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Landfill Gas to Cash: \$30+ Million in 3 Years

**Biogas Marketing for
Fresh Kills Landfill**

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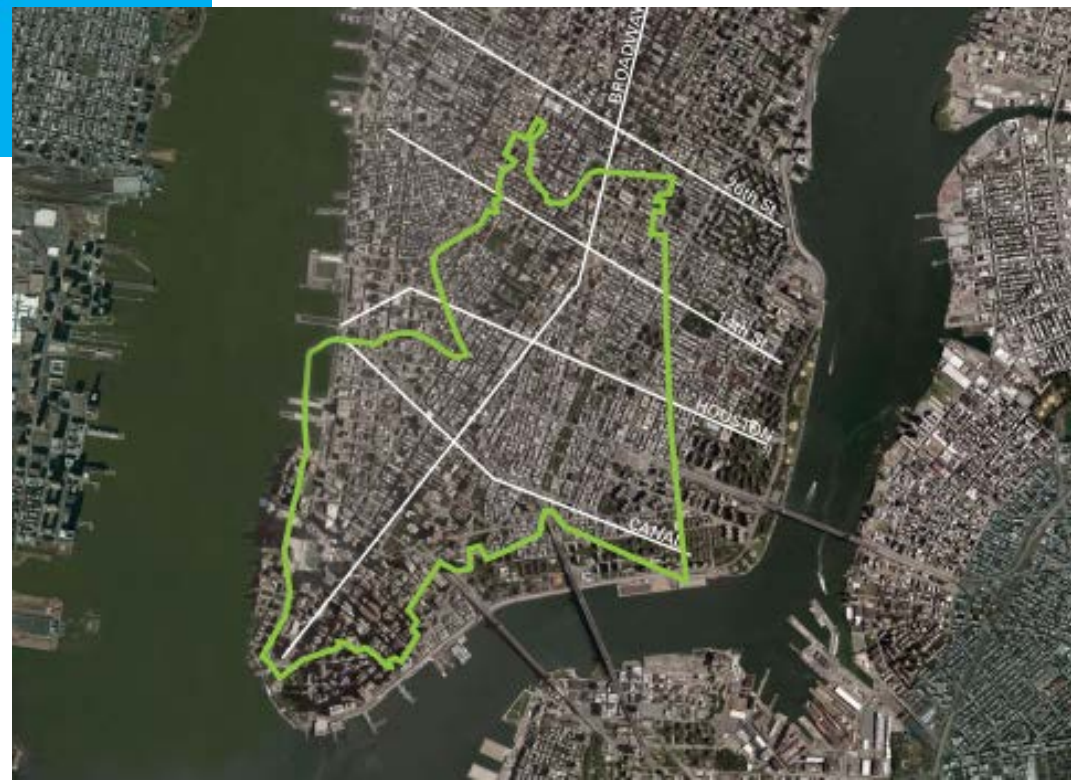


Fresh Kills Landfill

Fast Facts

Fresh Kills Landfill is a municipal solid waste landfill in Staten Island, NY that:

- Is owned by NYC and operated by the NYC Dept. of Sanitation (DSNY)
- Began operating in 1947; closed to receipt of waste in 2001 (except for 9/11 operations)
- Accepted ~150 million tons - at 1986 peak accepted ~27,000 tons per day
- Occupies ~2,400 acres – once the largest landfill in the world in terms of area and tonnage
- Is slated to become parkland (except for ~100 acres)
- 3 of 4 sections are capped, final section to be capped by 2021 (2 sections capped by 1998, Section 6/7 capped in 2011)





BIOGAS PURIFICATION FACILITY

- Design capacity of 10 million scf/day - operating since 1982!
- Purified natural gas sold to National Grid since 1982
- Facility is owned by DSNY, operated by a contractor

BIOGAS COLLECTION + FLARING

- Landfill gas collection systems are installed in all 4 landfill sections
- One flare station in each of 3 sections – each station has 2 flares
- A header connects can divert gas to flare stations or Facility



