Iris Glen Landfill Gas to Energy Project

Joint Venture

Energy Systems Group
&
City of Johnson City

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Director of Clean Fuel Projects
Energy Systems Group, LLC

Iris Glen Landfill

Iris Glen Landfill

- Owned by: City of Johnson City
- Constructed & Operated by: Waste Management
- Service Area: Regional

Iris Glen Landfill

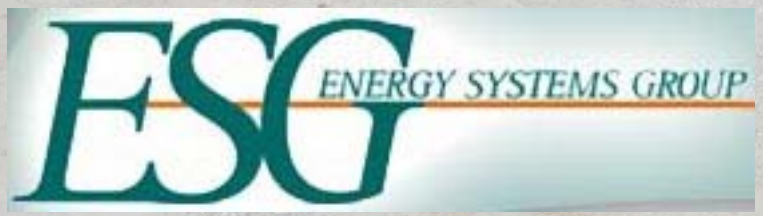
- Site: 365 acre of old Shale Strip Mine
- Landfill Footprint: 68 acres
- Began Operations: October 17, 1994
- Site Life: 12.1 million cubic feet; 27 year life
- TPD: 1300 TPD
- Expansion Potential: 17 – 80 years

Iris Glen Landfill Gas Recovery

- WM responsible for gas collection system
- Collect to a single point and flare / destroy
- City reserved right to tap into single point & redirect to future Gas to Energy Facility

Landfill Gas to Energy Project

Milestones



Landfill Gas to Energy Project

- RFP Advertised: September 2003
- Award RFP to Energy Systems Group: March 2004
- RFP Award based on:
  - Expertise in Technology > Medium / High BTU
  - Projected Royalty Rate
  - End User Consumption Risk
  - Ability to Perform

Landfill Gas to Energy Project

- Negotiation Process – Expert Advice to City
  - Rath, Young & Pignatelli – Concord, NH
  - Carolyn Associates – Bloomfield Hills, MI
  - March 2004 – April 2005
- Contract Executed April 7th, 2005
- Operation Commencement January 1st, 2007

Landfill Gas to Energy Project

- Contract Term: 25 years / 5 year renewable
- Contractor to permit, build & operate facility
- Royalty Payment
  - NYMEX 200 day moving average adjusted quarterly

Key Project Ingredients

- Customer (s)
- Landfill Gas Quantity and Quality
- Gas Processing & Delivery Technology

Our First Customer

Customer's Requirements

- 24 / 7 gas requirement
- 30 to 65 MMBTU/hr load
- 800+ BTU/CF Gas Quality Requirement
- 90 PSIG Delivery Pressure

Landfill Gas Quantity and Quality

- **Gas and Collection System Evaluation**
  - Verification of flow volume
  - Collections System Capabilities and Efficiency
- **Gas Quality and Constituents**

  Methane – Oxygen – Nitrogen – H_2S – Siloxane
- **Operational Review**
  - Filling patterns
  - Permit Expansions

Gas Processing & Delivery Technology

- State of Tennessee, **Regulated,** Pipeline
- H_2S Removal System
- Membrane Separation System

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Landfill Gas Presentation

Pipeline Basics

- Pipeline Length: 21,000 feet
- 90% directional drilled
- Pipeline Size: 6”
- Pipeline Material: HDPE SDR 7
- Installation Time: Three Months
- 125 psig MAOP

Certificate of Convenience and Necessity

- **T**ennessee **R**egulatory **A**uthority
  - Pipeline Safety & Financial Viability
- Process

  File Application – Staff Review – Staff Questions –

  Answer Staff Questions – Staff Questions -

  Answer Staff Questions – Submit Direct Testimony –

  Mayor Calls TRA Chairman - Public Hearing –

  Mayor calls all TRA Directors - Final Hearing & Approval.

Pipeline Right of Way

- State of Tennessee
- Norfolk & Southern Railroad
- City of Johnson City
- Veteran’s Administration
- No Private Landowners Were Involved


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Project Benefits

- **High/Medium BTU projects are in demand**
- **Electricity opportunities regional but growing**
- **Long Term Supply Source**
- **Landfills Are Located in Populated Areas**
- **New Source of Local Revenue**
- **Demonstrating Environmental Responsibility**

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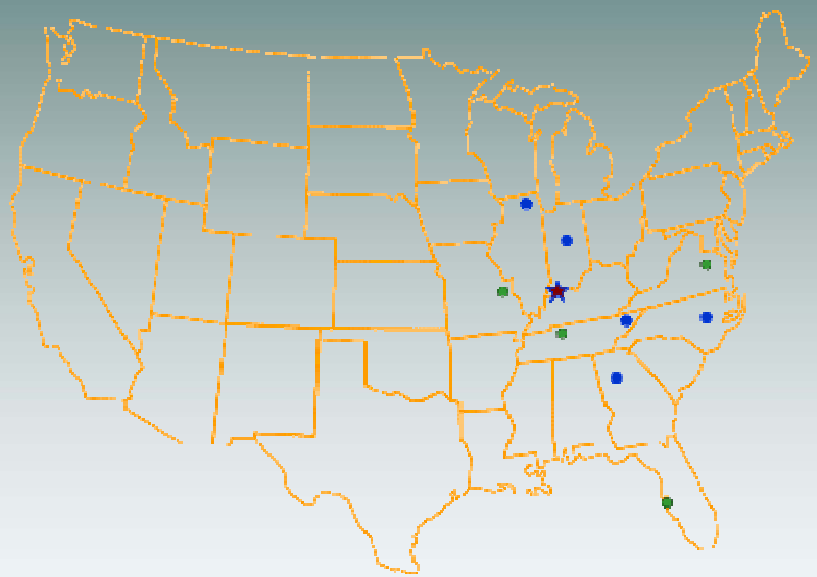
Building Performance with Energy



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Renewable Energy to Fuel Your Future

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Landfill Gas Presentation