



Air Quality Regulation Update Proposed MSW Landfill NSPS/EG Changes (& Other Relevant Musings)

Presented by Robert E. Dick, PE, BCEE

SWANA Old Dominion Regulatory Training Session
Glen Allen, VA
October 16, 2015

Overview

- Proposed NSPS and EG Rules (Subparts XXX and Cf)
- Air Quality and GHG Benefits/Impacts for Organic Waste Diversion Options
- CALMIM Model for Landfill Methane Emissions
- Final AP-42 Section 13.5 Update
- Final Ground-Level Ozone NAAQS Rule

Proposed NSPS and EG Rules

- Background on Current NSPS/EG
- Background on 2014 Rulemaking
- 2015 NSPS and EG Applicability
- Summary of Key Issues in 2015 Proposed Rules
- Schedule for Promulgation & Implementation

Background on Current NSPS/EG

- Accepted Waste After 11/8/87
- Commenced Construction, Reconstruction, or Modification:
 - Before 5/30/91, then EG Site subject to Subpart Cc
 - After 5/30/91, then NSPS Site subject to Subpart WWW
- NSPS and EG Promulgated in March 1996
 - EPA is Required to Update every 8 years
 - EDF sued EPA; CO established deadline 6/30/14
- Amendments proposed in 2002 & 2006 never finalized

2014 NSPS Proposed Rule

- 7/17/14 – Published in Federal Register
- New NSPS Regulation in 40 CFR 60 Subpart XXX
- Applies only to MSW LFs that commence construction, reconstruction, or modification after 7/17/14
- Reduced Threshold for requiring LFG Control System from 50 to **40** Mg/yr of NMOC
- Imposed quantitative LFG Treatment standards
- NSPS Standards to apply including SSM Events (current Rule exempts periods of SSM)

2014 NSPS Changes

- Criteria for exempting closed areas
- Mandates when LF must update GCCS Design Plan
- Clarifies timeframe for submitting Alternate Timeline Request
- Requires Higher Operating Value be submitted for approval and included in GCCS Design Plan
- All cover penetrations monitored during SEM event
- Clarifies that non-enclosed flares do not have to monitor temperature

2014 Request for Comments

- Utility flares represent Best System of Emission Reduction (BSER)
- LFG collection from LCRS
- Discovery of watered-in wells
- Enhanced SEM requirements
 - Tighter spacing
 - Every cover penetration
 - Integrated sampling
 - Maximum wind speed

2014 Request for Comments (cont'd)

- Use of wellbore seals
- Reducing timeframes for initial (30-month) or expansion (2-year/5-year) GCCS installation
- Use of remote sensing techniques
- Possible Tier 4 methodology

2014 ANPR - EG Update

- 7/17/14 – Published in Federal Register
- Not a Proposed Rule; rather requests information
- Would apply to existing MSW LFs that commenced construction, reconstruction, or modification prior to 7/17/14 (EG Sites and current NSPS Sites)
- Would replace Subparts Cc and WWW

2014 ANPR - EG Update

- Should CH₄ emission reductions be directly addressed?
- Changes to further reduce LFG emissions:
 - Reduce/eliminate Design Capacity threshold
 - Reducing NMOC emission threshold
 - Adjust Initial/Expansion times
 - Use of horizontal collectors for early control
 - Adjust duration for system operation
- Enhanced SEM criteria per AB 32 LMR
- Early installation of final cover systems
- Organics diversion to reduce LFG generation

2015 NSPS/EG Proposals

- August 27, 2015 published in Federal Register
- Expect NSPS and EG to have same requirements
 - Supplemental NSPS Subpart XXX
 - Applies to New, Modified or Reconstructed landfills **after** July 17, 2014
 - Industry comments previously provided September 2014
 - Proposed EG Subpart Cf
 - Replacing current NSPS (Subpart WWW) and current EG (Subpart Cc)
 - Applies to existing landfills accepted waste after 11-8-1987 and began construction, reconstruction or modification **before** July 17, 2014

2015 Proposed NSPS/EG Changes

Applicability	Current NSPS (WWW)	Proposed NSPS (XXX)
Design Capacity	2.5 MM Mg & 2.5 MM m3	2.5 MM Mg & 2.5 MM m3
NMOC Emissions Rate	50 Mg/yr	34 Mg/yr 50 Mg/yr (closed)
Installation Timeframe	30 mos. (5 yr/2 yr)	30 mos. (5 yr/2 yr)

