Report

Onondaga County
Resource Recovery Facility

NYSDEC Part 360 Permit ID No. 7-3142-00028/00011
Title V Air Permit ID No. 7-3142-00028/00009

Annual Report of Facility Performance
Operating Year 2011

Onondaga County
Resource Recovery Agency

WWW.OCRRA.ORG

May 2012

Prepared by: ***Amy K. Miller, P.E.***
Agency Engineer, OCRRA

Table of Contents

Section 1 – Introduction **3**
Section 2 – 2011 Highlights **5**
Section 3 – Operational Performance **7**
3.1 Summary of Operations 7
3.2 Refuse Processed 8
3.3 Steam Generated 11
3.4 Electricity Production 11
3.5 Ash Residue Generation 13
3.6 Metal Recovery 13
3.7 Boiler and Turbine-Generator Availability 14
3.8 Boiler Utilization and Steam Capacity 17
3.9 Pollution Control Reagent Consumption 18
3.10 Electricity, Natural Gas, and Water Utilization 20
3.11 Facility Inspections 20
Section 4 – Environmental Performance **22**
4.1 Summary of Environmental Performance 22
4.2 Stack Test Results 22
4.2.1 Parameters Tested Annually 24
4.2.2 Mercury 25
4.2.3 Dioxin/Furan 27
4.3 Ash Testing Results 28
4.4 Combustion versus Landfilling 29
4.5 Greenhouse Gas Emissions 32
4.6 Renewable Energy and Energy Independence 32
4.7 Preservation of Landfill Capacity and Greenfields 33
4.8 Compatibility with Recycling 33
4.9 Consistency with Waste Management Hierarchy 34
4.10 Zero Process Water Discharge and Beneficial Wastewater Reuse 34
Section 5 – Financial Performance **35**
5.1 Waste-to-Energy Facility Financial Summary 35
5.2 Waste-to-Energy Facility Operating Revenues 36
5.2.1 Tip Fee for MSW Delivered Directly to Facility 36
5.2.2 OCRRA's Electricity Share 37
5.2.3 OCRRA's Recovered Metal Share 37
5.2.4 Supplemental Waste Tip Fee 37
5.3 Waste-to-Energy Facility Operating Expenses 38
5.3.1 Operations and Maintenance Service Fee 39
5.3.2 Ash Transportation and Disposal 39
5.3.3 Excess Waste Fee 39
5.3.4 Pollution Control Reagents 39
5.3.5 Taxes/Fees 40
5.3.6 Utilities 40
5.3.7 Other Expenses 41
5.4 Bond Expenses 41
Section 6 – References **42**

Section 1 – Introduction

In the 1980s, the Onondaga County Solid Waste Management Program developed a plan to deal with the community's mounting garbage crisis. Realizing that there were no easy answers, they set out to design a safe, reliable, and cost-effective program that would serve the community's needs, at that time and into the future. They carefully analyzed the environmental impacts of different trash disposal alternatives and determined that no single method of disposal would solve the trash dilemma. Ultimately, a comprehensive, finely balanced, and integrated solid waste management system was required to manage the County's waste. The final plan consisted of four parts:

1) a waste reduction program,
2) an aggressive recycling program,
3) a state-of-the-art mass burn waste-to-energy (WTE) facility, and
4) a modern, lined landfill.

To manage this new County-wide waste management system, the County created a public authority – the Onondaga County Resource Recovery Agency (OCRRA). OCRRA would administer the County's solid waste management with a prioritization of management methods that exactly mirrored New York State's Solid Waste Management Plan: 1) waste reduction, 2) recycling, 3) recovery of useful energy through solid waste combustion (i.e., modern waste-to-energy facilities), and 4) use of permitted landfill facilities.

After a rigorous procurement process in 1988 and 1989, Ogden Martin Systems was selected to design, build, and operate the Onondaga County Resource Recovery Facility (Onondaga County WTE Facility). OCRRA entered into a service agreement with Ogden Martin Systems of Onondaga (currently Covanta Onondaga) in 1990. On December 18, 1992, with environmental permits in place and project revenue bonds totaling $178 million, formal groundbreaking ceremonies were held for the construction of the waste-to-energy facility. By late 1994 the Facility had its first official burn and by early 1995 the Facility was commercially operational.

Today, the Onondaga County WTE Facility continues to be an integral part of OCRRA's solid waste management system, or perhaps more aptly termed, OCRRA's resource recovery system. About 45% of materials that could otherwise go to the WTE Facility are source separated for recycling. The remaining non-recyclable portion goes to the WTE Facility, which uses a mass burn combustion system (and temperatures of 1800° - 2000° F) to safely and efficiently convert non-hazardous, non-recyclable trash into steam.

The steam is then used to generate electricity that is sold to National Grid, providing enough electricity for approximately 25,000-30,000 households and the Facility itself. Ferrous and non-ferrous metals that would otherwise have gone to a landfill are recovered at the WTE Facility for recycling. The by-product of the combustion process is a non-hazardous ash residue, which is about 10% of the original volume of the trash processed at the Facility. The ash residue is sent to a landfill for use as alternative daily cover.

Incorporated into the operations of the Facility is an air pollution control system, which helps the Facility comply with one of the strictest air permits in the nation, meeting federal and state emissions requirements. Emissions from the Facility are carefully monitored through a Continuous Emissions Monitoring System (CEMS) and annual stack testing.

Since its start-up in 1994 the facility's operational and environmental performance has exceeded expectations. In fact, the Facility has received several national awards and, in 2008, POWER Magazine ranked the Onondaga WTE Facility as one of the top five renewable energy facilities. By generating power for use by homes and businesses, the Onondaga County WTE Facility offsets the burning of fossil fuels by using an alternative, domestically-generated fuel: non-recyclable solid waste.

This report presents a summary of operational, environmental, and financial performance of the Onondaga County WTE Facility, located at 5801 Rock Cut Road (Town of Onondaga), Jamesville, New York for calendar year 2011. The Facility operates in accordance with NYSDEC Part 360 Permit ID No. 7-3142-00028/00011 (issued 8/8/11) and NYSDEC Title V Air Permit ID No. 7-3142-00028/00009 (issued 8/8/11). 2011 was the 17th full year of Facility operation since initial start-up on November 10, 1994. Commercial operation began on February 25, 1995.

The report is organized as follows:

- Section 2 of the report presents an Executive Summary.
- Section 3 presents a summary of the Facility’s operational performance.
- Section 4 presents a summary of the Facility’s environmental performance.
- Section 5 presents a summary of the Facility’s financial performance.
- Section 6 provides a list of references.

2011 Overview

- OCRRA's system is exceptionally consistent with the New York State and U.S. Environmental Protection Agency waste management hierarchy, which includes (in order of preference): 1) waste reduction, 2) recycling, 3) recovery of useful energy through solid waste combustion (i.e., modern waste-to-energy facilities), and 4) use of permitted landfill facilities.

- In 2011, trash tonnage slightly rebounded in conjunction with the nation's slow economic recovery. The Facility processed 326,782 tons, which was 4% higher than the 2010 tonnage but still about 6% below historical levels. Due to abundant natural gas supplies, electricity rates averaged a mere 4.0¢ per kilowatt hour (kWh). On a positive note, the Facility's operational and environmental performance remained strong and consistent with historical performance.

- In August 2011, the Facility received approval from the New York State Department of Environmental Conservation to initiate a program to beneficially reuse a wastewater stream that was previously being hauled 75 additional miles to a wastewater treatment facility. The wastewater stream is beneficially reused in the scrubber and ash conditioning systems in place of purchased potable water. This program provides significant environmental and financial benefits.

2011 Operational Performance

- The Facility has been for the past 17 years, and continues to be, well operated and maintained by Covanta Onondaga.

- The Facility processed 326,782 tons of non-hazardous, non-recyclable trash (enough to overfill the Syracuse Carrier Dome) or 90% of capacity and, in doing so, generated 235,455 megawatt hours (MWh) – enough electricity to power approximately 25,000-30,000 homes, as well as the Facility itself.

- The Facility had a net electricity production of 631 kWh per ton of refuse processed. This rate nearly equivalent to the Facility's 17-year average of 629 kWh/ton.

- In 2011, the Facility's metal recovery systems recovered about 8,500 tons of metal for recycling.

- Overall boiler availability for 2011 was 92.0%. This value reflects less downtime for scheduled maintenance and equipment malfunctions than the historical Facility average.

- Turbine-generator availability was very high at 99.8%, due to a thorough and detailed inspection of the turbine-generator system in 2010; the second major overall since Facility start-up.

2011 Environmental Performance

- The 2011 annual stack testing results indicate that the Facility is performing strongly. All parameters met the corresponding air permit limits, and most were significantly below the permit limit.

- Levels of mercury in the incoming waste stream continue to trend downward, indicating that OCRRA's mercury removal programs are effective. Furthermore, the Facility demonstrates high mercury removal efficiency. Mercury emissions from the Facility were 8.5% of the permit limit.

- In 2011, the estimated annual total dioxin toxic equivalence (TEQ) emissions were 0.00009 lbs (90 millionths of a pound) – an amount equivalent to 3% of the weight of a standard paper clip. Dioxin/furan emissions from the Facility were 5-6% of the permit limit.

- By sending the community's non-recyclable trash to the WTE Facility, rather than to a landfill, greenhouse gas emissions are avoided. As a general rule of thumb, approximately 1 ton of trash processed prevents 1 ton of carbon dioxide emissions. So in 2011, the WTE Facility avoided 326,782 tons of carbon dioxide emissions, which is the equivalent of taking about 58,000 cars off the road.

- The WTE Facility utilizes a locally-generated feedstock – the community's non-recyclable trash to generate a significant amount of electricity; this not only reduces dependence on fossil fuels, it also achieves goals of energy independence. In 2011, the WTE Facility generated enough energy to displace 325,000 barrels of oil or 80,000 tons of coal – enough energy to satisfy the needs of approximately 25,000-30,000 homes in OCRRA's service area.

- With one of the highest recycling rates in New York State, Onondaga County demonstrates that WTE and recycling are highly compatible; it also supports many studies that have concluded communities with WTE facilities often have higher rates of recycling.

- In 2011, all ash residue from the Facility was used as alternative daily cover at the landfill. This beneficial use of the ash ultimately means that other materials, such as clean soil, do not need to be used for daily cover at the landfill.

2011 Financial Performance

- Due to the slow economic recovery, trash tonnage was still down about 6% from historical levels and electricity rates remained low due to abundant natural gas supplies and low natural gas prices. As a result, OCRRA's 2011 Facility-related expenses were $952,000 more than Facility revenues. Total operating revenues were approximately $25.481 million and total (operating and bond) expenses were $26.433 million. As evident, WTE facilities like the local Facility have tremendous fixed costs. If those fixed costs are not offset by sufficient electricity revenue and tipping fees, there may be facility-related net losses, as in 2009, 2010, and 2011.

Section 3 – Operational Performance

3.1 Summary of Operations

Based on the 2011 operating data, overall Facility operations continued at high levels for the 17th year of continuous operation. The Facility processed 326,782 tons of municipal solid waste (MSW), 90% of the Facility's permitted throughput limit of 361,350 tons. Overall boiler availability for 2011 was 92.0%, which is higher than the 17-year Facility average of 91.4%. Turbine-generator availability was very high at 99.8% due to a thorough and detailed inspection of the turbine-generator system in 2010 (the second major overall since Facility start-up).

The average higher heating value (HHV) of waste processed in 2011 was 5,329 British thermal units per pound (Btu/lb). The 2011 HHV, which indicates the energy embodied in the incoming waste stream, was slightly below the Facility's 17-year average (1995-2011) average HHV of 5,374 Btu/lb. The Facility had a net electricity production of 631 kilowatt-hours per ton of refuse processed (kWh/ton). This rate is just about equivalent to the Facility's 17-year average of 629 kWh/ton.

In 2011, the WTE Facility generated 79,864 tons of combined ash residue, which were hauled by OCRRA to Seneca Meadows Landfill in Waterloo, NY (Jan.-May) and to High Acres Landfill in Fairport, NY (June-Dec). Based on the waste tonnage processed, this amount of ash was 24.4%; therefore the Facility reduced the weight of the refuse by over 75%. The 2011 ash ratio is significantly lower than the 17-year Facility average of 25.6%. For all of 2011, ash residue from the Facility was used as alternative daily cover at the landfill. This beneficial use of the ash ultimately means that other materials, such as clean soil, do not need to be used for daily cover at the landfill.

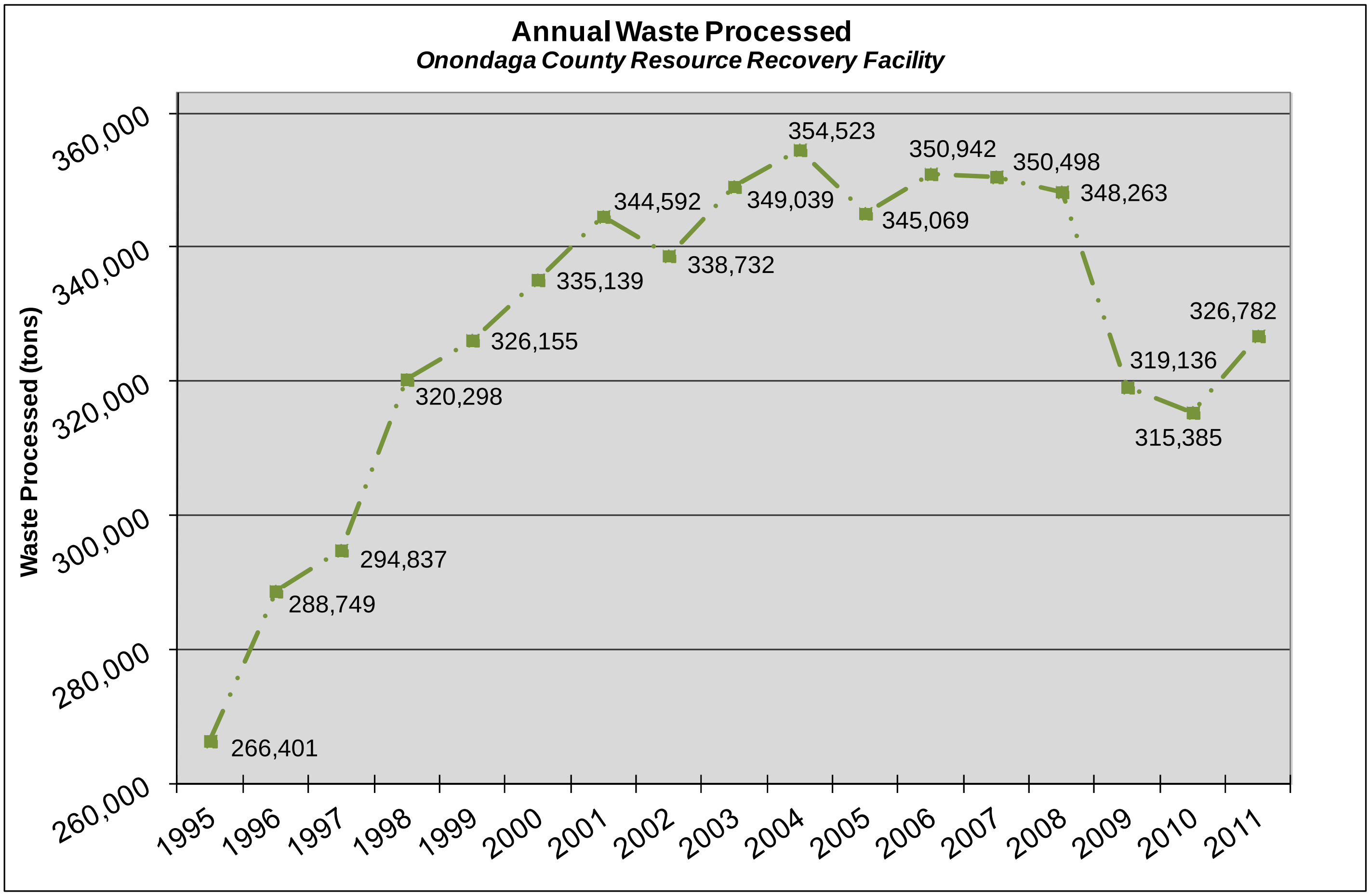
In 2011, the Facility recovered approximately 8,102 tons of ferrous metal, or 2.48% of the refuse processed, for shipment to recycling markets. The non-ferrous metal recovery system, which uses an eddy-current separator, recovered 472 tons of material, of which 344 tons were deemed to be non-ferrous metal – about 0.11% of the refuse processed.

