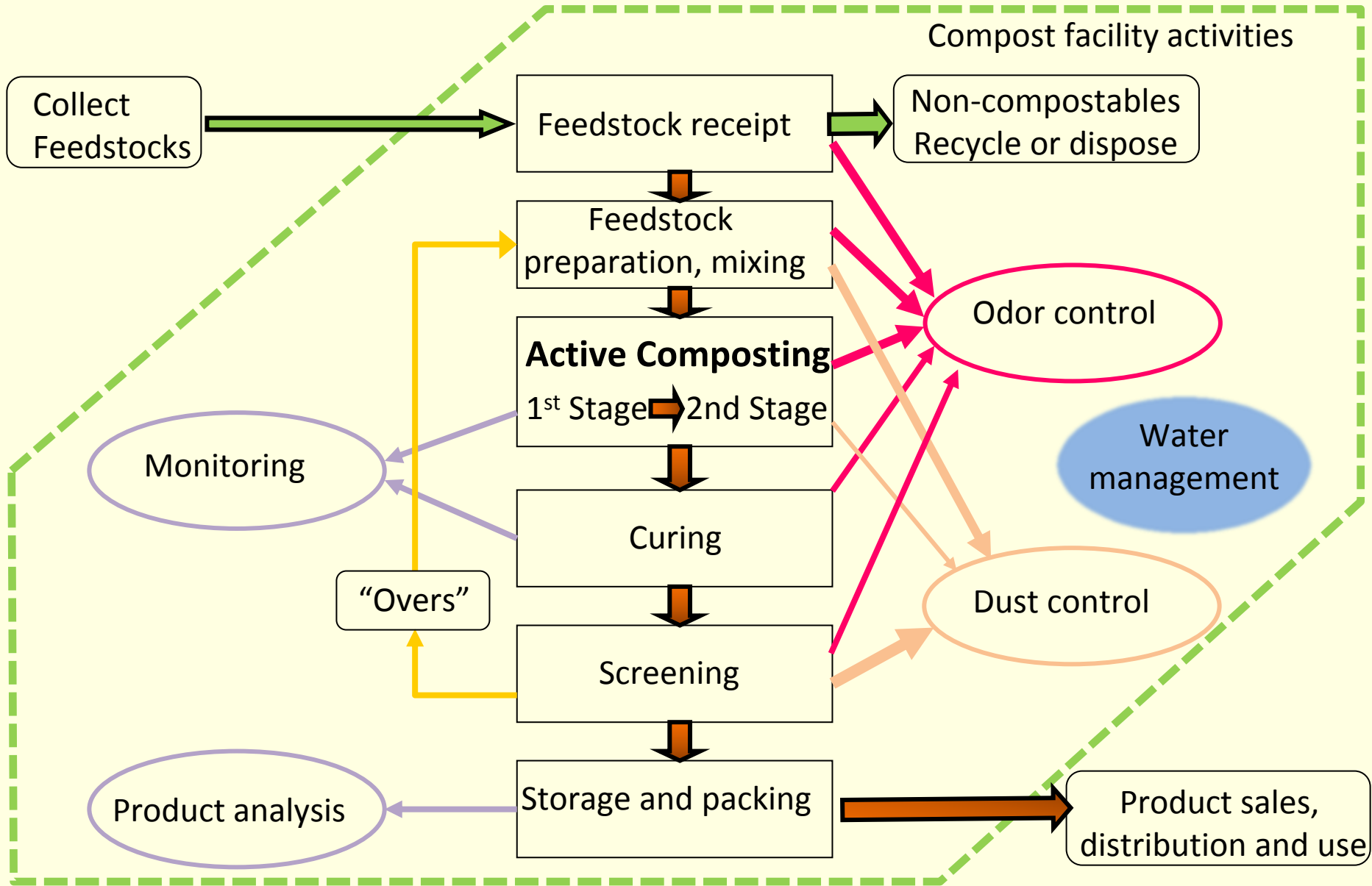
Kansas DH&E Dept.
2011 Works! Conference
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Craig Coker

What is Composting?

