



# LFGTE PROJECT DEVELOPMENT



**CHIA**

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# Introduction/Background



- Gaston County - located in the South-Central Piedmont of North Carolina
- Population - 210,000
- Part of Charlotte-Gastonia-Concord Metropolitan Statistical Area (MSA)

# County Map





# Sustainability Goals



GHG Emissions  
Reduction

Renewable  
Energy  
Production

Green Energy  
Park  
Development

# Sustainability Initiative



- Focus on existing Solid Waste Management Facility
  - Minimize Environmental Impacts (GHG emissions)
  - Conserve Existing Resources (leachate recirculation)
  - Develop Renewable Energy Source (change gas from liability to asset)

# Hardin Solid Waste Management Facility



- ~400-Acre Site
- Solid Waste Management Operations
  - MSW: 130,000 TPY
  - C&D: 50,000 TPY
  - Recycling Center
  - Leachate Pretreatment and Storage
  - Yard Waste
- MSW Disposal Capacity
  - In-Place Waste: 2,750,000 Tons (2011)
  - Estimated Site Capacity: 6,195,000 Tons



# Site Aerial





# Potential LFGTE Benefits<sup>1</sup>

- Per 1000 SCFM of LFG Recovered
- Emission Reduction (Direct & Avoided)
  - 120,000 MTCO<sub>2</sub>-e
  - Equivalent to Emissions from  $\approx$  23,000 Vehicles
- Electricity Produced
  - 27,000 MWh/Year
  - Power  $\approx$  2,100 Homes
- Catalyst for Green Business Development

<sup>1</sup>USEPA, *Emission Reductions and Environmental and Energy Benefits for Landfill Gas Energy Projects, LFGTE Benefits Calculator*, <http://www.epa.gov/lmop/projects-candidates/lfge-calculator.html>, December 9, 2009.



# Eco-Industrial Park Element



- Location for New Green Businesses
- Economic Benefit
  - Availability of Renewable Energy Source (primarily heat)
  - Materials Recovered from SWM Recycling and Disposal Operations
- Creates Jobs
- Further Improves Environment

# LFGTE Development



- Maximize Potential Economic and Environmental Benefits to the County
- Development options
  - Self Development
  - Private-Sector Development
- Key Issues
  - Revenue Potential
  - Financing
  - Complexity of Implementation
  - Commitment of County Staff Resources

# Major Development Considerations



- Major Risks
  - LFG Generation
  - Carbon Market Uncertainty
    - Verified Emissions Reduction Purchase Agreement (VERPA)
  - Energy Sales
    - Power Purchase Agreement (PPA)
    - Electric Interconnection Agreement
- Proven Internal Combustion Type Power Generation Technology
- Availability of Low Interest Financing
- Competitive Construction Market (2010/2011)



# Selected Approach



- Build, Own and Operate Proposed LFGTE Facility
- Develop Eco-Industrial Park
- Aggregate Potential Revenue Streams
  - Monetize Carbon Offsets Resulting from Methane Destruction (carbon credits)
  - Electric Energy Sales
  - Renewable Energy Credits (RECs)