In 2011, the average boiler utilization was 93.5%, indicating that while the boilers were operational, they operated at slightly less than full design levels (due to low trash tonnage). Whenever the boilers are operated at less than full capacity, their efficiency and, therefore steam production, drops. Often times, when there is not enough trash to run all three units at full capacity, one unit is taken offline so that the other units may be operated at full capacity, thereby still maximizing boiler utilization. However, it is not ideal to bring units online and offline too frequently. Another term, steam capacity, is also used to compare boiler utilization, and is defined as the ratio of actual steam to the maximum amount of steam that could be generated if the unit were running full time. For 2011, the Facility's average steam capacity was 80.4%.

3.2 Refuse Processed

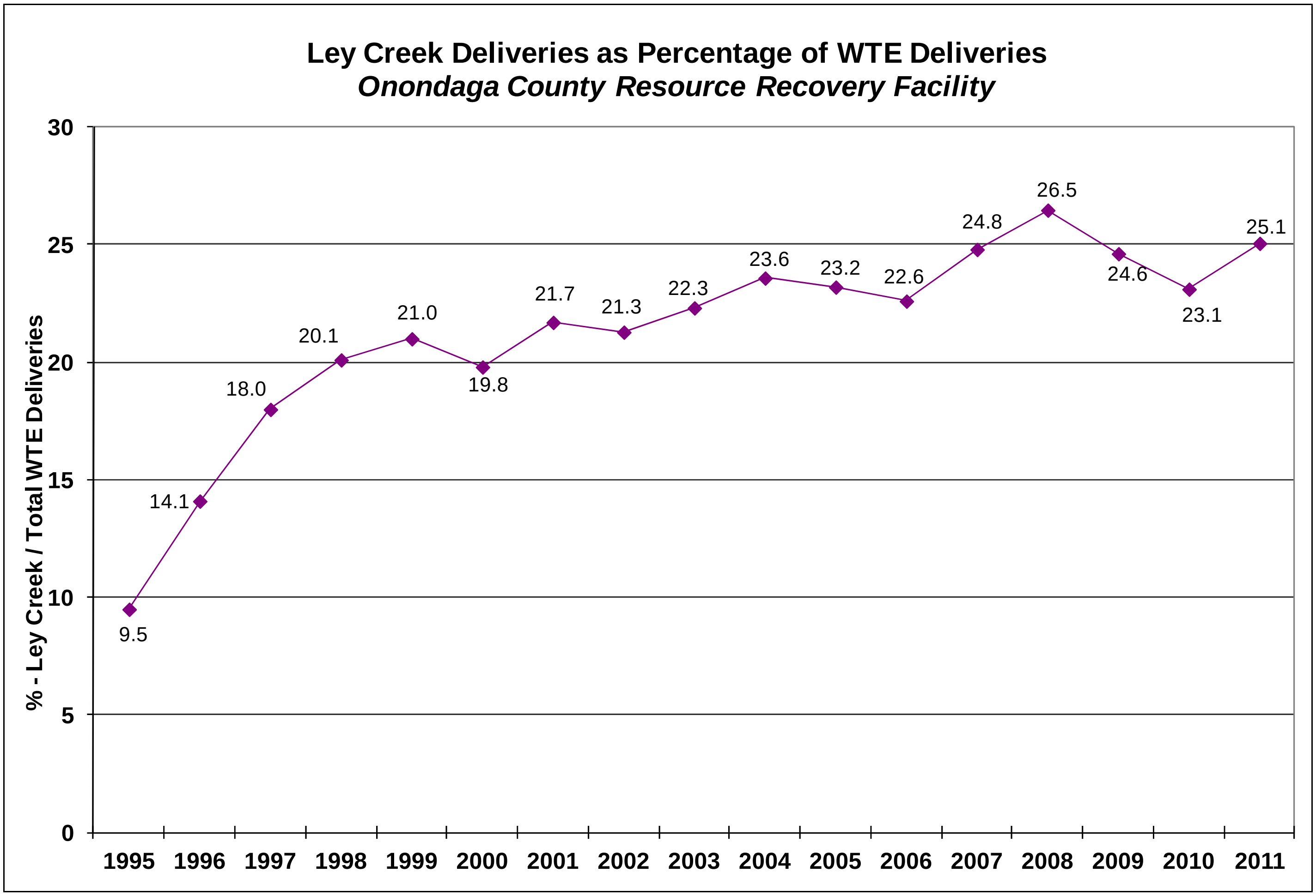
The WTE Facility received 327,412 tons of refuse during 2011, or 96.6% of OCRRA's total non-recyclable waste tonnage. Only 14 tons, or less than 0.004% of the incoming waste stream, were rejected from the Facility as non-processable waste. Taking into consideration the refuse received and the beginning and ending refuse pit inventory, 326,782 tons of solid waste were processed in 2011. This represents 90.4% of the Facility's permitted throughput limit of 361,350 tons, leaving 34,568 tons of unused processing capacity.

In 2011, trash tonnage slightly rebounded in conjunction with the nation's slow economic recovery. The Facility processed 326,782 tons, which was 4% higher than the 2010 tonnage but still about 6% below historical levels. The figure below shows the historical annual waste processed at the Facility.

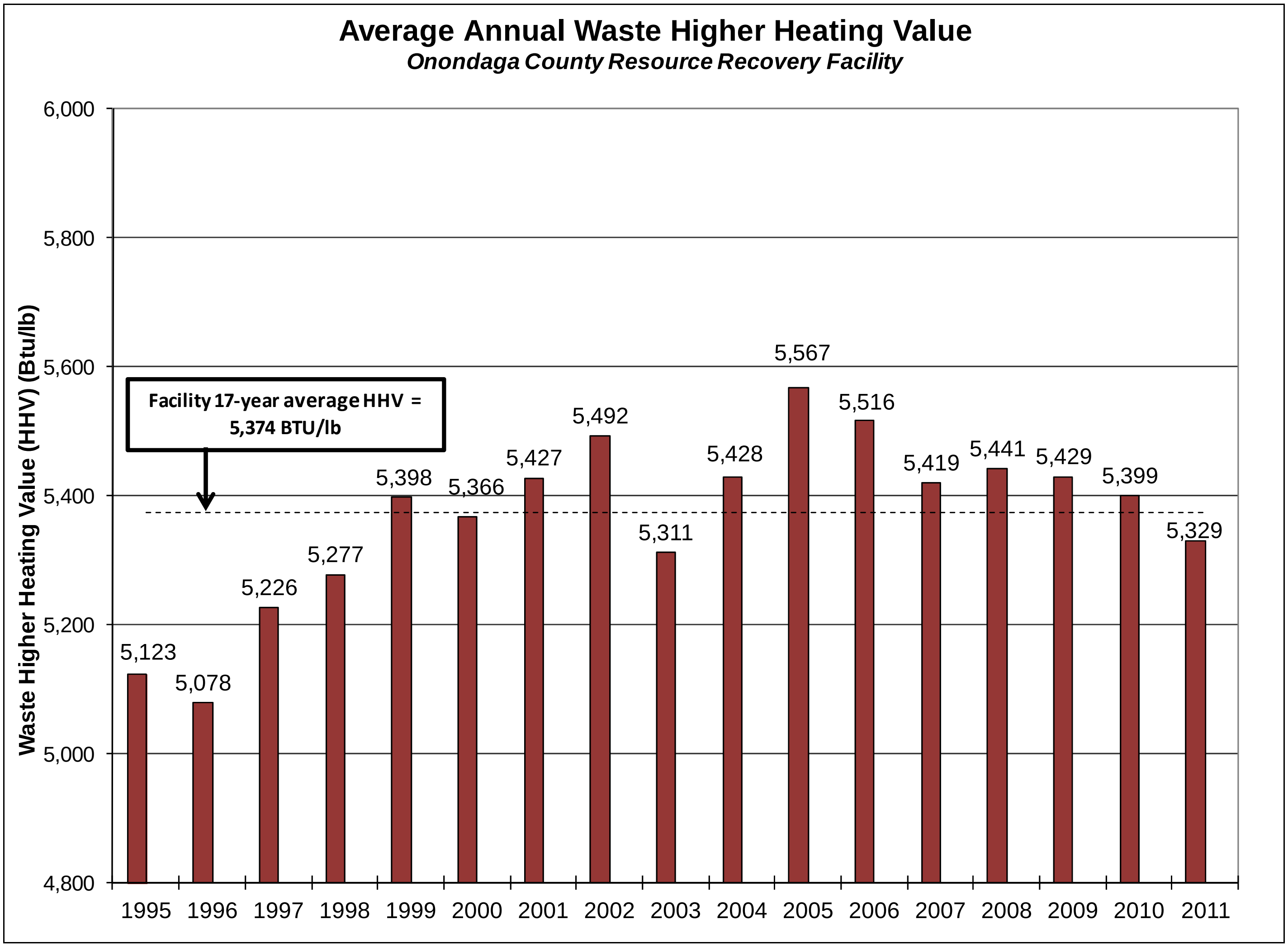


The refuse delivered to the Facility consists primarily of MSW and processable construction and demolition debris (C&D), including roofing. Licensed haulers collect Onondaga County (with the exception of the Town and Village of Skaneateles) MSW and deliver it directly to the Facility. Direct hauler deliveries generally account for about 75% of the tonnage processed. Direct hauler deliveries accounted for 73.6% of the tonnage delivered to the plant in 2011.

In addition to direct hauler MSW deliveries, OCRRA delivers MSW and processable C&D to the Facility from the Ley Creek and Rock Cut Road transfer stations (with the majority from Ley Creek). These deliveries generally account for about 25% of the tonnage processed at the Facility. The 2011 MSW and C&D tonnage delivered to the Facility from OCRRA's transfer stations was 26.4% of the total material delivered to the plant. Ley Creek deliveries as a percentage of total deliveries are shown below.



The average higher heating value (HHV) of waste processed in 2011 was 5,329 British thermal units per pound (Btu/lb). The 2011 average HHV was just slightly below the Facility's 17-year average (1995-2011) average HHV of 5,374 Btu/lb (see figure on next page). HHV, which is mainly determined by waste composition and moisture content, is a measure of the amount of energy contained in the waste being combusted. If other boiler operating parameters remain the same, the net effect of a greater waste HHV is increased steam production and, in turn, increased electricity generation.



For comparison purposes, according to a study of 13 mass burn facilities (including the Onondaga Facility), the average HHV was about 5,200 Btu/lb for years 2003-2008 (LoRe and Oswald, 2009).

OCRRA's average HHV is likely higher for two main reasons – 1) the proportion of processable C&D materials and 2) OCRRA's high recycling rate. Other facilities may not process C&D materials, which generally have a higher heating value than MSW, and therefore, if present, tend to increase a facility's average HHV. In contrast, some recyclable materials, such as glass and metal, tend to have a low heating value. By removing these materials from the waste stream, a facility's average HHV will increase. Therefore, OCRRA's highly effective recycling program also plays a role in the Facility's higher-than-average HHV.

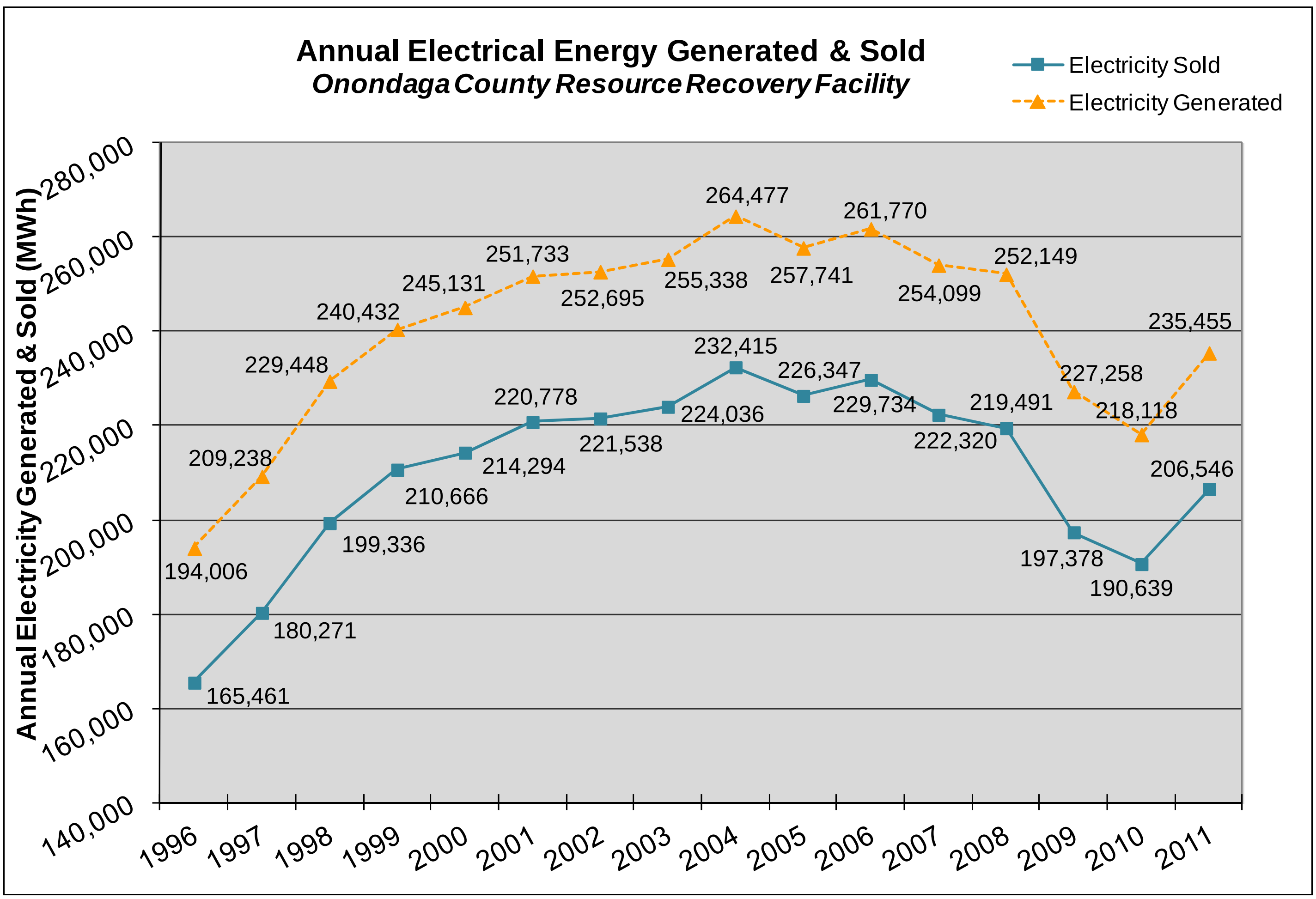
3.3 Steam Generated

Steam generated in 2011 was 2,196,620 kilopounds (klb), or 3.4 pounds of steam per pound of refuse processed. The amount of steam generated depends on the boiler efficiency and HHV of the waste being combusted. Of the total amount of steam generated, 2,119,170 klb were used by the Facility's turbine-generator for electricity production. About 5% is generally consumed for the Facility's internal needs, such as preheating combustion air and heating boiler feedwater.

