

**Preventing the E-Waste Apocalypse:
U.S. Government Efforts
to Manage E-Waste**

Edited by

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Table of Contents

Section	Page Number
About the Editor	3
Introduction	4
National Strategy for Electronics Stewardship (NSES)	6
Executive Order -- Planning for Federal Sustainability in the Next Decade	8
Implementation Study of the Electronics Recycling Standards: R2 and e-Stewards	49
Reducing and Reusing Basics	58
Sustainable Materials Management (SMM) Electronics Challenge	61
GSA Personal Property Disposal Process for Federal Electronics	73
A Long History	100
References	126

About the Editor

Michael Erbschloe has worked for over 30 years performing analysis of the economics of information technology, public policy relating to technology, and utilizing technology in reengineering organization processes. He has authored several books on social and management issues of information technology that were published by McGraw Hill and other major publishers. He has also taught at several universities and developed technology-related curriculum. His career has focused on several interrelated areas:

- Technology strategy, analysis, and forecasting
- Teaching and curriculum development
- Writing books and articles
- Publishing and editing
- Public policy analysis and program evaluation

Books by Michael Erbschloe

Social Media Warfare: Equal Weapons for All (Auerbach Publications)

Walling Out the Insiders: Controlling Access to Improve Organizational Security (Auerbach Publications)

Physical Security for IT (Elsevier Science)

Trojans, Worms, and Spyware (Butterworth-Heinemann)

Implementing Homeland Security in Enterprise IT (Digital Press)

Guide to Disaster Recovery (Course Technology)

Socially Responsible IT Management (Digital Press)

Information Warfare: How to Survive Cyber Attacks (McGraw Hill)

The Executive's Guide to Privacy Management (McGraw Hill)

Net Privacy: A Guide to Developing & Implementing an e-business Privacy Plan (McGraw Hill)

Introduction

“E-waste”, “electronic waste”, “e-scrap” and “end-of-life electronics” are terms often used to describe used electronics that are nearing the end of their useful life, and are discarded, donated or given to a recycler. Though “e-waste” is the commonly used term, the U.S. Environmental Protection Agency (EPA) considers e-waste to be a subset of used electronics and recognizes the inherent value of these materials that can be reused, refurbished or recycled to minimize the actual waste that might end up in a landfill or improperly disposed in an unprotected dump site either in the U.S. or abroad.

An undetermined amount of used electronics is shipped from the United States and other developed countries to developing countries that lack the capacity to reject imports or to handle these materials appropriately. Without proper standards and enforcement, improper practices may result in public health and environmental concerns, even in countries where processing facilities exist.

We have serious concerns about unsafe handling of used electronics and e-waste, in developing countries, that result in harm to human health and the environment. For example, there are problems with open-air burning and acid baths being used to recover valuable materials from electronic components, which expose workers to harmful substances. There are also problems with toxic materials leaching into the environment. These practices can expose workers to high levels of contaminants such as lead, mercury, cadmium and arsenic, which can lead to irreversible health effects, including cancers, miscarriages, neurological damage and diminished IQs.

EPA estimates that, in 2009, U.S. consumers and businesses discarded televisions, computers, cell phones and hard copy peripherals (including printers, scanners, faxes) totaling 2.37 million tons. Approximately 25 percent of these electronics were collected for recycling, with the remainder disposed of primarily in landfills, where the precious metals cannot be recovered.

Better data are needed to create a more comprehensive picture of the overall trade flows.

Accurate information about the amounts, types of materials and destinations of used electronics exported will provide valuable information for the Federal government, private industry and other stakeholders. To this end, EPA funded UNU-StEP to lead a study on US exports of used electronics in an attempt to better define the US contribution to the overall e-waste problem.

StEP collaborated with the Massachusetts Institute of Technology (MIT) and the National Center for Electronics Recycling (NCER). In December 2013 the final study, Quantitative Characterization of Domestic and Trans-boundary Flows of Used Electronics, was released. It presents a methodology for using existing trade data to calculate US exports and lays out challenges and options for future data-gathering efforts.

