

Testimony of William F. Brandes  
U.S. Virgin Islands  
January 9, 2012

My name is William Brandes. I appreciate the opportunity to talk to you today about waste management and Waste-to-Energy (WTE), particularly as they pertain to the specific issues associated with islands.

I have recently retired from the U.S. Environmental Protection Agency (EPA) after a 30 year career, mostly in EPA's Office of Solid Waste in Washington, D.C. Please note that I do not speak for the Agency here. However, everything I say here is the same or similar to comments and positions I took while I was working at EPA.

The last ten years of my career in EPA was focused on how to change from a national strategy on "waste" and getting rid of it to a strategy on ways to use waste materials as commodities in a more sustainable materials management system. I was part of the re-focusing effort by the Office of Solid Waste to concentrate the Agency's efforts more on the use of waste materials and less on treatment and disposal of those materials. In fact, during my time at EPA, the Office of Solid Waste changed its name and its organizational structure to reflect this needed change in focus. We went from the Office of Solid Waste to the Office of Resource Conservation and Recovery.

Also during this time, my thinking on resource conservation evolved and I became a strong proponent of capturing energy from waste, particularly Municipal Solid Waste or MSW.

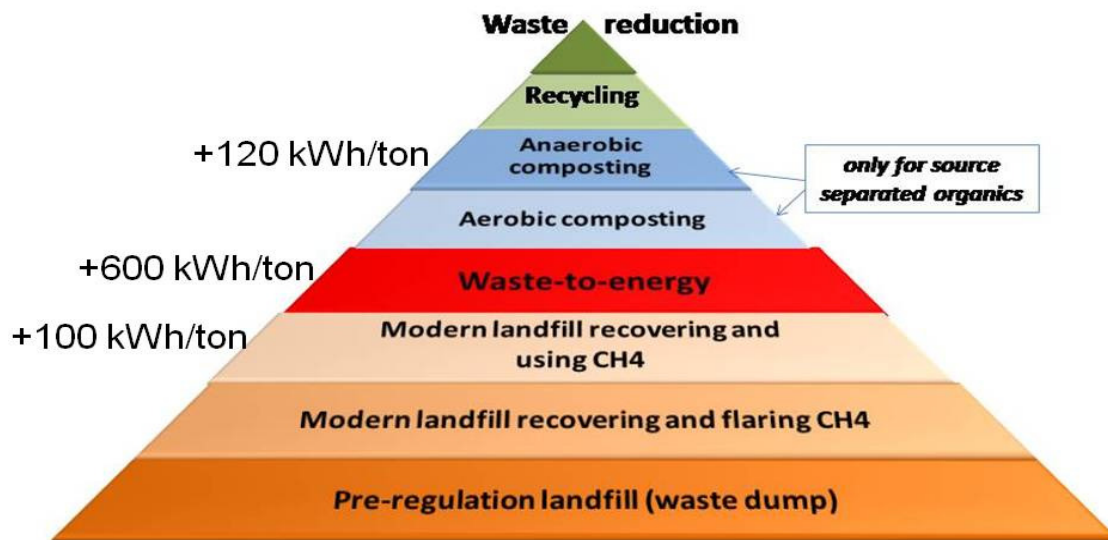
I was the first chief of the Energy Recovery and Waste Disposal Branch of the reorganized Office. Part of the branch's responsibility was assessing the energy value of waste materials as part of a materials management hierarchy. We also looked at ways to capture energy from former waste materials in environmentally safe and effective ways. We looked at advanced technologies, such as gasification, as ways to convert waste to energy and we looked at existing technologies, such as mass burn combustion, as part of a sustainable materials management system. My staff and I traveled all over the U.S. during this time as well as visiting European countries working on similar environmental priorities.

I'm here today to stress my conviction that the U.S. Virgin Islands can have a far more beneficial and more sustainable waste management system for the Island's municipal waste

materials. I believe that the best and most immediately implementable system to achieve your goals is to follow the internationally recognized waste management hierarchy and combine reduction and recycling of MSW with energy recovery via WTE combustion of post-recycled materials.