# Economic Feasibility



# Phased Development



## ● Phasing

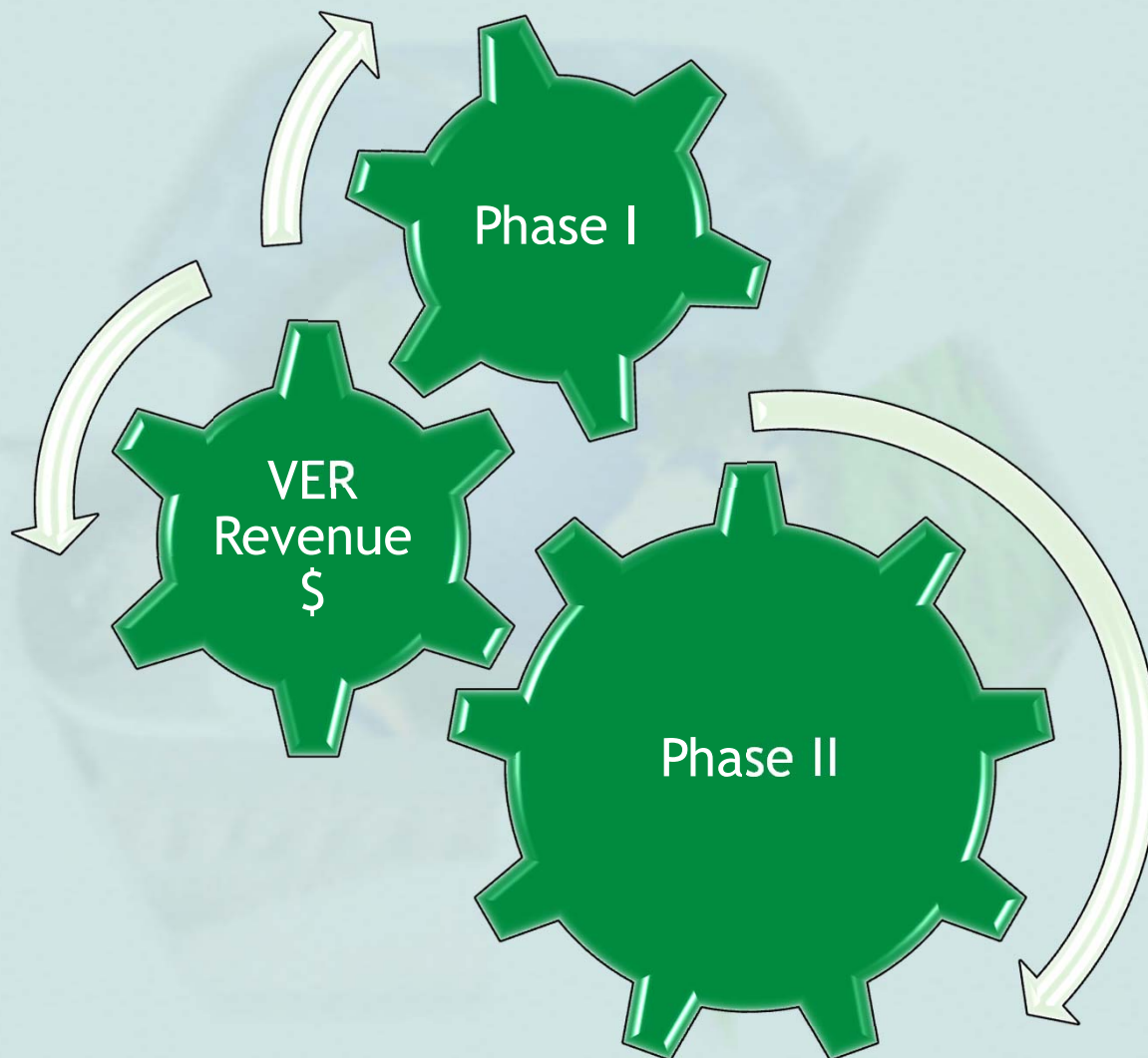
- LFG Collection and Flaring (Phase I)
- Power Generation (Phase II)

## ● Benefits of phasing

- Facilitate Permitting, Licensing and Financing Activities
- Accelerate Implementation Schedule
  - Design/Procurement
  - Construction
  - Revenue Generation
- Confirm Power Generation Design Feasibility
  - Gas Quality and Quantity
  - Electric Energy Production



