AMERESCO

Connect to Smarter Energy Solutions.

Renewable Energy for:

BMW of North America

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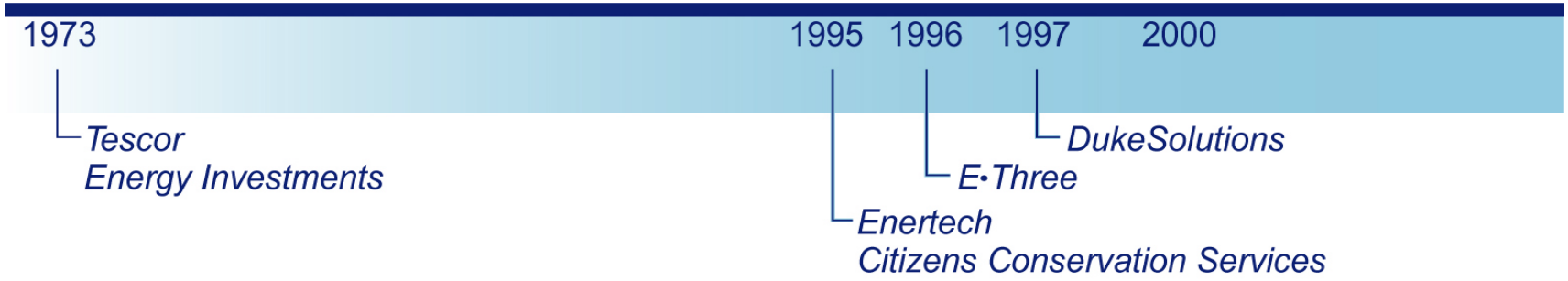
Background



- Over 30 years of Industry experience
- Largely employee owned with over 230 employees in 22 offices throughout North America
- Over 40% of Ameresco's employees are licensed Professional Engineers
- Ameresco has designed over $2 billion in energy solutions

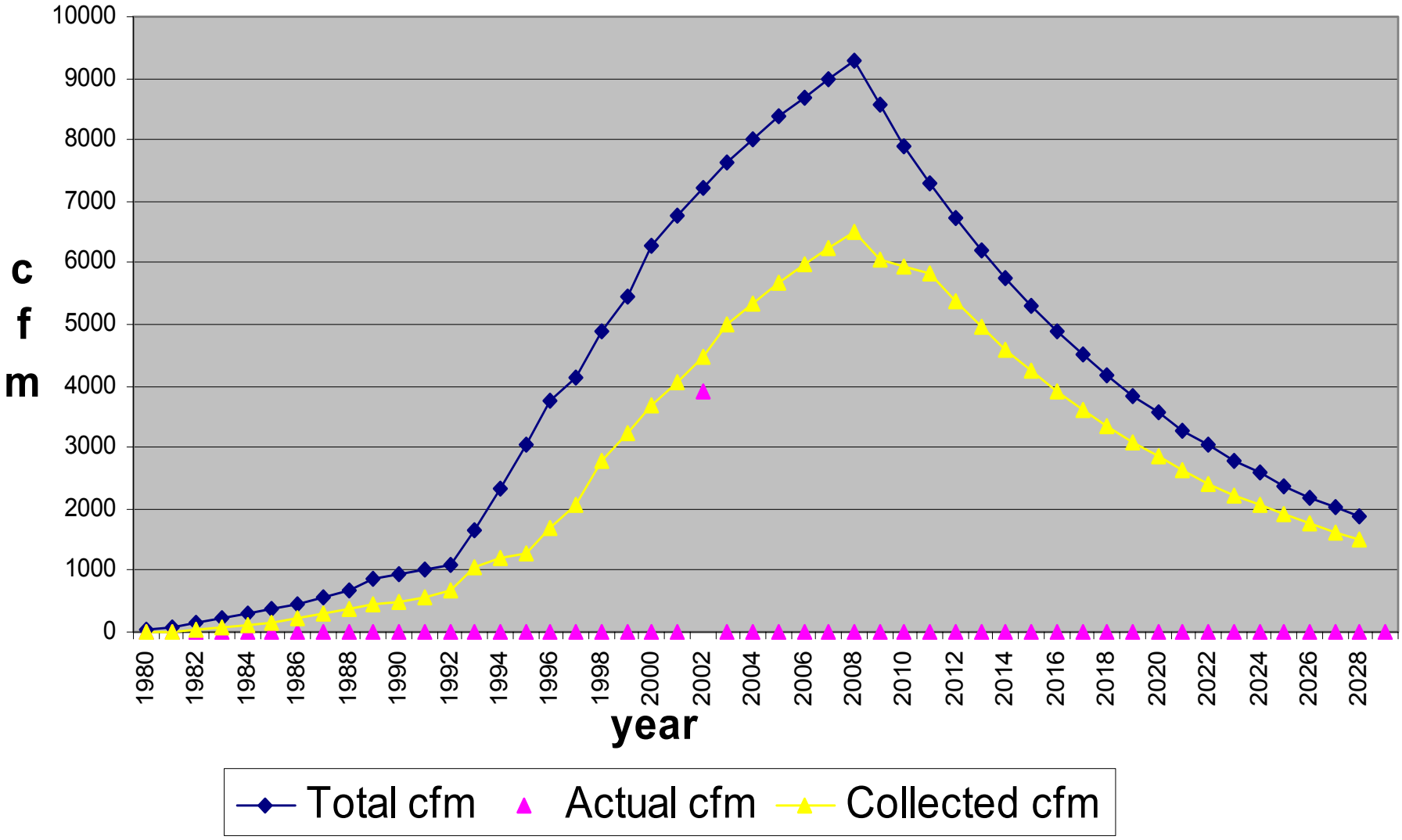
Business Partner
Rebuild America
U.S. Dept. of Energy

