Tier 4 Surface Emissions Monitoring Process and Issues

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INTRODUCTION

Since the original New Source Performance Standards (NSPS) and Emission Guidelines (EG) for landfills [40 Code of Federal Regulations (CFR) Part 60, Subparts WWW and Cc], were first promulgated in 1996, the landfill industry has significantly evolved in its ability to collect and control landfill gas (LFG) emissions. The landfill industry has also become adept at monitoring LFG emissions and using monitoring data to better design and operate LFG collection and control (GCCS) systems.

In 2016, the United States Environmental Protection Agency (EPA) promulgated new NSPS and EG rules, which lowered the non-methane organic compound (NMOC) threshold at which a GCCS is required from 50 Megagrams per year (Mg/year) to 34 Mg/year (except for designated closed subcategory landfills) and created a new method to avoid or delay the installation of a GCCS under the new NSPS/EG called a Tier 4. These rulemakings were published on August 29, 2016 and include the Emissions Guidelines and Compliance Times for Municipal Solid Waste Landfills (New EG) under 40 CFR Part 60, Subpart Cf and the Standards of Performance for Municipal Solid Waste Landfills at 40 CFR 60, Subpart XXX (New NSPS).

The original three tiers of the applicability process (Tiers 1, 2, and 3) remain the same in both sets of rules, and involve various methods of estimating NMOC emissions for comparison to the triggering thresholds. The new Tier 4 process requires the completion of four quarters of instantaneous surface emission monitoring (SEM) with no exceedance of the 500 parts per million by volume (ppmv) threshold, measured as methane, followed by an annual report, and then ongoing quarterly SEM with no exceedances for active sites. If the site has a single exceedance over 500 ppmv as methane, or the Site's NMOC emissions exceed 50 Mg/year, the Site will be required to install a GCCS and achieve full compliance with the NSPS/EG.

This paper will detail the Tier 4 process and the potential issues that have arisen from conducting a Tier 4. This paper will also assess potential Tier 4 sites, exceedance reporting, wind monitoring, additional SEM equipment requirements, penetration monitoring, notification and reporting requirements, and impacts on solid waste landfills that will use the Tier 4 SEM procedure for delaying GCCS requirements. This paper will also go over the changes between the draft NSPS and the final version of the new NSPS that was promulgated.

POTENTIAL TIER 4 SITES

The Tier 4 methodology will allow existing landfills with NMOC emission greater than 34 Mg/year but less than 50 Mg/year to test out of the regulatory requirements of installing a GCCS, however, any reading at or above 500 ppmv as methane (with no corrective actions allowed) requires GCCS installation. Once a Tier 4 is attempted, a landfill cannot go back to one of the other testing methods (Tier 1, 2, or 3) if the Tier 4 SEM monitoring fails. Landfills with and without existing GCCSs can use Tier 4 to test out of requirements. Landfills with a GCCS, which is not required by the NSPS/EG, are required to have operated for 6,570 out of 8,760 hours preceding the Tier 4 SEM demonstration and operate under normal conditions to collect and control as much LFG as possible during any Tier 4 testing.

Between the draft (2015) and final NSPS (2016), the rule changed to include the upper bound 50 Mg limit on NMOC emissions. Sites that are generally good candidates for using the Tier 4 methodology, have NMOC emissions rates over 34 Mg/year and under 50 Mg/year with no SEM exceedances over 500 ppmv as methane, but subsequently exceed 50 Mg/year after starting the Tier 4 methodology are required to install a GCCS due to the regulatory requirement. So even though these sites demonstrated that GCCSs are not needed based on SEM results, which is also the primary compliance requirement once they are subject to the rule, are still required to install a GCCS and fully comply with the rule. In most cases, these sites are generating very little LFG, hence the reason they can comply with the SEM requirements without a GCCS. Yet once one is required to be installed, they find it collects very little LFG and is plagued with operational issues due to the lack of available LFG (e.g. oversized equipment, must operate on a timer only when gas available for combustion, difficult to comply with NSPS/EG operational criteria, etc.).