I would like to start by saying that currently, there is no formal national policy in the U.S. on WTE and its role in waste management. The U.S. EPA currently has no specific, written policy regarding the use of WTE for the specific reason that Congress has not mandated that the Agency develop a formal policy or issue a specific statement on the use of WTE in waste management. Instead, EPA has helped establish, and encourages the use of, the internationally recognized waste management hierarchy. That hierarchy is familiar to most who work on waste management issues. While I was working in the Office of Solid Waste, the waste management hierarchy was modified by EPA to include WTE as an integral part of the strategy, clarifying that it was not "disposal" (landfilling is disposal in the hierarchy), thus placing it above landfilling as a desirable waste management tool. The figure below shows a detailed version of that internationally recognized hierarchy.

## Expanded Hierarchy of Waste Management (Themelis, GWMS, 2008)



While there are many reasons why I believe in an integrated materials management system for USVI's municipal waste management system, I will focus on three of them as important for decision makers to assess when making decisions on how to develop a better, more sustainable waste management program. However, I also attach to this testimony a paper that Dr. Nickolas Themelis of Columbia University and I wrote and presented at the recent North American Waste-to-Energy Conference (NAWTEC) that provides a more comprehensive argument as to why we should use MSW as an energy and materials resource and not treat it as a continuing, expensive problem.

### **1. WTE reduces landfill pressures while providing clean, baseload energy**

The unique waste management issues islands must address -- limited space that restricts landfilling and limited domestic markets for recycled material -- coupled with the reality of a limited domestic energy supply, are mitigated, in part, by the use of WTE. In fact, the combination of efforts to reduce waste generation overall and energy recovery from post-recycling MSW is the only practical, proven way to address these problems and to maximally extend landfill life while providing needed baseload power that is of domestic origin. This has been the experience of the rest of the world, including other island economies. The Hawaiian Islands' waste management/energy generation experience is a good example to consider. The solutions Hawaii has embraced seem to me to be persuasive for the USVI also.

In 1991, Hawaii generated 1.3 million metric tons of municipal waste. Of this mass of material, over 80% was landfilled. Only 5% was recycled and about 13% was combusted for energy recovery. It was clear this was unsustainable for the islands. In addition, Hawaii recognized that its energy generation system was dangerously dependent on oil, a commodity that in the 1990's (as it is today) was subject to significant fluctuations in price. Clearly, something had to be done to address these problems. By 1999, the state was generating close to 2 million metric tons of MSW. However, by that time Hawaii had increased its recycling rates to 24% and its WTE to 30%. In doing so, it halved its landfilling rate and reduced the number of active landfills from 23 to 11. Forward to today. Hawaii now generates 2.5 million metric tons of MSW (increased population, higher domestic consumption of goods) yet has been able to reduce landfilling to 40% of the total volume through the combination of increased recycling and increased WTE. Further reductions are planned.

One of Hawaii's major concerns throughout this period was its high energy costs. Hawaii was (and temporarily still is) the most dependent state in the U.S. on oil for its electricity generation. Almost 95% of its electricity came from oil in 1991. They wanted to begin the process of weaning the state away from this situation for reasons of economics. By 2008, the percentage had been reduced to 75% of Hawaii's electricity. But they still had to import a total of 43 million barrels of oil at a cost of \$4.1 billion. That was a 37% increase from 2007, due almost entirely to the short term price fluctuation in oil. Hawaii's response to their oil dependence was to create the Hawaii Clean Energy Initiative. This Initiative set a goal of 70% of the energy used in Hawaii be from clean energy sources by 2030. Now, the islands are adding to their domestic energy sources as quickly as they can. WTE is a significant part of this Initiative, along with wind and solar power development. In fact, WTE (currently 8% of O'ahu's power supply) has so far made the largest contribution to reducing oil imports. Each metric ton of MSW incinerated, reduces the needed oil supply by one barrel. In 2008, WTE in Hawaii replaced 600,000 barrels of oil, a significant cost saving.