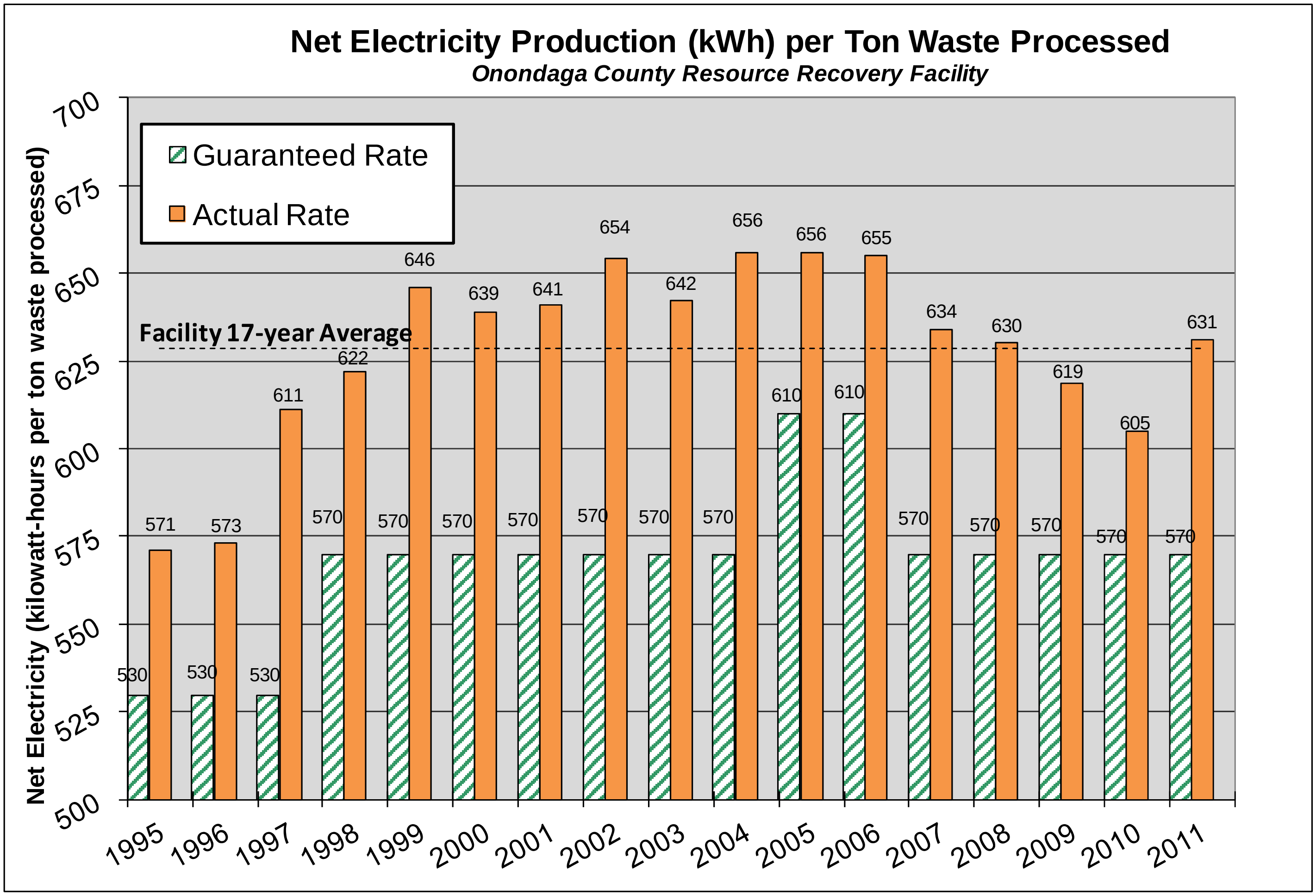
Boiler efficiency, in simplest terms, is the difference between the energy input (HHV of waste being combusted) and energy output (quantity of steam generated). Using monthly data, the 2011 overall boiler efficiency was 71.3%, a value consistent with historical levels and reported literature values.

3.4 Electricity Production

Total (gross) electricity generated for 2011 was 235,455 megawatt-hours (MWh). Of this amount, 206,546 MWh, or 87.7%, was sold to National Grid (net electricity). The balance, or 12.3%, was used for the Facility's electrical needs. The amount of electricity sold in 2011 increased by 8.3% from 2010, however it has not yet returned to historical levels (due to reduced waste generation as compared to historical waste generation).



The Facility had a net electricity production of 631 kilowatt-hours per ton of refuse processed (kWh/ton). This rate is slightly above the Facility's 17-year average of 629 kWh/ton. Furthermore, this rate exceeds the net electricity production guarantee of 570 kWh/ton (based on the average annual HHV of the waste processed, which was 5,329 Btu/lb for 2011). In their benchmarking report, LoRe and Oswald (2009) suggest an average 14-facility (including Onondaga County) net electricity production of 500 kWh/ton.

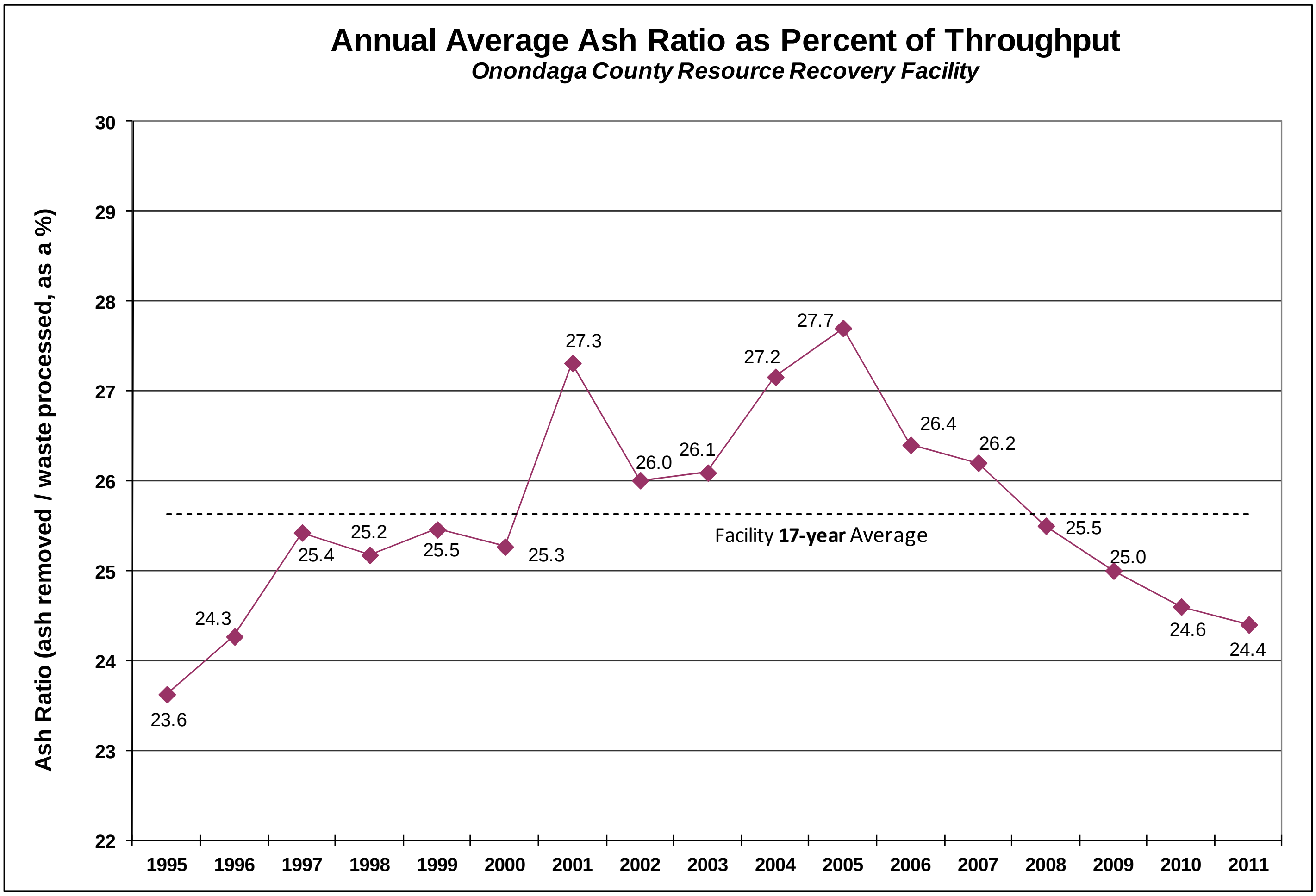


During normal Facility operation, the Facility's electrical demand is satisfied by the Facility's turbine-generator system, with the excess electricity being exported to the grid. Thus, the difference between the gross electricity produced by the turbine-generator and the net electricity sold to the grid is the Facility's electrical demand. In 2011 the Facility used an average of 90 kWh per ton of refuse. This is consistent with the Facility's long-term average, as well as that for other similar facilities. Lore and Oswald (2009) suggest a 14-facility average electricity usage of 90.4 kWh per ton.

3.5 Ash Residue Generation

In 2011, the WTE Facility generated 79,864 tons of combined ash residue, which were hauled by OCRRA to Seneca Meadows Landfill in Waterloo, NY (Jan.-May) and to High Acres Landfill in Fairport, NY (June-Dec). Based on the waste tonnage processed, this amount of ash was 24.4%; therefore the Facility reduced the weight of the refuse by over 75%. The 2011 ash ratio is significantly lower than the 17-year Facility average of 25.6% and well below the annual contractual limit of 32% (see figure below).

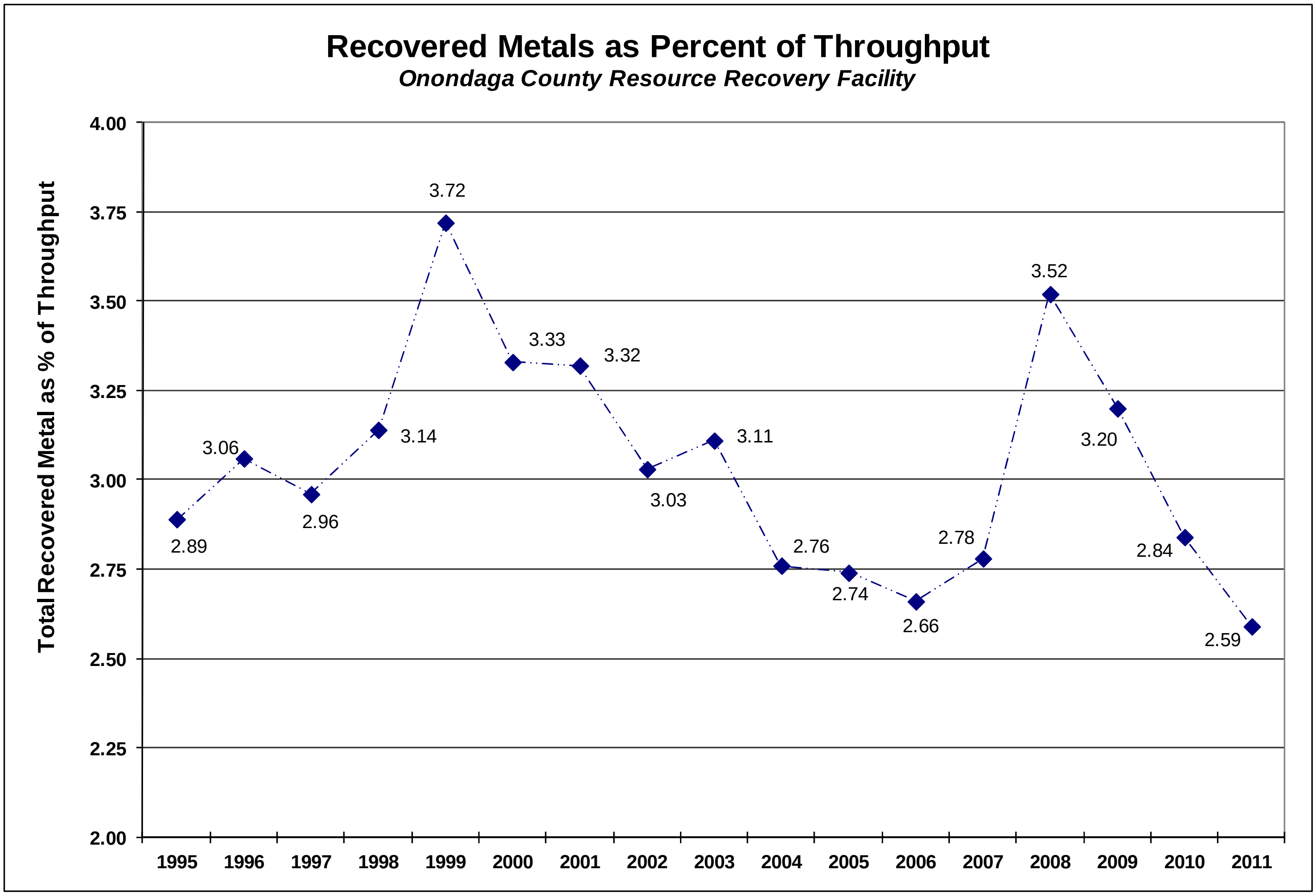
For all of 2011, ash residue from the Facility was used as alternative daily cover at the landfill. This beneficial use of the ash ultimately means that other materials, such as clean soil, do not need to be used for daily cover at the landfill.



3.6 Metal Recovery

In 2011, the Facility recovered approximately 8,102 tons of ferrous metal, or 2.48% of the refuse processed, for shipment to recycling markets. The non-ferrous metal recovery system, which uses an eddy-current separator, recovered 472 tons of material, of which 344 tons were deemed to be non-ferrous metal – about 0.11% of the refuse processed.

The following graph shows the metal recovery over the life of the Facility.



As shown, the annual quantity of recovered metal has varied over time. Recovery of metal is dependent upon the amount of metals in the incoming waste stream, as well as on the effectiveness of the Facility's metal recovery systems. With increase metal values, OCRRA is seeing less metal in the incoming waste stream.

3.7 Boiler and Turbine-Generator Availability

Though the boilers and turbine-generator are designed to operate 24 hours a day, 365 days per year, a WTE facility cannot realistically achieve 100% boiler availability because of necessary routine and periodic maintenance. Boiler and turbine-generator availability are generally defined as the percentage of hours that the boiler/turbine-generator is available for operation, taking into account downtime related to scheduled and unscheduled maintenance. Downtime related to low refuse deliveries is not generally counted against availability. This is consistent with industry standards (LoRe and Oswald, 2009).

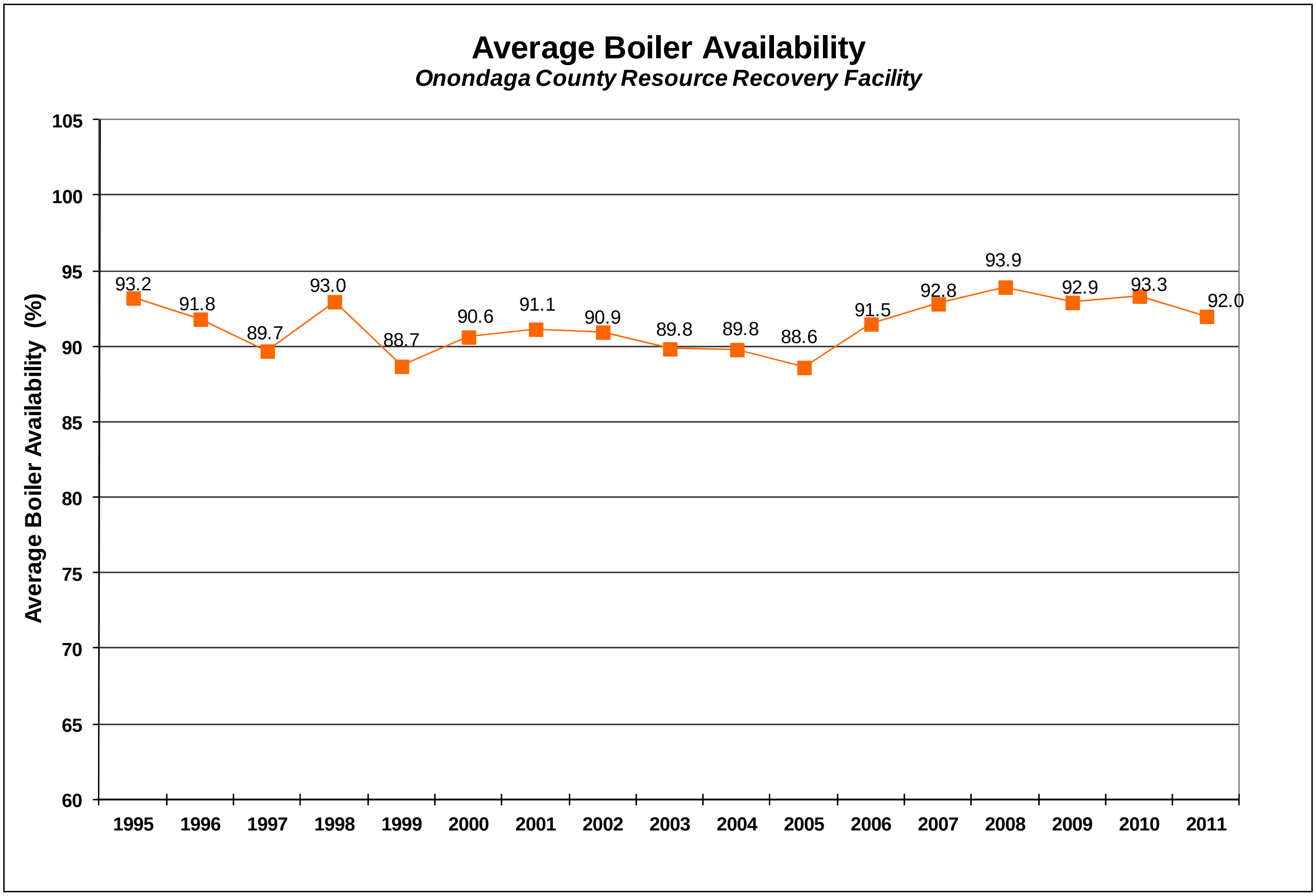
Facility boiler and turbine-generator availability are reported monthly and annually. 2011 availability information is presented below:

	Boiler Unit #1	Boiler Unit #2	Boiler Unit #3	Turbine/Generator
Total Scheduled Downtime (hr)	459.1	857.0	442.8	0.0
Total Unscheduled Downtime (hr)	177.4	0.0	168.7	21.0
Total Downtime (hr)	636.5	857.0	611.5	21.0
Total Downtime (days)	26.5	35.7	25.5	0.9
Availability (%)	92.8	90.2	93.0	99.8

Overall average boiler availability for 2011 was 92.0%, which is consistent with the Facility's 17-year (1995-2011) average of 91.4%. The 2011 average boiler availability reflects minimal downtime for scheduled boiler maintenance and equipment malfunctions. For comparative purposes, Covanta reported that their domestic WTE facilities had an average boiler availability of 91.7% for 2011 (Covanta, 2012) and LoRe and Oswald (2009) suggest a 15-facility average (including Onondaga County) of 90.3%.

