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

**Biogas Marketing for
Fresh Kills Landfill**

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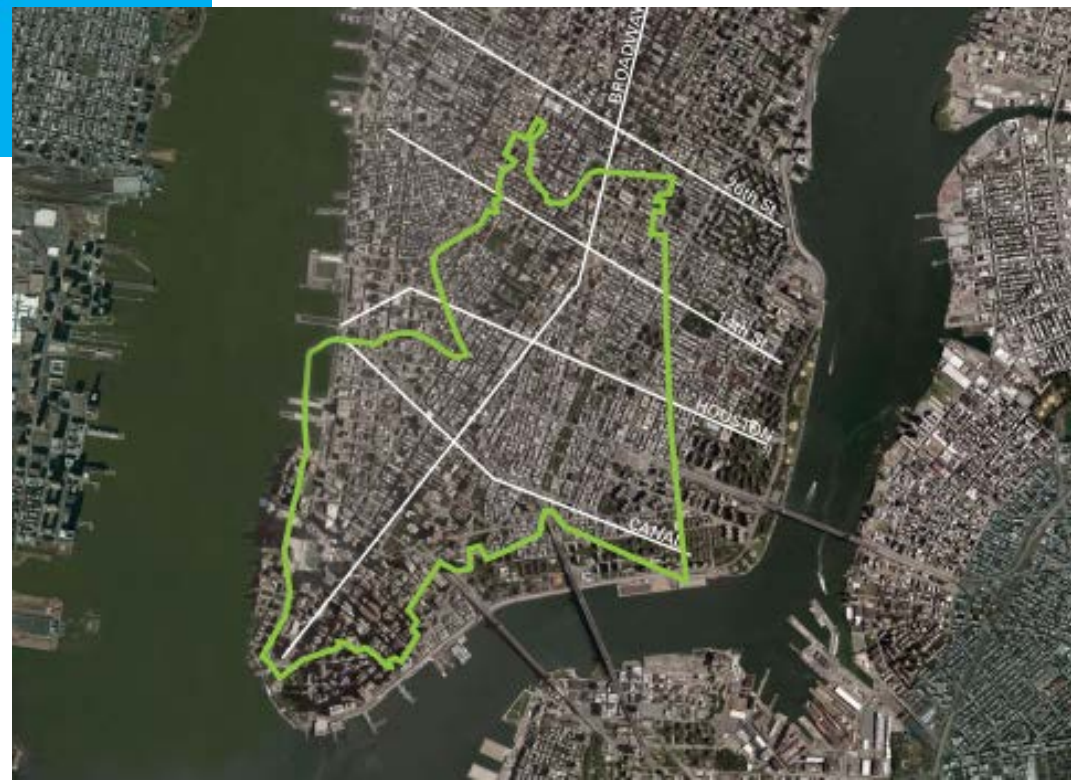


Fresh Kills Landfill

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



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)

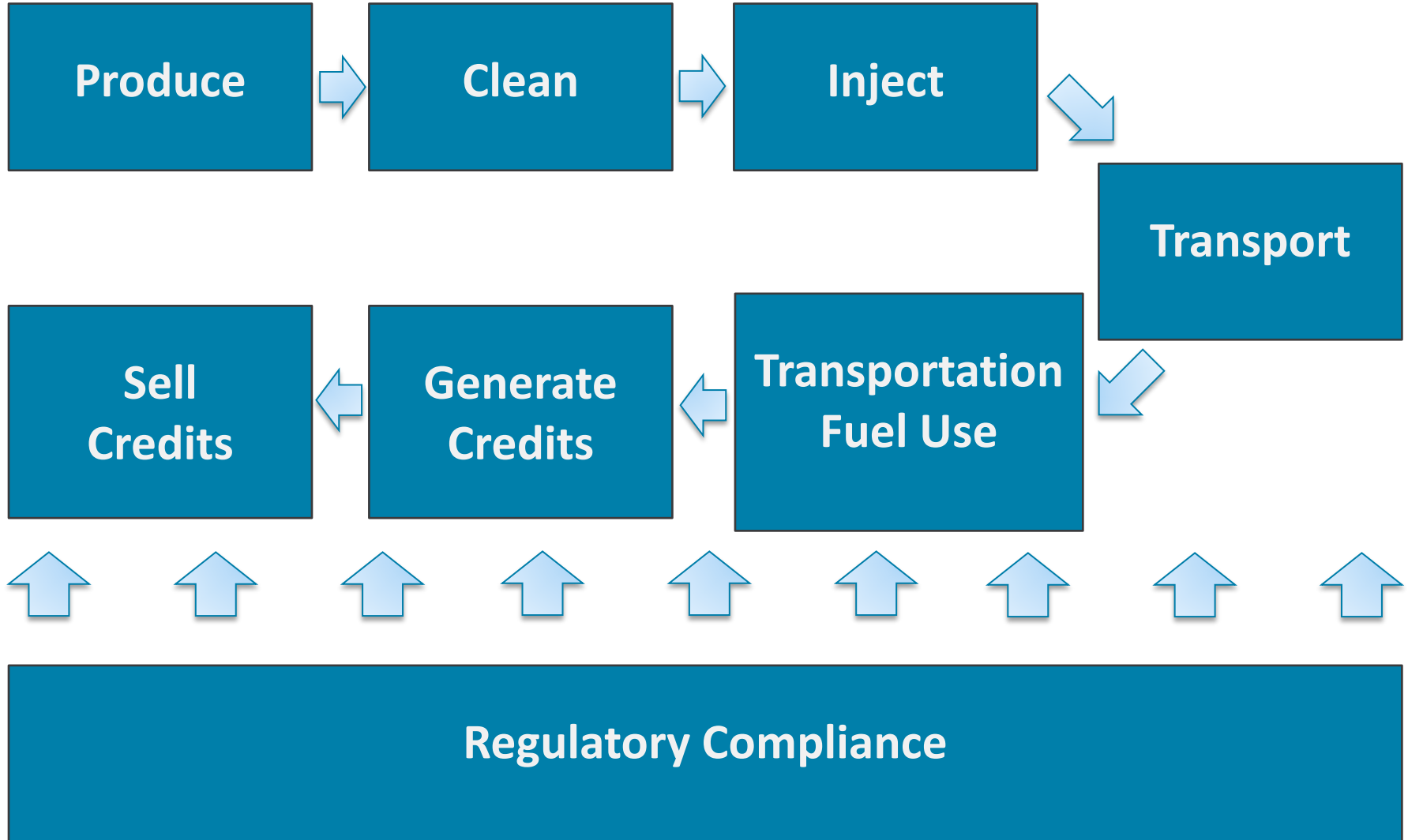


CALIFORNIA LOW CARBON FUEL STANDARD (LCFS) PROGRAM

- *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

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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