EPA
LANDFILL METHANE OUTREACH PROGRAM

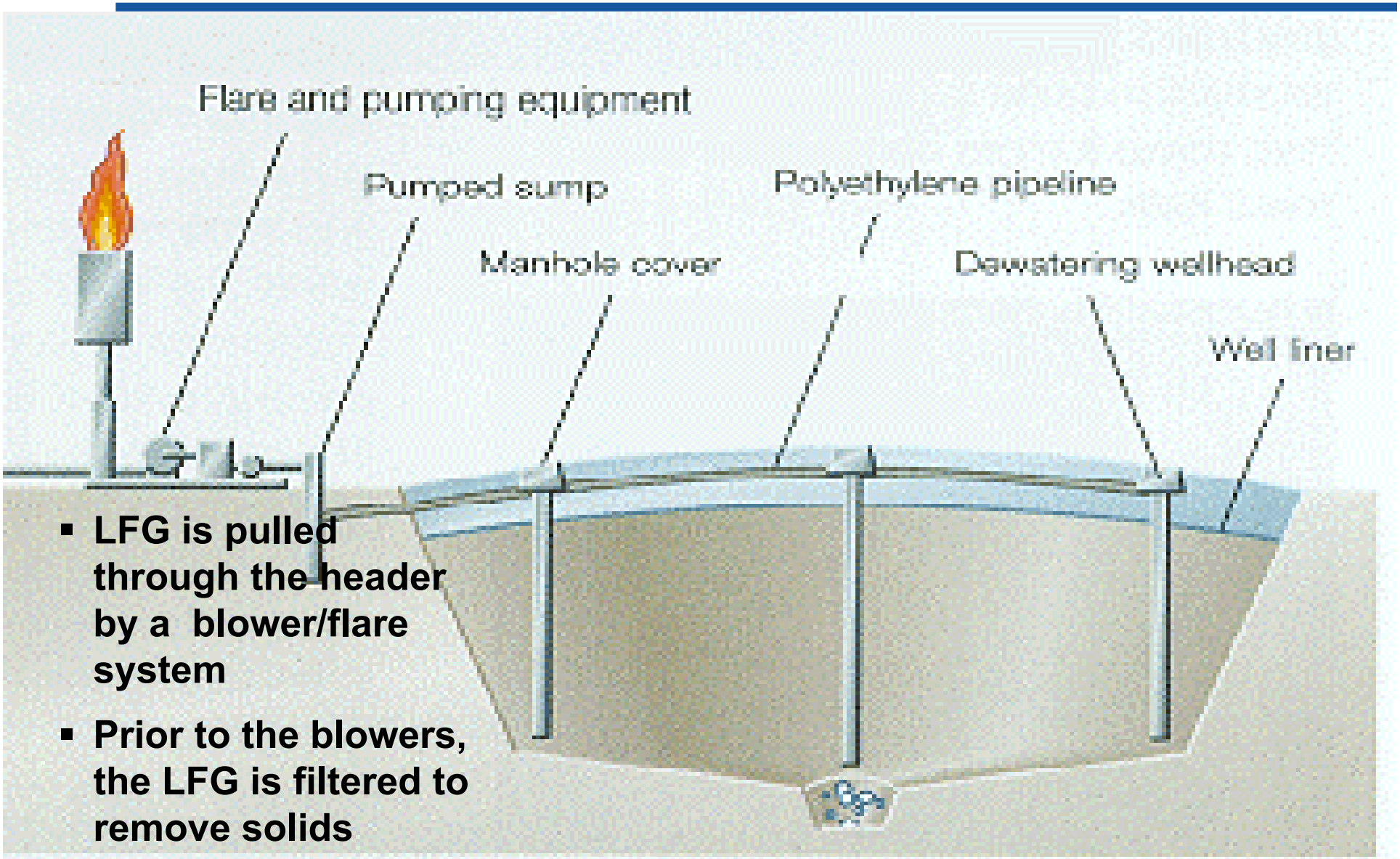
Palmetto Landfill - Overview

- Located in Spartanburg, SC
- Largest landfill in SC
- Opened in 1979; scheduled to close in 2007
- Accepts 4,000 to 6,000 tons/day
- Nearly 200 acres of permitted disposal (119 filled)
- 10 million tons of Waste In Place (WIP)
- Collecting approximately 5,000 cfm of landfill gas
- Subject to New Source Performance Standards (NSPS)

Landfill Emissions Model: Palmetto Landfill



BMW Project – At the Palmetto Landfill



- LFG is pulled through the header by a blower/flare system
- Prior to the blowers, the LFG is filtered to remove solids

Compression and Clean Up at the Landfill

- ***First Stage Condensate Removal:*** After passing through the Blowers, the temperature of the LFG will increase because of the compression of the gas from -2.5 to 5 psig. The LFG is then directed through Ambient Coolers that chill the LFG from 240 deg. F to 130 deg. F dew point