- An aerobic (with oxygen) biological manufacturing process
- Consists of volumetric materials handling systems
- Process efficiencies are critical
 - *No material moves more than twice in same physical condition*
- Products – composts, custom soil blends, mulches

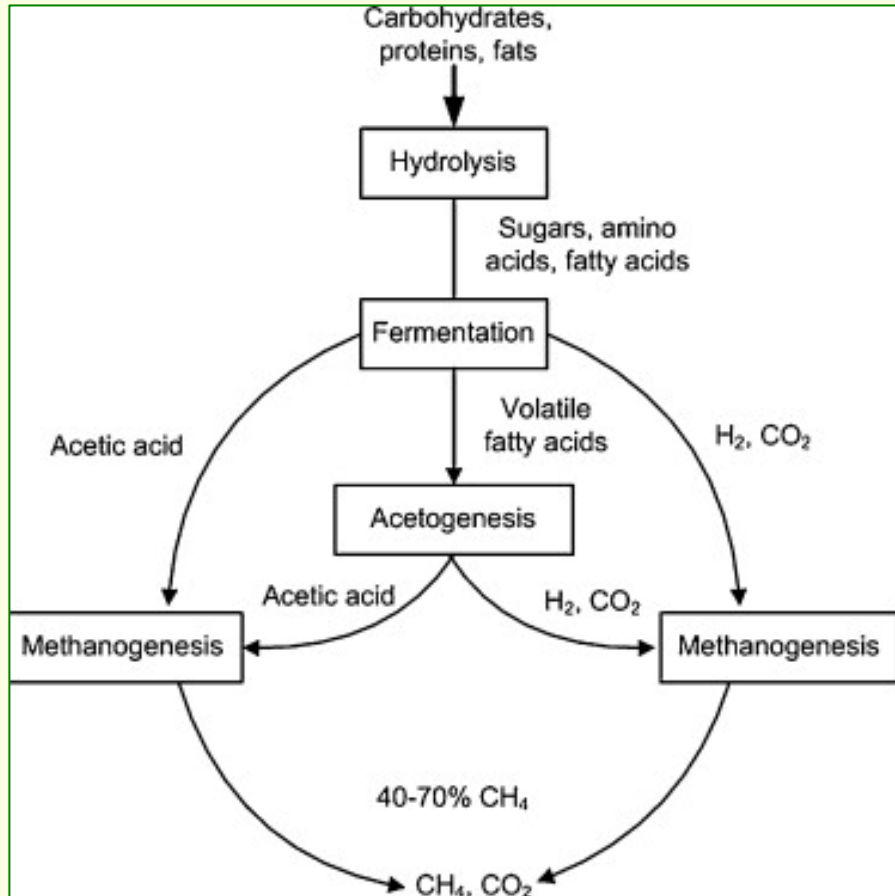
Flow of materials and activities at the compost facility



Composting as a Business

- Revenue from gate fees and from product sales
- Gate fees
 - Derived from waste management contracts
 - Some feedstocks won't produce revenues
 - Agricultural residuals, animal manures
- Product sales
 - Seasonal
 - Multiple products in product family essential

What is Digestion?