- Results in active landfills triggering the requirement to install and operate a GCCS earlier
- Extends operation of the GCCS

* Virginia Rule 4-43 assigns different applicability criteria for facilities located within Northern Virginia VOC Non-Attainment Area

Closed Landfill Subcategory

- MSW Landfills closed on or before August 27, 2015 continue to be subject to 50 Mg/yr NMOC threshold
 - Closed landfill defined as landfill that has submitted a closure report as specified by 40 CFR 60.38(f)
 - Comments on alternative approach to expand closed subcategory to include landfills that close within 13 months after publication of final EG
 - Existing closed landfills that are not already subject to the rule are not pulled into the new rule
 - Current closed landfills need to have proper documentation to support exemption

Tier 4 Demonstration (Optional)

- Surface emissions monitoring (SEM) demonstration to assess whether LFG system is required once NMOC > 34 Mg/yr
 - 4 consecutive quarters below 500 ppmv does not trigger GCCS install; Semi-annual testing thereafter
 - Monitor entire surface at no more than 30-meter interval path; visual observations indicate elevated concentrations of landfill gas
 - Proposes All cover penetrations & open areas
 - Proposes wind speed requirement < 5 mph avg.
 - Wind speed determined by an onsite anemometer

Tier 4 Demonstration (cont'd)

- Allows any existing landfill to demonstrate emissions below NMOC threshold to defer LFG system installation
 - Measurement at or above 500 ppmv requires GCCS installation
 - Can NOT use Tier 1, 2, or 3 if Tier 4 fails

Wellhead Operational Standards

- Monthly wellhead monitoring/recordkeeping of PTO still required
 - Maintain negative pressure
- Removal of Oxygen/Nitrogen and Temperature
 - Monthly monitoring of O₂ and Temp still required
 - Fluctuations/variations no longer require corrective action or reportable; must maintain records on-site
- Enhances landfill gas collection with operational flexibility

Surface Emissions Monitoring – Routine Events

- Proposes all penetrations and open areas must be monitored
- GPS technologies to track exceedances
 - Requiring latitude and longitude coordinates
 - Instrument accuracy of at least +/- 3 meters
 - Coordinates must be in decimal degrees with at least five decimal place
- Confusion about what is a penetration/open areas

LFG Treatment

- Treatment System Defined
 - System that filters, de-waters and compresses landfill gas for sale or beneficial end use of the gas
- Beneficial use expanded; not limited to stationary fuel combustion devices.
 - Vehicle fuels, high BTU for pipeline injection, raw material for chemical manufacturing
- Site-specific treatment monitoring plan required
 - Monitoring parameters, methods, frequency and operating ranges based on manufacturers recommendations or engineering analysis for intended use of treated gas

LFG Treatment (cont'd)

- Beneficial use dictates level of treatment; reflected in site-specific Monitoring Plan
- Site-specific Monitoring Plan requires agency approval via Design Plan
- Treated gas is not subject to landfill NSPS/EG control requirements for the end user's equipment

Startup Shutdown and Malfunction (SSM)

- EPA is proposing standards apply at all times, including periods of startup shutdown and malfunction.
 - Propose to remove 5-day and 1-hour downtime limitations
 - Close valves/stop gas mover within 1-hour of shutdown
- Focus on malfunction of the GCCS and monitoring equipment
- Recent NSPS/NESHAPs rulemakings indicate EPA has tailored SSM to address continuous operations (i.e., alternative emission limits, work practice standards)

Decommissioning/Removing GCCS

- Alternative Criteria for LFG System Removal
 - Landfill is closed or an area of an active landfill is closed
 - GCCS has operated for at least 15 years or demonstrate unable to operate due to declining flows
 - Demonstrate 4 consecutive SEM quarters below 500 ppmv
 - 1% NMOC emissions criteria not changed
- Demonstration allows operational flexibility to address low producing sections

GCCS Design Plan

- GCCS Design Plan
 - Revise within 90 days of expanding operations to an area not covered by previously approved plan
 - Prior to installing or expanding the gas collection system in a manner other than one described in a previously approved design plan
 - Requesting comment on third party certification program to supplement or replace EPA/State review & approval