- ***Second Stage Condensate Removal:*** The gas is cooled further to 40 deg. F dew point by a Shell and Tube Heat Exchanger cooled by a conventional chilled water/glycol system
- ***Third Stage Condensate Removal:*** The Triethylene Glycol Scrubbing System (a sprayed type absorption process-similar to an enclosed cooling tower) brings the temperature of the LFG down to 0 deg. F. dew point (40 deg. F. drybulb).
  - The LFG will be filtered again to remove any remaining solids
  - The LFG will then be compressed by two 400 hp rotary screw compressors to a maximum pressure of 64 psig

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Pipeline Implementation and Challenges

- 9.5 mile pipeline
- Multiple River Crossings
- Major Interstate Highway
- Interchange Crossing
- Installed along rural/urban sections
- Rock/Ledge
- Existing Underground Utilities
- Railroad Crossings
- Private Residence
- Commercial Facilities
- Inclement Weather

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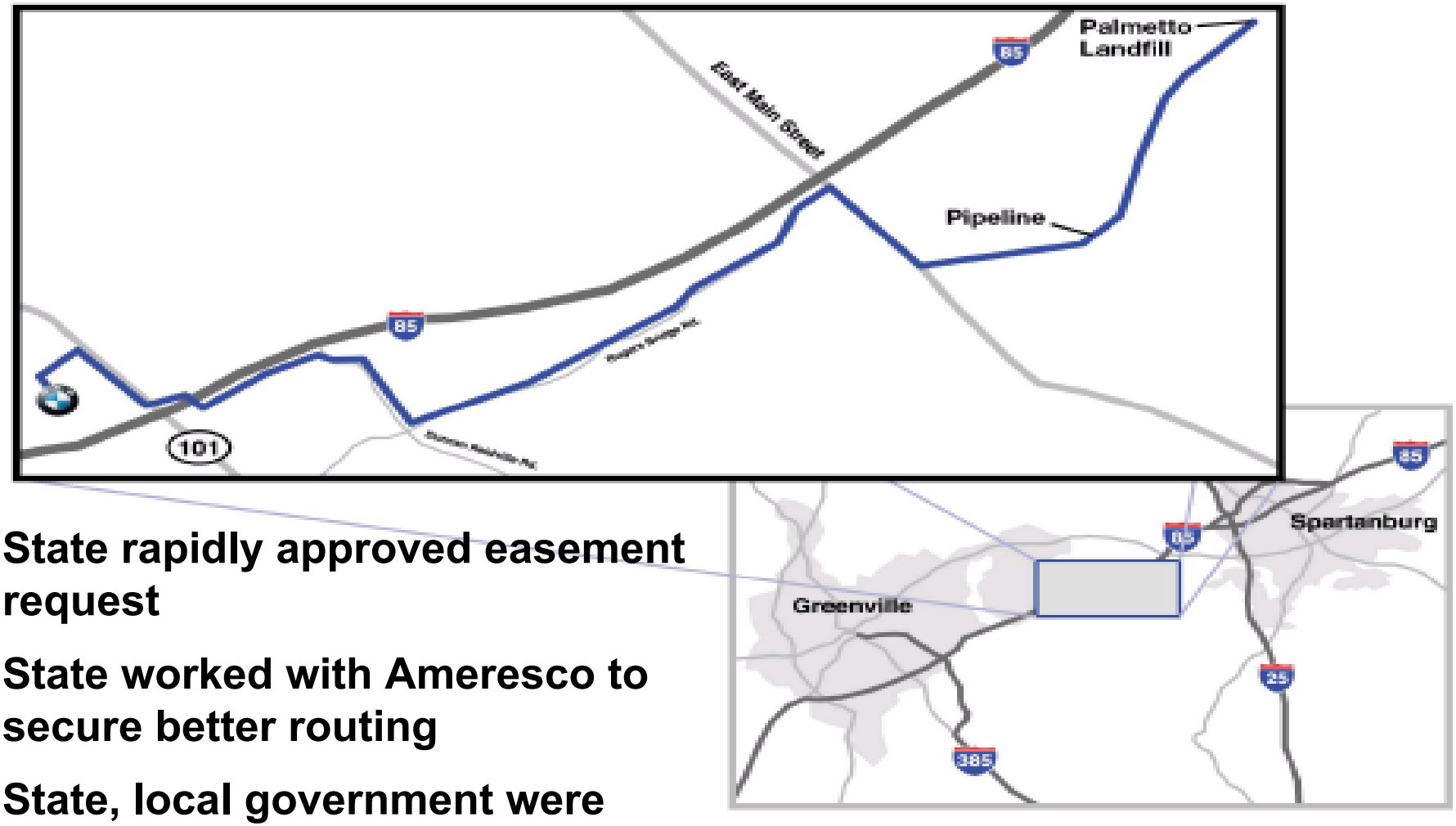
Easement and Permitting Challenges



