## Appendix A:

## List of Materials EPA shared with Small Entity Representatives in 2013

## Small Business Advocacy Review Panel on EPA's Planned Proposed Rules

## Standards of Performance for Municipal Solid Waste Landfills and Review of Emissions Guidelines for Municipal Solid Waste Landfills

- Agenda for Pre-panel meeting, October 30, 2013
- Power Point Presentation: An Overview of the Small Business Advocacy Review Panel Process, October 30, 2013
- Power Point Presentation: SBAR Pre-Panel Outreach Briefing: New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills, October 7, 2013
- Table of annualized costs and emission reduction estimates by option
- A set of questions for EPA developed by potential SERs
- Agenda for Panel Outreach meeting, December 19, 2013
- "Issues for EPA Consideration" submitted by Cornerstone Environmental Group
- Power Point Presentation: SBAR Pre-Panel Outreach Supplemental Briefing: New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills, December 5, 2013
- Power Point Presentation: Small Business Advocacy Review Panel Process Recap, December 5, 2013
- "Background Information for Estimating Cost and Emission Impacts of Landfill NSPS and EG Regulatory Options"
- Excel Spreadsheet: Landfill dataset (docket)
- Excel Spreadsheet: revised table of annualized costs and emission reduction estimates by option (docket)
- Excel Spreadsheet: Landfill survey responses (docket)

**EPA's Pre-Panel Outreach Meeting with Potential Small Entity Representatives**
**Review of New Source Performance Standards and Amendments to Emission Guidelines for Municipal Solid Waste Landfills**

Wednesday, October 30, 2013

2:00 p.m. – 4:00p.m., Eastern time zone

10:00 **Welcome and Introductions** (Alex Cristofaro, EPA's Small Business Advocacy Chair)

10:15 **RFA/SBREFA Overview** (Alex Cristofaro, EPA/OP)

10:30 **Background Presentation** (Hillary Ward, EPA/OAR)

11:15 **Discussion** (All)

11:50 **Summary and Closing** (Lanelle Wiggins/Stephanie Brown, EPA/OP)

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**Teleconference dial-in number: (866) 299-3188**
**Conference code: 202 566 2372**

Dial the toll-free teleconference number listed above. At the prompt, enter the conference code followed by the pound [#] sign. Note: You will hear music until the leader dials into the call.

**Attending the meeting in person:**

This meeting will be held at EPA Headquarters in William Jefferson Clinton North, Room 5530 at 1200 Pennsylvania Ave. NW, Washington DC. Any invited potential Small Entity Representative may attend in person if desired.

We are unable to pay for travel expenses to Washington, DC for the meeting. If you would like to attend in person, you must RSVP with Stephanie N. Brown 202-564-1192, brown.stephanien@epa.gov for directions and building access information.

# An Overview of the Small Business Advocacy Review Panel Process

**Alexander Cristofaro, Small Business Advocacy Review Chair (SBAC)**
**Pre-Panel Outreach Meeting, October 30, 2013**

**Office of the Administrator**
**Office of Policy**
**Office of Regulatory Policy and Management**
http://www.epa.gov/op/orpm.html

# Today, I'll answer these questions...

- What is a Small Business Advocacy Review (SBAR) Panel?
- How does a Panel fit into the rulemaking process?
- How do Small Entity Representatives (SERs) participate in the Panel process?
- What is the difference between this Pre-Panel meeting and the future Panel meeting?
- What does the Panel do with SER recommendations?

# What is an SBAR Panel?

- Chaired by EPA's Small Business Advocacy Chair (EPA's SBAC from Office of Policy)
- Other Panel members consist wholly of federal employees from:
  - agency authoring the regulation (SBAC, plus program office manager);
  - Office of Management and Budget (Office of Information and Regulatory Affairs (OIRA) Director); and
  - Small Business Administration, Chief Counsel for Advocacy.

# What is an SBAR Panel? (cont'd.)

- SBREFA amended the 1980 Regulatory Flexibility Act (RFA), which requires agencies to:

  "assure that small entities have been given an opportunity to participate in the rulemaking process"[1] for any rule "which will have a significant economic impact on a substantial number of small entities."[2]

[1] 5 USC 609(a)

[2] 5 USC 602(a)(1)

# What is an SBAR Panel? (cont'd.)

"the panel shall review **any material the agency has prepared**..., including any draft proposed rule, **collect advice and recommendations** of each individual small entity representative identified by the agency after consultation with the Chief Counsel [for Advocacy of the Small Business Administration], on issues related to"[1] the following:

- Who are the small entities to which the proposed rule will apply? [2]
- What are the anticipated compliance requirements of the upcoming proposed rule? [3]
- Are there any existing federal rules that may overlap or conflict with the regulation? [4]
- **Are there any significant regulatory alternatives that could minimize the impact on small entities?** [5]

[1] 5 USC 609(b)(4)
[2] 5 USC 603(b)(3)
[3] 5 USC 603(b)(4)
[4] 5 USC 603(b)(5)
[5] 5 USC 603(c)

# How do SERs participate?

"collect advice and recommendations"

- You have the opportunity, because of your status as a small entity expected to be regulated by this rule, to influence the decisions senior EPA officials make about the forthcoming regulation
- Advice and recommendations collected via two Outreach meetings with SERs:
  - EPA holds a pre-panel outreach meeting with potential SERs (this one), and
  - after the Panel convenes, the Panel itself will hold an outreach meeting with SERs.

# How do SERs participate? (cont'd.)

- You will have an opportunity to submit written comments as well as the verbal comments you provide in the meetings.
- Reminder: Those of you joining this meeting to assist a potential SER (aka "helpers") are asked to limit your input to representation of the small entity you are assisting.

# Pre-Panel vs. Panel Outreach Mtg.?

- Pre-Panel Outreach Meeting
  - Conducted by EPA with SBA and OMB as invitees
  - Overview of the RFA, how the Panel process works, and the role of SERs
  - Background and overview of proposed rulemaking
- Panel Outreach Meeting
  - Chaired by SBAC, but all Panel members have active role
  - Bulk of meeting spent discussing regulatory alternatives and input of SERs

# What does the Panel do with your recommendations?

- EPA, OMB, and SBA prepare a joint Panel report:
  - Submitted to the EPA Administrator
  - Considered during senior-management decision-making prior to the issuance of the proposed rule
  - Placed in the rule’s docket when the proposed rule is published

# Panel within the rulemaking process?

"any material the agency has prepared"

- It is EPA's policy to host SBAR Panels like this one well before a proposed rule is written so we have adequate time to incorporate your advice and recommendations into senior management decision-making about the proposed rule.
- EPA will not provide draft proposed rule text, though we expect to discuss regulatory alternatives in as great a detail as we can.
- Participation in the outreach meetings does not preclude or take the place of participation in the normal public comment period at the time the rule is proposed.

# Thank You

- We realize that small entities make significant sacrifices to participate
- Thank you for taking time and effort away from your business or organization to assist the Panel in this important work

# Contact Information

- Contact my staff:
  - Stephanie Brown, RFA/SBREFA staff contact
    EPA Office of Policy
    202-564-1192
    Brown.StephanieN@epa.gov
  - Lanelle Wiggins, RFA/SBREFA Team Leader
    EPA Office of Policy
    202-566-2372
    Wiggins.Lanelle@epa.gov

# SBAR Pre-Panel Outreach Briefing: New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills

Briefing for Potential SERs

October 7, 2013

Deliberative document. Do not cite or quote.

# Purpose & Overview

- Purpose:
  - To explain your role as a Small Entity Representative (SER) in providing feedback
  - To provide an overview of potential changes under consideration for NSPS standards for MSW Landfills as a result of the statutorily-required reviews
  - To provide an overview of potential changes under consideration for the Emission Guidelines for MSW Landfills
- Agenda:
  - SER guidance
  - Introduction to MSW landfills
  - Introduction to New Source Performance Standards and Emission Guidelines
  - Overview of the required review (court-ordered)
  - Additional changes under consideration
  - Approaches considered
  - Impacts of potential options
  - Next steps