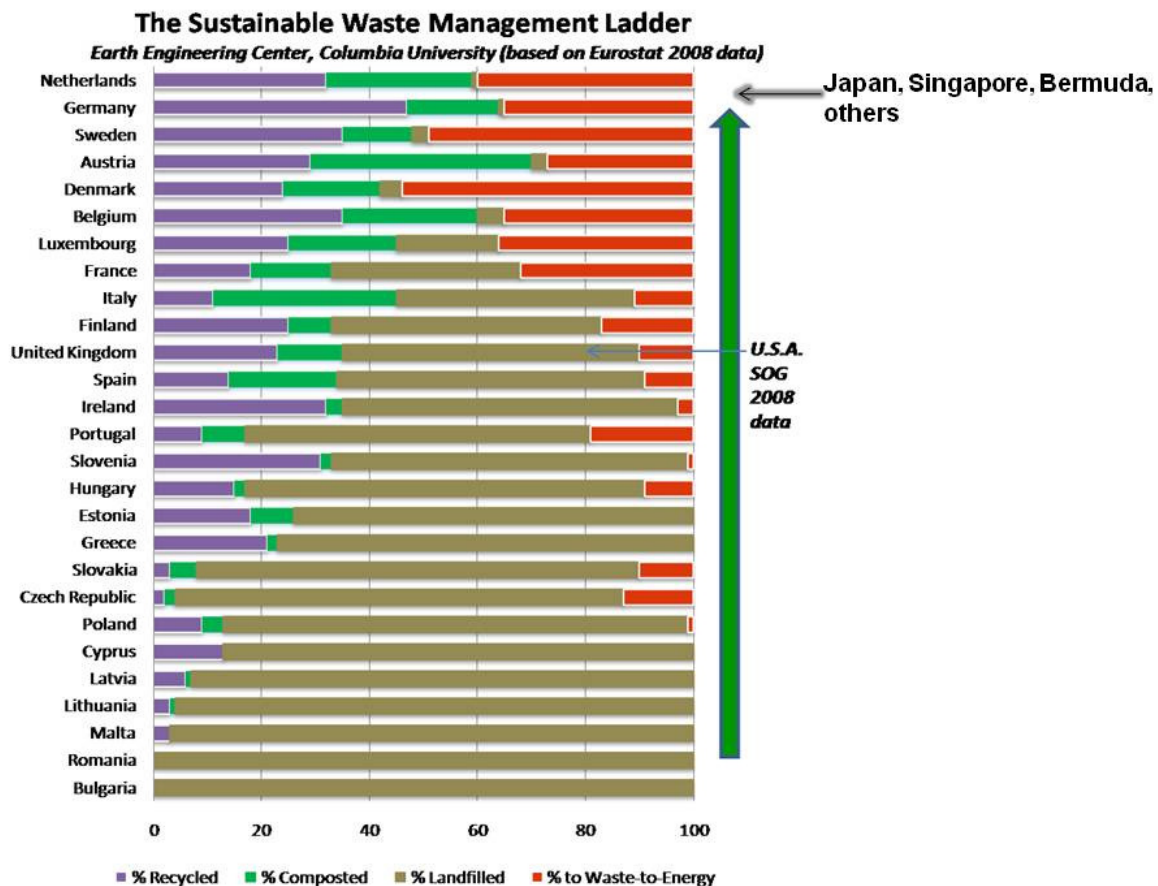
And WTE is a domestic baseload power source, i.e., local, reliable, always available.

## **2. Recycling and waste-to-energy must be used together**

Some people continue to insist that energy recovery cannot co-exist with robust recycling programs. I have never seen this in practice, either here or in any other country. A number of European Union nations have in fact attained much more sustainable MSW management systems by implementing recycling and WTE infrastructures that work in synergy. The same path should be followed by the U.S., which must focus on establishing more integrated waste management systems located in or near urban centers. These systems must combine all practical tools: single stream recycling to a modern Materials Recovery Facility (MRF), composting of source-separated organics, and combustion of the post-recycling materials to produce energy and recover metals and construction materials. The alternative is not, as some would claim, a 100% recycling/composting system without the need for WTE, but rather a continuing over-reliance on landfilling.

Energy recovery systems are fully compatible with recycling programs because they do not compete either for a limited feedstock or for markets. In fact, WTE enhances recycling efforts by recovering metals from the mixed MSW. Austria, Germany, Japan, the Netherlands

and other nations have high recycling rates and send the post-recycling residues to WTE plants. In contrast, countries without WTE infrastructure invariably have high rates of landfilling. Energy recovery systems exist in harmony with practical recycling systems by converting the non-recyclable materials into electricity and heat.



