

CASE STUDY

PALM BEACH COUNTY, FLORIDA SOLID WASTE AUTHORITY WASTE TO ENERGY FACILITY

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EXECUTIVE SUMMARY

ENERGY RECOVERY CASE STUDY: PALM BEACH COUNTY, FLORIDA

The Palm Beach County North County Resource Recovery Facility (NCRRF) is one of 13 Refuse Derived Fuel (RDF) facilities currently operating in the United States. Commencing operations in 1989, the plant is owned by the Solid Waste Authority of Palm Beach County and operated by a subsidiary of Babcock & Wilcox Power Generation Group, Inc. It has served Palm Beach County's population of 1.3 million people without interruption for the last 20 years. The company recently renewed its contract with the Authority for another 20 years and is also undertaking a full scale retrofit of the facility. Palm Beach County disposes of about 1.5 million tons of municipal solid waste annually, of which 30% is recycled, 40% is combusted and 30% is landfilled. Due to the success of the NCRRF and the issues with siting a landfill, the Authority is in the midst of procuring a new mass burn WTE plant. At 3000 tons per day, generating between 95 and 100 MW of electricity, it is expected to come on line in 2015. It will be the first such plant built in the United States in 15 years and will use cutting edge combustion and air pollution control technologies. With this plant, the Authority will be more than doubling its WTE capacity.

Economic Impacts

- **Energy Efficiencies:** The 605,000 tons of waste combusted at the NCRRF produces about 378,500 Mwh (megawatt-hours) of electricity, enough to service about 40,000 homes and displace the use of 226,000 barrels of oil annually. Residual or non-recycled plastics contribute about 31% of the energy recovered on a BTU basis.

- **Employment:** The plant employs 220 permanent skilled workers, who contribute about \$8.8 million to the local economy annually. In addition, the facility contributes at least an additional \$5 million to the region annually through purchases of goods and services.
- **Impact on the Public Budget:** The Solid Waste Authority of Palm Beach County is a special taxing district. Residential properties pay an annual disposal fee based on type of property. Businesses are assessed a waste generation fee which varies by type of business. Private haulers also pay a tip fee of \$35.00 (2009) at all disposal sites. The Authority's total budget in 2009 was \$253,599,000 of which 64% came from non ad-valorem assessments, 11% from electricity revenues, 10% from tip fees and 5% from material sales. The remainder came mainly from reserves.
- **Real Estate Footprint:** The facility, processing nearly 2400 tons per day, is located in the northwest quadrant of the county at the 1300 acre North County landfill. To handle that level of daily waste the Authority would have to double its landfill size.

Environmental Impacts

- **Recycling Levels:** The Authority has voluntary recycling for residents and businesses. Its recycling rate was about 25% in 1996 and reached 30% by 2008. The state goal recently changed to 75% by 2020; thus, the Authority is considering making recycling mandatory.
- **Metal Recovery:** The NCRRF recovers about 30,000 tons per year of ferrous metal and 4000 tons of non ferrous metal at a value of approximately \$9.5 million. The county receives 90% of the ferrous revenues; the operator retains all non-ferrous revenues.
- **Landfill Diversion:** Over the plant's life, about 10 million tons of waste have been kept out of landfill. This has preserved valuable landfill capacity in the county. In addition, by diverting wastes from the landfill, the Authority has avoided the leachate production and the emission of hazardous landfill gases associated with this waste.
- **Reduction of Reliance on Fossil Fuels:** The plant takes the non-recyclable portion of the waste stream and generates energy. This energy is sold onto the grid and is enough to service about 40,000 homes as well as meet the in-house energy needs of the plant, displacing 226,000 barrels of oil.
- **Greenhouse Gas Reductions:** The combustion of 605,000 tons of waste at the WTE plant plus the metals recovery at the plant contributes to the net reduction of Greenhouse Gas (GHG), compared to the alternative of landfilling this waste. Using the US EPA's WARM model, one can calculate that the waste to energy plant results in a net reduction of 178,151 MTCEs (Metric Tons Carbon Equivalents), which is comparable to taking about 119,642 cars off the road.
- **Air Emissions:** The WTE plant operates under strict federal and state air emissions and operating standards, which are monitored and tested on a regular basis. As a RDF plant, which removes hazardous materials and metals prior to combustion and sizes the remaining waste, the NCRRF has met all standards with electrostatic precipitators and dry scrubbers. After 20 years of operation, in 2010 the plant is undergoing a \$260 million retrofit and boiler upgrade a new air pollution control system will be installed. It will be one of the cleanest WTE plants in the United States.

Political/Institutional Impacts:

- **Community Support:** The plant has operated without significant opposition over the last 20 years. In fact, as a reflection of community support, the Authority will be building a new 3000 tons per day plant next to the current facility. Dan Pellowitz, Assistant to the Authority’s Executive Director that “the success of the RDF plant has allowed us to proceed with permitting a new mass burn facility. Community and environmental groups recognize that this is a much better alternative than a new landfill.”¹
- A recent editorial in the local paper echoed this sentiment stating: “Not only does that [the new WTE plant] slow up the rate this landfill—and perhaps the next one, should it ever get built—gets used, squeezing energy out of garbage puts trash to good use. That's not just green. It's smart. And it's the best plan the county has in the works for dealing with its growing trash pile.”²
- **Industry Recognition:** In 2009 the NCRRF was recognized by the American Society of Mechanical Engineers (ASME) by receiving the Large Waste to Energy Facility Recognition Award for outstanding performance among facilities in North America. It also received the 2009 Solid Waste Association of North America (SWANA) silver Excellence Award in the Waste-to-Energy category.

INTRODUCTION

Palm Beach County, the largest county in Florida, covers an area of 2034 square miles between the Atlantic Ocean on the east and Lake Okeechobee on the northwest. It has a population of 1,287,344, ranking third in the state. The county consists of 38 incorporated municipalities, containing 57% of its population as well as numerous unincorporated communities. Despite being the wealthiest county in Florida, it is highly diverse. Atlantic seashore high income resort communities such as Palm Beach and Boca Raton are part of Florida’s “Gold Coast”. In contrast, the western portions of the county are quite rural with active farming, sugar cane, and equestrian industries. The county also contains the most northern remnant of the Everglades ecosystem.

Palm Beach County was founded in 1909, when due to population growth it was carved out of Dade County. Its first non-native American settlement grew up around a U.S. Army fort in 1838. Two railroads, the Jupiter and Lake Worth were built in 1888 and by the early 20th century Henry Flagler completed the Florida East Coast Railroad, connecting Jacksonville to Key West. The coming of the railroads spurred population growth. With its beautiful beaches and sub-tropical climate, Palm Beach County rapidly became a tourist destination and by the mid-20th century an attractive location for regional, national and global corporations.

With its burgeoning population and increasing federal and state attention to environmental issues, Palm Beach County by the 1970s faced a garbage crisis. It was rapidly running out of landfill capacity. Many sub-standard landfills were being closed and the county was finding it extremely difficult to find a new site. To better address the problem the county formed the Solid Waste Authority (SWA) to take over all solid waste management activities. The SWA ultimately

¹ Interview with Dan Pellowitz, Assistant to the Executive Director, October 26, 2010.