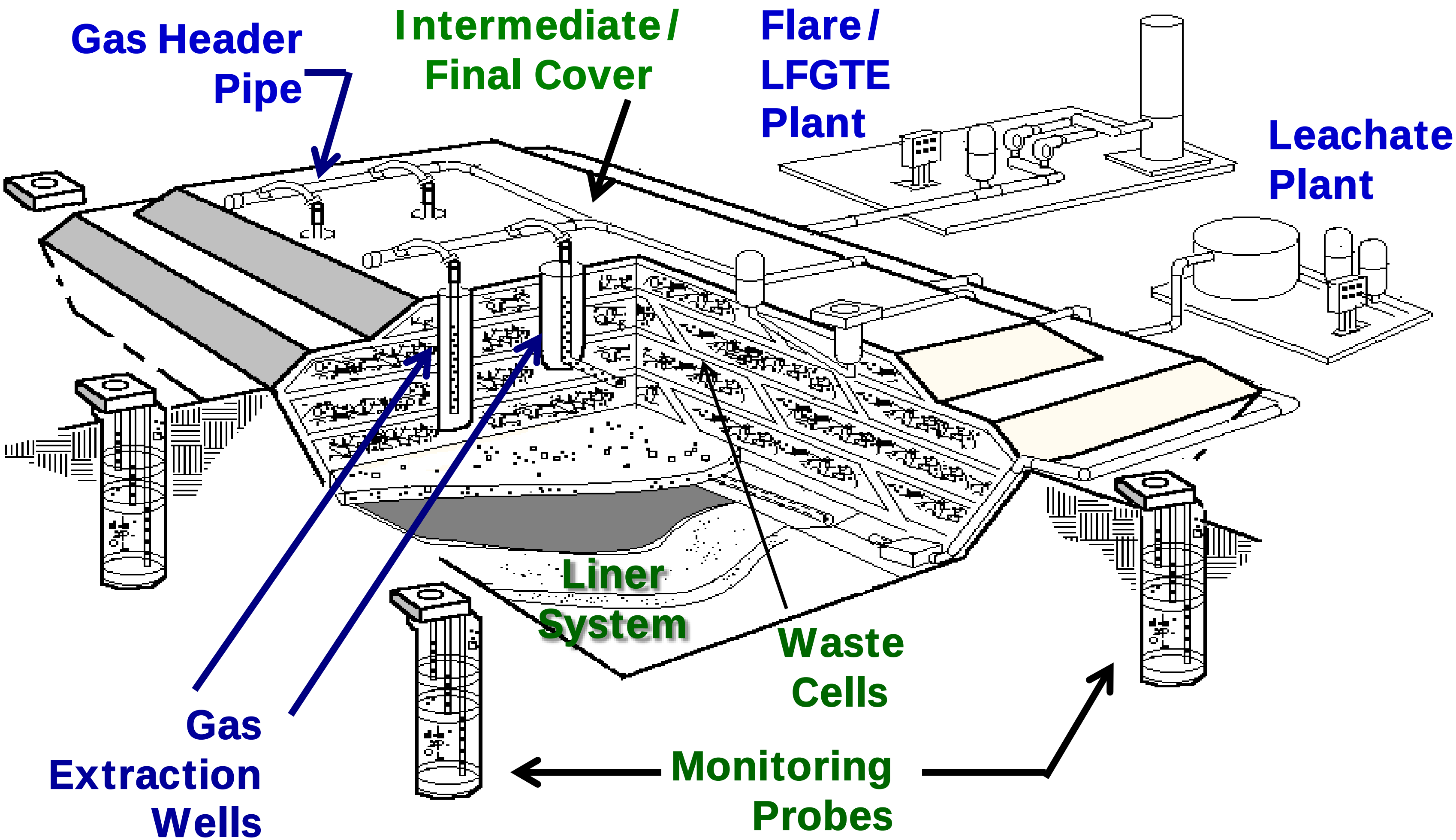
# What is a Small Entity Representative (SER)?

- A SER is a representative of a small entity who may be subject to the requirements of a proposed rule that the EPA has under development.
- SERs' participation in the rulemaking process helps to ensure that the EPA hears the concerns and suggestions of small entities.
- The Panel (EPA, SBA, & OMB) uses your input to prepare a report that includes the Panel's recommendations on minimizing the burden on small entities. The report is part of the rulemaking record and is considered by Agency decision makers.

# What are MSW Landfills?

- An MSW landfill is an entire disposal facility in a contiguous geographical space where household waste is placed in or on land
  - Landfills may also receive RCRA subtitle D waste (e.g., commercial solid waste, non-hazardous sludge, conditionally exempt small quantity generator waste, and industrial waste)
- The pollutant of concern is MSW landfill emissions
  - Commonly referred to as landfill gas
  - Generated by the decomposition of organic waste
- Landfill gas composition:
  - 50 percent methane
  - 50 percent carbon dioxide
  - Less than 1 percent nonmethane organic compounds (NMOC)

# Modern MSW Landfill




Deliberative document. Do not cite or quote.

# How big is the MSW landfill industry?

- Over 2000 active landfills in the United States
- 729 landfills are currently subject to either the NSPS or EG
- Ownership of MSW landfills may be public or private
- Over the next 5 years, 20 new landfills are predicted
- Screening analysis indicates approximately 100 landfills are owned by small businesses
  - Approximately 15 small entities own landfills that are subject to the Federal plan
  - Impacts analysis based on landfills directly regulated under the Federal plan

# What are NSPS?

- NSPS are technology-based standards that apply to stationary sources that “cause, or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare”
- NSPS applies to landfills that commenced construction, modification, or reconstruction on or after May 30,1991
- The Clean Air Act (CAA) requires EPA review, and if necessary, revise an NSPS at least every 8 years.
- Costs are considered in the development of NSPS

# What are EG?

- EG apply to existing landfills that accepted waste on or after November 8, 1987
- Provide guidance for regulating landfill gas emissions which the States are required to implement through individual State plans
- State plans must generally be as stringent as the EG, but states have the flexibility to apply less stringent limits or compliance schedules on a case-by-case basis

# What are the current rule requirements?

- The NSPS and EG were promulgated on March 12, 1996
- Landfill gas is the regulated pollutant for the NSPS and the designated pollutant for the EG
  - NMOC are measured as a surrogate for landfill gas in both rules
  - NMOC also contain hazardous air pollutants (HAP) (e.g. benzene, ethylene, toluene, xylene)
- NSPS and EG reduced VOCs, air toxics, and malodorous compounds from existing and new landfills. Also achieved significant methane reductions.

| Parameter | Value |
|---|---|
| Size Threshold | 2.5 million megagrams (mass) or 2.5 cubic meters (volume) |
| Emission Threshold | 50 Mg/yr NMOC |
| Collection System and Control System Installation Period | 30 months |
| Method of Gas Control | Open flare, enclosed flare, or treatment for beneficial use |
| Wellfield Expansion Period | 5 years for active cells; 2 years for closed cells or final grade |
| Monitoring | Monthly gas extraction well monitoring, quarterly surface monitoring |

# Why reevaluate the NSPS and EG?

- Landfill gas has adverse effects on public health and welfare
- NMOC (with a significant portion containing VOC) interacts with sunlight and nitrogen oxides (NOx) to form ground level ozone
- Ozone health effects: alteration of pulmonary function, damage to lung structure, adverse effects on blood enzymes, the central nervous system, and the endocrine system
- Ozone welfare effects: reduced plant growth, reduced crop yield, deterioration of certain synthetic materials
- Many of the NMOC in landfill gas are known or suspected carcinogens
  - Also have the potential to produce noncancer health effects and adverse effects on the kidneys, liver, and central nervous system
- Additional public welfare concerns: odor nuisance, on and off-site methane migration which could lead to explosions or fires

# Why reevaluate the NSPS and EG?

- Notice of Intent to Sue (Oct. 23, 2008) requests the NSPS be reviewed
- NSPS review required by the Clean Air Act and compelled by a court-ordered deadline (Mandatory duty suit filed June 30, 2011)
  - EPA agreed to propose the rule by February 4, 2014 and take final action on the proposal by December 17, 2014
- Data collected from several sources for the review
  - Voluntary ICR
  - EPA's Landfill Methane Outreach Program (LMOP) Landfill and Landfill Gas Energy Project Database
  - Greenhouse Gas Reporting Program (GHGRP)
- Data indicated a need to evaluate and account for changes that have occurred in the landfill industry since the NSPS and EG were originally promulgated in 1996
  - Proliferation of landfill gas to energy projects
  - Variety of new monitoring techniques
- Final data set includes:
  - 1,851 existing landfills
  - 20 predicted future landfills

# Why reevaluate the NSPS and EG?

- While a review of the landfill emission guidelines is not statutorily required, we believe that revisions to these rules are also appropriate for the following reasons:
  - Tools are now available to conduct a more robust assessment of the size, type, and emissions of landfills as well as their ability to support energy recovery projects
    - Indicates a need to reevaluate the thresholds and other requirements established in the emission guidelines
    - Data collection efforts also indicate the population of existing landfills is much larger than the projected number of new sources
  - The emission guidelines rely heavily on the NSPS
    - Guidelines need review to see if cross-references to the NSPS are still appropriate for existing sources
  - After the original rulemaking, Federal plan was issued to implement EG requirements in States and Indian Country where State and Tribal plans were not adopted
    - With a Federal plan in place, the EPA has implemented a regulation for existing sources
    - If action taken on existing sources, EPA will likely need to update the Landfills Federal plan

# Are there additional issues being considered?

- Amendments to the rules were proposed in 2002 and 2006 to address accountability and transparency
- A number of issues from those amendments may be addressed in this action including:
  - Clarification of landfill owner/operator and treatment system owner/operator compliance responsibilities
  - Definition of landfill gas treatment
  - Startup, shutdown, and malfunction
- We are also exploring changes to the surface monitoring requirements

# What has the EPA done so far?

- Held a technical meeting on October 22, 2012 to discuss various issues related to MSW landfills
  - Participants included: industry, states, environmental groups, and academics
- Assessed numerous technical options using data from voluntary survey, GHGRP, and LMOP
  - Model landfills created to address gaps in dataset
- Evaluated impacts of options by varying the following:
  - Design size
  - Emission rate threshold
  - Time allotted for gas collection system installation
  - Time allotted for wellfield expansion
  - Surface monitoring requirements
- Held a "Federalism" consultation meeting on September 10, 2013

