



Hill Air Force Base Landfill Gas to Energy

Biogas Case Study



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Overview

- Introduction to Hill AFB and Ameresco
- Biogas Energy Sources
- What / Why / How of Landfill Gas (LFG)
- Hill AFB, Operational Project
- Environmental Benefits
- Challenges and Rewards



Introduction to Hill AFB

- Air Force Materiel Command Base
- Located in Northern Utah
 - Home to the Ogden Air Logistics Center
 - Provides World-Wide Engineering, Logistics Management and Depot Maintenance Support
 - F-16 Fighting Falcon
 - A-10 Thunderbolt II
 - Minuteman III – ICBM
 - C-130 Hercules



Introduction to Hill AFB

- Large AFB comparable to a small city
- 16 Million square feet
 - Administrative, industrial, commercial, residential
 - ~ 2,100 Structures - 1,400 Buildings
 - ~ 26,000 military, civilian, and contractor personnel
- Annual Utility Bill in excess of \$26,000,000
- Electrical Demand – 40 to 45 mW
- Utah's Largest Employer



Introduction to Ameresco

- Largest independent energy solutions company in North America
 - Active in all market sectors
 - Renewable energy is a core business area
- 450+ employees; ~175 PEs
- Over 30 years in energy business
 - Experienced developer of Landfill Gas opportunities



Biogas Energy Sources

- Landfill gas
- Digester gas
- Coal bed methane
- Agricultural waste
- Others



Landfill Gas

- Gas formed from decaying waste
 - 50% methane
 - 50% carbon dioxide
 - <1% non methane organic compounds
- Heating value of ~ 500 BTU / MCF
 - Natural gas is ~ 1000 BTU / MCF



Methane Emissions

- Methane is a potent greenhouse gas
 - MSW Landfills are largest source of methane emissions in U.S
- Subtitle D landfills required to collect the gas
 - Dispose of by flare or vents
 - Combustion



Landfill Gas Specifics

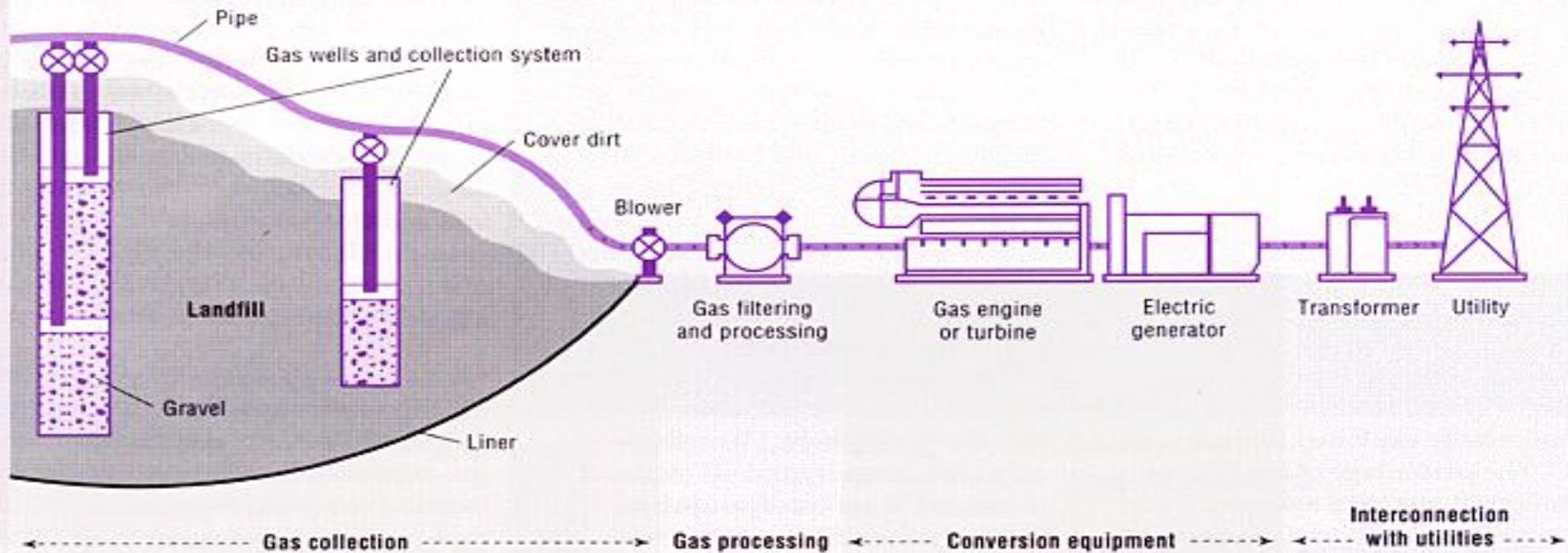
Component	% Volume (dry weight basis)
Methane	45% to 58%
Carbon Dioxide	32% to 45%
Nitrogen	0 to 3%
Hydrogen	Trace to less than 1%
Carbon Monoxide	Trace
Hydrogen Sulfide & other sulfur compounds	Varies (Normally 10 to 200 ppm)
Moisture	Up to 14 %
VOCs	Typically .25% to .50%