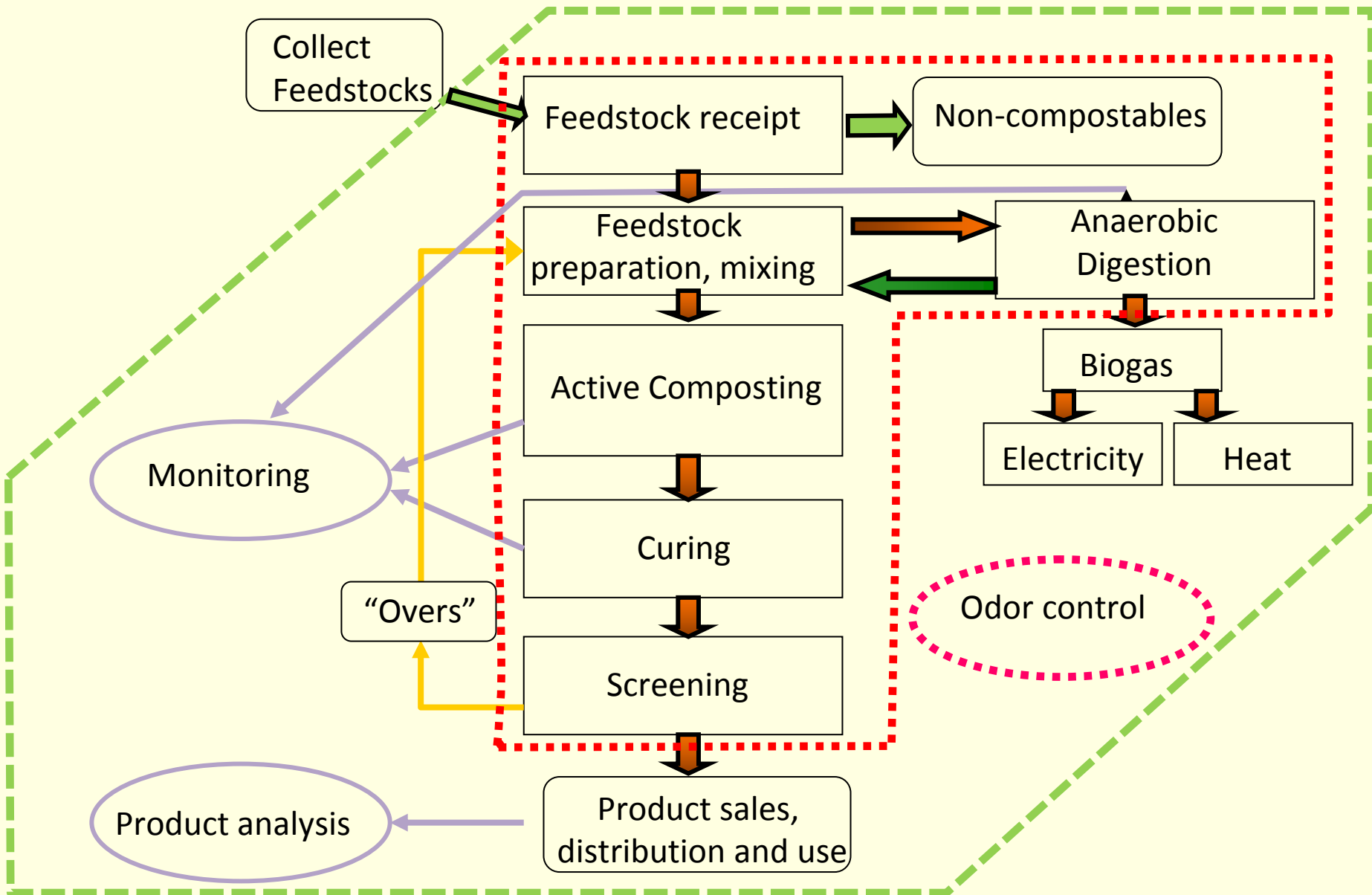
- Decomposition in absence of oxygen
- Conversion of organic carbon compounds to methane and CO₂
- Operates at mesophilic temperatures
- Residual is called digestate

Why Add Digestion?

- To add products to the portfolio
 - Electricity
 - Biofuels
 - Heat recovery & reuse
- Advantages of adding digestion
 - Existing manufacturing environment
 - Sites already approved for waste mgt.
 - Contracts for waste mgt. in place

With Digestion and Product Biogas/Energy Recovery

Compost facility activities



Feedstocks for Biogas

- In U.S., feedstocks with best biogas potential are industrial sources:
 - Rendering wastes
 - Fish processing residuals
 - Bakery wastes
 - Food processing residuals
- Next best – animal manures, food scraps
- Commercial/residential food scraps
 - High contamination; can be hard to get multi-yr contracts

Digestate Management

- If liquid or slurry, either land-apply (if farms within 20 mi.) or dewater for composting
- If/when solid, mix with fresh yard trimmings or similar high VS-high structure material for composting
 - Plan on 60% digestate / 40% fresh feedstock
 - Shoot for C:N = 25:1, Moisture = 50%, VS > 80%
 - Compost in windrows with compost blanket
 - Don't turn windrows for 1st 5 – 7 days for odor control
 - Compost in negative aeration ASP

Digestate Compost Quality

- With agricultural or industrial feedstocks, should be good quality compost
- With I/C/I or residential food scraps, plastics contamination is a likely problem
 - Can reduce market value from \$20/CY to \$6/CY