# Project Drivers

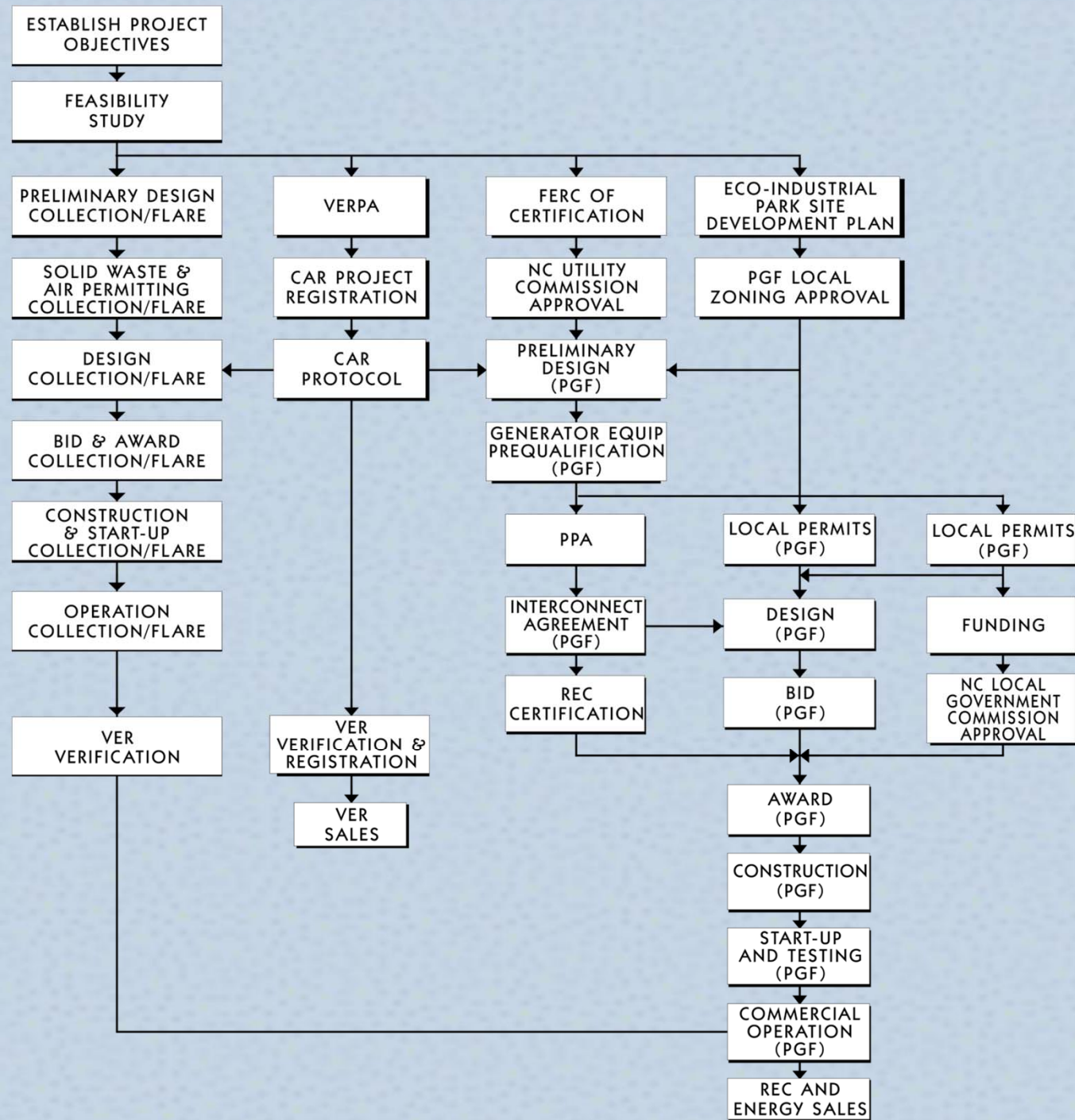


# Major LFGTE Pieces



- FERC Licensing
- Utility Commission Approval - Certificate of Public Convenience
- Renewable Energy Credit Certification
- Solid Waste Permitting (NCDENR)
- Air Permitting (NCDENR)
- VERPA
- PPA
- REMC Interconnection Agreement
- Financing
- Design/Procurement
- Construction