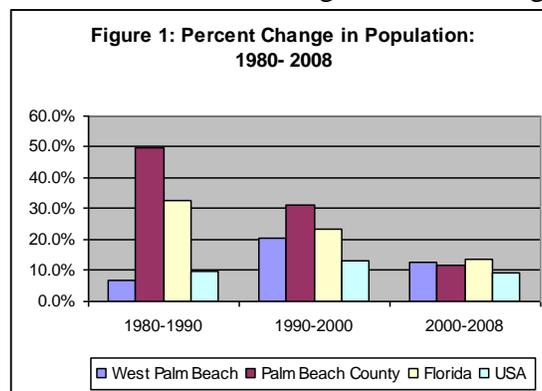
² Editorial. **Sun Sentinel**. February 27, 2010. <http://articles.sun-sentinel.com>

purchased acreage in the more sparsely populated northwestern quadrant of the county for a new landfill. However, at this time the state passed legislation, encouraging populated counties to examine the possibility of waste to energy. Following the state directives, the Solid Waste Authority voted in 1986 to construct a 2000 ton per day (tpd) Refuse Derived Fuel (RDF) waste to energy plant, siting it on the new landfill.

DEMOGRAPHIC AND ECONOMIC PROFILE OF PALM BEACH COUNTY AND WEST PALM BEACH, FL

Demographic Characteristics³

Palm Beach County, on Florida’s Atlantic Ocean “Gold Coast” is the wealthiest county in Florida. It continues to increase in population and contains a diverse mixture of coastal and inland, tourist destinations and agricultural centers. West Palm Beach, where the waste to energy facility is located, is the largest city in the county and the county seat. With a 2009 population of about 1.3 million people, the County has more than doubled in number since 1980, when it stood at 577,000. During the same period, West Palm Beach grew from 63,000 people to 91, 000, an increase of 46%, while the state’s overall population also nearly doubled. Figure 1 shows the percent of population growth of the city, county and state for the various census periods. As can be seen, the county experienced a 50% growth rate between 1980 and 1990. This fell to 30% in the next decade, but still outstripped the state and nation. Between 2000 and 2008 growth had slowed across all jurisdictions, but was still hovering in the 10% range.

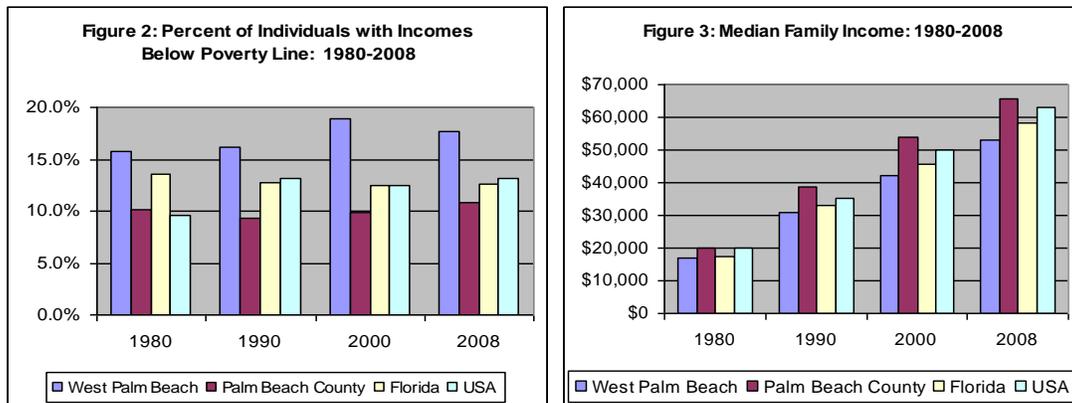


One aspect of the population that should be noted is its age. South Florida is a prominent retirement location. Since 1980, an average of 23% of Palm Beach County’s population is at or above 65 compared with the national average of 12% and the state’s average of 18%.

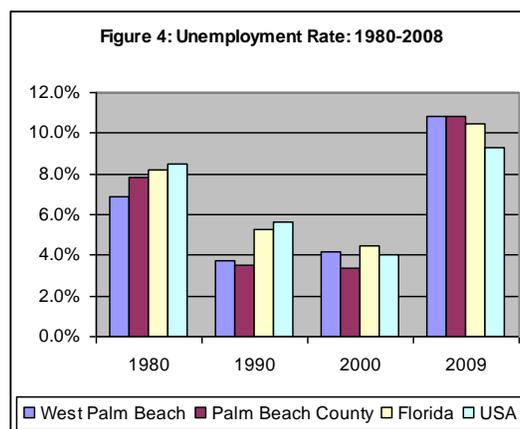
³ 1990, 2000, 2008 Population, housing and income data from Decennial Census and 2006-2008 American Community Survey 3-year Estimates. <http://factfinder.census.gov>. 1980 data is from U.S. Department of Commerce, Bureau of the Census. **County and City Data Book: 1983, 10th Edition**, 1983. Data on employment is from the Bureau of Labor Statistics. Local Area Unemployment Statistics. <http://www.bls.gov/lau/#tables>.

However, over time the percentage of persons in this age category has been rising in the U.S., but declining in both Florida and Palm Beach County.

When one examines poverty rates and median family income across the city, county and state certain differences become apparent. West Palm Beach appears to be less wealthy than both the county and state. As shown in Figure 2, the percentage of individuals with incomes below the poverty level in West Palm Beach was higher than in the county and state across all time periods, remaining at 16% to 19%. In comparison, the percent of individuals with incomes below the poverty in Palm Beach County hovered around 10% across all time periods. Figure 3 graphs median family income. While in 1980, the median family income of the West Palm Beach and the state were similar, incomes in Palm Beach County and the country were somewhat higher. By 1990, family income in Palm Beach County rose higher than city and state and has remained so through 2008. Oppositely median family income in West Palm Beach is lagging behind that of the county and state.



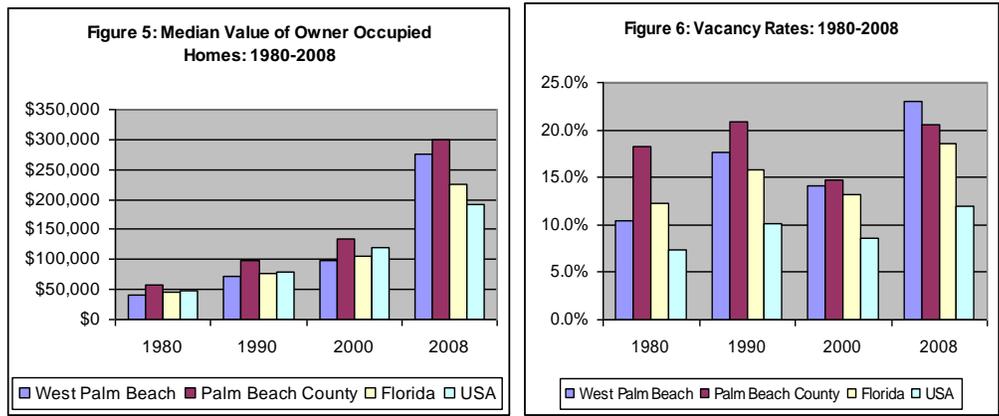
Although Palm Beach County has a higher income profile than either West Palm Beach or the state of Florida, both the county and the city reflect a similar employment picture. As can be seen in Figure 4 unemployment rates in the city and county were below those of the state and nation in 1980 and 1990.⁴ This gap had closed by 2000 and by 2009 county and city employment rates soared to nearly 11%, above that of the state and the U.S.