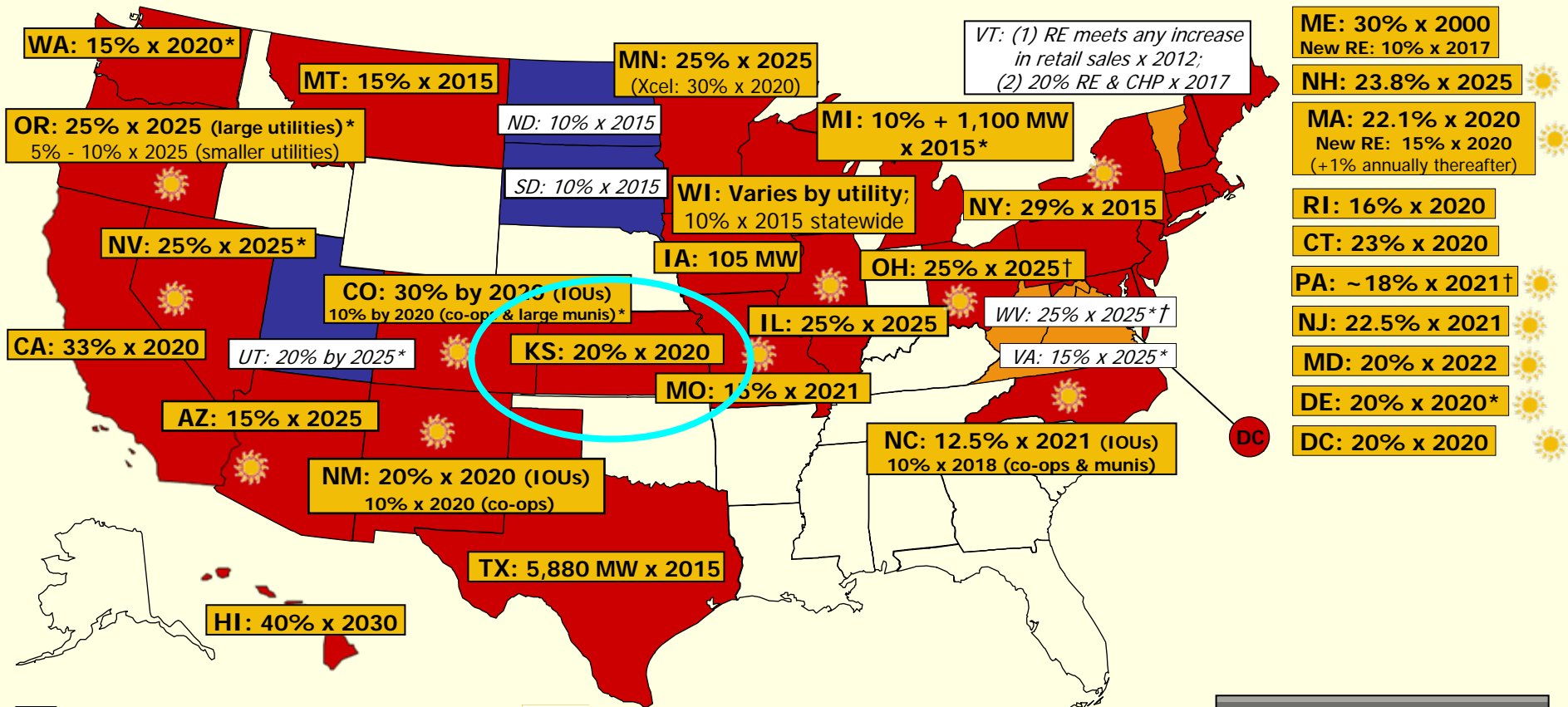
Challenges of Adding Digestion

- Need to marry type of AD to feedstocks
 - Sludges & manures – wet (liquid) digesters
 - Food scraps – slurry to send to wet or use HSAD
 - Yard trimmings – only as bulking agent in HSAD
- Feedstock & digestate processing
 - Changing physical state (solid↔slurry↔liquid) costs money
- Health & Safety
 - Flammable gas management
- Electricity purchase agreements
 - RPS states have other options (hydro, wind, etc.)

Renewable Portfolio Standards - -

Kansas – 20% of peak demand by 2020

www.dsireusa.org / May 2010



State renewable portfolio standard
 State renewable portfolio goal

Minimum solar or customer-sited requirement
 * Extra credit for solar or customer-sited renewables
 † Includes non-renewable alternative resources