Covanta has historically performed, and continues to perform, necessary boiler maintenance consistent with industry standards. Performing preventative maintenance remains critically important in prolonging the useful life of the boiler; replacing and repairing worn components prevents unscheduled downtime, thereby increasing boiler availability. Scheduled maintenance accounted for 72%, 100%, and 72% of downtime for Unit 1, 2, and 3, respectively. Unscheduled boiler downtime in 2011 (on Units 1 and 3) resulted mainly from furnace waterwall tube leaks and broken grate bars.

The figure on the next page shows the Facility's historical average boiler availability. The table on the following page presents a summary of historical scheduled and unscheduled total boiler downtime.



Historical Boiler Operating Data (total hours for three boilers)

Year	Scheduled Maintenance (hours)	Unscheduled Maintenance (hours)	Total Maintenance (hours)	Total Maintenance Downtime* (%)	Downtime due to low trash deliveries (hours)	Low Trash Downtime* (%)	Total Downtime (hours)	Total Downtime* (%)
1996	1,964	196	2,160	8.2	6,954	26.5	9,114	34.7
1997	2,124	586	2710	10.3	5,985	22.7	8,695	33.0
1998	1,262	588	1850	7.0	3,541	13.5	5,391	20.5
1999	1,873	1,101	2974	11.3	3,585	13.6	6,559	25.0
2000	1,728	745	2473	9.4	1,652	6.3	4,125	15.7
2001	1,991	338	2329	8.9	2,011	7.6	4,340	16.5
2002	1,998	383	2381	9.1	1,052	4.0	3,433	13.1
2003	1,958	714	2672	10.2	1,034	3.9	3,706	14.1
2004	1,954	738	2692	10.2	777	3.0	3,469	13.2
2005	2,373	790	3163	12.0	218	0.8	3,381	12.8
2006	1,688	551	2239	8.5	171	0.7	2,410	9.2
2007	1,321	565	1886	7.2	151	0.6	2,037	7.8
2008	1,337	264	1,601	6.1	920	3.5	2,521	9.6
2009	1,546	318	1,864	7.1	1,859	7.1	3,723	14.2
2010	1,453	299	1,752	6.7	2,978	11.3	4,730	18.0
2011	1,789	346	2,135	8.1	1,546	5.9	3,681	14.0

* Total Maintenance Downtime, Low Trash Downtime, and Total Downtime computed as a percentage of total unit-hours in calendar year.

The 2011 unscheduled and scheduled downtime represented 8.1% of total annual hours. The downtime due to low trash levels represents an additional 5.9%. Total boiler downtime, including downtime due to low trash deliveries, for 2011 was 3,681 hours, or 14.0% of the unit-hours in the calendar year.

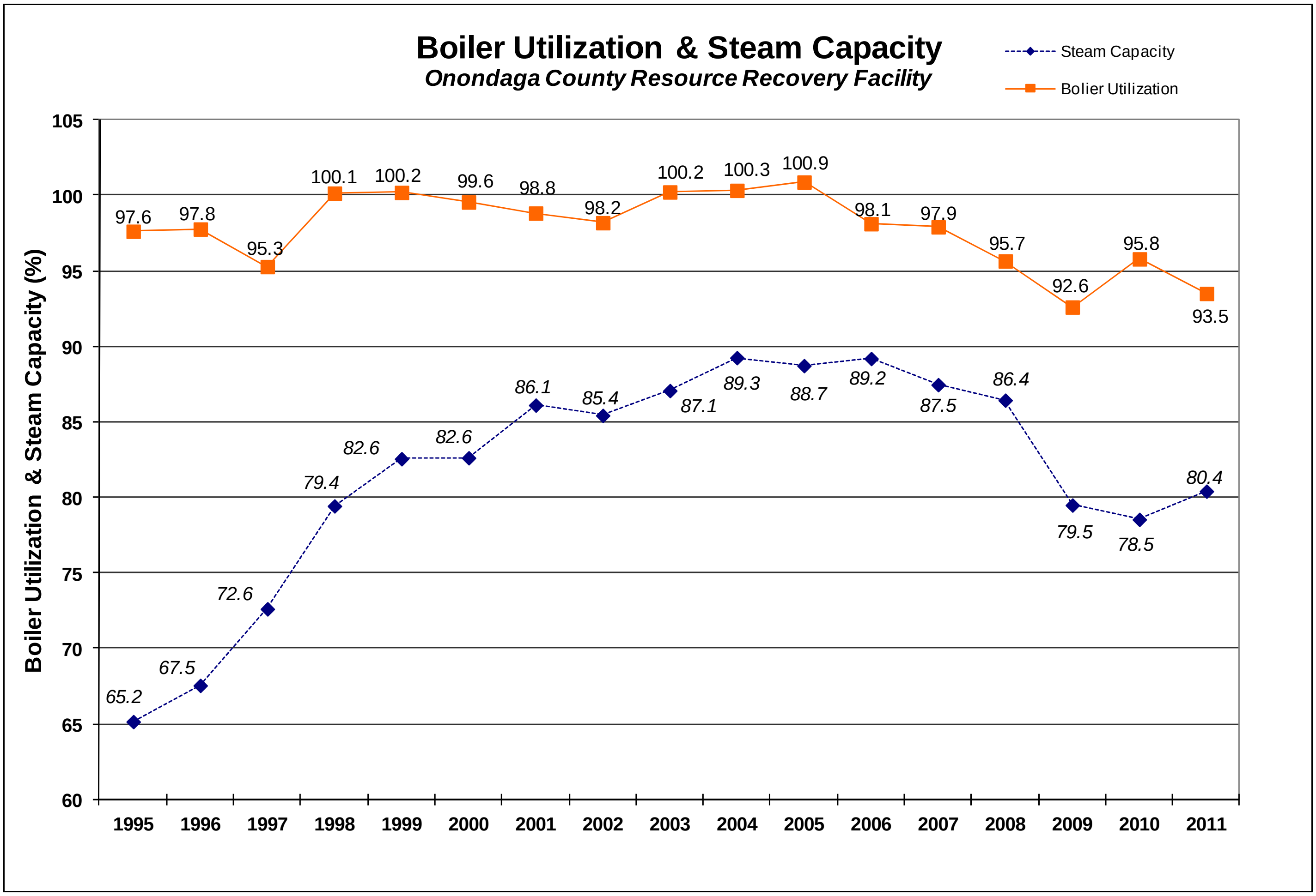
Turbine-generator availability for 2011 was 99.8% with 21 hours of unscheduled downtime. For comparative purposes, LoRe and Oswald (2009) suggest a 14-facility average (including Onondaga County) of 96.6%.

3.8 Boiler Utilization and Steam Capacity

Another metric used to evaluate Facility efficiency is boiler utilization. Each boiler is designed with a maximum steam rate (pounds per hour) at which the unit is intended to be operated. This is referred to as the “maximum continuous rating” (MCR). The maximum design steam rating for the Onondaga Facility is 103,950 lb of steam per hour per boiler, or 311,850 lb of steam per hour for all three boiler units. Boiler utilization is the ratio of actual steam generated by the boilers to the MCR. It is important to note that boiler utilization only takes into account boiler operating time; that is, it does not include boiler downtime. Another term, steam capacity, is also used to evaluate Facility efficiency, and is defined as the ratio of actual steam to the maximum amount of steam that could be generated if the unit were running full time.

For 2011, the average boiler utilization was 93.5%. Boiler utilization of 100% represents the most efficient mode of Facility operation, and will maximize steam production and thus electrical energy generation. Anything less than 100% indicates that while the boilers were operational, they were being utilized at less than their full steaming capacity. It is not optimal to frequently bring boilers on- and off-line, so an alternative for dealing with low trash levels is to run the boilers at less than full capacity. This was the case for 2011. For comparative purposes, LoRe and Oswald (2009) suggest a 14-facility average (including Onondaga County) boiler utilization of 96.0%. Steaming capacity, which also takes into consideration steam “lost” from boiler downtime, for 2011 was 80.4%.

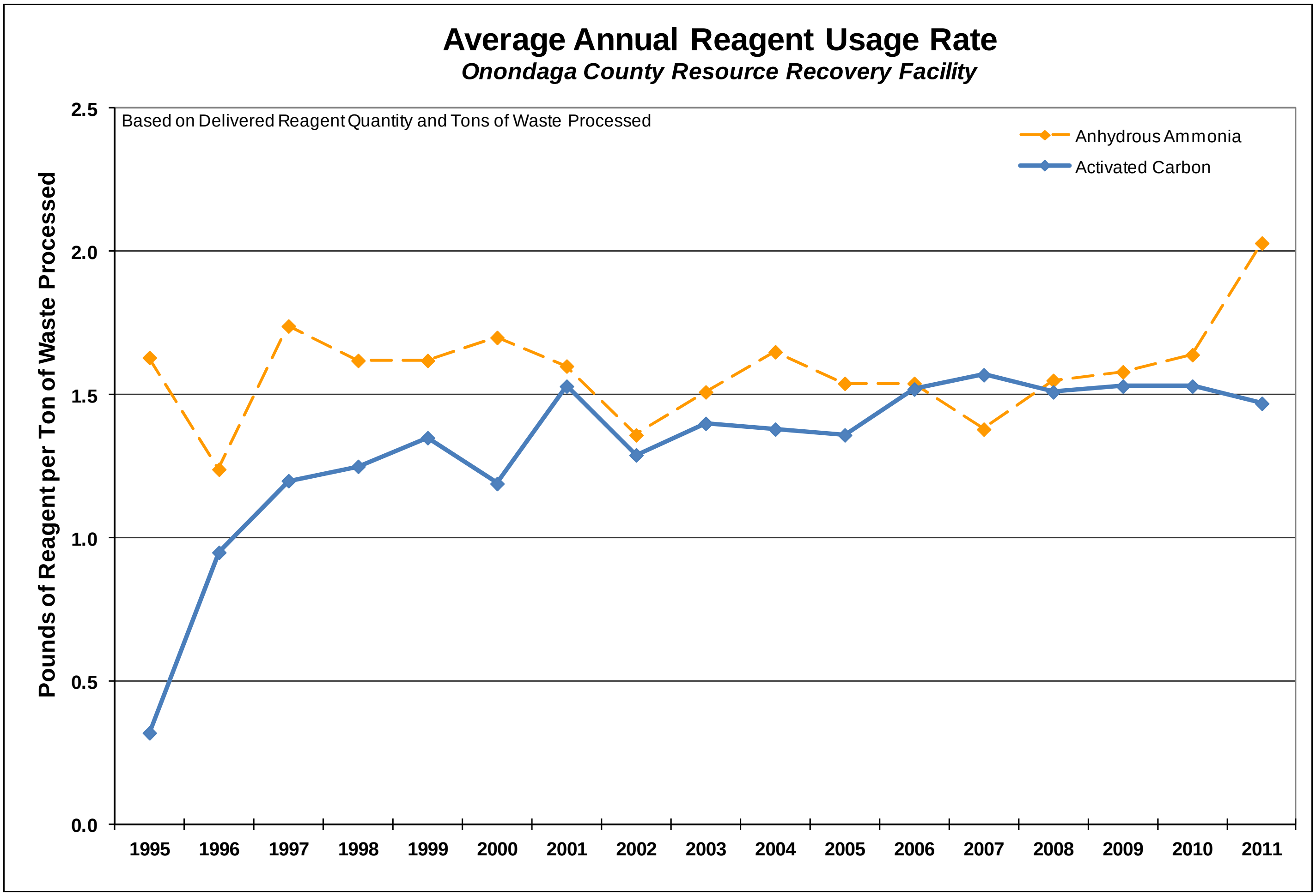
Historical data for boiler utilization and steam capacity are shown in the figure on the next page.



3.9 Pollution Control Reagent Consumption

The Facility uses several reagents for pollution control including anhydrous ammonia for control of nitrogen oxides (NO_x), activated carbon for mercury and dioxin/furan control, and lime for control of acid gases (as well as ash conditioning).

To control NO_x emissions, anhydrous ammonia is injected into the combustion chamber of each boiler unit. To control mercury emissions, as well as dioxin and furan emissions, powdered activated carbon is mixed into slurry and injected into the spray-dry scrubbers through the rotary atomizer. The rotary atomizer creates tiny droplets for optimal reaction. The average annual 2011 reagent usage rates for ammonia and carbon were 2.03 lb and 1.47 lb per ton of waste processed, respectively. As evident in the chart, the carbon usage rate has been consistent with historical rates. The anyhydrous ammonia usage rate is slightly above historical rates. According to Lore and Oswald (2009), the Facility's anhydrous ammonia usage rate is consistent with other facilities that use anhydrous ammonia and the carbon usage is a bit higher than a 12-facility average (including Onondaga County) of 1.01 lb per ton.



To neutralize acid gases, namely sulfur dioxide (SO_2), hydrogen chloride (HCl), hydrogen fluoride (HF), and sulfuric acid (H_2SO_4), a calcium-based lime, referred to as pebble lime, is injected into the spray-dry scrubbers through the rotary atomizer. In 2011, the average reagent application rate was 27.9 lb of pebble lime per ton of waste processed. This is consistent with 2002 (31.0 lb of pebble lime per ton of waste processed) and 2007–2010 (29.2, 28.4, 30.3, and 29.4 lb of pebble lime per ton of waste processed, respectively) when pebble lime was the only form of lime used.

Prior to making the decision to solely use pebble lime, dolomitic lime, a lime with a higher magnesium content than pebble lime, was added to the fly ash prior to combining with the bottom ash to provide additional conditioning of the fly ash. In August 2006, dolomitic lime use was discontinued and the reagent application rate for pebble lime increased above that needed for acid gas control. While still providing satisfactory ash conditioning, this change was implemented to improve housekeeping conditions, reduce OCRRA’s overall ash conditioning costs, and produce a drier, more manageable combined ash residue for disposal. In 2009, Covanta also experimented with another type of lime (in conjunction with pebble lime) called carbide lime but found it to be too abrasive.

3.10 Electricity, Natural Gas, and Water Utilization

During normal Facility operation, the Facility's electrical demand is satisfied by the Facility's turbine-generator system, with the excess electricity being exported to the grid. During those times when the turbine-generator is off-line due to maintenance or malfunction, electricity is purchased from National Grid to operate the Facility and continue combusting the incoming MSW. In March 2011, the turbine generator was taken offline for less than 24 hours to replace the inlet steam strainer. During this short timeframe, a nominal 61 MWh of electricity was purchased from National Grid for in-plant needs. The Service Agreement allows for 3,348,000 kWh over a three-year rolling period and at the end of 2011 the Facility had used 1,454,058 kWh for 2009-2011.

Natural gas is an auxiliary fuel used for boiler start-ups and shutdowns, and for maintaining minimum furnace temperatures when processing overly wet waste. 2011 natural gas usage was 144,620 therms, which is consistent with historical consumption. Under the Service Agreement, OCRRA is responsible for the first 110,000 therms and Covanta pays for usage in excess of 110,000 therms.

City water satisfies all potable and process needs of the Facility, with the majority being for process use. However, the Facility is a zero discharge plant relative to process wastewater; meaning that only sanitary sewage is discharged off-site. 32,267,000 gallons of potable were purchased in 2011. This amount of water translates into about 99 gallons per ton of waste combusted or approximately 61 gallons per minute. 2011 water usage remained consistent with historical levels and design parameters following initial start-up. The Onondaga Facility's water use is much lower than that of similar facilities because it is a zero-process water discharge Facility, meaning that all process water gets treated and reused, thereby requiring less potable water. Furthermore, in August 2011 the Facility initiated a program to beneficially reuse a wastewater stream in the scrubber and ash conditioning systems, with approval from the NYSDEC. This program further reduces the amount of purchased water. According to LoRe and Oswald (2009), a ten-facility average water consumption rate is 422 gallons per ton of waste processed.