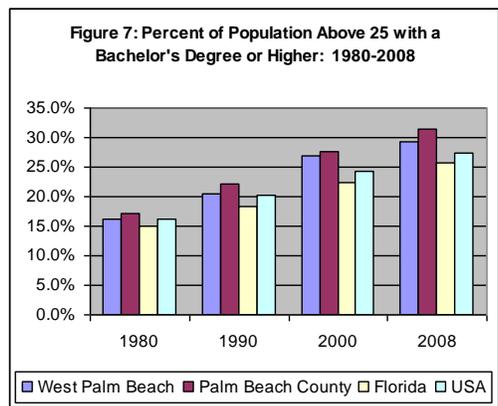
⁴ 1980 Unemployment percentages were for West Palm Beach. The 1990, 2000, and 2009 data were from the West Palm Beach-Boynton Beach-Boca Raton area.

With respect to the housing market, both Palm Beach and West Palm Beach enjoyed modest growth in the value of its owner-occupied homes through 2008, mirroring the home price values in the state and country. However as of 2008, the median value of a home in the city and county increased substantially. The entire south Florida region participated in the real estate boom, but subsequently suffered greatly when the housing bubble burst.

Figure 6 graphs housing vacancy rates between 1980 and 2008. Vacancy rates in the county have remained at or above 15% throughout the 28 year period. Rates in West Palm Beach have trended lower than those in the county, but both saw an increase to above 20% by 2008. Since 1990, vacancy rates in the city and county have been higher than averages across the state and country.



Finally Figure 7 reflects the percentage of persons above 25 years of age with a Bachelor's Degree or higher as an indication of educational attainment in the community. West Palm Beach and the county are quite similar across all time periods, showing slightly higher percentages than that of the state. The county has made an effort to attract high technology companies, particularly pharmaceutical and medical firms which may account for the higher levels of college graduates compared to the state and U.S. as a whole.



In sum, Palm Beach County is a growing, wealthy county with an educated employment base. West Palm Beach tracks the county in many demographic indicators, but at a slightly lower level. Like much of South Florida, the county has suffered in the current recession and housing market

decline. However, projections are for the county to continue growing at a rate of about .88 percent per year over the next 15 years.⁵

The Local Economy

The economic base of Palm Beach County has been dependent on the real estate and construction industries associated with producing housing for the growing population. This portion of the economy has been severely impacted during the current recession and has resulted in a general economic slowdown in the county. Agriculture is also a key industry in the rural western area of the county, producing winter vegetables, citrus, sugar cane, flowers and ornamental plants. Tourism serves as strong economic driver, bringing in a large influx of people during the winter and spring, due to warm weather and major league baseball training camps. Health care and technology firms are also becoming important to the county's economy as it seeks to diversify. In fact, the two largest employers are Tenet Health Care Corporation with 4500 employees and Hospital Corporation of America with 3400 employees. Florida Power and Light, The Breakers Hotel, Boca Raton Resort, Office Depot Headquarters, U.S. Sugar Corporation, Florida Crystals and AT&T each employ above 1300 employees. The SWA sees future economic growth in service businesses and light industry.

HISTORY OF WASTE TO ENERGY IN PALM BEACH COUNTY

Palm Beach County opted for waste to energy as a result of a disposal crisis and a state policy that encouraged the development of waste to energy facilities as alternatives to landfills. By the early 1980s, the state and county recognized that there was increasing ground water contamination from unlined landfills. Many landfills in Florida ended up on the National Priority Superfund list and about 500 open dump sites were identified and closed. In addition, Florida has a high water table, so even a lined landfill begins at ground level and goes up. Landfills can rise about two hundred feet above ground level and are prominent and unsightly features of many Florida counties. Public officials, environmental groups and community residents began to search for disposal strategies that could divert as much waste from landfills as possible, due to their negative environmental impacts

The State of Florida

Following the lead of federal legislation, the state passed the Florida Resource Recovery Management Act (RRMA) in the 1977, which created a Resource Recovery Council. The Council's purpose was to evaluate and promote resource recovery. The Act also directed the 19 most populous counties in the state to draft resource recovery and management plans to determine if WTE was a feasible option. Moreover, in order to create a viable financial and legal framework to support a WTE plant, the State Legislature enacted a flow control statute, which authorized those counties constructing waste to energy plants to direct the flow of solid waste in the county to a designated disposal facility. Furthermore, the legislature exempted resource recovery equipment owned by or operated on behalf of local governments from state sales taxes.

In 1988 in response to the continued inability of local governments to deal with dwindling landfill capacity, the Florida legislature passed the comprehensive Solid Waste Management Act,

⁵ Solid Waste Authority of Palm Beach County. **Comprehensive Annual Financial Report. Fiscal Years ended September 30, 2009 and 2008.**

which became a model for solid waste legislation nationwide.⁶ The Act was designed to promote waste diversion from landfills, focusing on recycling and resource recovery (waste to energy). It established an overall 30 percent recycling goal by 1994, setting up recycling and education grant programs. Every county had to establish a recycling program by 1989 and which at minimum had to have source separation of C&D (construction and demolition) debris, newspaper, aluminum and steel cans, glass and plastic bottles. Separation of other plastics, metal, paper and yard trash was also encouraged. The sales of beverage containers with metal rings, non-degradable plastic ring holding devices, non-degradable plastic bags, plastic containers without resin labeling, non-degradable polystyrene foam or plastic coated paper products and containers with polystyrene foam were banned. The 1988 Act also established landfill bans of used oil, lead acid batteries, white goods and yard trash. A flow control section was incorporated into the Act, giving counties the responsibility for the provision and operation of disposal facilities. Finally with respect to waste to energy, the law mandated that utilities purchasing electricity from WTE plants had to assume a 100% capacity factor, thereby increasing revenues to the WTE facility. Counties and municipalities had to determine the full cost for solid waste management and were permitted to implement user fees to cover a portion of the costs.

Two major revenue streams were created by the Act to provide grants to localities to assist them in achieving solid waste management goals. A \$1.00 fee was levied on each tire sold at retail. In addition the Act created the Solid Waste Management Trust Fund to help finance the various portions of the Act. The main source of revenues for the Trust Fund was the tire fee and an allocation of the statewide sales tax.⁷

In 1993, the Florida state legislature revised the 1988 Act. The immediate landfill crisis had passed and there were rising concerns that waste to energy plants might conflict with the state's growing recycling program as well as emit harmful air pollutants. To deal with these issues, the 1993 Amendments subjected waste to energy plants to new siting and need criteria. No WTE facility can be built or expanded unless the county proposing new capacity can demonstrate that it has met the 30% waste diversion goal and that it the new facility will be part of an integrated solid waste management program. At this point, waste to energy remains one of the central aspects of Florida's solid waste management policy due to continuing population growth and the lack of feasible waste disposal alternatives. Electricity from waste combustion is considered renewable and is being categorized as such in the Renewable Portfolio Standard legislation being debated currently before the Florida Legislature.