# Implementation Chart



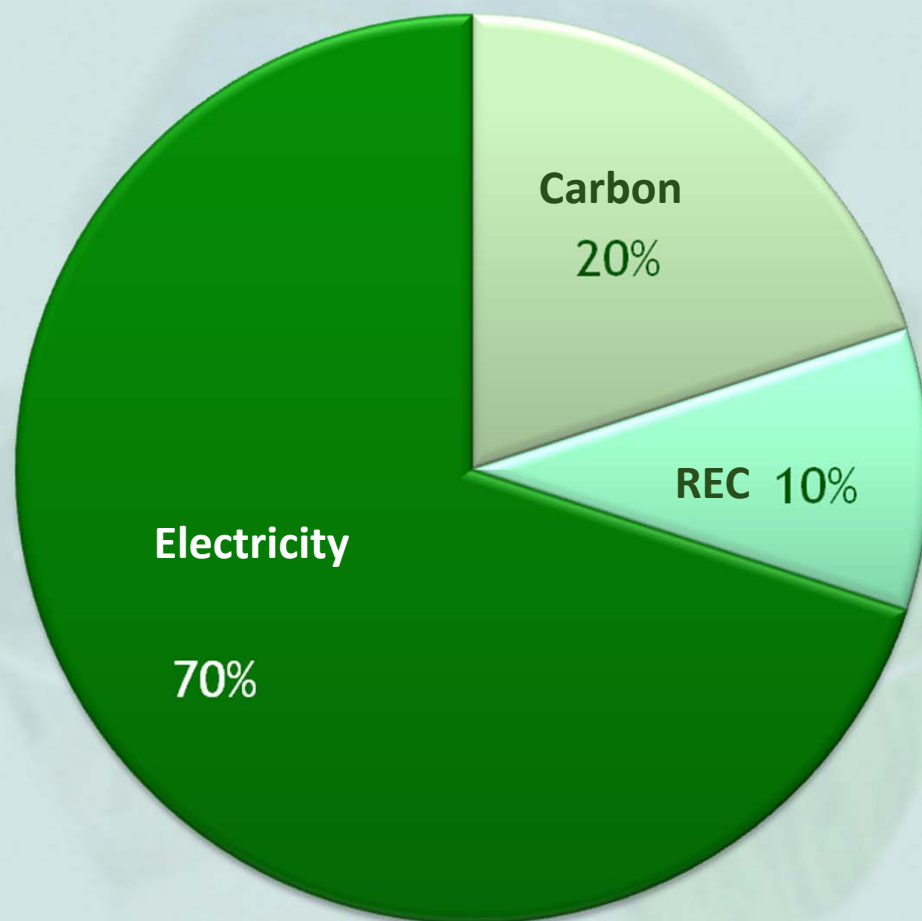


# Revenue Steams



- Carbon-Offsets (VER)
  - RFP to Select Carbon-Offset Company
  - Multiyear Verified Emissions Reduction Purchase Agreement (VERPA)
- Electric Energy
  - Purchase Power Agreement (PPA) with Duke Energy of the Carolinas
- Renewable Energy Credits (REC)
  - Bundled in Duke Energy Agreement

# Revenue Contribution



- Carbon
- REC
- Electricity

# Phase I – Collection & Flaring



- Purchased Used Blower and Flare Skid
  - Expedite Carbon Monetization
  - Reduce Initial Capital Investment
- Installed 70 Gas Wells
- Climate Action Registry Protocol  
Certified VERs = over 200,000 MTCO<sub>2</sub>-e