# Impacts of Potential Options

| IF… | THEN… | POTENTIAL IMPACTS… |
|---|---|---|
| We lower the design size threshold | Additional landfills will become subject to the rule. Higher emission reductions than those achieved by the current rule. | Likely to increase annual reporting burden for landfills under the emission threshold. Additional permitting for landfills under the threshold. |
| We remove the design size threshold | Small number of additional landfills will be required to install controls. Slightly higher reductions than those achieved by the current rule. | Require NMOC reporting from a significant number of landfills that would not be required to control. Creates a potential permitting issue. |
| We lower the emission threshold | Significantly higher emission reductions than those achieved by the current rule. | High net cost. |
| We shorten the time allowed for gas collection and control system installation | Controls will be required earlier. Majority of additional reductions achieved within the first few years. | Costs incurred earlier, contributing to a higher annualized cost over 10 year period. |
| We shorten the time allowed for well field expansion | Collect gas from areas or cells on a more frequent basis. Significantly higher emission reductions than those achieved by the current rule. | High cost effectiveness. |

# Options Under Consideration for New and Existing Landfills

| Option | Description |
|---|---|
| 1 | -Reduce time allotted for installation |
| 2 | -Reduce emission threshold<br>-Reduce time allotted for installation and expansion |
| 3 | -Reduce design size threshold<br>-Reduce emission threshold<br>-Reduce time allotted for installation |
| 4 | -Reduce design size threshold<br>-Reduce emission threshold<br>-Reduce time allotted for installation and expansion |
| 5 | -Increase design size threshold<br>-Reduce emission threshold<br>-Reduce time allotted for expansion |
| 6 | -Increase design size threshold<br>-Reduce emission threshold |

# What are the next steps?

- Do you have any additional information of which EPA should be aware?
  - If so, please provide to Hillary Ward: Ward.Hillary@epa.gov

- Do you have any other approaches that you would like the EPA to consider?

- We request that you provide written comments prior to the start of the panel to focus future discussions.
- The panel is scheduled to convene in November.

| | | Incremental Annualized Cost ($) | | | | | | Incremental Annual Emission Reductions (metric tons) | | | | | | Per Landfill Averages | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Incrementally Affected Landfills | | | Annualized Cost (Total) | | | Under Federal Plan | | Under State Plan | | All Landfills | | | | |
| Option | Ownership Category | Under Federal Plan | Under State Plan | All Landfills | Under Federal Plan | Under State Plan | All Landfills | NMOC | Landfill Gas | NMOC | Landfill Gas | NMOC | Landfill Gas | Avg. Annualized Cost per Landfill ($) | Avg. NMOC Reductions per Landfill (metric tons) | Avg. Landfill Gas Reductions per Landfill (metric tons) |
| **1** | Small Entity | 5 | 15 | 20 | 20,000 | 520,000 | 540,000 | 30 | 16,000 | 60 | 32,000 | 80 | 49,000 | 27,000 | 5 | 2,500 |
| | Not Small Entity | 30 | 65 | 95 | 240,000 | 1,870,000 | 2,100,000 | 180 | 102,000 | 330 | 190,000 | 510 | 292,000 | 22,000 | 5 | 3,100 |
| | **All Entities** | **35** | **80** | **115** | **260,000** | **2,380,000** | **2,640,000** | **210** | **118,000** | **390** | **222,000** | **600** | **341,000** | **23,000** | **5** | **3,000** |
| **2** | Small Entity | 10 | 70 | 80 | 380,000 | 4,910,000 | 5,290,000 | 60 | 33,000 | 410 | 232,000 | 460 | 265,000 | 66,000 | 5 | 3,300 |
| | Not Small Entity | 150 | 540 | 690 | 3,980,000 | 34,710,000 | 38,690,000 | 780 | 447,000 | 2,380 | 1,364,000 | 3,170 | 1,811,000 | 56,000 | 5 | 2,600 |
| | **All Entities** | **160** | **610** | **770** | **4,360,000** | **39,620,000** | **43,990,000** | **840** | **480,000** | **2,790** | **1,596,000** | **3,630** | **2,076,000** | **57,000** | **5** | **2,700** |
| **3** | Small Entity | 5 | 30 | 35 | 180,000 | 3,950,000 | 4,130,000 | 60 | 33,000 | 330 | 187,000 | 390 | 220,000 | 118,000 | 10 | 6,300 |
| | Not Small Entity | 60 | 160 | 220 | 1,430,000 | 25,980,000 | 27,420,000 | 660 | 378,000 | 1,760 | 1,005,000 | 2,420 | 1,383,000 | 125,000 | 10 | 6,300 |
| | **All Entities** | **65** | **190** | **255** | **1,610,000** | **29,930,000** | **31,540,000** | **720** | **411,000** | **2,080** | **1,192,000** | **2,800** | **1,603,000** | **124,000** | **10** | **6,300** |
| **4** | Small Entity | 10 | 80 | 90 | 1,350,000 | 8,190,000 | 9,540,000 | 120 | 67,000 | 590 | 335,000 | 700 | 402,000 | 106,000 | 10 | 4,500 |
| | Not Small Entity | 170 | 590 | 760 | 7,600,000 | 50,330,000 | 57,920,000 | 1,100 | 628,000 | 3,190 | 1,826,000 | 4,290 | 2,454,000 | 76,000 | 5 | 3,200 |
| | **All Entities** | **180** | **670** | **850** | **8,950,000** | **58,510,000** | **67,460,000** | **1,210** | **694,000** | **3,780** | **2,162,000** | **4,990** | **2,856,000** | **79,000** | **5** | **3,400** |
| **5** | Small Entity | 10 | 70 | 80 | 230,000 | 3,670,000 | 3,900,000 | 20 | 14,000 | 280 | 162,000 | 310 | 176,000 | 49,000 | 5 | 2,200 |
| | Not Small Entity | 150 | 540 | 690 | 3,130,000 | 29,700,000 | 32,830,000 | 550 | 316,000 | 1,870 | 1,068,000 | 2,420 | 1,384,000 | 48,000 | 5 | 2,000 |
| | **All Entities** | **160** | **610** | **770** | **3,360,000** | **33,370,000** | **36,730,000** | **580** | **330,000** | **2,150** | **1,230,000** | **2,730** | **1,560,000** | **48,000** | **5** | **2,000** |
| **6** | Small Entity | 5 | 20 | 25 | (40,000) | 2,520,000 | 2,490,000 | 10 | 4,000 | 200 | 112,000 | 200 | 116,000 | 100,000 | 10 | 4,600 |
| | Not Small Entity | 40 | 100 | 140 | 610,000 | 19,540,000 | 20,150,000 | 400 | 230,000 | 1,140 | 650,000 | 1,540 | 881,000 | 144,000 | 10 | 6,300 |
| | **All Entities** | **45** | **120** | **165** | **570,000** | **22,070,000** | **22,640,000** | **410** | **234,000** | **1,330** | **763,000** | **1,740** | **997,000** | **137,000** | **10** | **6,000** |

Notes:

Costs have been annualized at 7% and numbers have been independently rounded.

States and Territories Under Federal Plan:

- Alaska
- American Samoa
- Arkansas
- Connecticut
- Hawaii
- Massachusetts
- Michigan
- Mississippi
- New Jersey
- North Carolina
- Northern Mariana Islands
- Virgin Islands
- Virginia
- Washington
- Wisconsin

Pre-call Questions from SER's on the NSPS

10/4/13

EPA, please try to address the following questions throughout your October 7th presentation to the SER's:

1. What options are you considering for making revisions to NSPS/EG to the following provisions?
    a. Owner/operator definition
    b. Treatment definition
    c. Expanding SEM
2. Will EPA consider other NSPS issues beyond the 2002 and 2006 proposals and the six options included in your slides? How can the SERs propose other rule changes?

3. In regards to the SEM revisions that are indicated, what types of revisions are being proposed?

4. Is there any potential revision to the wellhead performance standards currently in NSPS (i.e., oxygen, temperature and pressure of extraction wells) if we have to shorten the 2yr/5yr period?

5. Does EPA plan to keep landfill gas as the regulated pollutant for NSPS/EG, and will NMOC be continue to be the surrogate parameter both rules?

6. What is EPA's goal in terms of additional NMOC reductions with these NSPS/EG revisions? What cost threshold is EPA considering reasonable in terms of dollars per ton of NMOC reduced?

7. EPA option questions:
    a. How were these 6 options developed and selected for consideration? Are other options or combinations possible?
    b. If EPA lowers the design size threshold (2.5 million Mg and 2.5 million m3), what design size thresholds are you considering and how did you assess the emission reductions that would result?
    c. If EPA lowers the emission threshold (50 Mg/yr NMOC), what emission thresholds are you considering and how did you assess the emission reductions that would result?
    d. If EPA shortens the time allowed for GCCS installation (30 months), what timing options are you considering and how did you assess the emission reductions that would result?
    e. If EPA shortens the time allowed for well field expansion (2yr/5yr rule), what timing options are you considering and how did you assess the emission reductions that would result?
    f. Option 5 and 6 include "Increase design size threshold" in their description. What threshold options are you considering? Would the rule still incorporate a two-step

test (i.e., does one first meet the design threshold before evaluating the emission threshold)?