Palm Beach County Solid Waste Authority

The SWA (Solid Waste Authority) was established as an independent special taxing district by the Florida Legislature in 1975 to deal with the garbage crisis. Its purpose was to develop and implement plans for an integrated County-wide solid waste management system comprised of recycling, resource recovery, transfer stations and landfill facilities to serve the future needs of the county at reasonable cost. The Act gave the authority the power to issue revenue bonds for the construction of waste to energy and other processing facilities as well as flow control powers to ensure that all county generated waste would use Authority facilities.

⁶ Jonathan F.K. Earle, Roger A. Nordstedt and Marie S. Hammer. "Overview of the Florida Solid Waste Management Act of 1988. University of Florida IFAS Extension. BUL272, November 1991.

⁷ This trust fund has been inactive, as revenues have been diverted to the general fund.

By 1979 the Authority had produced its first comprehensive solid waste management plan which proposed the construction or refurbishment of 6 transfer stations as well as two regional waste to energy facilities. Every community in the urbanized coastal area of the county was to be no more than 10 to 12 miles from a transfer station or waste disposal facility. By 1983, the Authority had assumed responsibility for the existing county landfills, which had closed or were in the process of closing. It had also acquired 1300 acres adjacent to one of the old landfills to site a waste to energy facility as well as develop a new landfill and construct Authority offices. In 1984, \$320,000,000 of revenue bonds was issued for the construction of the North County Resource Recovery Facility (NCRRF). One year later, the Authority procured 1650 acres in the southern part of the county, with the view to developing the second waste to energy facility and landfill. The Authority also levied a county wide, non ad-valorem annual disposal special assessment as a means to finance the construction and operation of the solid waste system.⁸

Since this time, the Authority has continued to develop a state of the art integrated solid waste management system incorporating waste to energy, landfill gas recovery, sewage sludge pelletization, and recycling processing facilities and composting plants. It also franchises residential waste collection in the unincorporated areas and licenses all commercial haulers. While the plan for a second waste to energy facility and landfill in the southern part of the county was abandoned, the Authority is now in the midst of procuring a second 3000 ton per day WTE plant to be located on the North County landfill site, adjacent to the NCRRF. The SWA will own the plant and will be selecting an operator from among three bidders by January 2011. It is expected that the new plant will be operational by 2015.

DESCRIPTION OF THE PALM BEACH COUNTY WASTE TO ENERGY PLANT

Site

The NCRRF is located in the north central part of the county within the City of West Palm Beach, taking up 40 acres of a 1320 acre site.⁹ The site also has a solid waste landfill, a C&D landfill, a commercial and residential recycling facility, a ferrous metal processing plant, a composting center, a household hazardous waste drop off facility and a sludge drying and pelletization plant. The new WTE plant will also be located there.

Technical Specifications

The facility began operations in 1989 and is one of 13 refuse derived fuel (RDF) plants operating in the country. When it was built it was the largest such facility in existence. An RDF plant pre-processes the waste, through sorting, size reduction and shredding, prior to combustion. The Authority selected this technology due to lower levels of air emissions and the high rates of recycling and waste diversion that could be achieved. The facility is owned by the Solid Waste Authority (SWA) and operated by the Palm Beach Resource Recovery Corporation, a subsidiary of Babcock & Wilcox Power Generating Group, Inc. In a joint venture with the Bechtel Corporation, Babcock & Wilcox designed, procured and constructed the plant. The original

⁸ A non ad-valorem tax is one that is not based on property value.

⁹ With the renaming of the North County site as the Palm Beach Renewable Energy Park, and the designation of the new WTE facility as Palm Beach Renewable Energy Facility #2, the NCRRF will be called Palm Beach Renewable Energy Facility #1.

operating agreement was signed in 1989 for 20 years. In 2009 it was renewed for an additional 20 years, through 2029.

Almost 90% of the waste coming into the NCRRF is transported from the five Authority transfer stations located throughout the county, with about 10% being delivered directly by private haulers. The waste first goes into a large building where hazardous and non-processible materials such as bulky items, carpets are removed. The remaining waste goes on a conveyor and enters a flail mill for initial size reduction. Ferrous metals are removed by an overhead magnet. Materials are then separated into three streams by a trommel: 1)small, low-BTU material, such as dirt and grit, that is hauled to the landfill; 2) medium-sized, high-BTU material; and 3)oversized high-BTU material that is further shredded before being mixed with the medium sized material for combustion. Aluminum and other non-ferrous metals are collected by an eddy current separator for recycling. At that point the separated and size reduced RDF is fed into the boilers and combusted. Any material that is cannot be combusted or recycled is hauled to the landfill.

The plant was originally permitted to handle 625,000 tons of waste per year. Its permit levels have been increased over the years and in 2009 it was processing about 876,000 tons of waste. Of this incoming tonnage, 640,000 tons are combusted as RDF or recovered as ferrous or non ferrous metals. The plant’s gross incoming throughput is 2400 tons per day of which about 1700 tons are combusted and converted into energy. The total non-combustible fraction of the waste after pre-processing is 236, 000 tons or 650 tons per day. In addition, RDF combustion generated about 118,000 tons of ash which is disposed at the adjacent Authority landfill. Table 1 shows a breakdown of tonnage.

Table 1: Tonnage Throughput Breakdown at NCRRF 2009		
Waste Breakdown at RDF Plant	Tons Per Year	Tons Per Day
Total Quantity of Incoming Waste	903,073	2474
Unprocessable Tonnage-Carpets, Large Items	27,316	75
Total Processible Tonnage to RDF Plant	875,758	2399
Total RDF Combusted and Metals Recovered*	639,760	1753
Amount RDF Combusted	604,767	1657
Metals Recovery	34,993	96
Non-Combustible Waste that is Landfilled	235,998	647
*The combustion process produces about 118,000 tons of ash which is landfilled		
Source: SWA. 2010 Component Cost Summary, March 2010.		

The plant is fitted with two B&W Stirling 1000 ton per day RDF boilers with Detroit Stoker traveling grates. It has a turbine/generator with a nameplate capacity of 62 MW. The original air pollution control system consisted of electrostatic precipitators and dry scrubbers. Currently, the entire plant is being retrofitted at a cost of about \$262 million. The two boilers are being completely refurbished and a state of the art air pollution control system is being installed including baghouses for particulate control, dry scrubbers for acid gas control, selective non-catalytic reduction for NOx control and activated carbon injection for mercury control as well as a new continuous emission monitoring (CEM) system. With these changes, this plant will have one of the lowest level of air emissions of all WTE plants in the United States. B&W, the plant operator, was the successful bidder for the retrofit.

Waste Flow

Waste flow control in Palm Beach County is built around four levels of agreement: 1) the 1983 Solid Waste Authority/Palm Beach county agreement in which the Authority assumed responsibility for all County landfill facilities; 2) Board of County Commissioners/SWA Inter-local Agreement in which responsibility for solid waste management programs were transferred from the County to the Authority; 3) Solid Waste Collection Franchises in which solid waste and recycling collection in the unincorporated areas of the County are managed through exclusive franchise agreements with private haulers granted by the Solid Waste Authority; 4) Inter-local agreements with municipalities in Palm Beach County granting the Authority the power to provide a comprehensive solid waste disposal and recycling plan.

