TEAMING TO RECYCLE SURPLUS ELECTRONICS ACROSS THE DOE COMPLEX

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ABSTRACT

Computers, monitors, scientific equipment – electronic tools have quickly changed today's businesses, government offices, and homes. Rapid advances in technology created an increasing backlog of outdated, end of life electronics, most containing hazardous materials. In a joint effort between DOE Oak Ridge, their Community Reuse Organization, and The Oak Ridge National Recycle Center, tons of obsolete electronics with hazardous components from the cold war era and beyond are being turned into assets. This unique relationship has resulted in the recycle of 2,694 metric tons of electronics and the development of a new industry – electronics recycling. Recycling will continue to save DOE and the taxpayer money and most importantly, will continue to preserve the environment in years to come.

INTRODUCTION

Computers, monitors, printers, copiers, scientific equipment – electronic tools have quickly changed today's businesses, government offices, and homes. End of life electronics has become a growing by-product of the Information Age and presents new challenges for waste management. Size and performance improvements contribute to the almost daily obsolescence of yesterday and today's electronics. In a joint effort with the Department of Energy (DOE) Oak Ridge Operations Office of Asset Utilization (ORO AU), the Community Reuse Organization of East Tennessee (CROET) and The Oak Ridge National Recycle Center (TORNRC), tons of obsolete electronics with hazardous components from the cold war era and beyond are being turned into assets. TORNRC, a commercial company was established in 1999 at the East Tennesse Technology Park in Oak Ridge Tennessee to recycle electronics from the DOE Oak Ridge Operations Office and private businesses. This unique arrangement allows DOE to recycle outdated electronics and avoid costly disposal. TORNRC is then able to refurbish the electronics for reuse or recycle of the basic components (e.g., plastic, metal, and glass) for profit. Utilizing this approach TORNRC achieves a 99% recovery rate on all materials received. The public then benefits by preserving the environment for the future as well as returning valuable resources to the commercial world.

This unique teaming arrangement has produced 2,694 metric tons of surplus electronic type materials being recycled, resulting in cost avoidance in excess of $7 million With rapid advances in technology, coupled with downsizing and site closures, the volume of obsolete electronics is steadily rising creating an even greater need for electronic recycle.

BENEFITS TO DOE

The cooperative efforts between DOE, CROET, and TORNRC have resulted in significant waste reduction and cost-saving benefits. Disposal of electronic equipment is not only costly to DOE when done correctly, it can also be costly to the environment if is not done properly. When electronics are landfilled, chemicals and heavy metals in the equipment can leach out, potentially contaminating the groundwater, harming the environment, and affecting the local community. Without recycling the proper disposal of electronics generally involves the costly process of macro encapsulation to prevent leaching.

Since TORNRC's inception, the DOE ORO AU has facilitated the recycle/reuse of 2,112 metric tons of surplus electronic equipment at TORNRC from the Oak Ridge Reservation. This alone has amounted to cost avoidance to DOE Oak Ridge in excess of $5 million. Figure 1 shows electronic equipment being processed at the TORNRC facility in Oak Ridge, TN. Table I is a summary of the amount of DOE electronic equipment processed through TORNRC.

Table I Summary of DOE Shipments to TORNRC

Number of DOE Sites	Years Recycling	Metric Tons Recycled	Cost Avoidance
5 ORO Sites	1999 to Present	2,112	$5.47 M
15 DOE Site outside ORO	2000 to Present	301	$1.23 M

Fig. 1 Electronic equipment being processed at the TORNRC facility in Oak Ridge, TN.

Even with this success, the team members realized that more could be done. Utilizing their contacts at the various DOE sites, the ORO AU began publicizing the successful electronics recycle program established in Oak Ridge. By offering their assistance and expertise in the area of property dispositioning and, specifically, electronics recycle, the ORO AU has facilitated the development of relationships between several DOE sites and TORNRC. This has resulted in shipments of surplus electronics totaling 301 metric tons to TORNRC from 15 different DOE sites outside of the Oak Ridge Operations area. The cost avoidance to DOE due to these recycling initiatives exceeds $1.23 million.

But this is not the end of the story. The depth and breadth of the electronics recycle program within DOE is continuing to grow with the dedication of ORO AU, CROET, and TORNRC. As DOE sites continue to downsize and site closures draw near, the materials and equipment in the facilities as well as the facilities them selves must be dispositioned. The Sites standard disposition alternative is generally disposal. The preferable alternative is being encouraged by the Team is recycle/reuse.

The ORO AU has been working over the past several years on the recycle/reuse of scrap metal and equipment by utilizing innovative bartering initiatives. The team decided to try the same approach on surplus electronics located in abandoned facilities. Several facilities in Oak Ridge, as well as the Mound Site, were identified. These sites were loaded with electronic-type equipment from past scientific experiments and were slated for disposal this year. The team went to work and a new concept was born. The first opportunity was three ORNL buildings at the Oak Ridge Y-12 site that were currently under contract for disposal. Agreements facilitated by the ORO AU were put into place with the clean-up contractor for TORNRC to remove the surplus material and equipment from the buildings and recycle it at their facility at ETTP for the materials intrinsic value. This agreement saved the contractor additional money in terms of disposal fees and allowed for the recycle of 885 metric tons of material. The idea matured with this success. Why not get TORNRC involved on the front end of the project and save DOE and the taxpayers money? This project saved taxpayers an additional $360,000.