3.11 Facility Inspections

In accordance with NYSDEC Part 360 regulations, an annual general Facility inspection must be undertaken to determine the operating condition of the safety, emergency, security, process, and control equipment. Covanta must have this inspection performed under the direction of a New York State licensed professional engineer. Covanta performed the required Facility annual inspection on December 14, 2011. Covanta's Director of Environmental Science and Community Affairs, Kenneth E. Armellino, P.E., certified: "*Based upon the above inspections and information, the safety, emergency, security, process and control equipment at the Onondaga County Resource Recovery Facility operated by Covanta Onondaga at 5801 Rock Cut Road, Jamesville, NY 13078 are considered to be in acceptable operating condition.*" This annual inspection report was submitted to the NYSDEC on February 28, 2012 as part of the Facility's 2011, 4th Quarter & Annual Solid Waste Report.

NYSDEC also conducted several facility inspections in 2011. The Division of Air Resources was on site for the annual stack testing activities. On May 12, 2011 the Division of Solid and Hazardous Materials visited the Facility for an inspection.

In 2011, OCRRA had its independent consultant, CDM, conduct a comprehensive 2-day site inspection. This visit focused on all various aspects of plant operations and maintenance, and coincided with the Unit #2 spring boiler outage. Based on the results of their visual inspection and experience at other WTE facilities, CDM opined that the Onondaga Facility continues to be well maintained, and is in overall good operating condition. The routine preventative maintenance and major repairs performed are consistent with the type and level of repairs observed at other facilities. The systems inspected were in good operating condition, and all equipment appeared to be operating properly. The level of daily repair and preventative maintenance observed was considered normal for facilities of the same type and age.

In addition to Facility inspections, CDM performed oversight for the annual air emissions stack testing and semi-annual ash residue testing. CDM concluded that testing was conducted in accordance with required procedures and protocols.

Section 4 – Environmental Performance

4.1 Summary of Environmental Performance

Operating under one of the strictest WTE air permits in the country, the Onondaga County WTE Facility turns the County's non-recyclable trash into energy. Results of the Facility's annual air emissions and ash residue test results consistently demonstrate the Facility's exemplary environmental track record. Coupled with Onondaga County's nationally high recycling rate of 60% in 2011 (nearly double the national average), the Onondaga County WTE Facility generates enough renewable energy to satisfy the needs of approximately 25,000 – 30,000 homes in OCRRA's service area while also reducing the volume of trash that needs to be landfilled by 90%.

4.2 Stack Test Results

Stack testing is an important tool that measures the amount of regulated pollutants being emitted from the Facility. Stack testing consists of a series of sampling events, in which a probe is inserted into the stack gases to collect a representative sample, over a defined amount of time. Sampling and laboratory analysis are conducted in accordance with NYSDEC and USEPA protocols. NYSDEC oversees stack testing at the WTE Facility.

In addition to annual stack testing, the Facility has a continuous emission monitoring system (CEMS) that measures equipment performance and stack emissions in order to constantly track Facility performance. The CEMS tracks carbon monoxide, carbon dioxide, oxygen, sulfur dioxide, and NOx as well as opacity and combustion temperatures.

The 2011 stack testing consisted of the 10 parameters that are tested annually. The results from the 2011 stack testing indicate that the Facility is operating acceptably and that the air pollution control devices are functioning properly. As shown by the summary data on the next page, many of the parameters were considerably below the permit limit.

2011 ANNUAL STACK TEST RESULTS

		Constituent	Average Measured Emissions[1] Unit 1	Unit 2	Unit 3	Permit Limit[2]	Pass/Fail? P/F
TESTED ANNUALLY	FEDERAL	Cadmium (mg/dscm @ 7% O_2)	1.29E-03	< 2.87E-04	5.82E-04	3.50E-02	**P**
		Cadmium (lb/hr)	2.04E-04	< 4.52E-05	9.74E-05	1.90E-03	**P**
		Carbon Monoxide (lb/hr)	1.00E+00	8.60E-01	1.10E+00	8.04E+00	**P**
		Dioxins/Furans (ng/dscm @ 7% O_2)	3.48E+00	2.62E-01	1.08E+00	3.00E+01	**P**
		Hydrogen Chloride (ppmdv @ 7% O_2)	2.49E+00	4.16E+00	5.34E+00	2.50E+01	**P**
		Hydrogen Chloride (lb/hr)	6.15E-01	9.95E-01	1.35E+00	5.24E+00	**P**
		Hydrogen Chloride Removal Efficiency (%)	99.7	99.5	99.3	>=95	**P**
		Lead (mg/dscm @ 7% O_2)	4.49E-02	3.43E-03	8.74E-03	4.00E-01	**P**
		Lead (lb/hr)	7.08E-03	5.42E-04	1.46E-03	3.81E-02	**P**
		Mercury (lb/hr)	7.75E-05	1.66E-04	7.77E-04	4.00E-03	**P**
		Nitrogen Oxides (lb/hr)	5.23E+01	4.93E+01	5.12E+01	5.80E+01	**P**
		Particulates (gr/dscf @ 7% O_2)	5.86E-05	1.27E-04	5.76E-04	1.00E-02	**P**
		PM_{10} (gr/dscf @ 7% O_2)	2.43E-04	3.14E-04	5.21E-04	1.00E-02	**P**
		PM_{10} (lb/hr)	8.19E-02	1.12E-01	1.80E-01	3.16E+00	**P**
		Sulfur Dioxide (lb/hr)	4.60E-01	7.00E-02	5.30E-01	1.62E+01	**P**
	STATE	Ammonia (ppmdv @ 7% O_2)	2.91E+00	< 7.10E-01	< 9.29E-01	5.00E+01	**P**
		Ammonia (lb/hr)	3.33E-01	< 7.93E-02	< 1.10E-01	4.88E+00	**P**
		Dioxins/Furans-2,3,7,8 TCDD TEQ (ng/dscm @ 7% O_2)	5.35E-02	1.10E-03	1.33E-02	4.00E-01	**P**
		Dioxins/Furans-2,3,7,8 TCDD TEQ (lb/hr)	7.93E-09	1.64E-10	2.04E-09	1.29E-07	**P**
		Mercury (µg/dscm @ 7% O_2)	4.69E-01	1.05E+00	4.61E+00	2.80E+01	**P**
		Mercury Removal Efficiency (%)	99.1	98.4	93.8	>=85	**P**
		Zinc (lb/hr)	1.36E-02	8.15E-03	6.86E-03	1.42E-01	**P**

NOTES:

[1] Based on three test runs

[2] NYSDEC Title V Permit #7-3142-00028/00009

UNITS:

gr/dscf = grains per dry standard cubic foot

ppmdv = parts per million dry volume

lb/hr = pounds per hour

ng/dscm = nanograms per dry standard cubic meter

µg/dscm = microgramsper dry standard cubic meter

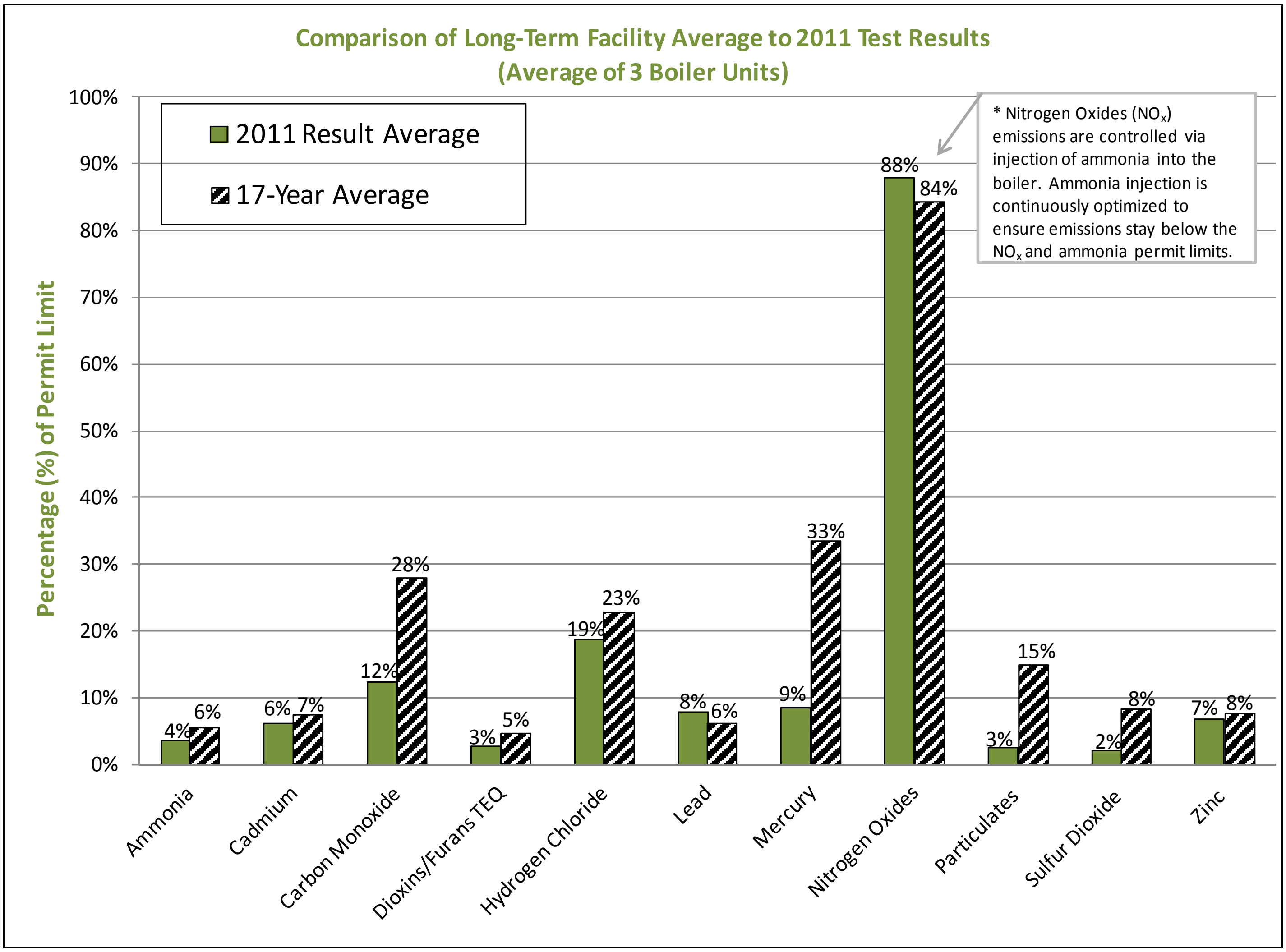
mg/dscm = milligrams per dry standard cubic meter

@ 7% O_2 = concentration corrected to 7% oxygen

4.2.1 Parameters Tested Annually

The figure below presents a comparison of the 2011 stack test results with their respective long-term (17-year) Facility averages (1995 through 2011) for the parameters tested annually. The results are graphed as a percentage of their respective permit limits. The graph shows that the 2011 results continue to be well below regulatory limits. These results indicate that the Facility's air pollution control system continues to operate effectively, and that OCRRA's efforts in screening the incoming waste continue to be effective.

Compared to the other parameters, NO_x emissions are much closer to the permit limit. This is because NO_x emissions are controlled via injection of ammonia into the boiler. Ammonia injection is continuously optimized to ensure emissions stay below the NO_x and ammonia permit limits.



WTE facilities have significantly reduced emissions over the past decade. In 1997 a memorandum by the United States Environmental Protection Agency (USEPA) documented this progress. The table from USEPA's memorandum is provided on the following page.

Emissions From Large and Small MWC Units

Pollutant	1990 Emissions (tpy)	2005 Emissions (tpy)	Percent Reduction
CDD/CDF, TEQ basis*	4400	15	99+ %
Mercury	57	2.3	96 %
Cadmium	9.6	0.4	96 %
Lead	170	5.5	97 %
Particulate Matter	18,600	780	96 %
HC1	57,400	3,200	94 %
SO_2	38,300	4,600	88 %
NO_x	64,900	49,500	24 %

(*) dioxin/furan emissions are in units of grams per year toxic equivalent quantity (TEQ), using 1989 NATO toxicity factors; all other pollutant emissions are in units of tons per year.

Source: USEPA Memorandum dated 1997

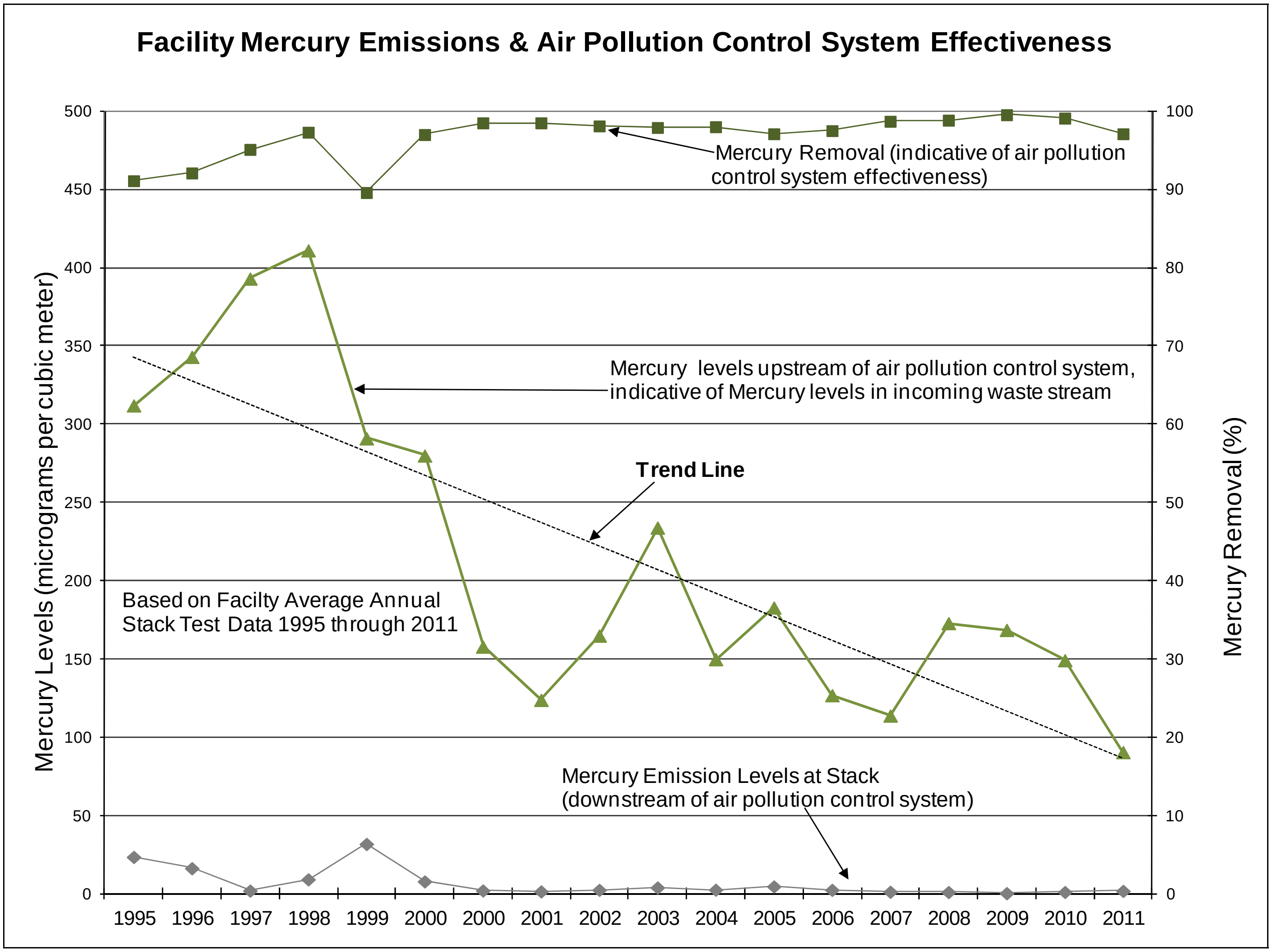
Some of these parameters will be discussed in further detail the following sections.

4.2.2 Mercury

To control mercury emissions, powdered activated carbon is mixed into slurry and injected into the spray-dry scrubbers through a rotary atomizer, which creates tiny droplets. The activated carbon reacts with the mercury in the gas exiting the boiler and forms particles that are captured in the baghouse. Still considered the most highly advanced control technology, activated carbon injection has been used at WTE facilities for the past decade; however activated carbon injection is just beginning to be used at coal-fired power plants.