Each of the participating 33 municipalities in the Authority are responsible for implementing their own solid waste and recycling collection programs; however all collected materials must be brought to SWA facilities for disposal or processing. Firms providing commercial refuse collection are also mandated to use Authority facilities. However, commercial recyclers can use any processing facility, whether in or out of the county. In addition, the SWA is responsible for refuse collection services in the unincorporated areas of the county, which comprise 43% of the county's population. These areas are divided into 11 collection districts. The SWA grants recycling and refuse collection service franchises for five year periods, through a competitive bidding process. The franchised haulers pay a percentage of their revenues as a franchise fee and must provide SWA mandated services at the bid price.

Financing

The SWA was established as an independent special taxing district in 1975, converting to a dependent special taxing district in 1991 with the county commissioners of Palm Beach Counterserving as the Board of the Solid Waste Authority. The Authority was given the right to levy taxes and fees and well as issue revenue bonds. The majority of the Authority's revenues derive from assessments levied on all county households and waste generators for waste disposal and all households and multi-dwelling units in unincorporated areas for refuse and recyclables collection.

As of 2009 the waste disposal charge for residences was \$156.00 per year for single family homes, \$87.00 per year for multi-family dwellings and \$149.00 for mobile homes. All commercial and industrial establishments pay a waste generation fee based on whether they fall into a low, medium or high generation category. At 2009 rates, a low waste generator (i.e. bank, parking garage, church) pays an annual charge of \$.073/sq. ft., a medium generator (i.e. arena, bowling alley, shopping center) \$.195/sq. ft, a high generator (i.e. supermarket, restaurant, bar) \$1.044/sq. ft. and a non-generator \$.011/sq.ft. Farms and other firms in the agricultural sector pay \$400 per year. In addition, any hauler handling non-residential loads pays a tip fee of \$35.00 per ton at all SWA disposal facilities. Out of county haulers pay \$118/ton.

In the unincorporated areas of the County, all households pay between \$94 to \$419 per year for solid waste collection and recycling services, depending on the franchise district in which they are located. Total revenues of the SWA totaled \$254 million in 2009. Of these revenues, waste

disposal and collection assessments make up 64%, electricity sales 11%, tip fees 10% and material sales 5%. The remaining revenues come from reserves and interest income.

The initial capital cost of the NCRRF, including the pre-processing facility was \$215,000,000. To pay for the plant, the SWA issued \$43,500,000 of revenue bonds in 1983 and \$320,000,000 in 1984. Additional monies raised by these bonds went towards landfill closure, landfill development, and the construction of wastewater and water facilities, administration buildings and three transfer stations in the southern parts of the county. In 2009 an additional \$261,545,000 in revenue bonds was issued to cover the full retrofit of the NCRRF and to fund preliminary studies for the second 3000 ton per day WTE facility.

The original agreement between the SWA and the NCRRF facility operator which just expired in 2009, guaranteed a throughput of 624,000 tons of processible waste. This guaranteed minimum has been exceeded by SWA in the last decade as its population grew and by 2009, about 876,000 tons of refuse was processed by the facility. Under contract the SWA pays the operator an annual operating fee based on the floor guarantee, with additional payments made for excess tonnage. The operator must guarantee an annual waste reduction of 60%, a base electric output of 311,000 mwh and a ferrous metal recovery amount of 30,800 tons. These guarantees have all been surpassed. Electricity is sold to Florida Power and Light at a current rate of \$.0796/kwh.¹⁰ The SWA receives an average of 85% of the revenues, the operator 15%. Revenues from ferrous metals recovered at the plant are split such that the SWA receives about 90% and the operator 10%. All revenues obtained from non-ferrous metals recovered at the plant revert to the plant operator. As of 2009, the total facility operating expenses were with debt service was \$78.1 million, of which debt service totaled \$40.7 million.¹¹ Electricity sales offset about 39% of the costs. Revenues from the sale of recovered ferrous metals contribute to less than 1% of costs. The remaining 60% of operating costs are covered by tip fees and solid waste assessments.

ECONOMIC IMPACTS OF THE WASTE TO ENERGY PLANT IN PALM BEACH COUNTY

Energy Recovery

The main purpose of the Palm Beach County's waste to energy plant is to divert waste from landfill, with the added benefit of energy and metals recovery. An RDF facility maximizes these two goals as waste is processed prior to combustion for the purpose of separating valuable metals and removing the non-processible fraction. Potentially toxic materials are removed from the waste at the front end, with the result that the amount and toxicity of both the ash and air emissions are reduced. In 2009, the plant produced 391,036 mwh of electricity, of which 378,466 were sold to Florida Power and Light. This is enough electricity to service about 40,000 homes and displace the use of 226,600 barrels of oil.¹²

¹⁰ This includes capacity payments. A new power sales contract has been negotiated and pricing will change.

¹¹ Operating Costs were taken from Solid Waste Authority of Palm Beach County. **2010 Component Cost Summary**, March 2010. Debt service costs were allocated according to figures in Solid Waste Authority of Palm Beach County. Fiscal Year 2009/2010 Adopted Budget.

¹² Household calculation is based on U.S. DOE average kwh per household data.

While solid waste is considered a renewable fuel in Florida, as of 2010, the state has not yet passed a Renewable Portfolio Standard. The Public Service Commission of Florida has unanimously approved draft legislation calling for each utility to achieve a goal of 20% renewable energy by 2020. Solar and wind energy are to be given priority, but energy from waste qualifies as a renewable fuel. In fact, energy from waste constitutes one-third of all the renewable energy produced in Florida.¹³ To contribute to the 20% goal, any source of renewable energy must be generated within the state. The draft rule also establishes a renewable energy credit market. The bill has failed to pass in the last two legislative sessions due to cost concerns and questions about the exclusion of nuclear energy; however, observers are confident that a bill will pass within the next year. In the long term, this should give a financial boost to the waste to energy in Florida.

Employment and Community Development Impacts

The Palm Beach County waste to energy plant is really two plants, a pre-processing mixed waste facility and a waste combustion plant. In total, the combined facility employs 220 full-time equivalent skilled and semi-skilled workers from the local area. With an average salary conservatively estimated at about \$40,000 per year, these employees put back about \$8.8 million into the local economy. In addition to providing direct employment, the plant regularly relies on local and regional contractors to provide goods and services. One can estimate that it spends about \$5,000,000 annually on businesses providing construction and maintenance, uniforms and health services, road cleaning, grounds maintenance and janitorial services.

The plant is located on a 1320 acre site which includes two landfills and contains most of the Solid Waste Authority's waste disposal and processing facilities. The site does not appear to have had any negative impacts on development. There are two private golf course communities that have been built within 1.5 miles of the facility. In addition, the Authority has developed a 300 acre Conservation Area and Rookery adjacent to the plant. This wildlife refuge harbors thousands of Florida wading birds and two endangered species, the Snail Kite and Wood Stork.

Public Budget Impacts

The Solid Waste Authority is independent of the county and is self-financing. It is responsible for the management of about 1.6 million tons of waste including residential and commercial waste, construction and demolition waste and vegetative waste. It oversees franchised refuse and recycling collection for about 180,000 households. Homeowners pay an average of \$350 per year for collection and disposal services. The WTE plant comprises about 23% of the Authority's total expense budget and contributes 13% of the revenues in electricity and material sales. Other than tip fees and the solid waste assessment, the sale of electricity is the largest revenue generator of the solid waste authority.

ENVIRONMENTAL AND HEALTH IMPACTS OF THE PLANT

Recycling

¹³ Navigant Consulting, Inc. **Florida Renewable Energy Potential Assessment**. Prepared for the Florida Public Service Commission, Florida Governor's Energy Office, and Lawrence Berkeley National Laboratory. November 24, 2008.