The figure above shows clearly that nations that have practically eliminated landfilling have done so by combining recycling and waste-to-energy. There is not a single country in the world that has even approached zero landfilling without combining the use of WTE with recycling and composting. Several years ago, while I was at EPA, I met with a group of 20 mayors from the major cities of Denmark. Denmark, a small country geographically, shares the common problem of restricted space with island communities. I presented to them the U.S.'s MSW management statistics, showing that while we recycle about 30% of our MSW, we still were landfilling over 60% on a national basis and only using 7% for energy recovery. They were

incredulous that the U.S. was still landfilling such a huge amount of MSW. They presented their cities' combined efforts in MSW management, showing that through the use of recycling and WTE (in fact Denmark recycles/composts about 50% and uses the other 50% of its MSW in combined heat and power systems) Denmark achieves its waste management and carbon reduction goals and landfills very little of its waste materials.

For some who claim that islands can ramp up recycling/composting to eliminate landfilling, I can only relay the experiences of the rest of the world and show the practical solutions that were implemented to reduce landfilling. Zero waste, i.e., 100% recycling/composting, is a philosophy rather than an applied practice, not achieved anywhere in the world. The U.S. has been working for over 30 years to implement the goals of the Resource Conservation and Recovery Act (RCRA). In that time we have gone from woeful single digit percentages to about 30% recycling nationally. Most of this recycling involves the more valuable commodities, like paper fiber and metals, that pay to recycle under most economic conditions. Data from the U.S. EPA's Office of Resource Conservation and Recovery suggest the recycling rate has leveled off in the past several years.<sup>1</sup> This result suggests that the low hanging fruit, i.e., the valuable commodities, have entered a permanent recycling system but the less valuable ones have not. Composting of organics is a promising area but it can be applied only on source-separated organics. Increasing the recycling rate has become increasingly difficult and will become more so at higher rates. A realistic MSW recycling rate is peaking at around 40-45% at a few locations. However, when the U.S. rate climbs, hopefully, to such levels, there will still be a significant volume of MSW that has to be either combusted or landfilled.

For islands, the addition problem of transportation of recyclables suggests that absent government funding at high levels, recycling rates will be limited by cost of transport to recycling centers at off-island locations. In other words, the higher recycling rates achieved by some locations would not be practical on islands and only high value commodities, like metal, would be recyclable economically. The rates estimated in the report by the National Renewable

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<sup>1</sup> see Municipal Solid Waste Generation, Recycling, and Disposal in the U.S., Facts and Figures for 2008, EPA-530-F-009-021, November, 2009 ([www.epa.gov/wastes](http://www.epa.gov/wastes)).

Energy Laboratory would seem to me to be more realistic. And even if you can achieve these recycling rates, the material left over would have to be landfilled unless you have WTE.

### **3. WTE is an effective energy capture system.**

Direct combustion of MSW is an efficient way to capture the energy contained in the material. Between 500 and 600 kilowatt hours of electricity can be generated from one ton of MSW. And because of the high volumes of MSW under any management scenario, whether you recycle a little or a lot of the waste, this can a significant source of domestic energy.

In contrast, the amount of energy that is captured from other systems, including landfill gas capture systems, is much lower; on the order of ten times lower than with WTE systems. I don't argue that landfill gas capture is undesirable. It is far better to use the gas generated than to allow it to escape to the atmosphere. However, methane capture systems are inefficient energy capturing systems that at best mediate undesirable attributes of landfills. We will always need some landfill capacity and we can offset the impacts of landfill gas emissions by capturing those emissions, where possible. But we can more efficiently capture the inherent energy in MSW through WTE systems than we can in any landfill gas capture scenario.

### **Conclusion**

My experience in materials management over the past 30 years has convinced me that for a number of reasons, including those in this written testimony, WTE combined with an economically viable recycling program is the best way for the U.S. Virgin Islands to manage its municipal waste stream. While increased recycling is highly desirable, it does not directly produce a commodity that can be immediately used on the Islands. WTE does produce a vital, domestically produced commodity that can be immediately used on the Islands.

Converting a waste problem into an energy solution via use of WTE has been the direction taken by much of the world. It is a particularly compelling, and practical, solution for island communities who face special problems in constructing a sustainable materials management system.

Thank you for the opportunity to testify before you today.

## Attachment

"Materials and Energy Recovery from Municipal Solid Waste: Why They are Both Needed."  
William F. (Rick) Brandes and Nickolas J. Themelis. Proceedings of the 19th Annual North  
American Waste-to-energy Conference. NAWTEC19. May 16 - 18, 2011.