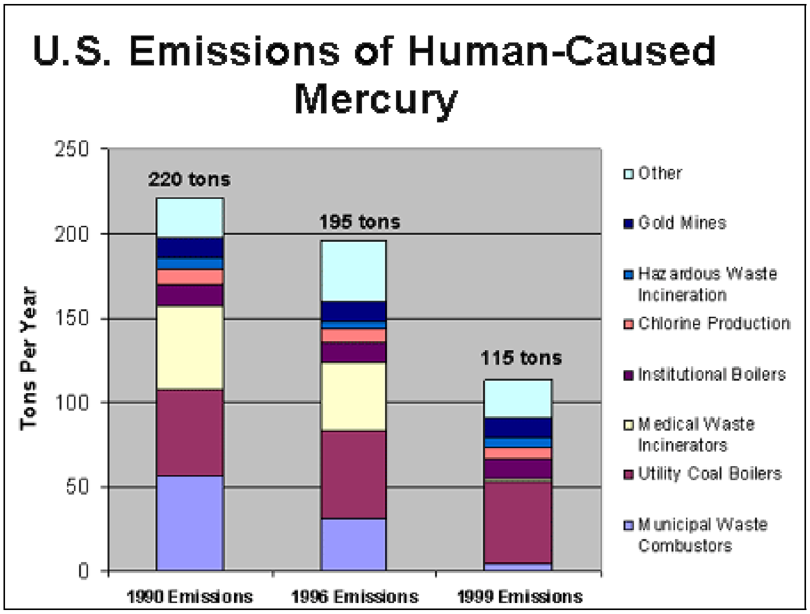
In addition to advanced control technologies, it's important to limit the amount of mercury in the incoming waste stream. OCRRA has multiple programs in place to do just that. These programs include household hazardous waste collection events, an ongoing mercury-containing thermostats and thermometer exchange at OCRRA's Rock Cut Road Transfer Station (a joint program with Covanta), partnerships with local businesses for electronic waste and household fluorescent collections, active daily sorting activities at OCRRA's transfer stations, and active daily screening at the Facility itself. Coupled with extensive public education efforts, these programs have had a significant impact.

The figure on the following page shows the effectiveness of the Facility's mercury control system, as well as the inlet and outlet (stack) average mercury concentrations. Inlet concentrations indicate the level of mercury in the incoming waste stream. As shown, inlet mercury levels since 1995 have exhibited a dramatic decrease, which has been the result of OCRRA's programs to remove mercury from the local waste stream, as well as restrictions on the mercury content of many products, most notably, alkaline batteries.



Average mercury emissions measured during 2011 annual stack testing event were 7% of the Facility's current permit limit of 28 micrograms per dry standard cubic meter and the average effectiveness of the Facility's carbon injection system for removing mercury was 97.1 % (85% removal efficiency is required).

In 1990, the contribution of atmospheric mercury from coal-fired power plants and WTE facilities were similar and substantial. During the following decade, Maximum Achievable Control Technology (MACT) emission standards were imposed on municipal waste combustors (MWCs) and the contribution to atmospheric mercury from MWCs relative to coal-fired power plants dropped dramatically. According to the USEPA Memorandum mentioned previously, mercury emissions from MWCs were reduced by 96% from 1990 to 2005. While coal-fired plants still contribute over 40% of all domestic human-caused mercury emissions in the U.S., according to the USEPA, mercury emissions from WTE plants have decreased to about 4% of the total. The following chart has been provided from USEPA's website.



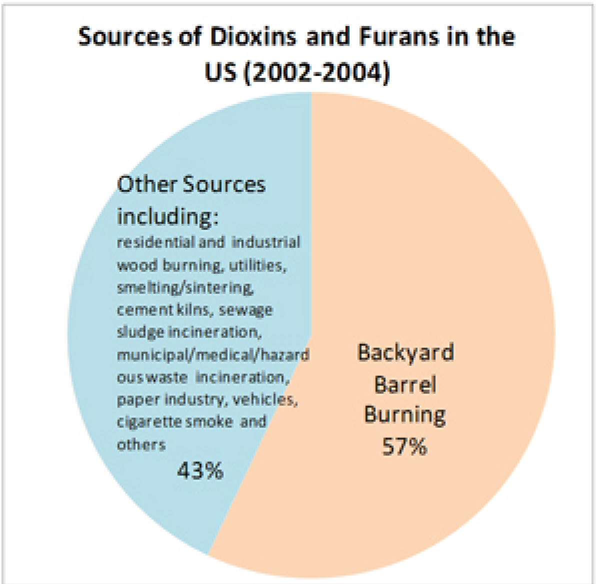
Source: USEPA website: www.epa.gov/mercury/control_emissions/emissions.htm

4.2.3 Dioxin/Furan

Like mercury emissions, dioxin and furan emissions constitute considerable environmental concern. The Onondaga County WTE Facility has several permit limits associated with dioxin/furan emissions. The 2011 results were all at least 94% below the associated permit limits. These levels are exceptionally small and indicative of effective combustion and air pollution controls.

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is the most toxic congener of dioxin. The total dioxin toxic equivalence (TEQ) value expresses the toxicity as if the mixture were pure TCDD. In 2011, the estimated annual TEQ dioxin/furan emissions are 0.00009 lbs (90 millionths of a pound); or 3% of the weight of a standard paper clip.

Over the past 20 years, the WTE industry has drastically reduced dioxin/furan emissions – by more than 99% (see table from referenced EPA memo). Today, backyard burn barrels emit more dioxins and furans than all other sources combined. The pie chart on the next page is from NYSDEC's website and it provides data from an EPA study during 2002 to 2004.



Source: NYSDEC website - http://www.dec.ny.gov/chemical/32060.html

Fortunately, in 2009, NYSDEC passed and enacted new open burning regulations that prohibit burning household trash in burn barrels or piles statewide.

4.3 Ash Testing Results

Semi-annual ash testing determines whether residual ash, the byproduct of turning non-recyclable trash into energy, should be managed as a non-hazardous or hazardous material. A representative sample of residual ash is collected according to NYSDEC and USEPA protocols. The sample is then analyzed by an independent laboratory for leachable metals, according to USEPA's Toxicity Characteristic Leaching Procedure (TCLP). TCLP analysis simulates landfill conditions (the final disposal site for the ash) and determines whether the ash exhibits hazardous characteristics. Over the life of the Facility (including 2011 results), TCLP analysis has always indicated that the ash is non-hazardous. A summary of the ash residue test results for 2011 is provided below.

2011 ASH RESIDUE CHARACTERIZATION TEST RESULTS			
Semi-Annual Test Results - June 2011			
Constituent	***Test Result***	***Permit Limit***	***Pass or Fail***
Cadmium	0.050 mg/L	1 mg/L	Pass
Lead	0.905 mg/L	5 mg/L	Pass
Semi-Annual Test Results - October 2011			
Constituent	***Test Result***	***Permit Limit***	***Pass or Fail***
Cadmium	0.131 mg/L	1 mg/L	Pass
Lead	0.250 mg/L	5 mg/L	Pass
CONCLUSION			
Ash residue does NOT exhibit a hazardous characteristic. As such, it should continue to be managed as a non-hazardous solid waste.			

In 2011, 79,864 tons of combined ash residue (consisting of mixed fly and bottom ash) were sent to Seneca Meadows Landfill in Waterloo, NY (Jan.-May) and to High Acres Landfill in Fairport, NY (June-Dec). Based on waste processed, this amount of ash was 24.4% of the waste tonnage combusted; therefore the Facility reduced the weight of the refuse by more than 75%. Since October 2009, ash residue from the Facility has been used as alternative daily cover at the landfill. This beneficial use of the ash ultimately means that other materials, such as clean soil, do not need to be used for daily cover at the landfill.

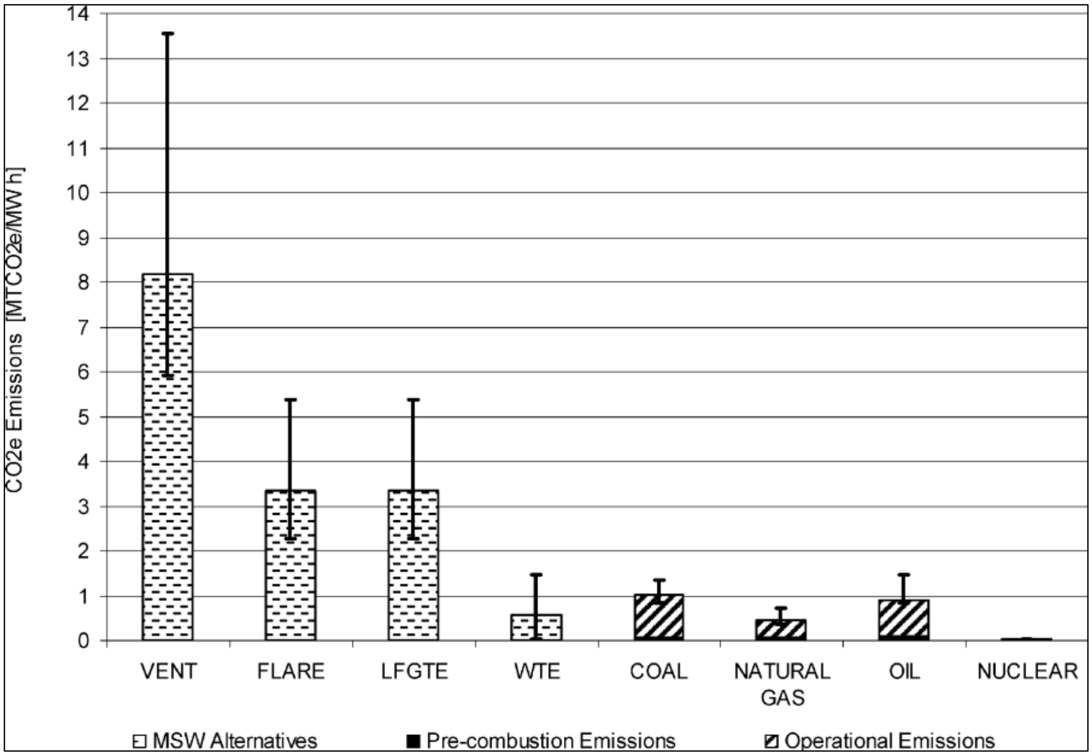
4.4 Combustion versus Landfilling

A recent USEPA-authored journal article published in Environmental Science and Technology applies a life-cycle analysis model to evaluate whether it's better to burn or bury MSW. The article is titled, "Is It Better to Burn or Bury Waste for Clean Energy Generation?" and the analysis compares greenhouse gas emissions and emissions of other pollutants for WTE and landfill gas-to-energy (LFGTE), using a life-cycle analysis model. The study states that MSW is a viable source for electricity generation and finds that WTE is a better option than LFGTE because WTE generates significantly more electricity from the same amount of waste, with fewer emissions. Though not immediately intuitive, emissions from LFGTE are due to fugitive methane emissions in a landfill, as well as emissions from combusting landfill gas in an internal combustion engine. The last paragraph of the article provides a good summary (Kaplan, Decarolis, and Thornloe, 2009):

> *"Despite increased recycling efforts, U.S. population growth will ensure that the portion of MSW discarded in landfills will remain significant and growing. Discarded MSW is a viable energy source for electricity generation in a carbon constrained world. One notable difference between LFGTE and WTE is that the latter is capable of producing an order of magnitude more electricity from the same mass of waste. In addition, as demonstrated in this paper, there are significant differences in emissions on a mass per unit energy basis from LFGTE and WTE. On the basis of the assumptions in this paper, WTE appears to be a better option than LFGTE. If the goal is greenhouse gas reduction, then WTE should be considered as an option under U.S. renewable energy policies. In addition, all LFTGE scenarios tested had on the average higher NOx, SOx, and PM emissions than WTE. However, HCl emissions from WTE are significantly higher than the LFGTE scenarios."*

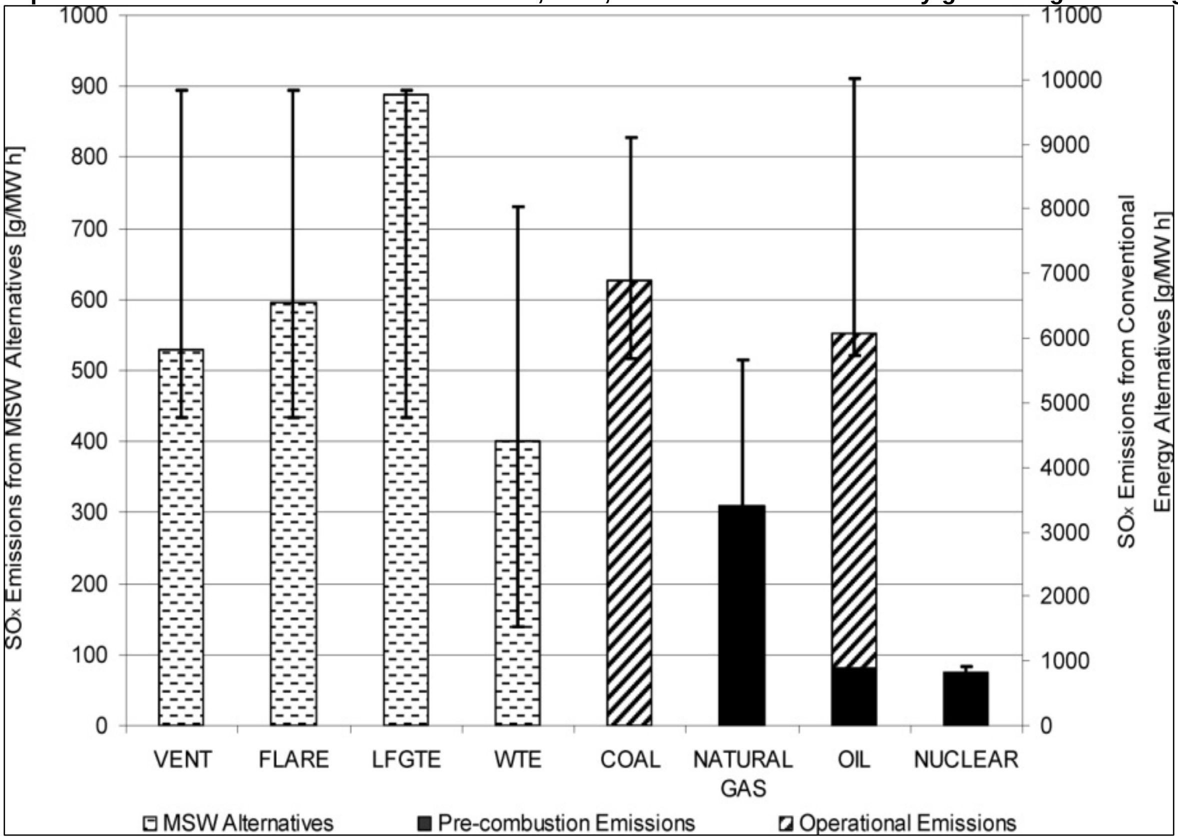
Several graphs from the article are provided below and on the next page. These graphs compare the relative emissions of greenhouse gas emissions, NO_x, and sulfur oxide (SO_x) for WTE, LFGTE, and several conventional electricity generating technologies.