The basis for an integrated solid waste management program which included recycling was established in the 1977 Resource Recovery and Management Act, which while directing populated counties to examine the feasibility of waste to energy, also directed them to examine source separation of recyclables. The 1988 Solid Waste Management Act mandated a recycling goal of 30% to be met by 1994 with specific goals of 50% recycling of five classes of materials: tin cans, aluminum cans, glass, plastic (#1 and #2) bottles and newsprint. All counties were to implement source separation programs for municipal waste and C&D debris. Statewide landfill bans were instituted for yard waste, white goods (appliances), motor oil and batteries.

The SWA's recycling collection programs have gone beyond the five original materials stipulated in the 1988 Act to include plastics (#1-#7), aseptic packaging, magazines, corrugated cardboard, junk mail, mixed paper, gable-top containers (milk, juice, etc.), other metals and aluminum products such as foil and pie plates. Commercial recycling programs collect office paper and corrugated cardboard, plus the same materials as the residential programs. Yard waste, construction/demolition debris, tires, white goods and used oil are also recycled. The Authority has also established an e-waste recycling program. The transfer stations serve as drop-off sites where residents can take electronics as well as household hazardous materials. Recycling for both residents and businesses is voluntary.

While constructing a waste to energy facility in 1989, the Authority also built a Materials Recycling Facility (RMRF), which opened in 1991. Handling mainly residential recyclables, it is operated by a private firm on behalf of the Authority. In addition, in 1996, the Authority opened a commercial MRF, to process commercial recyclables. It is both owned and operated by the Authority and is one of the few such public facilities in the country. In order to achieve production efficiencies and increase throughput, the Authority completed construction of a new \$40 million, 140,000 sq.ft MRF, which has replaced both plants. Opening in 2009, the Recycling Materials Processing Facility (RMPF) is the largest such facility in the state, sorting more than 120,000 tons of material per year.

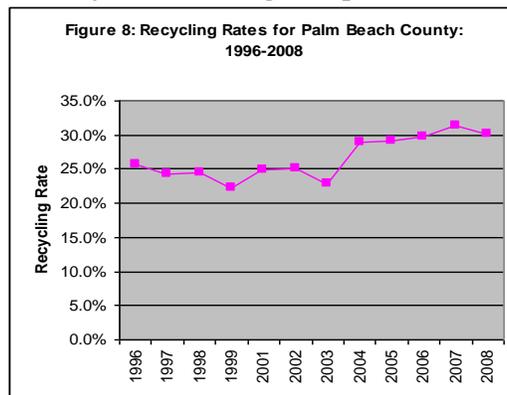
The Authority also built a ferrous metal processing plant. This plant handles all the metals and appliances that are diverted from the front end of the waste to energy facility as well as those metals recovered at the construction and demolition landfill, drop-off sites and the recycling plant. At this facility, the metals are size reduced by a shredder and passed through an air classification system which is coupled with magnets to separate the ferrous metals from any contaminants. The resultant ferrous material is loaded onto rail cars and shipped directly to manufacturers. The plant, processing about 34,000 tons of metal per year, is owned by the Authority and operated by a private contractor.

Because of its climate and frequent storms, southern Florida counties generate a great deal of vegetative and yard waste. To capture this stream and prevent its landfilling, the Authority maintains a separate vegetative waste system. It receives about 200,000 tons of this waste a year. About 50% is shipped to an outside processor to create agricultural grade mulch. Some is mulched on site and used by Authority properties. About one-third of the material is goes to the Authority's Compost Facility. This facility combines wastewater residuals from the Authority's wastewater treatment plant in West Palm Beach with the vegetative mulch to produce a Class AA compost suitable for agricultural and horticultural applications.

Recycling Rates in Palm Beach County

While the Authority processes most of the residential recyclables generated in Palm Beach County, it does not necessarily process all commercial recyclables. Both commercial and residential recycling is voluntary, and businesses can make their own arrangements for recycling pick-up with any licensed hauler in the county. The Florida Department of Environmental Protection has been reporting recycling statistics since 1996; however, definitions and waste classifications have changed over time, making comparison somewhat difficult. Figure 8 reflects Palm Beach County’s recycling rates over time.¹⁴ In 1996, Palm Beach County reported recycling rates at about 25%. These rates have trended upward over the next 12 years, reaching a rate of 31% in 2007 and dropping back to 30% in 2009.

As of 2009, the Authority reported a further drop off in waste and recyclables collected. In fact, due to the economic slowdown, the total waste collected in 2009 was the lowest amount since 2001. With its recycling rate at a plateau, the Authority is considering making recycling mandatory. The state enacted new recycling goals in 2008, calling for a 75% recycling rate statewide by 2020 and the Authority is examining all options to increase its recycling levels.



Plastics Recycling

PET and HDPE plastic bottles have been a part of the Solid Waste Authority’s curbside recycling collection program since the program began in the early 1990s. With the completion of the new MRF in 2009, the Authority has expanded its collection program to include all plastics. The percentage of plastics in the recycled waste stream has been growing. According to data reported by the state, the percent of plastics in the recycled waste stream has increased from below 1% in 1996 to above 2% in 2008. These numbers appear somewhat low in comparison to national percentages.

Based on the Palm Beach County waste composition data as reported by the state, plastics make up about 14.7% of disposed waste. Applying this percentage to the 2009 Authority disposal data, one can determine that about 89,000 tons of plastic are combusted and converted to energy at the WTE plant. Because of the RDF process, some percentage of the residue going to landfill is also plastic. Small pieces of the material get entwined with paper and food bits and fall through the

¹⁴ Yard waste recycling percentages going back to 1996 were adjusted using 2006-2008 recycling proportions. Special waste, process fuels, C&D waste and miscellaneous waste were excluded from the recycling rate calculations.

trommel during the waste sorting operation. When the new mass burn WTE facility is built, these fines will be combusted and additional energy from the plastic will be generated.

Landfill Diversion

Since the beginning of its operation, the NCRRF has resulted in the diversion of about 10 million tons of waste from the North County Landfill, avoiding additional leachate production as well as toxic gas emissions. Nearly all residential waste in the county comes to the NCRRF via transfer stations. In addition, most commercial haulers use the transfer stations, since all waste generators in the county pay an assessment and thus are already paying for a portion of the waste disposal bill. Of the total waste stream of 1.3 million tons under direct control of the Authority, 17% is recycled, 48% is combusted and 35% is landfilled.¹⁵ This number does not include the commercial recyclables that are being handled at non-Authority facilities.

Reduction of Fossil Fuel Consumption

In 2009, the NCRRF generated 378,466 mwh of electricity which was sold onto the grid, thereby reducing the amount of fossil fuel consumption in the region. The amount of fossil fuel saved is enough to power the equivalent of about 18,000 automobiles annually. The WTE also has diverted millions of tons from being transported to the North County landfill. However, because this landfill is co-located with the WTE facility, expenditures of energy for transportation are not impacted.