8. EXCEL spreadsheet questions:
    a. How many landfills in the data set are closed landfills? How many are active landfills?
    b. Why did EPA separate out landfill #'s affected by State Plans or the Federal Plan?
    c. Why does EPA think the costs for landfills under the Federal Plan are so much less than the costs for landfill under the State plans?
    d. Please confirm if a math error has occurred in column N.
    e. Please add a column that calculates the cost per ton of NMOC reduction to each option/entity.
    f. What is included in the annualized cost for the landfills?
        i. Is this only equipment installation or does your costs include the permitting, monitoring, and reporting requirements that will be required according to the revisions?
    g. Can EPA provide the actual data that were used to determine the number of landfills affected, the cost of compliance, and the NMOC/methane reduction calculations?
    h. Did EPA consider the cost of rule revisions that state and local jurisdictions will incur?
    i. What sources of information did EPA use to calculate costs? What weight was given to each source of information used to calculate costs (i.e., LMOP data was relied on more than ICR data. ICR data was relied on more than the GHGRP data)?

9. Why must the SER's return our comments before the state and local comments are due November 8th? We do not believe this is equitable treatment, particularly as our meeting is scheduled a month later than the Federalism Consultation meeting held in September.

**Panel Outreach Meeting with Small Entity Representatives**
**Review of New Source Performance Standards and Amendments to Emission Guidelines for Municipal Solid Waste Landfills**

Thursday, December 19, 2013
10:00 a.m. – 12:00 noon, Eastern time zone
EPA HQ – William J Clinton North 4530

10:00 **Welcome and Introductions** (Alex Cristofaro, EPA's Small Business Advocacy Chair)

- Panel member introductions/remarks
- SER introductions

10:15 **SER Presentation** (Khaled Mahmood, for Mike Michels, Cornerstone Environmental Group, representing Riverview MI)

10:30 **SER Presentation** (Anne Germaine, representing Caroline County MD)

10:45 **Open Discussion** (SERs and EPA)
This is an opportunity for SERs to provide comments to EPA on the following:

- Clarifications that are needed in the landfill rules
- Options and ideas that EPA should consider beyond those that were presented at the October 30,2013 Pre-Panel Meeting and the December 5, 2013 Supplemental Meeting
- Monitoring and recordkeeping: reactions to current requirements and recommendations
- Technological advances that should be considered
- Availability of new models
- Additional issues

11:50 **Summary and Closing** (EPA)

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**Teleconference dial-in number: (866) 299-3188**
**Conference code: 202 566 2372**

Dial the toll-free teleconference number listed above. At the prompt, enter the conference code followed by the pound [#] sign. Note: You will hear music until the leader dials into the call.

**Issues for EPA Consideration While reviewing the Landfill NSPS/EG**

Date for Delivery: 12/19/2013

Presented in-person by: Khaled Mahmood, Cornerstone Environmental Group on behalf of The City of Riverview, Michigan (small entity).

EPA is considering regulatory options to revise Landfill NSPS and EG. Due to time constraint I will touch base on three issues mainly 1) LFG Treatment System 2) Wellfield compliance & 3) Surface Emission Monitoring.

**LFG Emission Control via Treatment:**

Treatment filters, dewaters, and compresses the LFG.

Treatment is an alternative to flaring or combustion.

Treatment is a good option for small entities.

Current treatment system definition allows implementation of innovative gas to energy project.

Treatment allows use of the LFG as an energy source and thereby good for the environment

Treatment is not a control device but instead preparation for a control device.

Treatment does not typically have emissions (periodic use of a vent stack being the exception).

The City of Riverview employs "treatment" for its LFG in 2 ways:

1. Some raw LFG is sold to DTE Biomass. DTE filters the LFG, compresses it, and dewaters prior to destruction in gas turbines which generate electricity for distribution to the local grid.
2. Some raw LFG is used by the City in a BioCNG treatment system which filters it, compresses it, dewaters it, and lowers the $H_2S$, siloxane, and $CO_2$ concentration, prior to a fueling station where it is discharged into vehicles and destroyed. The waste gas from the BioCNG system is vented into the gas collection system and blended with other LFG and routed to DTE treatment system.

In summary, the City has two treatment systems on the same landfill. Both treatment systems are treating the LFG to different levels. These treatment levels are dictated by the control devices located after treatment. Both treatment systems function well. Both treatment systems have safety shutoffs if malfunctions occur. Neither treatment systems have emissions. Neither treatment systems are control devices.

In 2006 EPA proposed revising "treatment" to include operating limits and monitoring. We believe these proposals are inappropriate and unnecessary:

1. because the treatment systems are not control devices,
2. because the proposals would not provide the operator of the treatment system with any information that would enable a reduction in emissions because the filtration, compression, nor the dewatering process produce emissions that could be reduced, and
3. because regulating the operating limits and monitoring will inhibit the development of LFGTE at small entity facilities which are already challenged with numerous technical

and financial barriers to entry due to their small LFG flow. Adding more unnecessary regulatory and financial burden to these projects is inappropriate.

A one-size-fits-all approach, such as EPA put forth in the proposed 2006 rule, does not account for the site-specific characteristics that may impact operating requirements for each LFG treatment system and control device.

In closing we believe that all treatment systems need are a site-specific preventative maintenance plan and a Start-up, Shutdown and Malfunction Plan. Operating according to these two plans is sufficient to assure that it is done properly. As such, we believe that regulating the treatment of LFG is simply not necessary to ensure that LFG is properly combusted.

**<u>Regulating Wellhead Operation</u>**

I have been personally dealing with NSPS regulations/MRR for the last 14 years.

EPA's current wellhead compliance mechanism is very prescriptive and raises more questions, requires a significant amount of paperwork and reduces ZERO emissions.

Compliance mechanism attributes to generating letters, reports and paperwork. Let me illustrate the above noted issues with one example:
An oxygen exceedance greater than 15 days triggered a letter to the agency for alternate compliance time line. The facility reported this event as a deviation in the semi-annual Title V compliance report and subsequently in the Title V annual compliance certification. The facility received a notice of violation for this issue. In the notice of violation letter the agency required the facility to respond in great detail about the event, corrective action, and plan to prevent future occurrence of such event. So, what happened to the well that exceeded oxygen for 15-days? The well returned to compliance on 20$^{th}$ day. It was just a simple tuning issue. This is only one example of the pitfalls of prescriptive nature of the NSPS/EG regulation. The issue and its resolution did NOT provide any reductions in NMOC but cost the facility significant $$.

**We urge EPA to eliminate the temperature and oxygen standards in the NSPS/EG:**
Since the rule promulgation in 1996, the industry has gained significant and widespread field operations experience. The existing wellhead standards are not the best indicator of GCCS performance because they are arbitrary limits on a limited number of parameters which do not accurately represent proper GCCS performance.

Further, the existing wellhead operating standards do not provide any protection to the environment. We believe that landfill owners are already heavily incentivized to maximize GCCS collection efficiency to control odor, control subsurface migration, minimize groundwater impacts, maintain cap stability and integrity, control surface emissions, and maximize energy recovery. In addition, landfill owners diligently operate to avoid causing subsurface fires as potential damage to leachate containment liners, gas collection and control systems and other environmental controls can result in non-compliance and be extremely costly to mitigate.

The temperature limit in NSPS/EG was established as an alert level that may indicate a problem that prompts further investigation; well temperature at or above 55 degrees Celsius ($^{o}C$) does not mean there is a fire or indicate improper operation. A well temperature at or above $55^{o}C$ may be normal operating conditions for a facility based on site-specific climate and waste characterization. In the rulemaking record, EPA states that vacuum adjustment is the solution to reduce temperature, not system expansion. Nonetheless, some delegated agencies have required automatic system expansions as a result of well temperature above the action level.

Of the current wellhead operating standards, only pressure is directly tied to controlling emissions. We do not believe that the wellhead pressure standard provides additional environmental protection in light of other operating incentives described above. However, this negative pressure parameter could be maintained to ensure a minimum standard of gas collection is maintained.

We ask that EPA keep in mind that wellhead standards do not measure emissions that can only be done with surface emission monitoring. We ask that EPA relax wellhead standards and let the landfill owners operate their well field in whatever safe manner they feel appropriate such that surface emissions are maintain below the standard.

**<u>Surface Emission Monitoring (SEM)</u>**

Current SEM is adequate and no tweaking is desirable. EPA should allow more flexibility in SEM monitoring and locations.

Integrated SEM in grids with 25 ppmv limit (California's approach) is not desirable.
Integrated SEM will be burdensome for a small facility like Riverview, significant increase in cost, new equipment and training of personnel.

Riverview is a site with 211 acres of landfill foot print. Current estimate shows $5,000 of annual cost to perform NSPS SEM in the entire footprint. If the Riverview has to perform the SEM in accordance with Integrated SEM (~184 Grids of 50,000 sqft) it will cost approximately $100,000.00; a significant increase in cost of compliance.