No Change to BSER

- BSER = Best System of Emission Reduction
 - Open/Non-enclosed flares still allowed
- BMP's (e.g., well dewatering, well bore seals, organics diversion, etc.)
 - Not considered BSER
 - BMPs are not a one size fits all
 - BMPs are encouraged where feasible

Electronic Reporting

- Propose e-reporting for performance tests, NMOC reports and annual reports
 - Will apply to methods/reports supported by the Electronic Reporting Tool (ERT)
 - Maintain only electronic copies of the records to satisfy federal recordkeeping requirements
- Implementation:
 - Requires EPA to develop new procedures and tools to support electronic submittals
 - Requires sites to periodically monitor ERT website for new reporting tools/requirements
 - Emission factors updated periodically

Alternative Timelines

- —

2015 Request for Comments

- EPA seeking comments on the following topics:
 - Organics Diversion
 - Wet Landfills
 - Monitoring wellhead flow rate
 - Alternative Timeline Notification
 - SEM California LMR approach (25 foot spacing and integrated sampling at 25 ppmv)
- The EPA will have the ability to add additional provisions into the final version of the rule based on the information submitted as a part of these requests, depriving the industry of the ability to comment directly on any new rule language.

Implementation Schedule

- 60-day comment period ends October 26, 2015
- Anticipate final NSPS/EG rule July 2016
- NSPS (Subpart XXX) will be final and effective
- For EG (Subpart Cf) States have 9 months to submit Plans to EPA
- EPA then has 4 months to review and approve
- Waiting on EPA to propose Federal Plan

Air Quality and GHG Impacts for Organic Waste Diversion Options

- Goal is to summarize and quantitatively compare different organic waste management options
 - Landfilling
 - With and Without Energy Recovery
 - Composting
 - Open Windrows and Aerated Static Piles (ASP)
 - Organic waste as alternative daily cover (ADC)
 - Anaerobic digestion
 - Direct Combustion (aka Biomass to energy)
- –

Landfill, LFGE, and ADC

- Organic material decomposes anaerobically to create landfill gas (LFG)
 - Contains methane, a greenhouse gas (GHG)
 - Emits volatile organic compounds (VOCs)
- Regulation requires capture of LFG at many landfills
 - Reduces methane and VOC emissions
 - Collection efficiency varies from site-to-site
 - Combustion pollutant emissions
- Organics sometimes used as ADC at landfills.
 - Considered waste diversion in some states.
 - Still generates LFG, but increases methane oxidation in the landfill cover.

Composting

- Considered environmentally beneficial to manage green waste and other organics
 - Doesn't result in LFG and associated methane
 - Wasn't thought to generate VOCs (or GHG)
- Emissions historically not a concern (no air permit)
- Recent testing has shown VOC and other emissions are greater than previously thought
 - Methane and N_2O also found
 - But there is a lot of uncertainty relative to best emission factors to use
- Some agencies have rules for green waste/co-compost and established emission factors

Anaerobic Digestion

- Uncommon practice in United States but seen as environmentally friendly
 - Interest growing and may prove integral to meeting diversion goals
 - Generates methane, but has high capture and control rate; higher combustion emissions
 - Uses captured methane to generate electricity or other energy
 - Produces solid residual that can be composted or used as soil amendment
 - Requires extensive pre-processing of waste

Direct Combustion

- Good GHG profile because of no significant methane generation
 - CO₂ from organic waste is biogenic
- Significant source of most other pollutants, including CO, NO_x, SO_x, and particulate
 - Stack treatment of gas will be required by air agencies
 - Emissions can still be significant after treatment
- Creates residual ash that must be managed
- Hard to permit; NIMBY issues

Quantitative Comparison - Inputs

- 1,000,000 tons of organic waste managed by each strategy
- Biogenic CO₂ not included for any strategy
- All calculations assume a mixture of 85% greenwaste, 15% foodwaste, except as noted
- Emissions calculated over the entire waste management lifecycle
- Indirect benefit for electricity generation from LFG/biogas included in analysis

Quantitative Comparison - Inputs

- Indirect benefit from compost use per 2011 CARB compost methodology
- Biogas to energy based on typical engine specifications
- Composting emissions taken from data used to develop SJVAPCD and SCAQMD emission factors and rules
- Anaerobic digestion scenario does not assume complete digestion and may leave residual for composting or landfilling