Reduction in Greenhouse Gas (GHG) Emissions

Modern waste to energy plants with up to date air pollution controls have successfully reduced greenhouse gas emissions such they generate less greenhouse gas emissions per megawatt-hour than power plants using oil or coal, and they perform nearly as well as natural gas power plants. Furthermore, landfill gas to electricity projects generate nearly 6 times the amount of greenhouse gases per Mwh when compared to waste to energy projects. Only nuclear power plants create less greenhouse gas emissions on a per megawatt-hour basis than do waste to energy projects.¹⁶

In order to compare greenhouse gas emissions with other solid waste disposal and recycling alternatives, the U.S. EPA has developed the WARM Model. Using this model with specific data from Palm Beach County, one can determine that the NCRRF, given the current level of recycling and landfilling results in a net reduction of about 178,151 MTCE (Metric Tons Carbon Equivalents) compared to a scenario in which the county would dispose of all its waste at the North County landfill.¹⁷ This reduction is the equivalent of taking about 119,642 cars off the road per year. The major reduction in net greenhouse gas emissions is achieved through the generation of electricity from waste rather than fossil fuels and the recycling of metals at the NCRRF. Because the Authority has a landfill gas collection system, harmful emissions at the landfill are reduced.

Fully Controlled and Monitored Air Emissions

¹⁵ Solid Waste Authority of Palm Beach County. **2010 Component Cost Summary**, March 2010. Percentages exclude C&D waste as well as recyclables that are not processed at Authority facilities.

¹⁶ P. Ozge Kaplan, Joseph DeCarolis, Susan Thornloe. "Is it Better to Burn or Bury Waste for Clean Electricity Generation?" **Environmental Science and Technology**. 2009. 43. 1711-1717.

¹⁷ U.S. EPA. Waste Reduction Model (WARM) –Excel Format, Version 10, October 2009.

Waste to energy facilities operate in a highly regulated environment with respect to air emissions, water discharges as well as the transportation, storage and treatment of solid waste. Since the federal Clean Air Act Amendments of 1990, there have been stringent requirements placed on Waste to Energy facilities to use “maximum available control technology” (MACT). At the time it was evaluating waste to energy, the SWA considered and rejected a mass burn plant. Members of the Authority were extremely concerned about the levels of dioxin, mercury, lead and other harmful elements emitted into the air. They were not convinced that a mass burn plant could meet Florida’s stringent criteria air emissions criteria. Thus, the Authority selected an RDF technology, which was considered “cutting edge” at the time. Due to the substantial pre-processing and sorting of waste, batteries and other harmful substances could be screened out prior to combustion. Furthermore, RDF technology offered a high degree of front end metal recovery, reducing the amount of ash that would need to be landfilled. Finally, due to the pre-processing and sizing of the waste particles, combustion was thought to be more efficient and complete, further reducing the formation of dioxins and other pollutants.

The plant originally relied only on electrostatic precipitators for particle removal, a system in wide use at the time. However, it added dry scrubbers within a few years, since the electrostatic precipitators were getting fouled with carbon fibers and causing unscheduled shut downs. With this addition, the facility did not have to do any further upgrading to meet the requirements of the federal Clean Air Act Amendments of 1990. Due to the presence of a portion of the Everglades as well as marshlands and other natural habitats in the county, the Florida DEP has been particularly vigilant with respect to the NCRRF. Table 2 shows the most recent emission results as reported to the Florida DEP. As can be seen both RDF boilers are operating well within federal and state standards.

Table 2: NCRRF Emission Results Compared to Federal and Florida Standard in Tons Per Year Equivalents			
Pollutant	Boiler #1	Boiler #2	Allowable Emissions – Tons Per Year
Opacity	Below	Below	10%
SO ₂ -Sulfur Dioxide	110.95	117.02	200.68
NO _x -Nitrogen Oxides	629.462	656.138	1247.29
PM-Particulate Matter	7.25044	7.82495	71.63
VOC-Volatile Organic Compounds*	.158679	.313579	28.9
CO –Carbon Monoxide	183.457	184.346	603.56
HCl- Hydrogen Chloride	97.8102	49.338	122.98
Cd – Cadmium Compounds	.00316	.005115	Less than 1
Dioxin/Furans	.000043	.000005	Less than 1
F –Fluorides*	.587114	.219505	5.8
Hg-Mercury*	.015868	.005017	0.182
Pb-Lead	.190415	.153654	1.14
Be-Beryllium Compounds*	.000135	.000127	Less than 1
*Florida statutes more stringent than federal statutes			
Source: Florida Department of Environmental Protection, Final Title V Air Permit Renewal, Permit #0990234-101-AV. Also Florida Department of Environmental Protection, Division of Air Resource Management, Annual Operating Report for Air Pollutant Emitting Facility. Solid Waste Authority of PBC/NCRRF			

In 2006 EPA issued revisions to the New Source Performance Standards (NSPS) as well as emissions guidelines in a Revised MACT Rule. These revisions increased the stringency of emissions limits for most regulated air pollutants. This revised rule is being challenged and may result in standards being made more restrictive than current levels for some pollutants. In addition, there is a revised rule with respect to fine particulate matter, which will impact waste to energy facilities in areas of generally sub-standard air quality. Rules are also changing with respect to ozone standards. Thus, in anticipation of new federal regulations as well as the recognition that the NCRRF will have to achieve further reductions of air emissions to stay within standards which govern the entire site due to the construction of the new WTE plant, the Authority decided to fully upgrade the air pollution control system of the plant as well as retrofit both boilers to achieve higher combustion efficiencies. The project cost \$262 million and is currently underway. The plant is being fitted with new dry scrubbers for acid gas control, baghouse filters for particulate control, SCNR for NO_x control and activated carbon injection for mercury control. With these improvements, unusual for an RDF plant, the NCRRF will be one of the cleanest WTE facilities in the U.S.

Health Impacts of the WTE Plant

With its upgraded air pollution control system, the NCRRF will be operating well below strict standards for air emissions and water pollution. As Table 1 shows, even in the year before the full retrofit, the plant is operating well within federal and state standards. Its operating permit was renewed in 2006 to run through 2011. In the permit review it was found to be in full compliance with all air emissions, health and safety procedures as well as materials separation procedures.¹⁸

Under strict scrutiny by both federal and state regulators, there have been no health concerns with respect to the NCRRF. However, concerns were raised with respect to additional mercury deposits and particulate emission in surrounding marshlands due to the addition of the new mass burn waste to energy plant. As a result extensive air dispersion modeling was done for both nearby areas and areas downstream from the plant, particularly the Everglades National Park and the Biscayne Bay National Park. Modeling revealed that these areas are not currently adversely impacted by the existing waste to energy facility and that the new facility will not cause emission levels to exceed federal and state standards. In addition, an analysis was conducted to determine the effects on soils, vegetation, and visibility associated with the new WTE project. Again, even with added increments of emissions produced by the new plant, the modeling projects emissions to be well below threshold levels.¹⁹ Studies for the new plant also looked at existing conditions surrounding the site and found no negative impacts in adjacent residential, commercial and industrial areas.

POLITICAL AND INSTITUTIONAL IMPACTS OF THE PALM BEACH PLANT

When Palm Beach County and the Solid Waste Authority began to consider waste to energy in the 1983, solid waste management was a politically charged issue. Local landfills were being

¹⁸ Florida Department of Environmental Protection, Final Title V Air Permit Renewal, Permit #0990234-101-AV.

