Dane County Landfill
Gas to Energy Systems

Presented by
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Solid Waste Manager
Presentation Overview
- Small Beginnings
- Current Operations
- What the Future Holds
Verona – Small Beginnings

- Active landfill 1977 – 1987
- 1988 – 21 gas wells and enclosed flare
- Completed in July, 1995

- 1 Cat 3412TA (350 KW)
- 1 Cat 3412NA (220 KW)
- WI Renewable Energy Assistance Program
  Grant $75,000
Verona - Through the Present

- Peak output – 650 kW (enough to power 900 homes)
- Spring 2005 – shut down 3412NA due to decreasing gas quantity
- 3412’s require 50% methane to run
- Still powers Badger Prairie Complex
- Balance sold to local utility
Rodefeld – Current Operations

- History
- The Process
- Challenges
Rodefeld – History/Timeline

- Active Landfill opened in 1985
- Projected to reach capacity approximately 2020
- April 1996 – installed 31 gas wells
- Additional 9 wells installed January 2000
1997 – Completed Installations

- WI Renewable Energy Assistance Program Grant $75000
- 2 Cat 3516 (800 KW) Gen Sets
- Compressor skid
- Compressor building
- Gen Set building
Recent Completed Installations

- December 2003 – Candlestick Flare
  - Temporary to Permanent
  - Addition to building
- January 2004 – 3rd Cat 3516 (800 kW) Gen Set
  - Due to increasing methane production
- December 2004 – Cat 3520 (1600 KW) Gen Set
  - 4 new & 6 replacement gas wells to feed it
- March 2005 – Focus on Energy Grant $35,000
Contractors, Partners, and Engineers

- Jerry Mandli, P.E, Dane Co. P.W. Director
- Mike Rupiper, P.E., S.W. Engineer
- MGE of Madison, WI
- WPS-PDI of Green Bay, WI
- Fabco of Green Bay, WI
- H&H Industries of Madison, WI
- Hanover Company of Gaylord, MI
- B&B Electrical Contractors of Iron Mtn., MI
- Enercon Engineering of East Peoria, IL
- A.C. Engineering of Waukesha, WI
Costs

- $4.2 million in capital costs
- $200,000 annual operating cost
The Process – Dane County’s System

- Gas Processing
- Electricity Production
Decomposing Waste Produces Landfill Gas

- Landfill Gas Components
  - Methane – 55%
  - Carbon Dioxide – 35%
  - Nitrogen – 9%
  - Oxygen – 0.5%
  - Trace Organics – 0.5%

- Landfill Gas Temperature – 80°F to 120°F
Gas Movement

- Gas is drawn out through wells
  - Current total gas wells = 44
- Gas goes through transfer line
  - Currently 7000 feet of pipe
- Gas goes to the gas processing plant
In the Gas Processing Plant

- Gas is filtered
- Excess moisture is removed
- Gas is cooled and pressurized
- Gas passes into the electricity production plant
In the Electricity Production Plant

- Gas goes into the engine – gen sets and is converted into electricity

- Electricity passes through switchgear

  ✓ Maintains steady voltage and amperage
Electricity Production (continued)

- Electricity enters transformers
- Passes to utility breaker
- Measures output sold to local utility (MG&E)
Current Output

- Electricity equivalent to power 4000 homes
- $1.2 million annual County revenue source
- Provide direct power to area businesses
  - DeJope, Mobil, Wingate Inn, Americas Best Value Inn, and others
Challenges

- Maintenance
- Other Issues
Maintenance – A 24/7 Job

- Regular maintenance schedule mandatory
  - Maximize electricity output
  - Maximize revenue to County
### STATION INFO

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### Control Panel

- Q/U VLT PH1
- Q/U FREQ
- ENG RM HI
- RUNNING
- Q/U VLT PH2
- NEG SEQ
- ENG RM HIHI
- OFF
- Q/U VLT PH3
- DIR 0YR/CUR
- GAS SKID HI
- RUNNING
- ENG RM 2 HI
- ENG RM 2 HIHI
- GAS SKID HIHI
- RUNNING
Continuous Monitoring

✓ Inconsistent methane pressure requires constant engine adjustment

✓ Inclement weather, power outages, etc. may shut down the plant or one or more generators

✓ Cameras accessed via internet allow monitoring from home or mobile laptop

✓ 911 call-out reports faults to person on call
24/7 Web-based Monitoring
Other Issues

- Monitoring and balancing of gas wells
  - WDNR regs require negative pressure
  - Back-up flare required by WDNR
  - Restores negative pressure in the event of engine failure
What the Future Holds

- Landfill growth and expansion
  - Install more wells to handle increased gas production
  - Expand power generation plant
Landfill Closure

- Continued power plant operation for 20 – 30 years
- Eventual depletion of gas supply
- Shut-down and resale of generators

✓ Gen Sets hold their value
Potential New Technologies to Expand Life of Electricity Production

- Micro turbines may run on 40% methane
- Sterling gas engine claims to run on 30% methane
Summary

- History – Small start at Verona
- Current operations and process
- Future for Dane County
- Questions