# SBAR Pre-Panel Outreach Supplemental Briefing: New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills

Briefing for Potential SERs

December 5, 2013

**Internal Deliberative Material for SBAR Panel Members Only – Do Not Release**

# Overview

- Clean Air Act Section 111(b)
- Clean Air Act Section 111(d)
- Rationale for the Landfill NSPS Review
- Rationale for Reviewing the Landfill Emission Guidelines
- Additional Information about Various Rule Parameters
- Next Steps

**Internal Deliberative Material for SBAR Panel Members Only – Do Not Release**

# Clean Air Act Section 111: New Sources

- Clean Air Act Section 111(b) established requirements for new stationary sources; requirements referred to as new source performance standards (NSPS)
  - EPA is required to list categories of stationary sources which "cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare"
  - Standards must reflect "the degree of emission limitation achievable through the application of the best system of emission reduction which the Administrator determines has been adequately demonstrated"
  - Costs are considered
  - Standards are reviewed at least every 8 years and revised if appropriate
- NSPS applies to landfills that commenced construction, modification, or reconstruction on or after May 30,1991

# Clean Air Act Section 111: Existing Sources

- Clean Air Act Section 111(d) sets up a partnership between states and EPA
- EPA's role:
  - Establish process for states to issue performance standards for existing sources in the source category
  - Provide emission guidelines (EG) to the states on the level of the standard they need to meet
  - Review and approve state plans
  - Promulgate a Federal plan for states that either don't submit a plan or for which EPA disapproves their plan
- State's role:
  - Develop section 111(d) plan establishing standards of performance for the affected sources in their state
  - Submit plan to EPA that is responsive to the EPA guidelines
  - Implement plan if EPA approves it

# Clean Air Act Section 111: Existing Sources

- Section 111(d) provides greater flexibility to EPA and states to design a program  in consultation with diverse range of stakeholders
- EPA may specify different guidelines or compliance times (or both) for different sizes, types, and classes of designated facilities when costs, physical limitations, geographical location, or other factors make subcategorization appropriate 40 C.F.R. § 60.22(b)(5)
- EG applies to existing landfills that accepted waste on or after November 8, 1987

# Why is EPA reviewing the Landfill NSPS?

- In 2008, Environmental Defense Fund filed a Notice of Intent to Sue and requested that the Landfill NSPS be reviewed
- A mandatory duty suit was filed in 2011
- EPA was compelled by a court ordered deadline to review the Landfill NSPS
- When promulgated in 1996, best system of emission reduction was established as a well-designed and well-operated landfill gas (LFG) collection and control system with a control device capable of reducing non-methane organic compounds (NMOC) by 98%

# Why is EPA reviewing the NSPS and EG?

- Data collected from several sources for the review
  - Voluntary information collection request (ICR)
  - EPA's Landfill Methane Outreach Program (LMOP) and Landfill Gas Energy Project Database
  - Greenhouse Gas Reporting Program (GHGRP)
- Data indicated a need to evaluate and account for changes that have occurred in the landfill industry since the NSPS and EG were originally promulgated in 1996
  - Proliferation of landfill gas to energy projects
  - Variety of new monitoring techniques

# Why is the EPA reviewing the EG?

- As part of its data collection efforts for the NSPS review, EPA received new information regarding existing landfills
  - Information allows a more robust assessment of the size, type, and emissions of landfills
- EG's applicability thresholds, monitoring, recordkeeping, and control requirements rely on and parallel the NSPS
  - Review will ensure that those cross-references are still appropriate
- Because the number of existing sources is significantly higher than projected new sources, any cost-effective emission reductions may realize their greatest benefit from sources subject to the emission guidelines
- Because the NSPS and EG are so interrelated, we recognized a resource savings by reviewing simultaneously

## Why is EPA reviewing various parameters that were established in the original NSPS and EG?

- Landfill NSPS and EG differ from most stationary source rules in that they have an emission profile that can last for decades
- Promulgated in 1996, the original NSPS were designed in a manner that accounted for the changing aspects of landfills over time
- Parameters such as the emission threshold, design capacity, well monitoring, and surface monitoring were developed to ensure control of emissions from large landfills
- Because these parameters are central to the structure of the rule, it is appropriate to evaluate the incremental impacts of changes to these parameters

# Additional Information about Various Rule Parameters

# NSPS Landfill Size Threshold and NMOC Emissions Threshold

- EPA is reviewing the design capacity cutoff (current rule is 2.5 million Mg and 2.5 million cubic meters design capacity) and the NMOC threshold (current rule is 50 Mg/yr)
- Adjustments to either of these parameters will affect emission reductions achieved

# Schedule for Installing or Expanding Controls

- EPA is exploring options that adjust times for installing initial controls after thresholds have been triggered (current rule allows 30 months)
- Timing and extent of reductions are dependent on the initial installation of controls
- EPA is also exploring a change to the schedule for expanding a gas collection system (current rule allows 2 years after initial waste placement in closed areas and 5 years after initial waste placement in active areas)
- Incremental emission reductions may be achieved each time the gas collection system is expanded

# Landfill Gas Treatment

- Treatment is one of three control options (combust LFG in a flare or enclosed combustion device or treat the LFG in a treatment system)
- Received significant comments over time requesting clarification of what constitutes sufficient gas treatment
  - Received comments on regulatory uncertainty in treatment determinations and the inability to consistently enforce the treatment control option
  - Received comments on whether numeric limits are needed to define treatment
- Amendments proposed in 2002 and 2006 attempted to address outstanding issues related to landfill gas treatment (specifically what constitutes sufficient treatment)
  - Proposed to define treatment as filtration, dewatering, and compression of the landfill gas (2002)
  - Proposed numeric limits to define treatment and ensure long-term protection of the combustion equipment (2006)
- Proposal needs to provide a path forward for defining treatment

# Parametric Monitoring for Wells

- Temperature/nitrogen/oxygen levels indicate whether the LFG collection system is operating properly
- Elevated nitrogen/oxygen levels indicate too much air in the landfill, which could contribute to fires. Elevated temperatures may significantly inhibit anaerobic decomposition by killing methanogens
- EPA is reviewing the temperature/oxygen/nitrogen wellhead requirements
- EPA is also exploring whether surface monitoring requirements are sufficient indicators of whether the gas collection and control systems are being operated properly

# Clarification of Responsibilities for LFG Energy Projects

- Landfill gas is commonly collected and combusted to produce electricity, steam, or other useful energy by using a variety of equipment. Such equipment can be owned, operated, or located on the landfill site or off site at separate industrial, commercial, or institutional facilities
- Multiple parties can be involved in the ownership or operation of a landfill and the associated landfill gas collection, control, and/or treatment systems
- Clarifying responsibilities could improve implementation and enforcement for existing LFG energy projects
- Parties would also know their responsibilities without ambiguity before participating in future LFG energy projects

# Surface Monitoring Requirements

- Low surface emissions demonstrate that LFG collection system and cover are working properly
- EPA is exploring the need to address visual observations potentially indicating elevated concentrations of landfill gas
- We have received information about new surface monitoring techniques and are exploring whether these new techniques are appropriate

# Closed Areas of Landfills

- Owners/operators may exclude from control a "nonproductive" area of a landfill if the area accounts for less than 1 percent of total NMOC emissions from the landfill
- EPA has learned that it is difficult to demonstrate that such an area accounts for less than 1 percent of landfill NMOC emissions using the calculation method in the rule, which is based on modeled LFG flow
- EPA is exploring the use of measured and modeled landfill gas flow to address the need for more accurate measurement of NMOC emissions

# Next Steps

- The Panel's formal Outreach Meeting is scheduled for Thursday, December 19th from 10:00 am to 12:00 pm
- It is anticipated that written comments from SERs will be due in early January

- For assistance with technical questions, please contact:
  - Hillary Ward
  - Ward.Hillary@epa.gov.
- For general panel process questions, please contact:
  - Lanelle Wiggins
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# Small Business Advocacy Review Panel Process Recap

**Panel Outreach Meeting with SERs**
**December 19, 2013**

**Office of the Administrator**
**Office of Policy**
**Office of Regulatory Policy and Management**
http://www.epa.gov/op/orpm.html

# This presentation recaps...

- What is the purpose of a Small Business Advocacy Review (SBAR) Panel?
- How do Small Entity Representatives (SERs) participate in the Panel and rulemaking process?
- What does the Panel do with SER recommendations?

# Purpose of a Panel

- SBREFA[1] amended the 1980 Regulatory Flexibility Act (RFA), which requires agencies to:

  "assure that small entities have been given an opportunity to participate in the rulemaking" process for any rule "which will have a significant economic impact on a substantial number of small entities."[2]

[1] Small Business Regulatory Enforcement Fairness Act of 1996

[2] 5 USC 609(a)

# SER participation

- The Panel is conducting this Outreach Meeting with SERs today to collect your verbal advice and recommendations on the following issues:
  - Who are the small entities to which the proposed rule will apply?
  - What are the anticipated compliance requirements of the upcoming proposed rule?
  - Are there any existing federal rules that may overlap or conflict with the regulation?
  - **Are there any significant regulatory alternatives that could minimize the impact on small entities?**
- You will also have the chance to provide the Panel with written advice and recommendations, due January 10th.

# What does the Panel do with your recommendations?

- EPA, OMB, and SBA prepare a joint Panel report:
  - Submitted to the EPA Administrator
  - Considered during senior-management decision-making prior to the issuance of the proposed rule
  - Placed in the rule's docket when the proposed rule is published

# Thank You

- We realize that small entities make significant sacrifices to participate
- Thank you for taking time and effort away from your business or organization to assist the Panel in this important work

**Background Information for Estimating Cost and Emission Impacts of Landfill NSPS and EG Regulatory Options**

To estimate the cost and emission impacts of each regulatory option EPA determined which landfills met the design capacity and emission rate cutoffs for each regulatory option, then calculated the annual emission reductions and costs for each landfill for each year from 2014 through 2063 under each regulatory option using the equations described below. The resulting costs and emission reductions incurred by each landfill during the period of 2014 through 2023 were used to assess the overall impacts of each option.