¹⁹ Solid Waste Authority of Palm Beach County. **Class I Air Dispersion Modeling Report (Submitted as Attachment A of the Air Quality Modeling Report) Palm Beach Renewable Energy Facility No. 2.** Prepared by Malcolm Pirnie, Inc. April 2010

forced to close, leaving the county scrambling for alternatives. The creation of the Solid Waste Authority insulated the County politically from difficult decisions on solid waste management that were on the horizon. Furthermore, it allowed solid waste professionals and planners to develop an integrated solid waste system with a dedicated revenue stream.

The Authority first had to find a site for a new landfill and the proposed waste to energy facility. Various alternatives were considered and abandoned due strong community opposition. In public meetings and hearings, environmental groups, homeowners associations and concerned citizens lashed out against the Authority's intentions to site a new landfill and plant. They were concerned the WTE plant would emit dangerous soot and chemical by-products into the air, causing infertility and cancer and that chemicals from the landfilled combustion ash would leach into the ground, contaminating drinking water.

Under Florida law, new power plant construction must be reviewed by a state hearing officer whose decision is then reviewed by the Governor and Cabinet. The NCRRF, classified as a power plant had to go through the hearing process. In 1986, various attempts were made to convince the state hearing officer to recommend moving the plant elsewhere.²⁰ Oppositely members of the Authority indicated that without the new landfill and waste to energy facility, the County would run out of disposal capacity in two years. In order to respond to state input and community concerns about air pollution, the Authority decided against a mass burn plant in favor of RDF technology. With modifications to the plan, the state decided in favor of the Authority and it was able to proceed with the construction of the landfill and WTE plant.

After the initial hurdles in siting the NCRRF, there has been minimal opposition to its operation. A recent issue related to the selection of a subcontractor selected to undertake a portion of the facility retrofit. In 2009, the Authority awarded a \$126 million contract to Kellogg, Brown & Root, a former subsidiary of Halliburton, which had worked in Iraq for the U.S. Government. Some residents and editorials opined that the Authority was bringing Iraqi style contracting with its shoddy workmanship and high costs to Palm Beach County.²¹ Others have complained that the company has not done enough to hire local residents.

Opposition to a new plant did surface in the 1990s when the Authority, anticipating future growth, began planning a new landfill and WTE plant in the southern portion of the county. Rural homeowners, county planners, Water Management District officials mobilized against the plan. The Authority acquired the land, but did not proceed with its plans. It is still seeking to site a second landfill in the western portion of the county, but there is strong opposition to any of the proposed areas. With the decision to build the new WTE facility and declining waste quantities, the Authority felt it could defer landfill acquisition into the future. While there has been much opposition to any new landfill site, there has been none surrounding the second WTE facility on the North County site.

²⁰ Robert McClure. "Opponents Say Plant Byproducts a Hazard" **Sun Sentinel**. March 18, 1986. <http://articles.sun-sentinel.com>

²¹ Lisa Rab. "One of the Worst Contractors in Iraq Lands in Palm Beach County." April 16, 2009. <http://blogs.browardpalmbeach.com/>

Recent concerns have centered on costs and the level of debt incurred by the Authority. One manifestation of this issue has been the simmering debate over whether recycling should remain voluntary or be made mandatory. Some business owners claim that forced recycling would add to their costs in a time of economic hardship. Others charge the Authority with overreaching and adding to their already substantial budget by having to add a recycling enforcement division.²²

EPILOGUE: SUCCESS BREEDS SUCCESS--NEW WTE PLANT CONSTRUCTION

Due to the success of the NCRRF and continued problems in siting a new landfill, the Authority is procuring a new 3000 tpd WTE plant adjacent to the first plant, with an expected power output of 90 to 100MW. The proposed Palm Beach Renewable Energy Facility 2 (PBREF2) will be the first new WTE facility constructed in the United States in 15 years and the largest in terms of power output and tonnage throughput. Its estimated cost is in the range of \$700 million. With this plant, the Authority will be able to divert nearly all of its non-recyclable, processible waste from landfill for the next decade, relieving pressure to acquire a new disposal site.

The new plant's proposed emission limits of NO_x, SO₂ and mercury are lower than the most stringent permit limits specified for these pollutants from any MWC unit in the United States.²³ For example, NO_x emission limits have been reduced from the current standard of 85 ppm (parts per million) on an annual basis to 45 ppm. Mercury limits have been dropped from 15 ug/dscm (micrograms/dry standard cubic meter) to 12ug/dscm. Due to pressure from the state of Florida to reduce emissions to the lowest possible limit, the location of the new plant near to an existing facility, and the intentions of some of the Florida utilities to adopt a new approach to NO_x control, the Authority recently decided to modify its proposed air pollution control system on the new plant. It will require Selective Catalytic Reduction (SCR), instead of the widely used SNCR (Selective Non Catalytic Reduction), found on most waste to energy plants in the United States. Although SCR technology is widely used on European WTE plants, the PBREF2 will be the first municipal WTE facility in the U.S. to adopt it.²⁴

The Authority opted for mass burn technology for the new plant. It is a proven technology and with major advances in combustion and air pollution control systems resulted in high operating performance. Furthermore, a mass burn plant occupies less space and has lower operating costs than a comparable RDF facility, which needs a companion pre-processing plant. In addition, mass burn plants have demonstrated the ability to recycle residual metals at the back end of the combustion process; thus, the Authority would still be able to recover high value metals. The Authority has issued its RFP for the construction and operation of the facility and has pre-qualified three bidders. The successful bidder will be chosen by the beginning of 2011.

²² Andy Reid. "Enough Asking Nicely: Mandatory Recycling May Come to Palm Beach County." August 30, 2010. <http://www.palmbeachpost.com/>

²³ Solid Waste Authority of Palm Beach County. **Prevention of Significant Deterioration (PSD) Permit Application. Palm Beach Renewable Energy Facility No. 2.** Prepared by Malcolm Pirnie Inc., May 2010.

²⁴ SNCR- ammonia or urea is injected in the flue gas stream at the boiler at an appropriate temperature (1600 to 1800F). Under proper conditions it reduces the NO_x to elemental nitrogen and water. Used with enhanced combustion design, reduces NO_x between 40 and 60%

SCR- uses a catalytic process in which ammonia is injected into the flue gas downstream from the boiler in the presence of a catalyst. This can be done at cooler temperatures, with less ammonia.

CONCLUSION

The Palm Beach NCRRF has operated successfully since 1989. After 20 years of operation, it is currently undergoing major refurbishing, in order that its life can be extended for at least another 20 years. Over this period the facility processed nearly 16 million tons of solid waste, about 3.7 million tons above its original commitment. It produced about 6.9 million net megawatt-hours of electricity, which was enough to service about 625,000 homes since the plant has been in service. The plant has also recovered more than 664,000 tons of ferrous metal and 63,000 tons of non-ferrous metal. Without the pre-processing at the RDF facility, these metals would have ended up in the landfill.

Facing a severe disposal crisis in the county in the 1980s, the Solid Waste Authority, despite controversy and opposition sited a landfill and an RDF facility. Since that period, the Authority has expanded its recycling and waste diversion programs. While unable to site a second landfill due to community opposition and environmental concerns, it has successfully procured a second waste to energy plant. With a stable revenue stream of solid waste assessments, tipping fees, electricity and materials sales revenue, the Authority is on a solid financial base and able to meet the demands of future population growth and development.