When calculating a site's NMOC emission rate, the EPA Landfill Gas Emissions Model, Version 3.02 (LandGEM) is used with NSPS defaults for certain parameters, which does not allow to accurately incorporate site actual conditions into the model. For instance, many sites in dry climates or low-gas producing landfills fall into this category, where the site exceeds 50 Mg and has no SEM exceedances, but are required to install GCCSs due to the LandGEM model over predicting NMOC emissions. This creates a scenario where an expensive GCCS is not needed to control LFG but is built and operated intermittently only to satisfy regulatory requirements. EPA did not consider these issues when they placed the upper bound limit on NMOC emissions.

EXCEEDANCE REPORTING

The new Tier 4 methodology requires SEM to include the entire landfill surface with a serpentine path at no more than a 30-meter interval; visual observations to indicate elevated concertation of LFG and specific monitoring of the identified areas, and monitoring all cover penetrations and open areas. If a single exceedance over 500 ppmv as methane is detected, the landfill fails the Tier 4 and will be required to submit a GCCS design plan within 1 year of the first exceedances of 500 ppmv as methane according to 40 CFR Section 60.767(c), and install and operate a GCCS according to 40 CFR Section 60.762(b)(2)(ii) and (iii) within 30 months of the most recent NMOC emissions rate report.

This is extremely stringent requirement, especially with the addition of all penetrations to the landfill cover and open areas of the cover. Landfills can have extremely large surfaces with hundreds of acres. The SEM monitoring devices can take readings every several seconds, resulting in thousands and even tens of thousands of individual methane readings during each monitoring event. Therefore, one exceedance could represent a less than 0.01% failure rate, which would cause failure of the Tier 4. This could represent small crack in the cover, which could be easily fixed by placing soil on the area.

For comparison purposes, under the California Air Resource Board's (CARB's) AB 32 Landfill Methane Rule (California LMR), landfills are allowed to reduce the stringency of SEM monitoring by showing four quarters of monitoring events with no exceedances. However, in subsequent monitoring under the reduced requirement, the landfill is allowed to remediate any exceedances detected during the monitoring within 10-days without losing their exemption. Allowing 10-days to remediate the issue, would allow sites to check the cover integrity in a specific area and do repairs to the location to address minor exceedances. Furthermore, 10-days is only sufficient time to conduct small-scale remediation efforts, such as adding additional soil cover, but it would not allow for large-scale remediation efforts for significant LFG issues. This 10-day allowance for remediation per the California LMR was suggested to EPA; however, they chose not to implement this reasonable approach.

WIND MONITORING

The Tier 4 methodology requires the average on-site wind speed must be determined in an open area at 5-minute intervals using an on-site anemometer with a continuous recorder and data logger for the entire duration of the Tier 4 SEM event. A wind barrier is used when onsite average wind speed exceeds 4 miles per hour (mph) (2 meters per second [m/s]) or gusts exceed 10 mph. The Tier 4 SEM cannot be conducted if the average wind speed exceeds 25 mph.

The new wind thresholds discussed above, which are not required for regular SEM under the New NSPS/EG, make Tier 4 monitoring impossible at many sites and increases the cost of monitoring. It is very common for landfills to experience winds in excess of 25 mph, which would eliminate any opportunity for those sites to utilize the Tier 4 option. The California LMR, which has similar wind speed requirements, allows for site-specific exemptions due to local wind conditions. The new NSPS/EG allows no such exemptions under the Tier 4 process. Further, the Tier 4 SEM procedures require a 30-day notice prior to testing and if wind conditions are not favorable on the selected day, it may not be possible to reschedule and/or could significantly increase the cost due to the number of failed attempts. On sites with intermittent high winds, it can be impossible to provide a 30-day notice before any SEM event because changing wind conditions cannot be predicted that far in advance. EPA clearly did not think through the Tier 4 wind requirements before they promulgated the rule, and thus have created a situation where many sites simply cannot use the option because of wind conditions that are outside of their control.

ADDITIONAL SEM EQUIPMENT

During the Tier 4 SEM, concentrations of methane are monitored above the landfill surface using an organic vapor analyzer equipped with a Flame Ionization Detector (FID) or other portable device and a data logger. Monitoring is performed with a probe extension on the FID to allow the sampling inlet to be held no more than 5 centimeters of the ground surface (2 inches), as measured based on a mechanical device (such as a wheel on a pole). This is common for all SEM monitoring.