Power Generation

Typical Landfill Gas-to-Electricity Facility

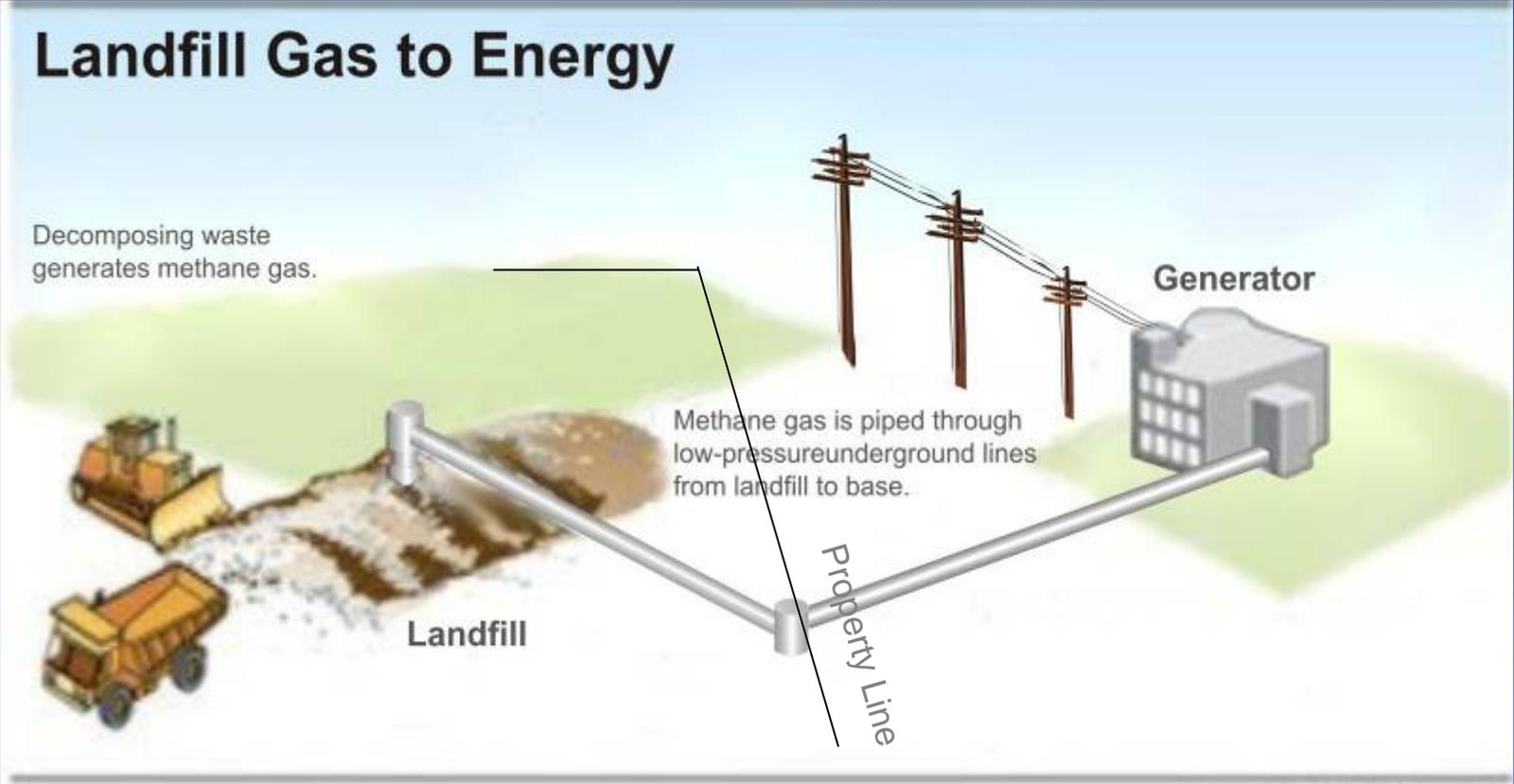


Source: Rhode Island Solid Waste Management Corporation





Concept of an LFG Project





LFG Utilization Options

- Power generation – 65%
- Sale of medium-Btu gas – 35%
- Potential to use in production of ethanol



LFG – A Viable Fuel Source?

- It is a renewable energy source
- Relatively low-cost
- High availability: 95% on-line
- Proven technology
- 400+ LFG plants operating in the U.S.
 - Generating ~10 billion kWh / year in electricity
 - Delivering more than 230 million cf / day for direct-use



Hill Air Force Base

- First Landfill-Gas to Energy Generating Facility in the USAF / DOD / Utah
- First Project Under DOE Biomass Alternative Methane Fuel (BAMF) Contract





Hill LFG Performance Data

- Plant Commissioned Jan 2005
 - First 2 years produced 13.2 million kWh
 - Saved \$635K in purchased electrical cost
 - Contract modification in place to add 3rd generator increasing production to 2.25 MW (ECD Dec 2007)



Project Milestones

Groundbreaking: Nov 03



Ribbon Cutting: Jan 05





Project Milestones

- Contract Awarded 30 Sep 03
 - Design and Permits: Oct 03 – Mar 04
 - Construction: Apr – Nov 04
 - Testing and Commissioning: Nov 04 – Jan 05
 - On Line: 20 Jan 05 generating about 1.25 mW
 - May 07 modification to add third generator



