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**Landfill Gas Alternatives
Louisiana DNR Performance Contracting**

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Landfill Gas to Energy Industry History

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- 400 Projects
 - 310 Electric Generation
 - 75 Direct Use
 - 20 other
- New York and California most active states
- Two projects in Louisiana
- Increases in Energy Prices make projects more viable
- Section 29 tax credits promoted projects in the 90's

- Electricity
- Direct Use
- Natural Gas Pipeline Injection
- Compressed Natural Gas
- Liquid Natural Gas

- Reciprocating engines or combustion turbines
- Combustion turbines unlikely for small projects
- Relatively high capital cost
- Requires reasonable wholesale electric prices, above \$45 per mWhr or other incentives
- Most common type of project
- Increased siloxane concentrations in landfills create a new problem

- LFG is piped directly to an end user of the gas
- Numerous applications such as boilers, limekilns, asphalt plants, reformers, and other applications
- Economic distance depends on size and fuel costs: higher priced fuels and larger volumes can justify up to 25 mile pipelines.
- Pipeline construction can be complicated particularly if private right of ways are required
- Increased fuel prices make these projects more attractive than in the past

- CO₂ from the gas is removed from the LFG creating a 90-92% methane product which is compressed and injected into a natural gas pipeline
- Membrane and solvent based systems
- Is capital and operating intensive
- Some of the Methane is lost in the CO₂ stream
- Requires relative large natural gas pipeline to take volumes from larger landfills
- Very high natural gas prices make these projects more attractive at this time

- Landfill gas is converted to compressed natural gas or liquid natural gas and used in vehicles
- Uses cryogenic, solvent, or membrane technologies
- Very capital and operating intensive
- Requires fleet vehicles to be modified to burn CNG or LNG
- LNG has storage issues
- As with other projects higher energy prices may make this attractive



Development Process

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- Every project is unique
- Different end users, electric rates, natural gas pipeline locations, ect.
- First step is to determine optimal project
- Development process takes time and capital