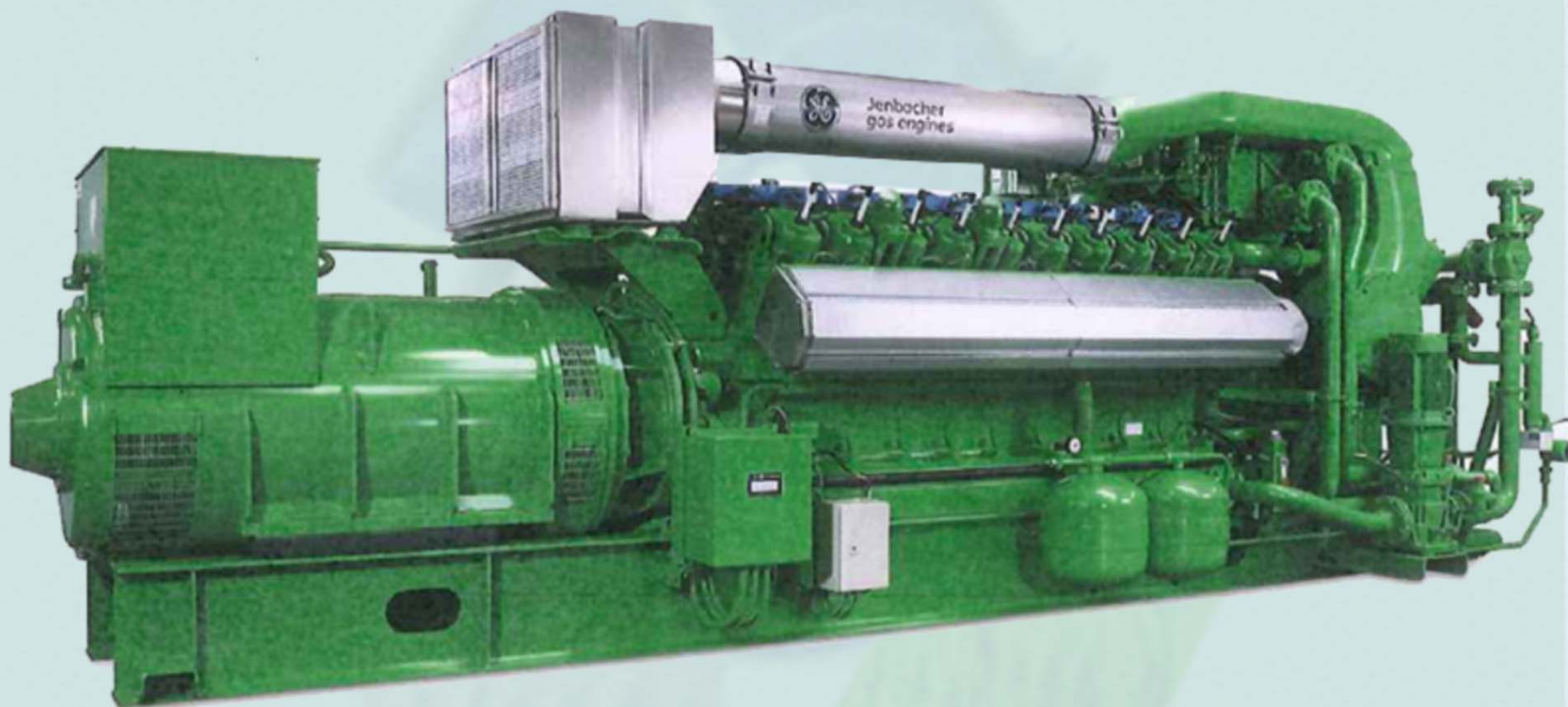


# Phase II – Power Generation Facility

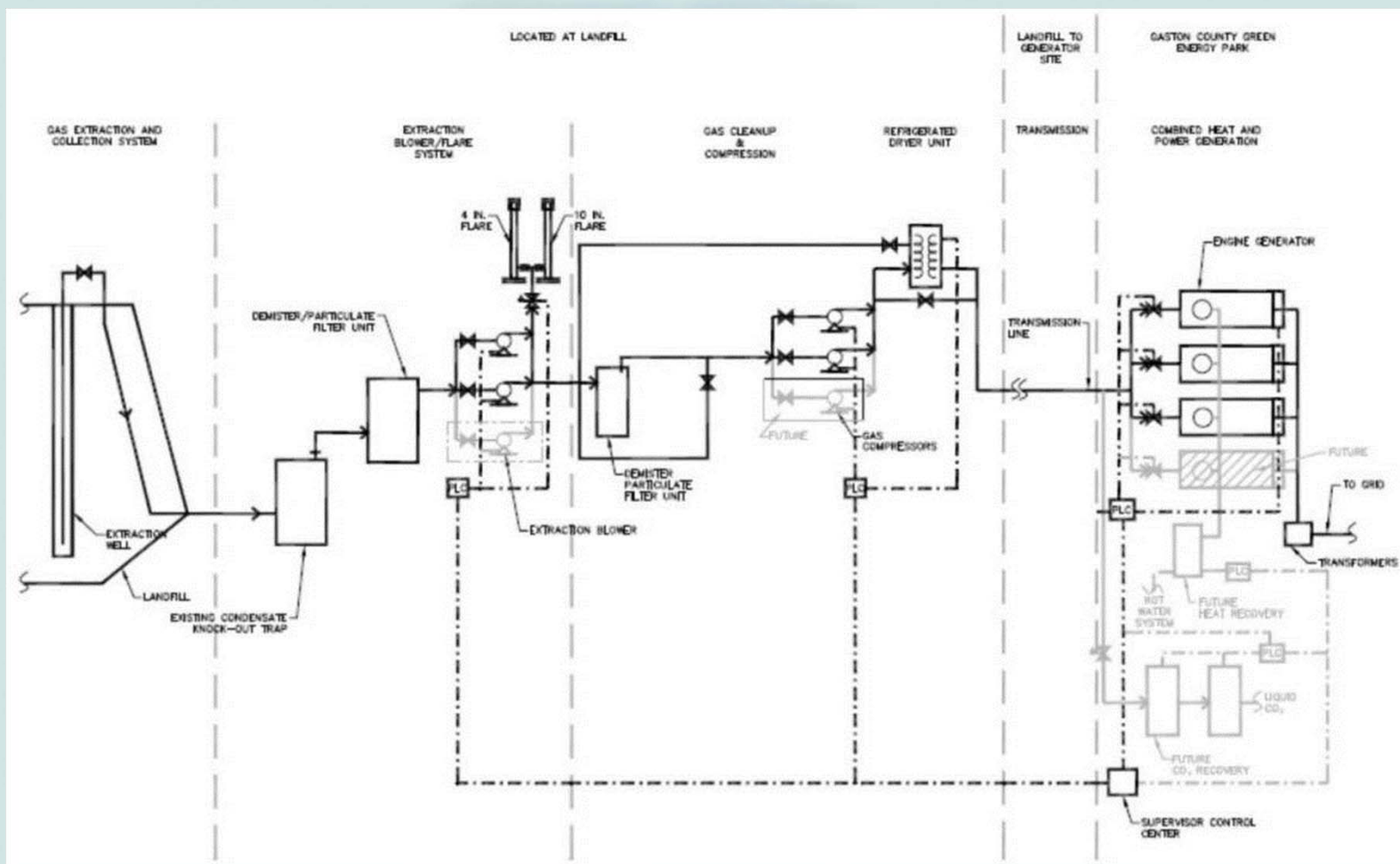


- Extraction and Flaring System
  - 2-York (Fan-Type) Blowers
  - 10-in Primary Flare
- Gas Clean-Up and Compression
  - 2-Hoffman (Multi-Stage Centrifugal) Blowers
  - After-Cooler
  - Chiller/Heat Exchanger
- 12-in HDPE Transmission Line
- Power Generation - 4.2 MW
  - 3-Jenbacher J-420 Generators