Fresh Kills Biogas Infrastructure *(cont'd)*

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BIOGAS GENERATION

- Gas generation decreasing over time
- Produced 2,591 Decatherm (Dth^{*})/day of Biogas in 2013
- Now producing approximately 1,300 Dth/day

* (one Dth = 1,000,000 BTUs)

REVENUES FROM NATURAL GAS SALES TO NATIONAL GRID

- ~\$3.5 million in 2013
- ~\$1 million in 2017



Fresh Kills Biogas Marketing Procurement



DSNY's 2013 *Negotiated Acquisition Solicitation for Environmental Markets Services Consultant for RIN Trading of Fresh Kills Biogas* (Solicitation):

Goal: Capture \$ from creation/sale of renewable fuel credits through Renewable Fuel Standard (RFS) Program

- **Min quals:** 2 years experience monetizing renewable fuel credits through RFS Program
- **Scope/Price:** Proposer registers Fresh Kills w/RFS Program + provides Program compliance in return for share of revenues from sale of RFS renewable fuel credits
- **Term:** 2 years w/potential for 2 add'l years
- **Selected:** **EM Gas Marketing LLC (Element)** for best combination of technical expertise, price (revenue share), schedule
- **Contract:** registered June 2015; renewed - up to year remains



Element Overview

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Launched in 2005, Element Markets has become a leading marketer of renewable natural gas and environmental commodities in the U.S.

- Transacted over \$1.6 billion in environmental commodities since 2005
- Provides environmental asset management services for over 6,000 MW and 18 landfill gas projects
- Extensive expertise in the North American biogas market
- Customer base of over 800 companies within the environmental markets
- Robust back office and process management practices provide ease of execution

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Emissions & GHG Credits

- Largest regional marketer of emission credits in US
- Managing 18 GHG projects
- Transacted over 40 million tonnes of GHG credits

Renewable Energy Credits

- Active in all compliance and voluntary REC markets in North America
- Transacted over 19 million RECs
- Transacted RECs in 38 different markets

Biogas & RINs

- Exclusive marketer for 15 RNG facilities
- EPA and ARB registered to generate RINs and LCFS credits
- Over 50 million RINs transacted



What is the RFS Program?

FEDERAL REWABLE FUEL STANDARD (RFS) PROGRAM

- Managed and enforced by EPA
- RFS Program Goal: *to reach 36,000,000,000 gallons of renewable fuel in the fuel pool by 2022*
- Obligated parties (fossil fuel generators) are required to purchase specified quantities of renewable fuel credits called Renewable Identification Numbers (RIN) each year
- In November, EPA sets requirements for each category of Biogas
- Landfill Biogas is in D3 category
- A **RIN** represents 1 ethanol-gallon-equivalent of renewable fuel
- Biogas currently earns **11.727 RIN/Decatherm (Dth)** (one Dth = 1,000,000 BTUs)