Project Details

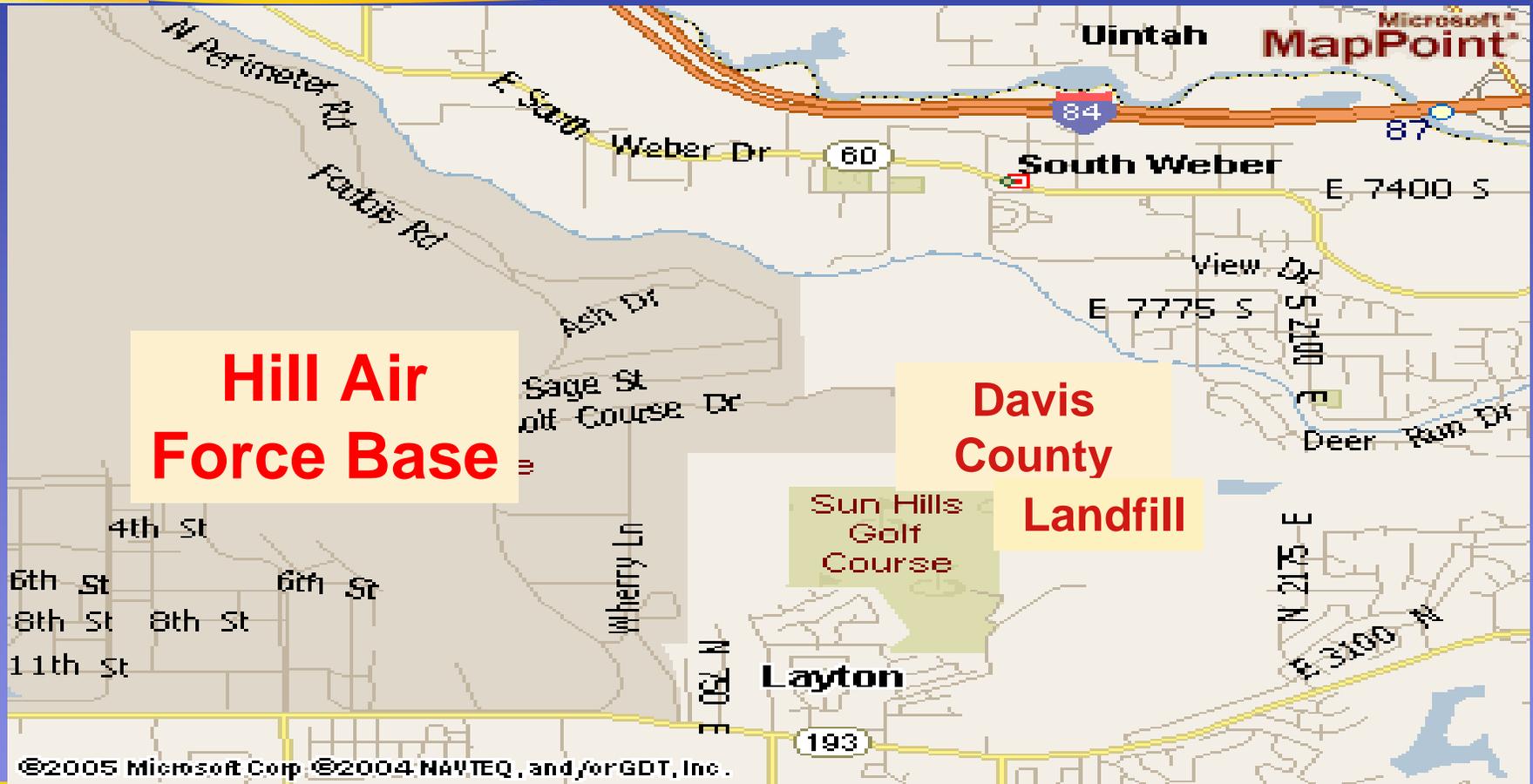
- Two Internal Combustion Engine Generators
 - Designed for landfill gas combustion
 - Output of 1200 kW @ 1200 RPM / 460 volts
- Electrical Interconnection
 - Low voltage switchgear connected to transformer to step power up to 12470
 - High voltage gear connected to distribution system via two substations