- State rapidly approved easement request
- State worked with Ameresco to secure better routing
- State, local government were instrumental in expediting all necessary permits for this project

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BMW Facility - Compression

- The gas is then compressed again to 140psi for delivery into the BMW Power Generation Facility by two 400 hp rotary screw compressors
- Dual Compressor Stations at both the Landfill and at BMW increase reliability of plant

- Due to the cost savings, BMW can be expected to run these Turbines up to 8760 hours per year based on plant availability

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BMW Turbines

- **Retrofit to allow combustion of LFG**
  - ✓ Diesel fuel for turbine start-up
  - ✓ New combustor head with a low Btu/diesel dual fuel nozzles
  - ✓ Addition of controls and software
- **BMW has four 1.25 MW gas turbines**
  - ✓ 5 MW electricity
  - ✓ 275 deg. high temperature hot water
    - ❑ Meets 80% of BMW's Thermal Needs or approximately 500,000 MMBTU per year
    - ❑ Each Turbine can generate 18 MMBTUs per hour of Thermal Heat recovery

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BMW Turbines – LFG Results

- This is the one of the largest project of this type in North America
- The retrofit of BMW's KG2 turbines to combust LFG instead of natural gas has improved the maximum power output by approximately 10% due to the lower combustion temperatures of LFG.
- A web-based monitoring system was developed so that the project partners can monitor real time data from the project

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Why did BMW decide to use LFG?

- **Project makes strong environmental sense, and fits perfectly with BMW's Sustainability goals**
  - ***Benefit: Corporate Image***
- **Sound Business Case & financial approach with long-term reduction in Utility expenditures**
  - ***Benefit: Cost savings***
- **Extreme volatility in Natural Gas Market has caused 300% price fluctuations in NG with associated cost impacts**
  - ***Benefit: Reduced dependence on Natural Gas & Budget stabilization***
- **Partnered with Ameresco for technical expertise & project financing**
  - ***Benefit: Outsource non-core competencies***
  - ***Benefit: Minimize use of BMW's Capital***
  - ***Benefit: Future project expansion***

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Environmental Benefits

BMW estimates the environmental benefits from the landfill gas project will be:

- Reduction in carbon emissions equivalent to driving more than 100 million miles, or 4,000 times around the Earth at the equator
- Recover sufficient energy to heat 15,000 homes a year

Future Environmental Benefits

- Gas collection system was sized for future expansion
- BMW and Ameresco are already exploring other options for using excess gas

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Publicity

Created a high profile project worthy of acclaim and recognition

BMW recently hosted a ribbon cutting for their Renewable Energy Project, which was attended by top state and national officials, including EPA Administrator, Christie Todd Whitman

Recipient of:

2003 US EPA Green Power Leadership Award
2003 Governor's Excellence Award
2004 US EPA LMOP's Project of the Year

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Integrity - Flexibility - Independence - Innovation