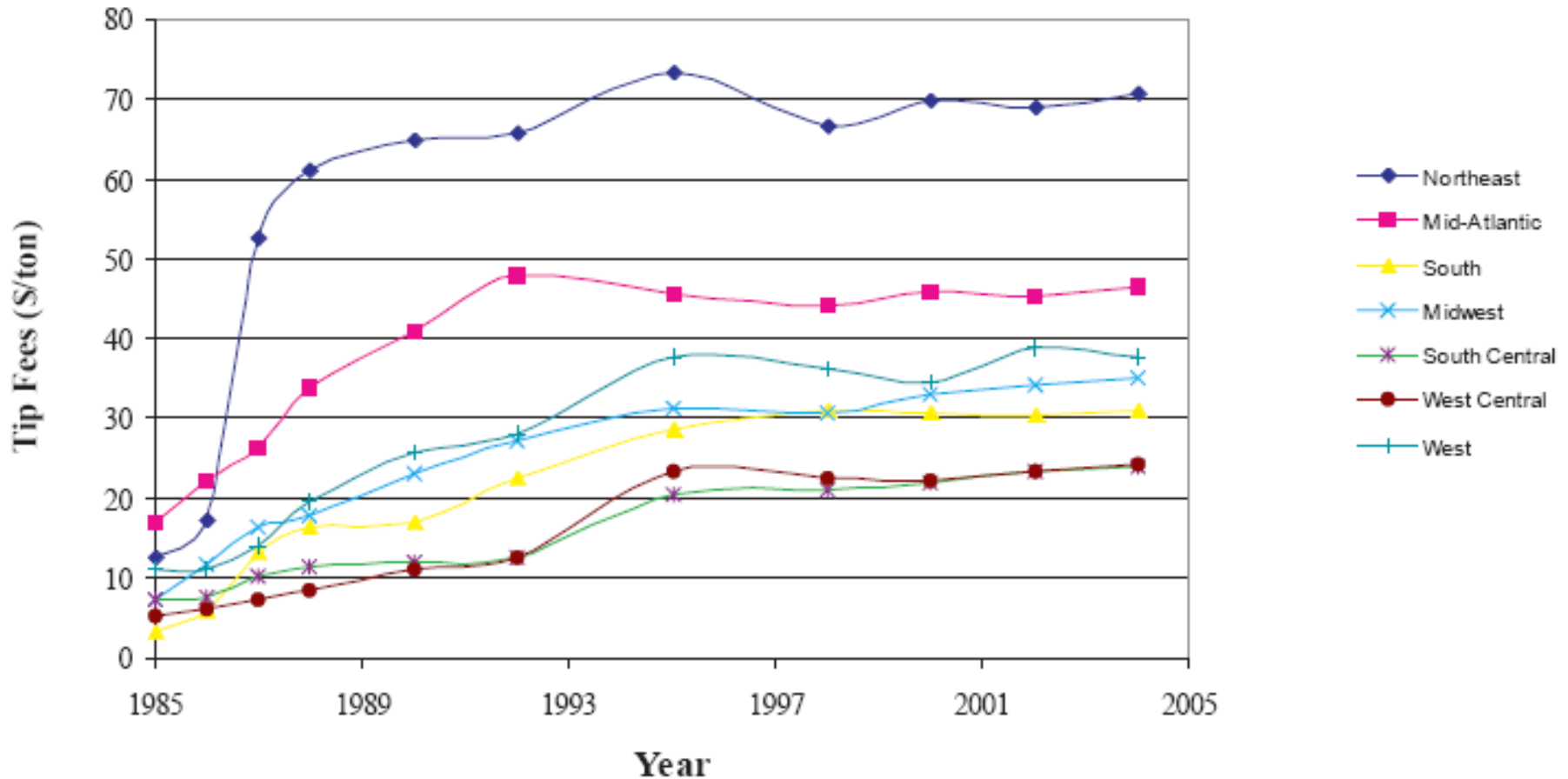
29 states + DC have an RPS
(6 states have goals)

More challenges

- Heat Recovery
 - Need nearby user
- Odor Potential & PR Problems
 - Land applying or composting digestate
- Regulatory Approval
 - Some states struggling with how to regulate AD of solid wastes
- Still competing with landfill tip fees
 - Challenging economics in many areas