Quantitative Comparison

Organics Scenario		Direct GHG	Power Gen. Offset	Overall GHG Profile			CO	NO _x	VOCs
				(no seq.)	Carbon Storage	(with seq.)			
		MTCO _{2e}					tons		
Landfill	no capture	1,700,000	0	1,700,000	-730,000	970,000	0	0	250
	75% capture to flare	430,000	0	430,000	-730,000	-300,000	360	36	70
	75% capture to engines	430,000	-150,000 (260,000 MWhr)	280,000	-730,000	-450,000	940	1,100	70
	90% capture to flare	170,000	0	170,000	-730,000	-560,000	430	14	30
	90% capture to engines	170,000	-170,000 (310,000 MWhr)	0	-730,000	-730,000	1,100	1,500	76
Landfilled as ADC -75% capture to flare		410,000	0	410,000	-730,000	-280,000	360	36	70

Quantitative Comparison (cont.)

Organics Scenario		Direct GHG	Power Gen. Offset	Overall GHG Profile			CO	NOx	VOCs
				(no seq.)	Carbon Storage	(with seq.)			
		MTCO _{2e}					tons		
Compost	no control	6,000	0	6,000	-	-	0	0	2,900
	finished compost cover, 54% control	6,000	0	6,000	-	-	0	0	1,300
	enclosed ASP, 90% control	6,000	0	6,000	-	-	0	0	290
	foodwaste Ag-Bag	6,000	0	6,000	-	-	0	0	19,000
	foodwaste with Compostex	6,000	0	6,000	-	-	0	0	13,000
	foodwaste with 90% control	6,000	0	6,000	-	-	0	0	870
Anaerobic Digester		1,900	-110,000 (190,000 MWhr)	-110,000	99,000	-210,000	1,000	1,300	Low
Direct Combustion		0	-505,000 (900,000 MWhr)	-505,000	0	-505,000	4,600	1,700	130

Conclusions

- Landfill emissions are highly dependent on presence and level of LFG collection/control
 - No LFG capture has worst GHG profile
 - 90% capture/energy recovery has best GHG profile next to composting
- Energy recovery improves GHG profile but increases other emissions (e.g., NO_x, CO)
- Carbon is permanently sequestered in the landfill and with composting for all scenarios
- ADC does not increase emissions but increases oxidation of methane in the landfill surface

Conclusions

- Composting has highest VOC emission rate when uncontrolled, much better controlled
 - Higher with food waste
- Composting has largest GHG benefit, but factor includes indirect benefits
- Combustion has strong GHG profile before sequestration is considered
- Direct combustion has highest criteria pollutant emission rates

Conclusions

- There is no “silver bullet” waste management option for organics
 - Each has pros and cons
- Some “green” solutions have significant emissions
 - But controls are available (with added cost)
- Some options may not be feasible in all locations
 - Some are cost prohibitive
 - Some require access to power grid
 - Some require a steady supply and/or source-separated feedstock
- Don't forget about transportation impacts/benefits

CALMIM LFG Model

- California Landfill Methane Inventory Model
- Inputs
 - Site location, surface area, thickness, texture of cover, area of LFG system coverage
- Embedded USDA climate models
- Soil gas transport
- Variable methane oxidation rates
- Outputs
 - Methane emissions for each cover with and without oxidation

AP-42 Updates

- AP-42 Section 13.5 Flares
 - Finalized April 2015
 - Maintained NO_x factor at 0.068 lb./MM BTU
 - Reduced CO factor slightly to 0.31 lb./MM BTU
- AP-42 Section 2.4 Landfills
 - No news on draft section
 - Citing draft version is risky
 - If you want to use something from draft section, use EPA testing studies instead

Ozone NAAQS

- Ground level Ozone created by chemical reaction between VOC and NO_x in presence of sunlight
- Standard set to protect public health and welfare
- 2008 standard = 75 ppb
- Ozone NAAQS Final Rule – 10/1/15
- Reduced standard to 70 ppb
- Solid waste facilities emit VOC and Nox

Action Items

- Review information submitted to address EPA's request regarding both NSPS and EG Proposed Rules
- Prepare for more stringent Air Quality regulations governing LFG emissions