However, for the Tier 4 monitoring, latitude and longitude readings are also required to be recorded for each location of exceedance within +/- 3 meters, which requires a hand-held global positioning system (GPS) device to be used at each SEM event. The EPA is also requiring that coordinates be in decimal degrees with at least five decimal places, so only certain GPS equipment can be used. Wind speed monitoring equipment is also required, and must be constantly checked to make sure wind conditions have not changed during the event that would affect the requirements. To do this, it may be necessary for the SEM technician to carry a hand-held wind speed device. If mandated by wind speed requirements, the technician would also be required to carry a wind barrier device to shield the monitoring probe. And of course, every technician must carry a field note book to take notes, a cellular phone to communicate with their office and with site personnel, as well as appropriate health and safety equipment to allow working in a dangerous landfill environment.

EPA did not adequately consider the safety risks for the SEM technician related to all of the hand-held equipment that is necessary including the inherent risk of any work on a landfill.

PENETRATION MONITORING

Monitoring all penetrations can add significant time and cost to quarterly Tier 4 SEM events, particularly for landfills that have a significant number of penetrations. There are certain landfills with over 1000 individual penetrations, including LFG wellheads, storm water system components, utilities, fence posts, valve boxes, etc. Further, EPA did not adequately define penetrations in the NSPS/EG. EPA considers penetrations to be the largest source of surface emission exceedances; therefore are mandating they be included in any Tier 4 monitoring. EPA included this requirement even though the landfill industry supplied significant data from the California LMR program, which demonstrated that less than 5% of penetrations (a number that decreases over time) have exceedances and that monitoring every penetration during every monitoring event is not necessary. A more reasonable approach would have been to require monitoring of each penetration at least once per year.

NOTIFICATION AND REPORTING REQUIREMENTS

Prior to conducting a Tier 4 SEM, the local enforcement agency (LEA) and EPA require 30-day notifications needed per 40 CFR Section 60.767(l). In the case that a Tier 4 monitoring event is postponed (e.g. due to weather [including not meeting the wind speed requirement] as discussed above or other unforeseen reasons), the landfill will notify LEA to arrange a rescheduled Tier 4

SEM event by email or telephone no later than 48 hours before any delay or cancellation of the original test date as well as arrange a mutually agreed upon new test date.

A Tier 4 SEM report is required to be submitted annually within 30-days of completing the fourth quarter of Tier 4 SEM monitoring for that year, which demonstrates that site-specific surface methane emissions are below 500 ppmv as methane. If a single measured surface emission exceedance of 500 ppmv as methane is detected, the Tier 4 SEM report will be submitted within one year of the exceedance, and no further Tier 4 SEM monitoring will be conducted. The notification requirement is especially problematic. It is not required for standard SEM events under the NSPS/EG, and EPA had given no reason why it should be required under Tier 4. Also, trying to schedule Tier 4 events 30-days in advance is almost impossible for sites that have intermittent high winds. This just adds an unnecessary complication.

SUMMARY

The Tier 4 could be a useful tool for solid waste landfills for delaying GCCS requirements. However, the various requirements and limitation, as detailed above, reduces the viability of Tier 4 for many sites. And sites that are able to complete a Tier 4 will be faced with unnecessary costs and regulatory burdens that add little value to the process. The ongoing issues with Tier 4 have been brought to EPA's attention, and the landfill industry is hopeful that EPA will consider these concerns when they reconsider the new NSPS/EG rules in 2019 and 2020.

REFERENCES

1. Code of Federal Regulations Title 40 Part 60 Subpart WWW

2. USEPA, 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Washington, D.C.

3. Federal Register, Title 40 Part 60 Emission Guidelines, Compliance Times, and Standards of Performance for Municipal Solid Waste Landfill; Proposed Rules, 2015.

4. Federal Register, Title 40 Part 60 Emission Guidelines, Compliance Times, and Standards of Performance for Municipal Solid Waste Landfill; Final Rule.

5. Code of Federal Regulations Title 40 Part 60 Subpart XXX, Standards of Performance for Municipal Solid Waste Landfills; Proposed Rule

6. Code of Federal Regulations Title 40 Part 60 Subpart XXX, Standards of Performance for Municipal Solid Waste Landfills; Final Rule

7. Code of Federal Regulations Title 40 Part 63 Subpart AAAA, National Emission Standards for Hazardous Air Pollutants for Source Categories