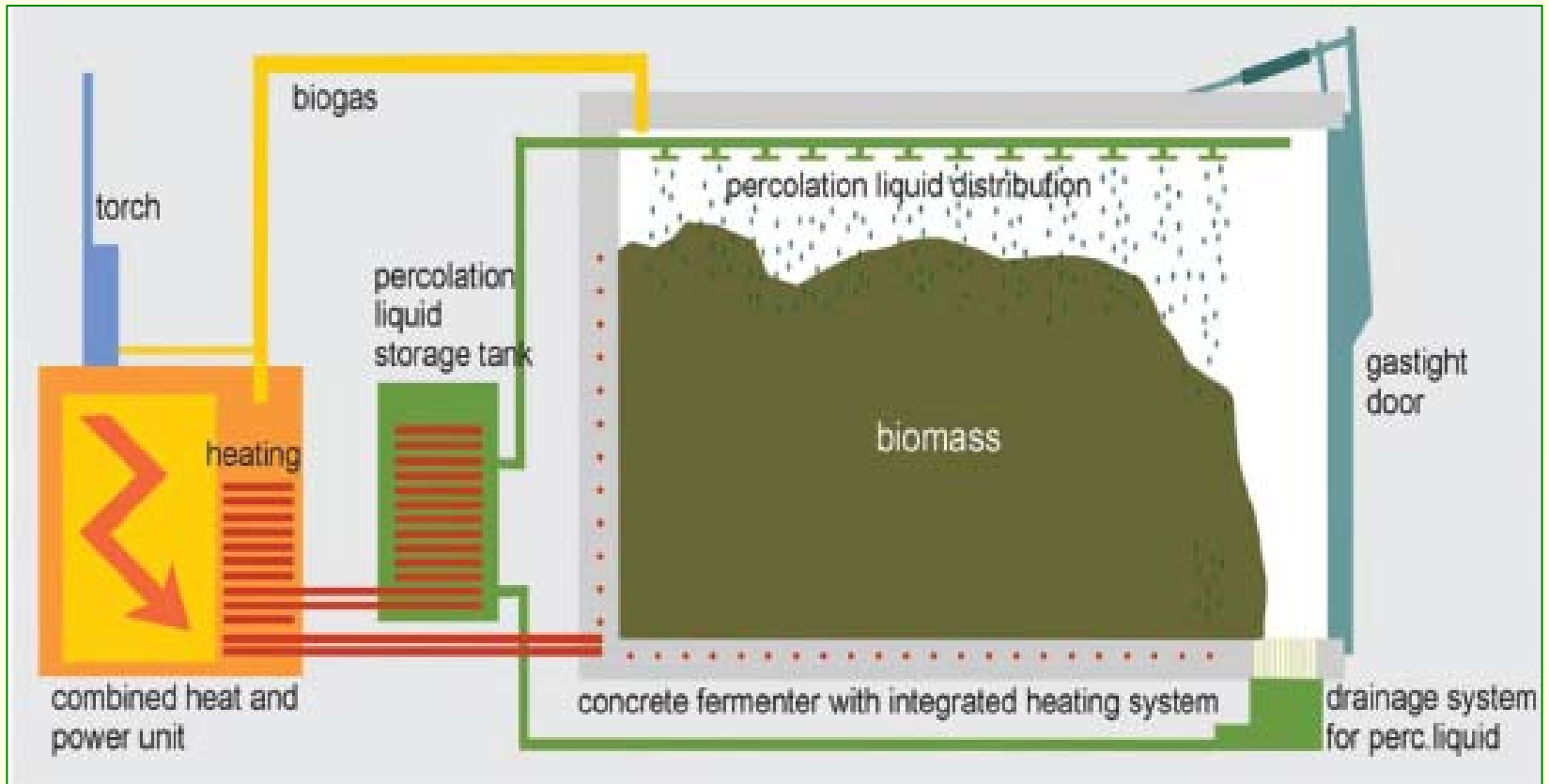
Landfill Tip Fees

(2005 Data from NSWMA)



Solid Waste Digestion

European Percolation Reactors



Coker Composting & Consulting



Coker

Composting & Consulting

Potential Capital Costs for Percolation Reactors

Capacity (tons/year)

25,000 → 50,000 → 100,000

Reactors

\$8,000,000 → \$30,000,000

CHP Engine,
generator, etc.

\$750,000 → \$3,500,000

Biomethane System

\$1,250,000 → \$5,000,000

iAD – *integrated* Anaerobic Digestion

- Developed in 2010 by Ohio Ag R&D Center
- Liquid digestion of animal manures to create biogas
- Digestate used as liquid in percolation reactor containing ag residuals (corn stover, wheat straw, etc.) for more biogas
- Perc reactor digestate to composting
- Logical linkage between manure and solid waste digestion/composting

Recommendations to Composters

- Investigate energy markets carefully
 - Electricity production & sale
 - Biogas cleanup to RNG for fleet use
 - Heat recovery for nearby user
 - Secure contracts for recovered energy
- Ensure right AD technology for your feedstock(s) – dry / slurry / liquid
- Consider operational, H&S impacts of:
 - Liquids & flammable gas management



Questions?



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