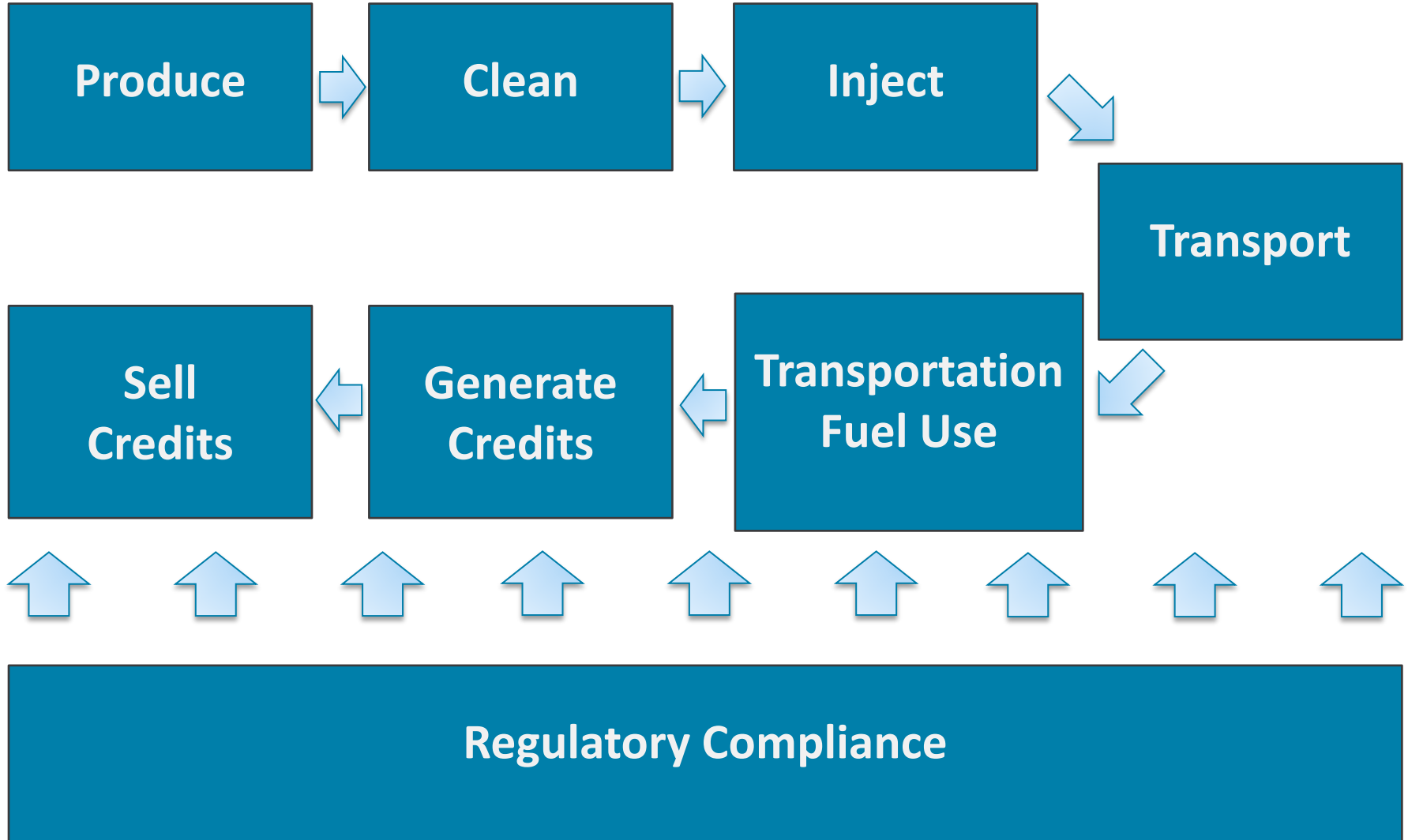


CALIFORNIA LOW CARBON FUEL STANDARD (LCFS) PROGRAM

- *Goal: to reduce the carbon intensity of California fuels by 20% by 2030*
 - Managed and enforced by **California Air Resources Board (CARB)**
 - Each **LCFS credit** represents 1 metric ton of CO₂ emission reductions
 - **Carbon Intensity (CI)** is grams of CO₂ emitted per MJ
 - Biogas value is a function of the Carbon Intensity of fuel
(ex. dairy/swine manure Biogas has a CI of ~-250 and landfill Biogas has a CI of ~50)
-
- **Both RFS + LCFS Programs Incentivize Use of Renewable Fuels in Transportation**
 - **Renewable transportation fuels used in California generate both RIN and LCFS credits if fuel is transported to and used in California**



Understanding the Process





Understanding Value – Not All Biogas Created Equal

Feedstock Type	RIN Value	LCFS Value
Landfill Gas	High (D3)	Low (CI ~50)
MSW Wastewater Treatment	High (D3)	Low – Medium (CI~40)
Agricultural Digesters	High (D3)	<i>Very High</i> (CI~-250)
Various Organics Digesters	Low (D5)	Medium – High (CI~-10)
Codigestion	Medium* (D3/D5)	Medium – High (CI~-10)

*The value of renewable fuel produced from the codigestion of food wastes, crop residue and manure depends on the amount of cellulose in the feedstock.