The second opportunity realized was a research laboratory in Oak Ridge being prepared for closure. DOE-supported biochemical research ended in 1995, at which time several laboratories were decommissioned and converted to office space. Other laboratories were left as is. This time an agreement was put into place with DOE and TORNRC directly with the support of the contractor for TORNRC to remove the surplus scientific equipment from the facility for recycle/reuse in exchange for the value of the equipment. Approximately 74 metric tons of scientific equipment was removed from the facility with a cost avoidance exceeding $318,000.

The third opportunity involved expanding this concept to another DOE site. With the Mound Site on the path to closure, there were several facilities available on which to test this unique bartering approach. Building 87 at the Mound site was utilized for explosives testing and has been abandoned for several years. After several initial walk-throughs by the recycle team, and numerous meetings with the Mound project team, the Ohio property personnel, and the Ohio Community Reuse Organization, a list of electronic equipment was agreed upon for removal by TORNRC. With all the proper agreements in place TORNRC removed 18 metric tons of equipment for recycle. The savings to DOE exceeds $75,000. With the success of this venture

the Mound site has three additional buildings that will follow the same path. An example of the type of electronic equipment removed from the Mound Site is shown in Fig. 2.

Fig. 2 Electronic equipment removed from the Mound Site

BROADER APPLICABILITY

With their unique teaming arrangement, ORO AU, CROET, and TORNRC have come a long way in solving Oak Ridge's surplus electronics problem. As a result, DOE and CROET have aided in the establishment of a viable commercial industry. Before this project, surplus electronics dispositioning was limited generally to school and other organizational donation programs or disposal. With the successes in Oak Ridge and the initial successes at the other DOE sites, interest in electronics recycle is growing throughout the DOE complex. ORO AU has fielded numerous inquiries from DOE sites wanting to recycle their excess computer electronics. Sites now have a responsible outlet for their surplus electronics at a reasonable cost.

In the area of decontamination and decommissioning, based on the clean-up successes at Oak Ridge and the Mound facilities, new opportunities are arising for these innovative bartering arrangements. Not only do they save DOE money from avoided disposal, but they also save DOE money due to scheduled reductions at the closure sites. Because of the success of the three pilot projects, other sites will be able to benefit from the unique partnership and bartering arrangements put into place by ORO AU. The Mound site has already identified three additional buildings that they will be using this bartering approach on in efforts to save their dwindling DOE funds as well as to save time on their site closure schedule.

As interest in the recycle project continues the ORO AU, CROET, and TORNRC team are looking at expanding the program to include the destruction for recycle of high-risk electronics. The only option for these types of electronics at this time is treatment, storage, and/or disposal. Classified electronic equipment destruction is an important issue with DOE. Consequently, the

development of a program where the destruction of classified equipment is physically verified, allowing for the recycle of raw materials, is a challenge the team is willing to pursue.

The benefits realized by DOE through electronic recycling are also being carried over into other Government Agencies. In 2001 the DOE formed a Tri-Lateral Alliance. The Tri-Lateral Alliance represents a partnership between National Aeronautics and Space Administration Marshall Space Flight Center, DOE ORO, and the U.S. Air Force Arnold Engineering Development Center (AEDC) established to share physical assets and technical expertise in support of the Tennessee Technology Corridor and regional economic development. Beginning in January 2002, in support of the Tri-Lateral Alliance, ORO AU has arranged for recycling of 144 metric tons of obsolete computer and electronic equipment from the (AEDC) located in Tullahoma, Tennessee. The equipment is delivered to TORNRC located at ETTP for processing. Processing of this material in Tennessee supports over ten jobs at TORNRC and has eliminated the need for costly alternatives previously used by AEDC.

Additionally the Tennessee Valley Authority (TVA) and the DOE-ORO signed a Memorandum of Understanding (MOU) on June 27, 2003 to utilize TORNRC for the reuse/recycle of large quantities of surplus electronic and computer equipment from TVA and its distributors. Under the MOU, TVA and its distributors will provide TORNRC with surplus electronic and computer equipment as feedstock to their reuse/recycle process and support the growth and expansion of the center. TVA has shipped approximately 137 metric tons of electronic equipment to TORNRC. TORNRC will recondition, refurbish, and remarket this equipment, thus keeping useable equipment and hazardous materials out of landfills, while reducing costs and environmental liabilities. TORNRC is also developing an expansion plan to deploy a licensed plastics-recycling technology that is expected to create 75 to 100 jobs in Oak Ridge over its first five years of operation. Under this plan, the TVA will help finance this new venture and provide raw materials and a market to sustain and grow the business. Pioneering this new process in Oak Ridge will provide an excellent solution to a growing national environmental problem.

The innovative bartering arrangements being utilized with DOE and the other government agencies are being applied in the commercial world by TORNRC. Over the past several years TORNRC has recycled several thousand metric tons of obsolete electronics from commercial clients thereby avoiding the toxic implications of being placed in our nations landfills.

CONCLUSION

The progress exemplified above by the ORO AU, CROET, and TORNRC depicts the growing importance of the establishment of recycle facilities such as TORNRC. The success realized is credited to the unique relationships forged by the entire Team. These relationships have allowed for the recycle/reuse of more than 2,694 metric tons of surplus electronics and have also promoted the development and growth of a much-needed industry – electronics recycling. The recycle/reuse of electronics will continue to save DOE and the taxpayer's money and most importantly it will continue to preserve the environment in years to come.