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# New Sources, New Requirements, New Challenges – Air Quality & New Waste-to-Energy Capacity

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## ABSTRACT

Renewed interest in waste-to-energy (WTE) has spurred a number of plans for facility expansions, retrofits and in several cases, new facilities. Complex federal and state regulations governing stationary air pollution sources challenge projects to develop and implement a compliance strategy that meets current and emerging regulatory requirements and which consists of commercially available and technically feasible control technologies, while managing the financial viability of the project. Past experience in the WTE industry is indicative of current challenges, and the deliberate development of WTE in the United States over the last 15 years now creates challenges when technologies developed and implemented elsewhere must be considered. One example is control of nitrogen oxides. Individual projects are subject to regulatory requirements differently, with net emissions increases, location and other attributes establishing the basis for regulatory compliance. This paper will discuss the complex New Source Review permitting requirements that typically apply to WTE projects, review commercially available air pollution control technologies, and discuss, through the use of a case study, the decision-making process used to develop the air pollution control strategy for the York County Resource Recovery Center expansion, one recent development of new WTE capacity in the United States.
**Keywords:** Waste-to-energy, air quality, nonattainment, nitrogen oxides

## 1. INTRODUCTION

Newly proposed WTE facilities and expansions at existing WTE plants are subject to complex permitting requirements applicable to major sources of air pollutant emissions. These air quality permitting requirements are mandated by the federal New Source Review (NSR) regulations with the responsibility of issuing permits falling on state regulatory agencies that have federally approved programs. A primary objective of NSR is to create a permitting framework supporting compliance with the National Ambient Air Quality Standards (NAAQS) that have been established for six criteria pollutants.[1]

## 2. THE REGULATIONS

The United States Environmental Protection Agency (USEPA) tracks NAAQS compliance for each criteria pollutant by designating air quality management areas within a given state as either "attainment" if the area meets the NAAQS or "nonattainment" if the area's air quality does not meet the NAAQS. Consequently, a given geographical area may enjoy attainment status for some pollutants and be classified as nonattainment status for others. Such is the case for York County.

To address permitting of facilities in attainment and nonattainment areas, two separate permitting programs exist under NSR. Prevention of Significant Deterioration (PSD) permitting requirements apply with respect to attainment areas, while Nonattainment NSR (NNSR) requirements are applicable in areas with impaired air quality. Both NSR programs impose substantial permitting challenges.

Under PSD, applicants are required to complete air quality analyses using sophisticated atmospheric dispersion

[1] NAAQS criteria pollutants include nitrogen oxides, carbon monoxide, sulfur oxides, particulate matter, ozone and lead.

models and demonstrate that Best Available Control Technology (BACT) will be implemented to minimize air pollutant emissions. NNSR requirements are more onerous in that the Lowest Achievable Emission Rate (LAER)[2] must be achieved, normally without consideration of economic impacts, and emission offsets must be obtained. In addition to these permitting requirements, new and reconstructed municipal waste combustors (MWCs) must meet New Source Performance Standards (NSPS) as established by 40 CFR 60, Subpart Eb.

## 3. STRATEGIES FOR COMPLIANCE

To reduce air pollutant emissions and satisfy stringent air quality requirements, WTE facilities have employed various air pollution control technologies. In the United States, these control systems often include selective non-catalytic reduction (SNCR) for control of nitrogen oxides ($NO_x$), spray dryer or semi-dry absorbers (scrubbers) to reduce emissions of acid gases, carbon injection systems for control of mercury, and fabric filter baghouses for control of particulate matter. These emissions control technologies have been widely established to satisfy BACT by various permitting authorities in numerous NSR permits issued for MWCs.

Globally, WTE plants have generally used similar control systems to reduce air pollutant emissions. However, the implementation of selective catalytic reduction (SCR) technology has emerged, particularly in Europe, for enhanced $NO_x$ emissions control from MWCs. While SCR is more expensive on both a capital and operating cost basis in comparison to SNCR, this technology is able to achieve $NO_x$ reductions at levels approaching 90 percent while SNCR systems are typically capable of reducing $NO_x$ emissions by 50-60 percent.

## 4. THE CASE STUDY

The York County Resource Recovery Center (YCRRC) is a WTE facility located in south central Pennsylvania that began operations in 1989. Three MWC units currently operate, providing a total municipal solid waste processing capacity of 1,344 tons per day. In September 2008, YCRRC submitted a NSR permit application to the Pennsylvania Department of Environmental Protection for authorization to expand the facility and install a fourth MWC unit with a rated capacity of 600 tons per day.

The operation of the fourth MWC will allow the YCRRC to continue meeting the waste management needs of York County's growing population. The YCRRC expansion project is subject to unusually complex permitting requirements due to its location within the Ozone Transport Region (OTR). Permitting projects in the OTR must satisfy the same regulations as projects located in ozone Nonattainment areas. Consequently, NNSR applies thereby triggering LAER and emission offset requirements with respect to emissions of $NO_x$ (as an ozone precursor pollutant).

Further, the project is subject to PSD permitting for emissions of other pollutants including particulate matter, metals, and acid gases. To satisfy PSD obligations including BACT requirements for the new MWC, a spray dryer or semi-dry absorber, carbon injection system and a fabric filter baghouse are planned. These control systems are well established as BACT and have a long operating history in the United States for reducing emissions of a variety of air pollutants present in MWC exhaust streams.

Conversely, for $NO_x$ emissions control LAER applies as the expansion unit is a major source and because of the OTR York County is Nonattainment for $NO_x$. The evaluation of regulatory requirements, technology performance and operating data, and case law resulted in a proposed LAER limit and SCR as the control technology. This will be the first application of SCR on a MWC unit in the United States. SCR control systems have been demonstrated to be technically feasible and reliable for application to a MWC considering the successful operating experience in Europe. While the costs associated with SCR are greater than those incurred with the more ubiquitous SNCR systems, an adverse economic impact disqualifier (often used in a BACT analysis) is not valid when determining LAER under the NNSR provisions.

After careful review of SCR operating experience including site visits to three European WTE plants and consideration of potential operational impacts including energy loss, the project team determined that SCR reliably provides top-level $NO_x$ emissions control to comply with the LAER requirement for the YCRRC expansion MWC unit.

[2] LAER is defined by 40 CFR 51.165(a)(1)(xiii) as "the more stringent rate of emissions based on the following: (A) The most stringent emissions limitation which is contained in the implementation plan of any State for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or (B) The most stringent emissions limitation which is achieved in practice by such class or category of stationary sources."