Fresh Kills Biogas Marketing Contract



ELEMENT CONTRACT RESPONSIBILITIES

- Fresh Kills Registration Under RFS Program
 - i. Register Element as RIN generator for Fresh Kills Biogas
 - ii. Register Fresh Kills project (retain firm to perform RFS Program-required independent engineering compliance report + ongoing compliance during term)

- Gas Transportation Set-Up

Prepare/submit applications + documents to transport + deliver Biogas to 3rd parties for use as vehicle fuel for transportation purposes under RFS Program and other programs (LCFS)



Fresh Kills Biogas Marketing Contract



ELEMENT CONTRACT RESPONSIBILITIES (cont'd)

- Additional Programs

Propose other renewable fuel programs for which Fresh Kills Biogas may be eligible

- Environmental Credits

Create, validate + use commercially reasonable efforts to sell all Environmental Credits generated

- Costs

Responsible for all direct costs + expenses associated with documentation, tracking + reporting requirements under RFS Program (other marketing costs are direct expenses to be reimbursed)



Fresh Kills Biogas Marketing Contract

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- Sale of Natural Gas

DSNY has an agreement with National Grid that controls the price of the Fresh Kills Natural Gas sold to National Grid

- DSNY sells Natural Gas directly to Element, which sells it to National Grid at the agreed upon price (without Environmental Attributes)
- Element sells the Environmental Attributes of that gas to third parties for conversion to CNG or LNG for use as vehicle fuel



Fresh Kills Registration

RFS REGISTRATION

- **Third-party Professional Engineer Report, including:**
 - Summary of project + regulatory compliance
 - Landfill layout, gas collection system, Biogas production
 - Process diagram
 - Landfill gas historical production records
 - Evidence for purification facility nameplate capacity
- **Contracts/affidavits to show how Biogas reaches transportation fuel end user (CNG/LNG)**
- **Map of pipeline systems establishing physical connection between Biogas production facility + transportation fuel end user**



LCFS REGISTRATION

LCFS Documents (in addition to RFS Registration Documents)

Minimum 3 months of meter data covering:

- Electricity used at Biogas purification facility
- Non-renewable natural gas procurement at Biogas purification facility
- Volume and methane content of raw landfill gas withdrawn from wellfields, entering processing
- Any other process fuel usage (e.g. diesel, propane)



Element Services for DSNY



Element created value from DSNY Biogas over the entire activity chain:

- **Gas operations** – handles receipt, storage + delivery of environmental value – including pipeline agreements, scheduling + nominations
- **Contract management** – negotiates contracts for Biogas sales + renewable fuel production capacity
- **Renewable fuels compliance** – manages registration, reporting, generation, recordkeeping + quality management of renewable fuel credits (RINs & LCFS)
- **Renewable fuel credits marketing/sales** – secures credit monetization by offtake agreements w/credit buyers + established contacts w/obligated parties
- **DSNY and Element receive % of net value – Element fully incentivized**



Additional Value Created for DSNY

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Since April 2015, over \$30 million in value has been generated for DSNY under the Contract from RIN and LCFS credits sales alone:

- Value does **not** include natural gas sales to National Grid
- Value is net value created in excess of CNG/LNG tolling fees + Element expenses



Landfill Gas to Cash - \$31M and counting



- Biogas produced + delivered to Element Markets has:
 - Created 20,293,146 gallons of renewable fuel
 - Captured + avoided 84,843 tonnes of Carbon emissions
- Under the Element contract, DSNY receives two revenue streams from the daily production of the injected Biogas:

• Natural Gas Sales	\$3,944,184
• Environmental Credit Sales	<u>\$31,749,487</u>
• Total Value from Biogas =	\$35,693,671



THANK YOU Questions?

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WORLD FINANCE



“US Emissions House of the Year”, 2014 and 2010 by Energy Risk Energy Risk Environmental Rankings

- #1 U.S. Regional Greenhouse Gas Dealer
- #1 U.S. Voluntary GHG Credit Dealer
- #2 Renewable Energy Credit Dealer
 - #1 NO_x & SO₂ Dealer

Environmental Finance Magazine

- Best Trading Company in North American Renewable Energy
- Runner- Up, Best Trading Company of North American GHG Markets (California)
 - Best Trading NO_x & SO₂ Company Emission Credits