Comparison of greenhouse gas emissions for LFGTE, WTE, and conventional electricity-generating technologies



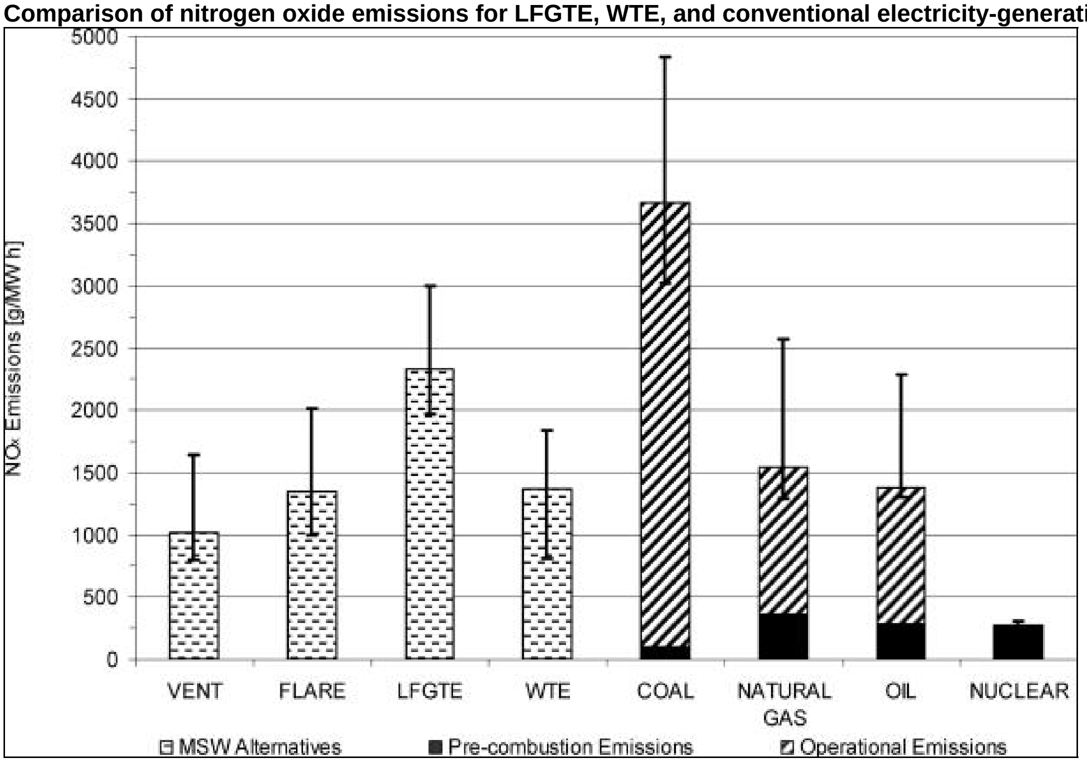
Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 2)

Comparison of sulfur oxide emissions for LFGTE, WTE, and conventional electricity-generating technologies



Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 3)

Comparison of nitrogen oxide emissions for LFGTE, WTE, and conventional electricity-generating technologies



Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 4)

4.5 Greenhouse Gas Emissions

Managing what happens to the County's non-recyclable trash is about choices. If Onondaga County did not have a WTE Facility, the County's non-recyclable trash would be destined for a landfill. Landfills generate methane (a potent greenhouse gas) as the trash degrades anaerobically. Although many landfills now have landfill gas collection systems and, ultimately, flare the landfill gas (and convert the methane to carbon dioxide), or preferably, generate electricity from the gas (landfill gas-to-energy), there are still fugitive landfill gas emissions because the landfill gas collection systems are not 100% effective. Although the Onondaga County WTE Facility generates carbon dioxide as a result of the complete combustion processes, when compared to emissions associated with landfilling, the emissions from the WTE Facility are significantly less.

In addition to having lower emissions (in terms of carbon dioxide equivalents), the WTE Facility offsets electricity that would have otherwise been generated using coal, natural gas, or nuclear fuels. According to the latest USEPA eGRID data (for 2009), Upstate New York's (NYUP) electricity generation resources (with associated percentages) are natural gas (18.9%), nuclear (30.6%), hydropower (30.8%), coal (14.5%), oil (0.9%), biomass (1.6%), other fossil (0.4%), and wind (2.4%). The carbon dioxide equivalent emissions associated with this profile are 500 lb/MWh. Assuming a given energy demand, the WTE Facility generates electricity that would have otherwise by generated by an alternative source.

Lastly, every year the WTE Facility recovers roughly 8,000 - 9,000 tons of metals that would have otherwise gone to a landfill. The recovered metal is then recycled, which saves considerable energy and prevents greenhouse emissions that would have resulted from virgin metal production.

When all of these factors are considered, the Onondaga County WTE Facility reduces greenhouse gas emissions (in carbon dioxide equivalents) by one ton for every ton of waste processed. Thus, in 2011, the Facility prevented 326,782 tons of carbon dioxide equivalent greenhouse gas emissions, which is the equivalent of taking more than 50,000 cars off the road!

USEPA recently released a study entitled, "Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices" (September 2009). The study highlights several waste management practices, including waste prevention (source reduction), reuse/recycling, and WTE (energy recovery), that can lead to significant reduction in the country's greenhouse gas emissions. The study indicates there is significant GHG reduction potential associated with WTE facilities (*i.e.,* energy recovery).

4.6 Renewable Energy and Energy Independence

The Facility utilizes a locally-generated feedstock – the community's non-recyclable trash to generate a significant amount of electricity. This not only reduces dependence on fossil fuels, it also achieves goals of energy independence. In 2011 alone, the WTE Facility generated enough energy to displace nearly 325,000 barrels of oil or 80,000 tons of coal – enough energy to satisfy the needs of approximately 25,000 – 30,000 homes in OCRRA's service area. That is in addition to reducing the volume of non-recyclable trash by 90% and recovering ferrous and non-ferrous metal for recycling.

In many European countries and about half of the U.S. states, WTE (or energy from waste, as it is referred in Europe), is considered a renewable energy source. In 2011, Maryland Governor Martin O'Malley signed into law a bill elevating waste-to-energy to a Tier 1 renewable status in Maryland's Renewable Portfolio Standard. WTE was also highlighted as one of eight "key renewable energy sectors" by the World Economic Forum's recent (January 2009) report, "Green Investing – Towards a Clean Energy Infrastructure."

In a February 2003 letter to the Integrated Waste Services Association (IWSA) (currently the Energy Recovery Council), USEPA assessed WTE as "…clean, reliable, renewable power…"; "These plants produce 2,800 megawatts of electricity with less environmental impact than almost any other source of electricity." The Onondaga County Resource Recovery Facility is leading the way in providing an environmentally sound and cost-effective method of solid waste disposal while partially providing the energy needs of a community of 450,000 people.

4.7 Preservation of Landfill Capacity and Greenfields

In the United States, landfills are the predominant disposal alternative for MSW, with 54% of MSW ending up in landfills, 12% going to WTE facilities, and 34% being recycled or composted (Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2010, USEPA). Over the past couple of decades, the number of landfills has decreased dramatically, however the size of the remaining landfills is substantially larger. Due to economies of scale, these "mega-landfills" are becoming the norm. However, as you can imagine, "mega-landfills" take up massive amounts of open space.

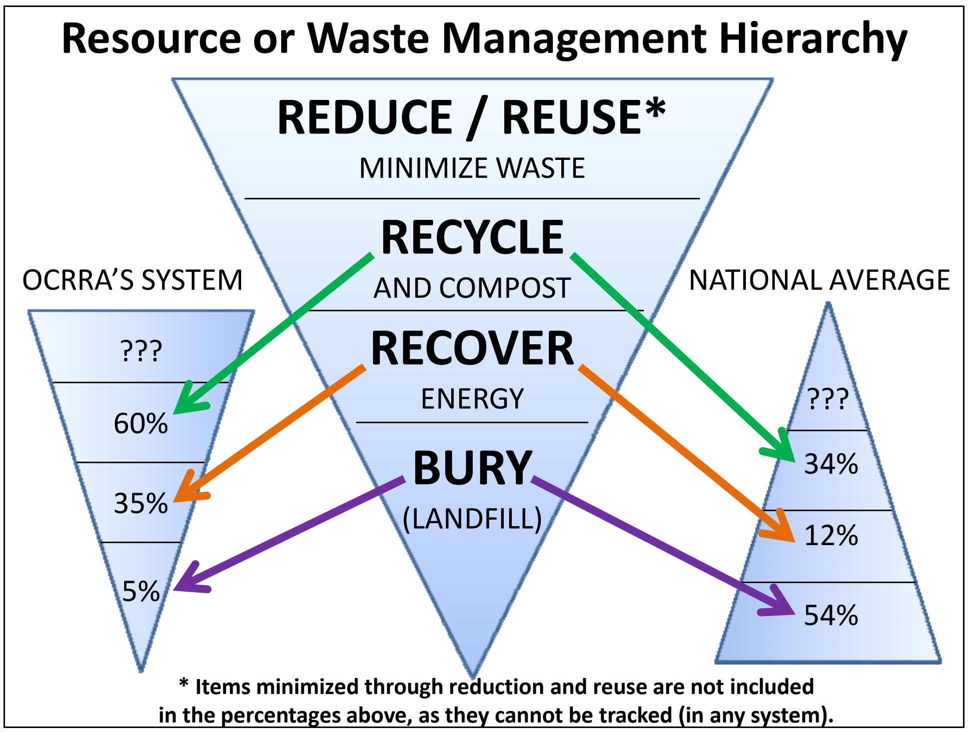
WTE facilities preserve existing landfill capacity by reducing the volume of MSW by 90%. This means that the current landfill capacity will last longer, and that "greenfields" will not be utilized for landfill expansion projects. Had the 326,782 tons of waste processed at the Facility in 2011 been landfilled, it would have utilized more than half of a million cubic yards of landfill space. To put this into perspective, if the waste was compacted to a 20-foot height, the landfilled waste would consume nearly 17 acres of land.

4.8 Compatibility with Recycling

In Onondaga County, which has one of the highest recycling rates in the State and perhaps in the nation, it seems trivial to question the compatibility of WTE and recycling. However, WTE facilities are often thought to compete with recycling. Interestingly, study after study, it has been shown that communities with WTE facilities often have higher recycling rates than communities that landfill their non-recyclable trash, both in Europe and the United States. A recent study (June 2009) entitled "A Compatibility Study: Recycling and Waste-to-Energy Work in Concert, A 2009 Update" again indicates the same conclusion.

4.9 Consistency with Waste Management Hierarchy

The waste management hierarchy set forth in New York State's 2010 "Beyond Waste" Solid Waste Management Plan, as well as in USEPA guidelines, includes (in order of preference): 1) waste reduction, 2) recycling, 3) recovery of useful energy through solid waste combustion (i.e., modern waste-to-energy facilities), and 4) use of permitted landfill facilities. This hierarchy, supported by our state and the nation, considers the environmental impacts of each level and prioritizes them accordingly, with the most preferred option being waste reduction/reuse and the least preferred option being landfilling. It also provides a good measuring stick for evaluating OCRRA's system. As indicated in the figure below, OCRRA's system is extremely consistent with the hierarchy. On the other hand, the national average doesn't do nearly as good a job with its low recycling rate and heavy reliance on landfilling. In fact, the national numbers are upside down.



National data from USEPA Report, "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010."

4.10 Zero Process Water Discharge and Beneficial Wastewater Reuse

In addition to the other environmental benefits of the Facility, it's important to note that the Facility is a zero discharge plant relative to process wastewater; meaning that only sanitary sewage is discharged off-site. All process water generated by the Facility is treated and reused on-site, thereby requiring less potable water. Furthermore, in August 2011 the Facility initiated a program to beneficially reuse a wastewater stream in the scrubber and ash conditioning systems, with approval from the NYSDEC. This program further reduces the amount of purchased water by substituting a wastewater stream that was previously being hauled 75 additional miles to a wastewater treatment facility.

5.1 Waste-to-Energy Facility Financial Summary

A simplified financial summary of OCRRA's revenues and expenses associated with the WTE Facility for 2011 is provided below. Please note that the presentation of information in this report is different from the presentation in OCRRA's financial statements. The information in this report should not be used for financial accounting purposes and is only intended to provide a simplified perspective on OCRRA's costs and expenses associated with the WTE Facility. It should be emphasized that the revenues and expenses described in this report pertain specifically to OCRRA; Covanta Onondaga also has Facility-related operating revenues and expenses that are not described in this report.

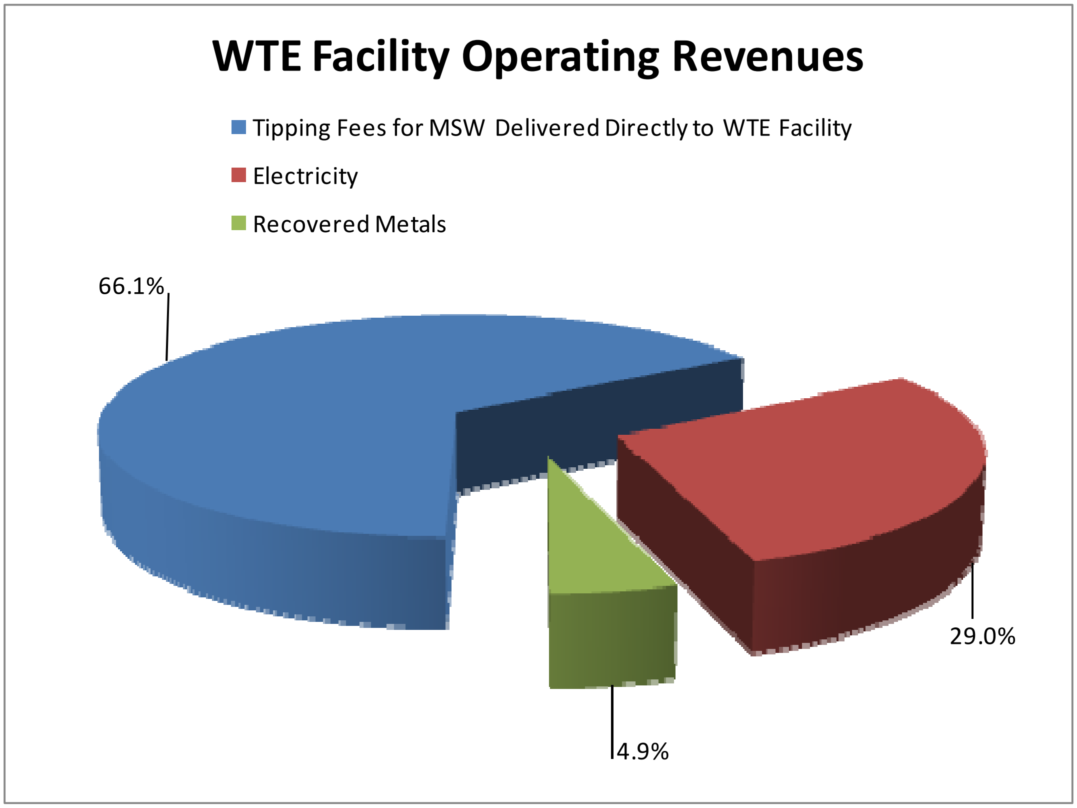
Waste-to-Energy Financial Summary for 2011		
Operating Revenues		
	Tip Fee for MSW Delivered Directly to Facility…………………	$16,844,000
	OCRRA's Electricity Share…………………………………………	$7,383,000
	OCRRA's Recovered Metals Share………………………………	$1,249,000
	Supplemental Waste Tip Fee………………………………………	$5,000
	Total……………………………………………………………	**$25,481,000**
Operating Expenses		
	Operations and Maintenance Service Fee	$11,658,000
	Ash Transportation and Disposal	$3,353,000
	Excess Waste Fee	$389,000
	Pollution Control Reagents	$876,000
	Taxes/Fees	$338,000
	Utilities	$266,000
	Other Expenses (Mainly insurance)	$329,000
	Total……………………………………………………………	**$17,209,000**
Bond Expenses…………………………………………………………		**$9,224,000**
Total Expenses………………………………………………………		**$26,433,000**

As evident, OCRRA's 2011 WTE-related expenses exceeded the WTE-related revenues (net loss of $952,000). These Facility-related revenues and expenses constitute a significant portion of OCRRA's total Agency revenues and expenses. To provide some perspective, in the 2011 budget, WTE Facility-related operating and bond expenses accounted for about 77% of OCRRA's total Agency expenses. Similarly, WTE Facility-related operating revenues accounted for 77% of OCRRA's total Agency revenues.

In 2011, total cost per ton of MSW processed was approximately $81 and total revenue per ton of MSW processed was approximately $78. As evident, WTE facilities like the local Facility have tremendous fixed costs. If those fixed costs are not offset by sufficient electricity revenue and tipping fees, there may be facility-related net losses, as in 2011. In 2011, the average electricity rate (including the capacity factor) was 4.0¢ per kWh; less than 2010's average rate of 4.5¢ per kWh, but better than 2009's average rate of 3.7¢ per kWh. Prior to 2009, OCRRA the electricity rate was above 6¢ per kWh. 2011's low electricity rate, compounded by relatively low trash tonnage, resulted in a net loss.

5.2 Waste-to-Energy Facility Operating Revenues

OCRRA's operating revenues associated with the WTE Facility include tipping fees for waste delivered *directly* to the Facility (not including tipping fees for waste delivered to OCRRA's transfer stations), sale of electricity generated by the Facility, the sale of metals recovered by the Facility, and revenue derived from the supplemental waste program, which was negligible for 2011. A summary of the relative contribution of these revenues is provided in the pie chart below. It should be emphasized that the revenues described in this report are revenues that pertain to OCRRA. Covanta Onondaga also receives Facility-related operating revenues that are not described in this report.



Although MSW and C&D from OCRRA's transfer stations are delivered to the WTE Facility, tipping fees are collected at the transfer stations and are therefore not included in this financial summary. Similarly, the cost of processing MSW and C&D at the transfer stations is not included in this report. However, it should be noted that electricity generated from the transfer station MSW and C&D is included in the electricity revenue.

5.2.1 Tip Fee for MSW Delivered Directly to Facility

In 2011, tipping fees for MSW delivered directly to the Facility accounted for roughly two thirds of the revenues associated with the WTE Facility. In previous years, when electricity rates had been higher, tipping fees generally accounted for about half of the Facility-related revenues.