Project Details

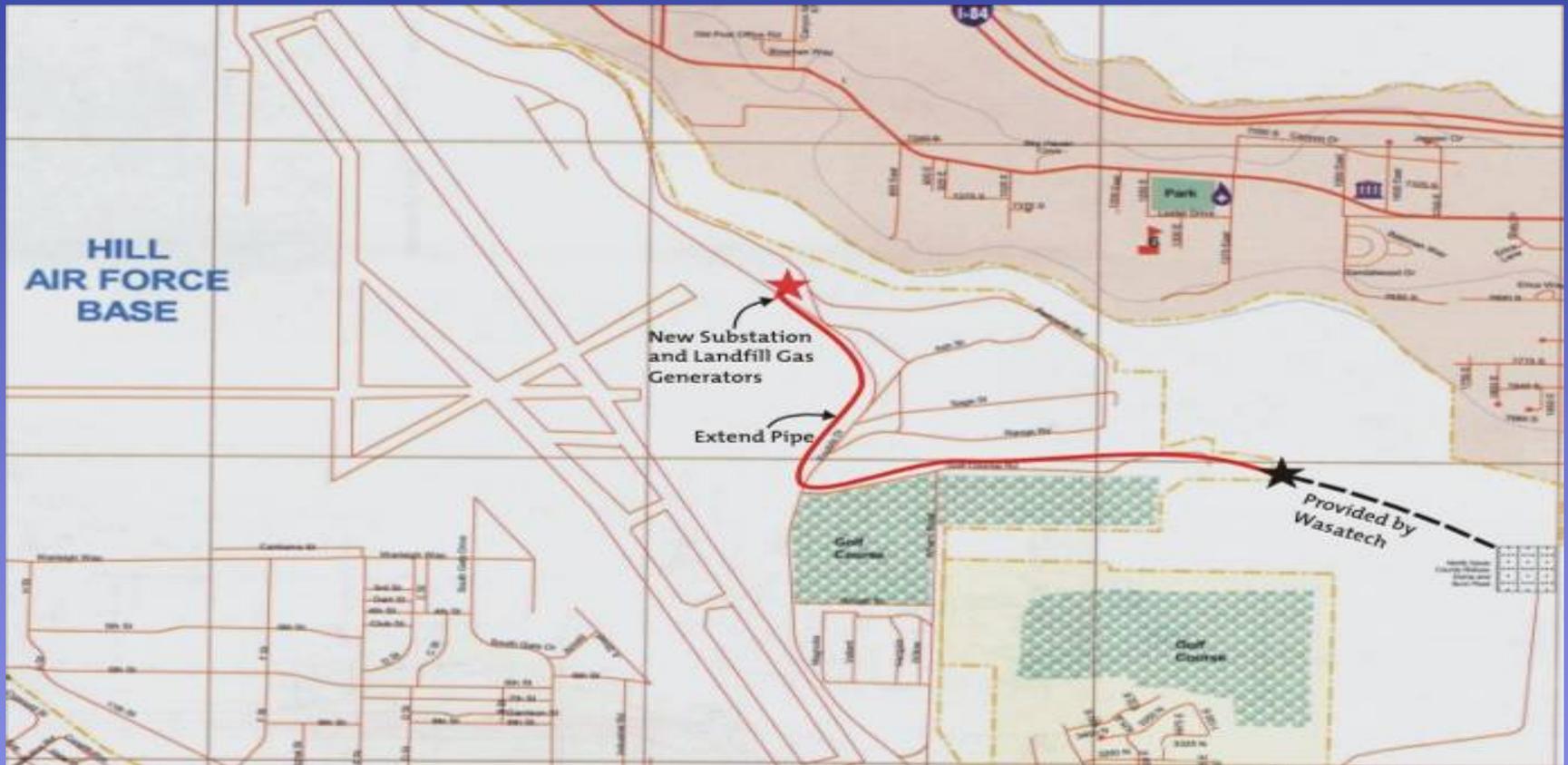
- Control System
 - Allows for continuous monitoring and trending
 - Web-based system allows remote monitoring and control of plant
- Gas Pipeline
 - 8" low pressure HDPE SDR13
 - About 2.5 miles from flare station to plant
 - About 1 mile of pipeline on Hill AFB

LFG Delivery Route





LFG Delivery Route







Project Environmental Facts

- Reduction in Source Emissions
 - 95K metric tons CO²
 - 220K barrels oil equivalent
 - 21K cars off the road
- Reduces Methane Venting
- Landfill is member of Chicago Climate Exchange



Multi-Agency Effort

- Hill AFB (End User)
 - Civil Engineers, Environmental, Contracting, Legal
- Department of Energy
 - FEMP, National Energy Technology Laboratory (NETL)
- State of Utah
 - Energy Office, PSC, Environmental Quality
- Wasatch Waste Management District (Landfill)
- Rocky Mountain Power / PacifiCorp
- Ameresco (Project Developer/Operator)



Project Challenges

- Gas Purchase Agreement
 - Defined standards of gas quality
 - Defined quantity of gas and delivery obligations
- Air Quality Permit
- Qualifying Facility (QF)
 - FERC and State PUC
- Power Purchase (PPA) and Interconnection Agreements (IA)



Awards and Recognitions

- Association of Professional Energy Managers (APEM)- Utah Chapter: 2004 Energy Champion Award Winner (Oct 2004)
- EPA's Landfill Methane Outreach Program: 2004 Industry Partner of the Year (Feb 2005)
- American Council of Engineering Companies - Tennessee Chapter: "Honors Award" for Environmental Project of the Year (Mar 2005)
- 2006 Federal Energy Award for Renewable Energy



For More Information

Would you like to know more about this session?

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Don't forget to fill out and drop off your session evaluations!



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