**General Assumptions and Procedures**

- The baseline represents the emission reductions and costs associated with the requirements of the current rule. Each alternative regulatory option was compared to this baseline option.
- Landfill would install GCCS when the landfill exceeds the emission rate and design capacity cutoffs.
- Landfill would remove GCCS when the actual emissions are below the emissions cutoff, the landfill is closed, and the controls have been in place for at least 15 years.
- Costs were annualized using a 7 percent interest rate, which is consistent with EPA guidance for cost evaluations.

Alternative regulatory options varied the emission rate cutoffs, design capacity cutoffs, initial lag time to install gas collection and control systems (GCCS), and expansion lag time for GCCS:

- **Emission rate cutoff.** Baseline = 50 Mg NMOC per year. The alternative regulatory options include alternative NMOC cutoffs.

- **Design capacity cutoff.** Baseline **=** 2.5 million Mg and 2.5 cubic meters. The alternative regulatory options include alternative landfill size cutoffs.

- **Initial lag time.** Baseline = 30 months, modeled at 3-years because the first-order decay equation used to model emissions is on an annual, instead of monthly, basis. Further, because NMOC emission reports under the current rule are required to be submitted in June of the following year (6 months) the landfill would get 30 months after the submittal of its NMOC emission report to install the GCCS, and so the total time to install a GCCS would be approximately 36 months after the excess emissions occurred. The alternative regulatory options include shorter initial lag times.

- **Expansion lag time.** Baseline = 2 or 5 years, modeled at 4 years. Expansion lag time is the amount of time until the landfill expands the GCCS into waste being placed in new areas of the landfill. The current rule allows 2 years after initial waste placement in closed areas and 5 years after initial waste placement in active areas of the landfill, so the actual lag time varies by landfill depending how quickly expansion areas are filled and closed, although more landfills probably tend toward the 5 years. Therefore, a 4-year expansion lag time was assumed to represent the baseline. The alternative regulatory options include shorter expansion lag times.

**Estimating Annual Emissions**

*Estimating Waste*

- If a landfill's annual waste acceptance rate (WAR) and waste in place (WIP) values were available in the landfill dataset and associated with a particular year, then those values were extrapolated to estimate the landfill's WAR and WIP for each year.
- If WIP and WAR values were not available in the landfill dataset, the annual WAR was estimated using the landfill open and closure years and the landfill capacity and assuming a constant WAR over the lifetime of the landfill. The annual waste in place was calculated by summing the waste acceptance rate over time.

*Estimating Annual Emissions*

- Estimated annual methane emissions from each landfill for each year during the period of 2014-2063 using Equation 1.

**Equation 1** $CH_{4_t} = k \times L_0 \times M \times e^{-kt}$

Where:

| | | |
|---|---|---|
| $CH_{4t}$ | = | Methane, $ft^3$ in year t |
| k | = | Methane generation rate, $year^{-1}$ |
| $L_0$ | = | Potential methane generation capacity, $ft^3$ methane per ton |
| M | = | Mass of waste accepted in year t, tons |
| t | = | Analysis year (year 1 through 50), year |

- Estimated the volume of LFG produced by a landfill using Equation 2.

**Equation 2** $LFG_t = CH_{4t} \times 2$

Where:

| | | |
|---|---|---|
| $LFG_t$ | = | Landfill gas, $ft^3$ in year t |
| $CH_{4t}$ | = | Methane, $ft^3$ in year t |
| 2 | = | Multiplier to convert methane to LFG (assuming that LFG is 50 percent methane), unitless |

- Estimated the mass of NMOC emissions produced by each landfill, based on the amount of LFG produced at the landfill, using Equation 3.

**Equation 3** $NMOC_t = LFG_t \div 35.32 \times 595 \times 3.6E^{-9}$

Where

| | | |
|---|---|---|
| $NMOC_t$ | = | NMOC in year t, Mg in year t |
| $LFG_t$ | = | Landfill gas, $ft^3$ in year t |
| 35.32 | = | Conversion, $ft^3$ per $m^3$ |
| 595 | = | Concentration of NMOC in LFG, ppm NMOC by volume as hexane |
| 3.6E-9 | = | Conversion factor, Mg NMOC per $m^3$ LFG |

- Estimated the mass of methane emissions, in terms of carbon dioxide equivalents, produced by each landfill using the Equation 4.

**Equation 4** $$Mg\ CO_2eq = CH_{4t} \times 0.0423 \div 2000 \div 0.90718 \times GWP_{CH4}$$

Where:

| | | |
|---|---|---|
| $Mg\ CO_2eq_t$ | = | Carbon dioxide equivalents, Mg in year t |
| $CH_{4t}$ | = | Methane, $ft^3$ in year t (From Equation 1) |
| 0.0423 | = | Density of methane, lb per $ft^3$ |
| 2000 | = | Conversion, lb per short ton |
| 0.90718 | = | Conversion, short ton per Mg |
| $GWP_{CH4}$ | = | 25, Global Warming Potential of Methane |

*Calculating Emissions Using NSPS/EG and AP-42 Default Values*

The current NSPS/EG requires the use of Tier 1 default value for the potential methane generation capacity ($L_0$) and methane generation rate (k) to determine when the landfill exceeds the 50 Mg NMOC per year emission rate cutoff. To determine when landfills may remove controls, the current rules allow landfills to measure the actual collected gas flow rate as well as the concentration (instead of relying on Tier 1 default $L_0$ and k defaults).

*Installing controls.* The combination of the Tier 1 defaults for k and $L_0$ and the NMOC concentration of 595 ppmv were used to represent how landfills currently calculate NMOC emissions to determine if they have to install controls under the NSPS/EG. These values, known as $LFG_{NSPS/EG}$ and $NMOC_{NSPS/EG}$, tend to overestimate actual emissions at most landfills (due to the conservatively high $L_0$ and k values).

Landfills have conducted Tier 2 tests and gotten much lower values that are consistent with the AP-42 average NMOC concentration of 595 ppmv. The use of AP-42 $L_0$ and k values in the emission calculation produces results that more closely match actual landfill emissions. The use of these values, in combination with the NMOC concentration of 595 ppmv, result in estimates of LFG and NMOC that are in accordance with the AP-42; in this evaluation these estimates were called $LFG_{AP\text{-}42}$ and $NMOC_{AP\text{-}42.}$

*Removing controls.* $LFG_{AP\text{-}42}$ and $NMOC_{AP\text{-}42}$ were used to determine when landfills would remove controls. The current rules allow landfills to measure the actual collected gas flow rate as well as the concentration (instead of relying on Tier 1 default L0 and k defaults). Because the AP-42 values for $L_0$ and k produce results that more closely match actual gas flow rates and emissions, AP-42 values were used to determine when landfills would remove controls.

*Applying Landfill-Specific k Factors*

The k values depend on the amount of precipitation at the landfill. For this evaluation, precipitation data by climate division from the National Oceanic and Atmospheric Administration (NOAA) were obtained and averaged over the period of 2000 to 2009.[1] These average precipitation factors of each climate division were matched to the county-level location of each landfill. The k factors were assigned to each landfill based on the resulting amount of precipitation at each landfill.

[1] NOAA climate division data are available online at: http://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp# and are available for download at ftp://ftp.ncdc.noaa.gov/pub/data/cirs.

*Estimating Emission Reductions*

To estimate emission reductions, the amount of LFG and NMOC emitted at each landfill was estimated using Equations 1-3.

- The model assumes that the collection equipment is installed and operational at the landfill after the initial lag time of the regulatory option.
- As the landfill is filled over time, the model assumes the landfill expands the GCCS into new areas of waste placement in accordance with the expansion lag time of the regulatory option. See Table 1, below.
- Once the landfill has reached the maximum gas production and the gas production starts to decrease, the analysis assumes that the GCCS will collect all of the emitted gas.
- To determine the amount of LFG and NMOC collected, the analysis uses the $LFG_{AP\text{-}42}$ and $NMOC_{AP\text{-}42,}$ estimates with the appropriate lag times, because this is the best estimate of actual gas collected.
- The emission reductions are equal to the amount of collected NMOC or methane that is combusted, which is estimated by multiplying the amount of collected gas by a destruction efficiency of 98 percent.

**Table 1. Example of Collected NMOC Estimate at a Landfill with an Initial Lag Time of 3 Years and an Expansion Lag Time of 4 Years**

| Year | $NMOC_{NSPS/EG}$ | $NMOC_{AP\text{-}42}$ | Collected NMOC |
|---|---|---|---|
| 1 | 50.2 | 27.7 | 0.0 |
| 2 | 50.4 | 27.9 | 0.0 |
| 3 | 50.6 | 28.0 | 0.0 |
| 4 | 50.8 | 28.2 | 28.2 |
| 5 | 51.0 | 28.3 | 28.2 |
| 6 | 51.1 | 28.5 | 28.2 |
| 7 | 51.3 | 28.6 | 28.2 |
| 8 | 51.5 | 28.7 | 28.7 |
| 9 | 51.6 | 28.9 | 28.7 |
| 10 | 51.7 | 29.0 | 28.7 |
| 11 | 51.9 | 29.1 | 28.7 |
| 12 | 52.0 | 29.2 | 29.2 |
| 13 | 52.1 | 29.3 | 29.2 |
| 14 | 52.2 | 29.4 | 29.2 |
| 15 | 52.3 | 29.5 | 29.2 |

**Estimating Control Costs**

The cost equations used in this regulatory evaluation were derived from EPA's Landfill Gas Energy Cost Model (LFGcost), version 2.3, which was developed by EPA's Landfill Methane Outreach Program (LMOP).