OCRRA receives the full tipping fee for MSW delivered directly to the Facility. In 2011, tipping fees were $74 per ton, with a $4 prompt payment discount. Most haulers take advantage of the prompt payment discount; therefore OCRRA generally received revenues of $70 per ton. OCRRA's office staff is responsible for billing and collecting payments from haulers.

5.2.2 OCRRA's Electricity Share

Electricity sales represent the other major revenue component associated with the WTE Facility. Historically, electricity had accounted for about 40-45% of Facility-related revenues. However, due to the low electricity rates in 2011, electricity sales accounted for 29% of Facility-related revenues. OCRRA receives 90% of the electricity revenues, with Covanta Onondaga receiving the remaining 10%.

For 2011, the total amount of electricity sold was 206,546 MWh, with an average electricity rate (including the capacity factor) of 4.0¢ per kWh. While this was better than the average rate of 3.7¢ per kWh in 2009, it was less than the 2010 average rate of 4.5¢ per kWh. Prior to 2009, a contract between OCRRA/National Grid (formerly Niagara Mohawk), provided minimum floor pricing of 6¢ per kWh. Ironically, the historical annual average electricity rate had generally exceeded the floor pricing. Unfortunately, in 2009, when electricity prices took a sharp decline, the minimum floor pricing had expired. In 2011, total energy revenues were $8,203,000, with OCRRA's share generating $7,383,000 in revenue. For comparison, 2008 energy revenues were $15,006,122, with OCRRA's 90% share generating $13,505,512 in revenue.

5.2.3 OCRRA's Recovered Metal Share

In 2011, recovered metal revenue accounted for nearly 5% of Facility-related revenues. Unlike electricity rates, metal prices rebounded in 2010 and 2011. OCRRA and Covanta Onondaga evenly split metal recovery revenues, each receiving 50%. A breakdown of 2011 tonnage and revenues for the non-ferrous and ferrous recovery systems is provided below.

	Tonnage	*OCRRA's Revenue*
Ferrous Metal	8,102	$1,012,889
Non-Ferrous Metal	344	$236,545

In 2011, average ferrous and non-ferrous prices were about $250 and $1,375 per ton, respectively. In comparison, average ferrous and non-ferrous pricing for 2008 were about $250 and $1000 per ton, respectively. In 2009, average ferrous and non-ferrous pricing were about $90 and $550 per ton, respectively.

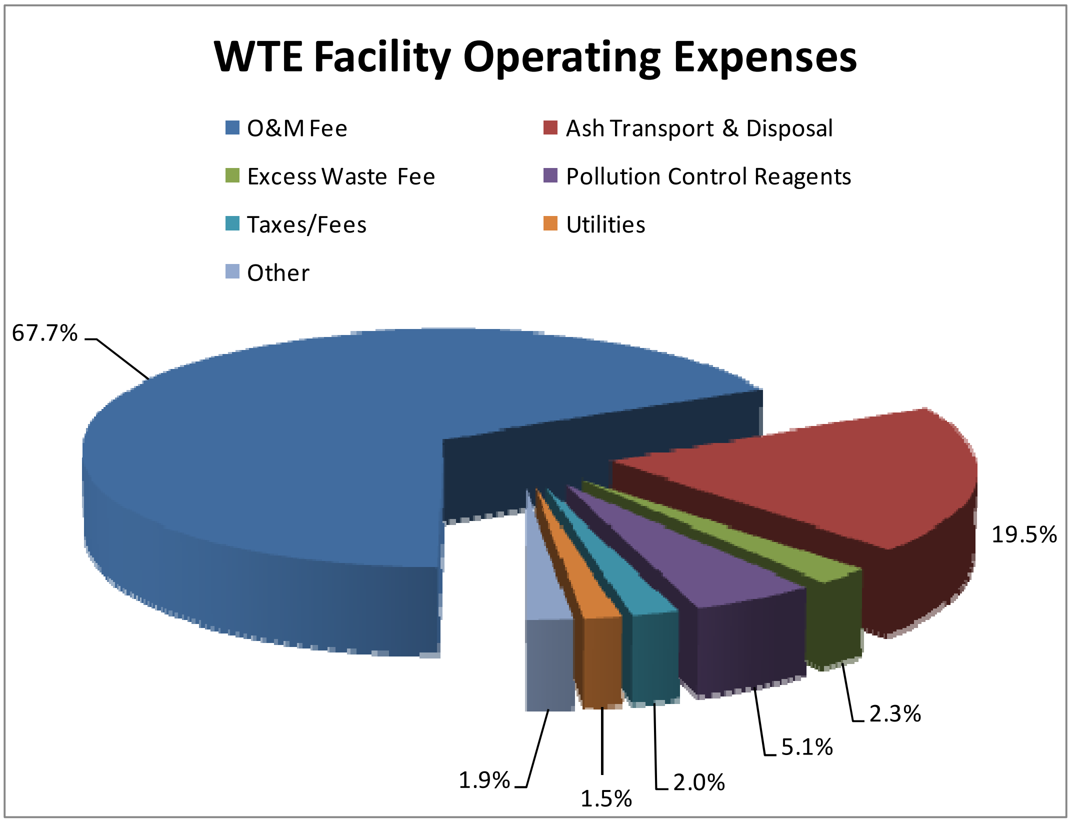
5.2.4 Supplemental Waste Tip Fee

The supplemental waste program is in place to provide proper disposal for waste streams other than MSW that may need special handling, secure destruction, or other special provisions. These wastes are carefully screened and evaluated to ensure that they will not impact Facility operations, including air emissions and ash residue characteristics. Covanta Onondaga administers the supplemental waste program with oversight from NYSDEC and OCRRA. As such, Covanta receives the established tipping fee less $10 (which OCRRA receives) for the first 500 tons of waste and thereafter Covanta receives the established tipping fee less OCRRA's MSW tipping fee, which OCRRA receives.

In 2011, 497 tons of supplemental wastes were processed, generating roughly $5,000 in revenue for OCRRA. The types of waste processed in 2011 include pill bottles with labels (which under the HIPAA regulations require secure destruction); confiscated drugs, uniforms, and other paraphernalia from drug enforcement agencies; and pharmaceutical laboratory debris.

5.3 Waste-to-Energy Facility Operating Expenses

The operating expenses associated with the WTE Facility include an operations and maintenance (O&M) service fee paid to Covanta to maintain the Facility, the costs to transport and dispose of ash generated by the Facility, an excess waste fee payment to Covanta if more than 310,000 tons of MSW are processed at the Facility, costs associated with pollution control reagents, taxes/fees, utilities, and other miscellaneous expenses (described further below). A summary of the relative contribution of these expenses is provided in the pie chart below. It should be emphasized that the operating expenses described in this report are expenses that pertain to OCRRA. Covanta Onondaga also has Facility-related operating expenses that are not described in this report.



5.3.1 Operations and Maintenance Service Fee

OCRRA pays an operations and maintenance (O&M) service fee for Covanta Onondaga to operate, repair, and maintain the Facility in accordance with the 2003 Service Agreement between OCRRA and Covanta Onondaga. This is, by far, the largest Facility-related expense. Each calendar year the O&M fees are adjusted according to several indices (skilled labor index, producer price index, and employment cost index) and OCRRA's annual tipping fee. In 2011, the base O&M service fee was \$11,616,408 and the non-ferrous O&M fee was \$41,808, for a total of \$11,658,216.

5.3.2 Ash Transportation and Disposal

OCRRA is responsible for transporting and disposing of ash residue generated at the Facility. The associated costs were estimated from a unit cost report and include all costs associated with handling and disposal of ash residue (salaries, fuel, tolls, tip fees, social security, insurance, and maintenance). The average unit cost for 2011 was approximately \$41.98 per ton, with 79,864 tons of ash being managed. Therefore, the total ash transportation and disposal costs for 2011 were approximately \$3,353,000.

5.3.3 Excess Waste Fee

According to the 2003 Service Agreement between OCRRA and Covanta, OCRRA is required to pay Covanta an excess waste fee if the Facility processes more than 310,000 tons of material in the calendar year. The unit fee per ton of waste greater than 310,000 is adjusted annually, based on the same indices as the O&M Service Fee adjustment. For 2011, the unit fee was \$23.91. The excess waste fee is not applicable for supplemental waste; therefore the quantity of supplemental waste is subtracted from the amount of waste processed in excess of 310,000 tons. In 2011 the Facility processed 16,284 tons of excess waste, resulting in an excess waste fee payment to Covanta of \$389,350. Prior to 2009, the excess waste fee ranged between \$500,000 and \$800,000. The 2011 fee was less because of the relatively low waste tonnage in 2011.

5.3.4 Pollution Control Reagents

The Facility uses several reagents for pollution control including anhydrous ammonia for control of NO_x, carbon for mercury and dioxin/furan control, and lime for control of acid gases. The cost of these reagents is generally a pass-through cost to OCRRA, with the exception of lime for which OCRRA only pays a portion of the cost.

To control NO_x emissions, anhydrous ammonia is injected into the combustion chamber of each boiler unit. There are no contractual maximum levels for ammonia usage, so OCRRA is solely responsible for the expense of all ammonia used. In 2011, the cost for ammonia reagent was \$298,793 for 332 tons of anhydrous ammonia at an average cost of about \$900/ton. Given the 2011 waste tonnage processed, these figures translate into an application rate of 2.03 lb per ton of waste processed and a unit cost of \$0.91 per ton of waste processed. The costs for anhydrous ammonia have significantly increased over the past several years.

To control mercury emissions, as well as dioxin and furan emissions, powdered activated carbon is mixed into slurry and injected into the spray-dry scrubbers through the rotary atomizer. The rotary atomizer creates tiny droplets for optimal reaction. There are no contractual maximum levels for carbon usage, so OCRRA is solely responsible for the expense of all carbon used. In 2011, the cost for activated carbon was $409,725 for 239.5 tons of activated carbon at an average cost of $1,711 per ton. The average carbon reagent application rate for 2011 was 1.47 lb per ton of waste processed, a rate within the historical range, and the unit cost was $1.25 per ton of waste processed. The costs for activated carbon have significantly increased over the past several years.

To neutralize acid gases, namely sulfur dioxide (SO_2), hydrogen chloride (HCl), hydrogen fluoride (HF), and sulfuric acid (H_2SO_4), a calcium-based lime, commonly referred to as pebble lime, is injected into the spray-dry scrubbers through the rotary atomizer. According to an agreement between OCRRA and Covanta, OCRRA is responsible for the cost associated with the pebble lime usage in excess of 21 pounds of pebble lime per ton of waste processed, up to a maximum of 32 lb per ton of waste processed. Covanta is responsible for pebble lime reagent costs up to 21 lb per ton of waste processed and above 32 lb per ton of waste processed. In 2011, OCRRA's cost for lime was $167,141 and the average reagent application rate was 27.9 lb of lime per ton of waste processed. The cost of the lime reagent for 2011 was about $149 per ton.

5.3.5 Taxes/Fees

OCRRA is contractually responsible for the cost of the following taxes/fees:

- State and local sales taxes on Facility-related purchases – $41,050 in 2011
- Regulatory operating permit annual fees – $24,453 in 2011
- Host Community Agreement payments to the Town of Onondaga – $147,110 in 2011
- Special fire district tax assessments – $119,388 in 2011
- Special water district tax assessments – $6,320 in 2011

5.3.6 Utilities

During normal Facility operation, the Facility's electrical demand is satisfied by the Facility's turbine-generator system, with the excess electricity being exported to the grid. During those times when the turbine-generator is offline due to maintenance or malfunction, electricity is purchased from National Grid (NG) to operate the Facility and continue combusting the incoming MSW. OCRRA is financially responsible for paying for the electricity purchased during these periods. The contractual threshold levels beyond which Covanta is responsible for such costs are as follows:

Electrical Energy	3,348,000 kWh/rolling 3-year period (maximum)
Electrical Demand	4,400 kW (maximum per billing period)

In 2011, 61,002 kWh of electricity was purchased from National Grid for in-plant needs during a brief turbine-generator outage. The 3-year rolling period total for 2009-2011 was 2,043,378 kWh, significantly less than the contractual maximum amount stated above. For 2011, the maximum monthly metered electrical demand was 3,888 kW. The cost of purchased power paid by OCRRA for 2011, including electrical usage and demand charges, was $110,616.

City water satisfies all potable and process needs of the Facility, with the majority being for process use. 32,267,000 gallons, representing 81% of the contractual maximum (40 million gallons per year) for which the Agency is financially responsible, were purchased in 2011. This amount of water translates into about 99 gallons per ton of waste combusted or approximately 61 gallons per minute. 2011 water usage remained consistent with historical levels and design parameters following initial start-up. Total 2011 water costs were $77,700, or $2.41 per thousand gallons, or roughly a 15% increase from 2010.

Natural gas is an auxiliary fuel used for boiler start-ups and shutdowns, and for maintaining minimum furnace temperatures when processing overly wet waste. 2011 natural gas usage was 144,620 therms, which is consistent with historical usage. The contractual maximum amount of natural gas OCRRA is financially responsible for is 110,000 therms per year, with Covanta being responsible for usage over 110,000 therms. Covanta exceeded the usage threshold in September 2011, at which point OCRRA was no longer responsible for natural gas costs (other than associated assessments). OCRRA's total annual natural gas costs were $77,817.

5.3.7 Other Expenses

In 2011, OCRRA was financially responsible for several other Facility-related expenses totaling $329,161, which consisted of:

- Facility-related insurance premiums ($287,660);
- System telecommunications between Facility and National Grid ($6,347);
- Traffic signalization for the hauler entrance to the Facility ($1,527);
- OCRRA's WTE engineering consulting services related to providing technical assistance and annual stack and ash testing on-site observations ($23,967);
- Trustee fees ($8,620); and
- Other miscellaneous ($1,040).

5.4 Bond Expenses

Until May 2015, OCRRA is responsible for paying debt service on the bonds for the Facility. At that point, the Series A bonds will have been paid off and the responsibility of the Series B bonds will be transferred to Covanta Onondaga. OCRRA pays a set amount for the principal and interest on the Series A bonds; however the amount paid on the Series B bonds depends on the profitability of OCRRA in any given year. OCRRA did not have a profitable year in 2011 (similar to 2009 and 2010); therefore, OCRRA did not make payments on the principal of the Series B bonds. The total payment on the Series A bonds in 2011 was $9,223,952.

Berenyi, Eileen B. "Recycling and Waste-to-Energy: Are They Compatible? 2009 Update." June 2009. Available at: www.energyrecoverycouncil.org/userfiles/file/2009%20Berenyi%20recycling%20update.pdf.

Covanta Energy. "2012 Covanta Partners Presentation – Onondaga County." PowerPoint presentation at meeting. Syracuse, NY. May 7, 2012.

Kaplan , P. Ozge, Decarolis, Joseph, and Thorneloe, Susan. "Is it Better to Burn or Bury Waste for Clean Electricity Generation?" *Environmental Science and Technology*. 2009, *43* (6), 1711-1717. Available at: www.wte.org/userfiles/file/Better%20to%20burn%20or%20bury.pdf.

LoRe, Anthony M. and Oswald, Kelsi J. "Benchmarking Mass Burn WTE Facility Performance – How Does Your Facility Measure Up?" *Proceedings of 17th Annual North American Waste-to-Energy Conference, May 18-20, 2009, Chantilly, Virginia.*

New York State Department of Environmental Conservation. "Don't Trash Our Air." Available at: www.dec.ny.gov/chemical/32060.html.

World Economic Forum. "Green Investing – Towards a Clean Energy Infrastructure." January 2009. Available at: www.weforum.org/pdf/climate/Green.pdf.

U.S. Environmental Protection Agency. August 10, 2007 Memorandum with subject "Emissions from Large and Small MWC Units at MACT Compliance." Available at: www.wte.org/userfiles/file/2007_EPAemissions_memo.pdf.

U.S. Environmental Protection Agency. "Controlling Power Plant Emissions: Emissions Progress." Available at: www.epa.gov/mercury/control_emissions/emissions.htm.

U.S. Environmental Protection Agency. eGRID2012 Version 1.0. Available at: www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

U.S. Environmental Protection Agency. *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010.* EPA-530-F-11-005. U.S. EPA: Washington, DC, 2011. Available at: http://www.epa.gov/wastes/nonhaz/municipal/msw99.htm.

U.S. Environmental Protection Agency. *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*. September 2009. Available at: www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf.

U.S. Environmental Protection Agency. February 14, 2003 Letter from Assistant Administrators Marianne Horinko, Office of Solid Waste and Emergency Response, and Jeffery Holmstead, Office of Air and Radiation, to Maria Zannes, IWSA. Available at: www.energyrecoverycouncil.org/userfiles/file/epaletter.pdf.