# GE Jenbacher Generator

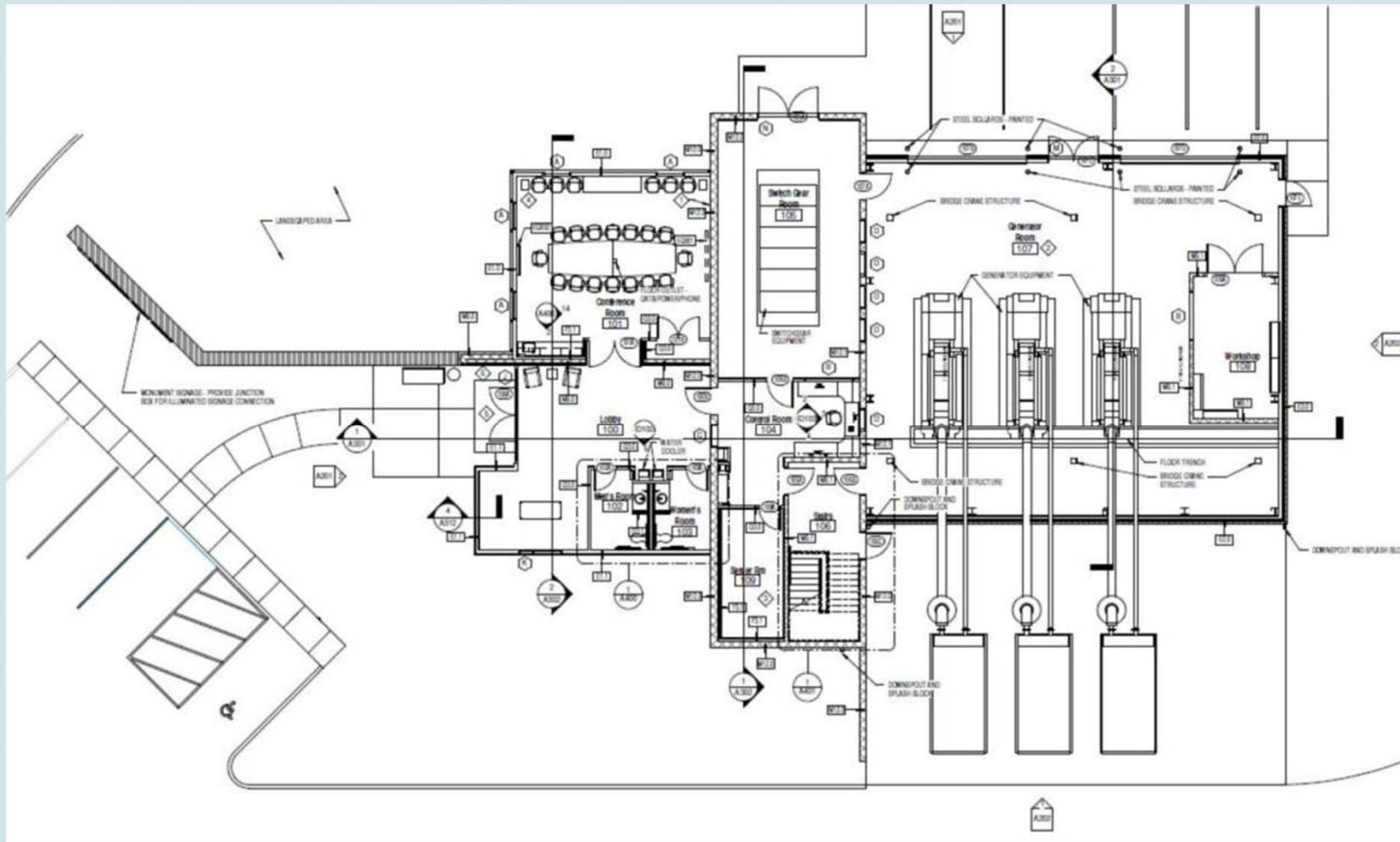


# Process Flow Schematic





# Renewable Energy Center Plan



# Renewable Energy Center



# Summary



- Phase I - Monetize Carbon Offsets from Landfill Methane Destruction
- Phase II - Build Power Generation Facility and Sell Electricity and RECs
- Develop an Eco-Industrial Park for Private-Sector Ventures
  - Green Partnership Initiative
  - Education
  - Research



# Lessons Learned



- Every landfill site is different
- Need minimum of 1.5 million tons waste for practical use of LFG
- Phase approach to development of LFGTE projects is critical to success
  - Phase 1 - LFG collection system & flare
  - Phase 2 - Add power generation facility
- RPS and RECs increase the viability of LFGTE projects



# LFGTE PROJECT DEVELOPMENT



QUESTIONS  
& ANSWERS

CHIA

## ACKNOWLEDGEMENTS

Ray Maxwell, PE, Gaston County Public Works Director  
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