- LFGcost estimates costs for gas collection, flare, and energy recovery systems and was developed based on cost data obtained from equipment vendors and consulting firms that have installed and operated numerous gas collection and control systems.
- LFGcost encompasses the types of costs included in the EPA OAQPS control cost manual including capital costs, annual costs, and recovery credits.
  - Total capital costs include purchased equipment costs, installation costs, engineering and design costs, costs for site preparation and buildings, costs of permits and fees, and working capital.

- Total annual costs include direct costs, indirect costs, and recovery credits.
- Direct annual costs are those that are proportional to a facility-specific metrics such as the facility's productive output or size. \
- Indirect annual costs are independent of facility-specific metrics and may include categories such as administrative charges, taxes, or insurance.
- Recovery credits are for materials or energy recovered by the control system.

For this evaluation, all costs are presented in 2012$. The costs included in LFGcost are in 2008$ and were escalated to 2012$ using an escalation factor of 1 percent for capital costs and 2.5 percent for O&M costs.

The analysis presents the annualized capital cost of flares, wells, wellheads (including piping to collect gas), and engines over the lifetime of the equipment. The equipment is assumed to be replaced when its lifetime is over, so the annualized capital costs are incurred as long as the landfill still has controls in place. In order to calculate the annualization factors, flares, wells, well heads, and engines are assumed to have a 15-year lifetime. In addition, there is a mobilization/installation charge to bring well drilling equipment on site each time the gas collection system is expanded. Because the landfill will be drilling wells to expand the control system during the expansion lag year, this capital installation cost is assumed to have a lifetime equal to the expansion lag time.

A number of the capital costs equations depend on the number of wells at each landfill. In order to estimate the number of wells at each landfill, EPA estimated the number of acres that have been filled with waste for each landfill for each year. EPA assumed that the percent of design area filled (acres) would track the ratio of waste in place/design capacity (e.g., if a landfill has a waste-in-place amount equivalent to 40 percent of design capacity, then 40 percent of the planned acreage is filled). In addition, EPA assumed that each landfill would install one well per acre, consistent with the guidelines provided in the LFGcost model, and that the number of wells would increase periodically based on expansion lag time.

***Capital Costs***

The equations used in this evaluation to calculate capital costs for flares, wells, wellheads (including gas collection piping), mobilization/installation, and engines are presented below. All costs equations are shown on an individual landfill and year basis. To assess the capital costs of each regulatory option, the capital costs for all landfills assumed to install a GCCS under each regulatory option were summed if those capital costs were incurred anytime during the 10-year period of 2014-2023.

***Flare Capital Costs***

Flares are the primary control device used at landfills. All landfills that are required to comply with the regulatory options are assumed to install flares; even landfills using engines would have flares as the back-up control device for periods when the engines are not operating. The capital flare costs are estimated using the equation below, which is based on the installed cost of the knockout, blower, and flare system as determined in LFGcost. The flares are sized based on the maximum LFG flow rate over the 15-year flare lifetime.

**Equation 5**

$$\text{Flare}_{\text{capital}} = z_{15,y} \times \left(\frac{\text{LFG}_{15\text{yr max}}}{525{,}600}\right)^{0.61} \times 4{,}100 \times (1.01)^{4}$$

Where:

| | | |
|---|---|---|
| $Flare_{capital}$ | = | Installed annualized cost of knockout, blower, and flare system, 2012$ |
| $z_{15,y}$ | = | Annualization factor where x=15 yrs and y=interest rate (0.07), unitless |
| $LFG_{15yrmax}$ | = | Maximum LFG collected for 15 year project period, $ft^3$ per year |
| 525,600 | = | Conversion factor, minutes per year |
| $4,100 | = | Installed capital cost of knockout, blower, and flare system, 2008$ per $ft^3$/min LFG |
| $(1.01)^4$ | = | Adjustment from 2008$ to 2012$, unitless[2] |

***Well Capital Costs***

The well capital costs are based on a dollar per foot of well depth installed estimate from LFGcost. As shown in the equation below, wells are assumed to have a depth of 10 feet less than the landfill depth. The method used to estimate the number of wells at the landfill each year is described above.

**Equation 6** $$Well_{capital} = z_{15,y} \times (Depth - 10) \times 90 \times Wells_{annual} \times (1.01)^4$$

Where:

| | | |
|---|---|---|
| $Well_{capital}$ | = | Installed annualized cost of wells, 2012$ |
| $z_{15,y}$ | = | Annualization factor where x=15 yrs and y=interest rate (0.07), unitless |
| Depth | = | Landfill waste depth, feet |
| 10 | = | feet |
| $90 | = | Installed capital cost of one well, 2008$ per foot of well depth |
| $Wells_{annual}$ | = | Number of wells operated each year |
| $(1.01)^4$ | = | Adjustment from 2008$ to 2012$, unitless |

***Wellhead Capital Costs***

The capital wellhead cost covers the equipment associated with each well, including the wellhead and gathering lines (and associated sumps) connecting the wells, and is dependent on the number of wells. The capital wellhead costs at each landfill are estimated using a dollar per wellhead installed cost from LFGcost and the number of wells at each landfill.

**Equation 7** $$Wellhead_{capital} = z_{15,y} \times 15{,}000 \times Wells_{annual} \times (1.01)^4$$

Where:

| | | |
|---|---|---|
| $Wellhead_{capital}$ | = | Installed annualized cost of wellheads, 2012$ |
| $z_{15,y}$ | = | Annualization factor where x=15 yrs and y=interest rate (0.07), unitless |
| $15,000 | = | Installed capital cost of one wellhead, 2008$ per well |
| $Wells_{annual}$ | = | Number of wells operated each year |
| $(1.01)^4$ | = | Adjustment from 2008$ to 2012$, unitless |

[2] Escalation equation uses a formula of $(1+escalation/100)^t$, where capital cost escalation is assumed to be 1 percent and t is equal to 4 years

***Mobilization/ Installation Costs for Wellfield Expansion***

The cost occurs each time the gas collection system (i.e., wellfield) is expanded into new areas of the landfill, so the frequency is dependent on the expansion lag time. This cost is independent of the number of wells being added. It includes costs such as planning and set-up, mobilization costs to get the well drilling rig on site, and limited engineering/management costs. This cost is estimated using the following equation:

**Equation 8** $$\text{Installation}_{\text{capital}} = z_{x,y} \times 25{,}000 \times (1.01)^4$$

Where:

| | | |
|---|---|---|
| $\text{Installation}_{\text{capital}}$ | = | Mobilization/installation annualized cost, 2012$ |
| $z_{x,y}$ | = | Annualization factor where x=expansion lag time in yrs and y=interest rate (0.07), unitless |
| $25,000 | = | Mobilization/Installation costs, per occurrence, 2008$ |
| $(1.01)^4$ | = | Adjustment from 2008$ to 2012$, unitless |

***Engine Capital Costs***

Engines are assumed to be installed only at landfills that produce enough LFG to power the engine and only when the electricity buyback rates allow the operation of the engine to be profitable. Standard engines used at landfills have approximately 1 MW capacity, which equates to 195 million $ft^3$ per year of collected LFG (at 50 percent methane). Therefore, engines were assumed to be installed at landfills that have at least 195 million $ft^3$ per year of collected LFG for at least 15 years.

EPA calculated and summed the engine capital and operation and maintenance (O&M) equations to determine at what electricity buyback rate an engine is profitable. The profitable electricity buyback rate is greater than $0.0457 per kWh at 7 percent interest. ERG assumed engines were only installed in states with buyback rates exceeding those values.

Multiple engines may be present at a landfill when there is sufficient gas flow to support additional engines. As noted above, one engine requires 195 million $ft^3$ per year of collected LFG, so in order to have two engines on site, the landfill must have double that amount of LFG (390 million $ft^3$ per year) for at least 15 years.

The capital costs for engines are based on the capital costs for standard reciprocating engine-generator sets in LFGcost. These costs include gas compression and treatment to remove particulates and moisture (e.g., a chiller), reciprocating engine and generator, electrical interconnect equipment, and site work including housings, utilities, and total facility engineering, design, and permitting.

**Equation 9** $$\text{Engine}_{\text{capital}} = z_{15,y} \times 1{,}850{,}000 \times (1.01)^4 \times \text{Engine}_{\text{multiplier}}$$

Where:

| | | |
|---|---|---|
| $\text{Engine}_{\text{capital}}$ | = | Installed annualized cost of engines, 2012$ |
| $z_{15,y}$ | = | Annualization factor where x=15 yrs and y=interest rate (0.07), unitless |
| $1,850,000 | = | Installed capital cost of one reciprocating engine-generator set, 2008$ per engine |
| $(1.01)^4$ | = | Adjustment from 2008$ to 2012$, unitless |
| $\text{Engine}_{\text{multiplier}}$ | = | Number of engines needed |

***Operation and Maintenance (O&M) Costs***

The following equations were used to calculate O&M costs for flares, wells, electricity, and engines. All cost equations are shown on an individual landfill and year basis. These costs for all landfills were summed by year and the resulting annual sums were used to estimate NPV costs.

To accurately estimate annual electricity costs and engine revenue from the generation and sale of electricity, two electricity prices were needed. Landfills must purchase electricity to operate the blowers used to collect LFG. EPA used commercial average retail electricity prices by State from the U.S. Energy Information Administration to estimate electricity purchase prices at the landfill.

Landfills utilizing engines generate revenue from the sale of the LFG-produced electricity. The amount of revenue generated depends primarily on the buyback rate negotiated between the landfill (or third party developer) and the electric company purchasing the LFG-generated power. ERG used average wholesale prices for each state from the U.S. Energy Information Administration (EIA) to estimate electricity buyback rates[3]. These wholesale prices generally fit in the range of typical buyback prices for LFG of $0.025 - $0.07/kWh, as discussed in LMOP's Project Development Handbook. Additionally, LFGcost uses a default buyback rate of $0.06/kWh and the U.S. average of the wholesale prices used is $0.058/kWh.

EIA wholesale data were not available for three States (HI, RI & WV); hence, electricity purchase prices were used to ratio the average U.S. wholesale price to estimate buyback rates for these States. Electricity price data for the U.S. territories of Guam, Puerto Rico, and the Virgin Islands were not found. Therefore, an LFGcost scenario was created using economic inputs expected on an island to estimate a buyback rate of $0.12/kWh utilized by all three territories.

***Flare O&M Costs***

An estimate of the flare O&M costs from LFGcost was used to estimate the flare annual costs, as shown in the equation below:

**Equation 10** $$\text{Flare}_{O\&M} = 4{,}500 \times (1.025)^4$$

Where:

| | | |
|---|---|---|
| Flare $_{O\&Ml}$ | = | Flare annual O&M costs, 2012$ |
| $4,500 | = | Annual O&M flare cost, 2008$ |
| $(1.025)^4$ | = | Adjustment from 2008$ to 2012$, unitless[4] |

***Well O&M Costs***

An estimate of the well O&M costs from LFGcost was used to estimate the well annual costs, as shown in the equation below:

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[3] http://www.eia.gov/electricity/data/eia861/

[4] Escalation equation uses a formula of $(1+\text{escalation}/100)^t$, where O&M cost escalation is assumed to be 2.5 percent and t is equal to 4 years

**Equation 11** $$\text{Well}_{O\&M} = 2{,}250 \times \text{Wells}_{annual} \times (1.025)^4$$

Where:

| | | |
|---|---|---|
| $\text{Well}_{O\&Ml}$ | = | Well annual O&M costs, 2012$ |
| $2,250 | = | Annual O&M well costs, 2008$ per well |
| $\text{Wells}_{annual}$ | = | Number of wells operating each year |
| $(1.025)^4$ | = | Adjustment from 2008$ to 2012$, unitless |

***Electricity O&M Costs***

The electricity cost of operating the blowers was calculated using the electricity usage of blowers and the electricity purchase price.

**Equation 12** $$\text{Electricity}_{O\&M} = 0.002 \times \text{Electricity}_{purchase} \times \text{LFG}_{collected}$$

Where:

| | | |
|---|---|---|
| $\text{Electricity}_{O\&M}$ | = | Electricity annual O&M costs, 2012$ |
| 0.002 | = | Electricity usage by blowers, kWh per $ft^3$ LFG |
| $\text{Electricity}_{purchase}$ | = | Electricity purchase price, 2012$ per kWh |
| $\text{LFG}_{collected}$ | = | Amount of LFG collected, $ft^3$ per year |

***Engine O&M Costs***

For landfills with engines installed, the O&M costs of the engine were estimated using the annual costs for standard reciprocating engine-generator sets from LFGcost, and taking into account the amount of time that the engine is operating each year and the number of engines on site.

**Equation 13** $$\text{Engine}_{O\&M} = 0.02 \times 1{,}000 \times 8{,}760 \times 0.93 \times (1.025)^4 \times \text{Engine}_{multiplier}$$

Where:

| | | |
|---|---|---|
| $\text{Engine}_{O\&M}$ | = | Engine annual O&M costs, 2012$ |
| 0.02 | = | Annual O&M engine cost, 2008$ per kWh |
| 1,000 | = | Amount of electricity as kW produced by a 1 MW engine, kW per engine |
| 8,760 | = | Conversion factor, hours per year |
| 0.93 | = | Fraction of time that the engine is online, unitless |
| $(1.025)^4$ | = | Adjustment from 2008$ to 2012$, unitless |
| $\text{Engine}_{multiplier}$ | = | Number of engines |

***Engine Revenue Costs***

For landfills with engines installed, ERG calculated the revenue of the electricity produced by the engines using the equation below. This equation assumes that all electricity generated is sold to the grid instead of some of the electricity generated being used to power the GCCS.

**Equation 14** $$Engine_{revenue} = 1{,}000 \times 8{,}760 \times 0.93 \times Electricity_{buyback} \times Engine_{multiplier}$$

Where:

| | | |
|---|---|---|
| $Engine_{revenue}$ | = | Engine annual revenue, 2012$ |
| 1,000 | = | Amount of electricity as kW produced by a 1 MW engine, kW per engine |
| 8,760 | = | Conversion factor, hours per year |
| 0.93 | = | Fraction of time that the engine is online, unitless |
| $Electricity_{buyback}$ | = | Electricity buyback rate, 2012$ per KWh |
| $Engine_{multiplier}$ | = | Number of engines |

**Estimating Testing and Monitoring Costs**

EPA estimated testing and monitoring costs for uncontrolled and controlled landfills. The types of testing and monitoring required by the proposed amendments differ depending on whether the landfill is required to control its emissions. Table 2 shows the various testing and monitoring requirements that would apply to controlled and uncontrolled landfills.

**Table 2: Applicability of Various Testing and Monitoring Requirements**

| Testing and Monitoring Requirement | Applicability |
|---|---|
| NMOC Emission Rate<br>• Annual (Tier 1)<br>• Once every 5 years (Tier 2) | Uncontrolled Landfills |
| Initial Performance Tests<br>• NMOC % destruction or control device outlet ppmvd<br>• Oxygen | Controlled Landfills |
| Continuous Combustor Monitoring<br>• Temperature<br>• Flow rate | Controlled Landfills |
| Monthly Wellhead Monitoring<br>• Nitrogen or oxygen<br>• Gauge pressure<br>• Temperature | Controlled Landfills |
| Quarterly Surface Monitoring | Controlled Landfills |

Table 3 summarizes the testing and monitoring costs for controlled and uncontrolled landfills. These costs are added to the control costs in order to develop a total cost for each regulatory option.

## Table 3. Summary of Annual Testing and Monitoring Costs for Categories of Affected Landfills

| Affected Landfill[a] | Annualized Initial Performance Test ($)[b] | Continuous Combustor Monitoring | Monthly Wellhead Monitoring | Quarterly Surface Monitoring: Equipment Rental ($/period) | Quarterly Surface Monitoring: Annual Labor Cost ($/acre) | NMOC Testing ($)[c] |
|---|---|---|---|---|---|---|
| **Uncontrolled Landfills** | | | | | | |
| **Using Tier 1** | NA | NA | NA | NA | NA | $668 |
| **Using Tier 2** | NA | NA | NA | NA | NA | $2,700 |
| **Surface Monitoring** | | | | | | |
| **Controlled (<=283 acres)** | $1,105 | Already included[d] | Already included[d] | $125/day | $49.73 | NA |
| **Controlled (>283 acres up to 1,984 acres)** | $1,105 | Already included[d] | Already included[d] | $350/week | $49.73 | NA |
| **Controlled (> 1,984 acres)** | $1,105 | Already included[d] | Already included[d] | $350/week | $49.73 | NA |

[a] The listed acreages correspond to the length of time a monitor would need to be rented to complete surface monitoring for a landfill (daily, weekly, monthly).

- 1 hour/acre for 25-foot traverse pattern.
- Loaded Labor Rate of 48.95 per hour for Civil Engineering Technician. US Bureau of Labor and Statistics. May 2011 Occupational Employment Statistics. http:/stat.bls.gov/oes/home.htm
- Equipment Rental Rates for TVA100b. http://usenvironmental.com/air/fids/thermo-tva-1000b/

[b] Cost of Method 25 test, USEPA Monitoring Costs Assessment Tool. November 30, 2009. $10,067, annualized over 15 years.

[c] 8 hours for Tier 1, every year; 12 hours for Tier 2, every 5 years.

- Loaded Labor Rate of for Civil Engineer $83.50 per hour. US Bureau of Labor and Statistics. May 2011 Occupational Employment Statistics. http:/stat.bls.gov/oes/home.htm.
- Cost of Method 25 test, USEPA Monitoring Costs Assessment Tool. November 30, 2009. $10,067, annualized over 5 years.

[d] Already included in the control cost estimates for O&M.