In October 2016 the North American Commission on Environmental Cooperation (CEC) released another study by MIT identifying the flow of electronics trade from and within North America. This study involved assessing and mapping flows of electronics, including those exported from the U.S. for recycling, reuse, and refurbishment.⁽¹⁾

National Strategy for Electronics Stewardship (NSES)

The National Strategy for Electronics Stewardship (NSES) provides recommendations on steps the federal government, businesses, and all Americans can take toward achieving the goals identified by President Obama in Executive Order 13693, “Planning for Federal Sustainability in the Next Decade.”

The NSES results from collaboration among 16 federal departments and agencies, collectively known as the Interagency Task Force on Electronics Stewardship, as well as consultation with stakeholders from the electronics, retail, and recycling industries; environmental organizations; state and local governments; and concerned citizens. It has the following goals:

- Build incentives for design of greener electronics and enhance science, research, and technology development in the United States.
- Ensure that the federal government leads by example.
- Increase safe and effective management and handling of used electronics in the United States.
- Reduce harm from U.S. exports of electronics waste (e-waste) and improve handling of used electronics in developing countries.

Interagency Task Force on Electronics Stewardship Members }

- White House Council on Environmental Quality
- U.S. EPA
- General Services Administration
- Office of Management and Budget
- Office of the U.S. Trade Representative

- U.S. Department of Commerce
- U.S. Department of Defense
- U.S. Department of Education
- U.S. Department of Energy
- U.S. Department of Justice
- U.S. Department of State
- U.S. Department of Veterans Affairs
- Federal Communications Commission
- U.S. Customs and Border Protection
- U.S. Postal Service

EPA estimates that, in 2009, 438 million electronic products were sold in the United States, and 2.4 million tons were ready for end-of-life management. Both numbers are increasing substantially each year. As President Obama has stated, the United States must increase its capacity to responsibly recycle our used electronics. Doing so can create green jobs, lead to more productive reuse of valuable materials, and support a vibrant American recycling and refurbishing industry.

If properly executed, NSES can increase our domestic recycling efforts, reduce the volume of e-waste that is managed unsafely (both domestically and abroad), strengthen both domestic and international markets for viable and functional used electronic products, and prevent health and environmental threats at home and abroad. As discussed in the NSES and in the subsequent 2014 accomplishments report, federal agencies are working together on various initiatives that will further progress towards these goals.

NSES Accomplishments and Ongoing Activities

- National Strategy for Electronics Stewardship: Interagency Task Force on Electronics Stewardship - July 20, 2011, strategy to lay the groundwork for improving the design of electronic products and enhancing our management of used or discarded electronics.
- Moving Sustainable Electronics Forward: An Update to the National Strategy for Electronics Stewardship - Interagency Task Force on Electronics Stewardship's August 2014 update to the 2011 strategy. This accomplishments report highlights some of the key achievements made under the NSES.
- Agency Benchmarks to the Federal National Strategy for Electronics Stewardship - Annex of benchmarks listing each project, the primary agency responsible for the project, any supporting agencies, and the target completion date.
- Implementation Study of the R2 & e-Stewards® Recycling Standards - EPA completed a limited study evaluating the implementation of the two third-party certification programs for electronic waste recyclers in the U.S. - R2 and e-Stewards®. The study fulfills a key commitment under the 2011 National Strategy for Electronics Stewardship for the federal government to lead by example in encouraging the greener design and responsible management of used electronics.⁽²⁾

**MOVING SUSTAINABLE ELECTRONICS FORWARD:
An Update to the National Strategy for Electronics Stewardship. Interagency Task Force
on Electronics Stewardship. August 2014**

Electronic devices and technologies continue to advance and increase in number. It is likely that our society will continue to incorporate these devices into our daily activities and that the number of electronic devices in our homes and offices will increase. Our growing reliance on electronics highlights the need to take a long-term sustainable approach towards electronics stewardship, both at work and at home. With the prevalence of electronics in mind, the federal government is committed to being a responsible consumer of electronics and a leader of electronics stewardship in the US. This report serves to increase the awareness of the importance of electronics stewardship and recognize the opportunities and challenges created by the exponential growth of electronics in the US. This report focuses on the major achievements under the NSES as of July 2014, as well as the impacts of improved electronics stewardship and the significance of upcoming commitments within the NSES.

This report is organized according to the goals established in the NSES:

1. Build Incentives for Design of Greener Electronics, and Enhance Science, Research and Technology Development in the United States;
2. Ensure that the Federal Government Leads By Example;
3. Increase Safe and Effective Management and Handling of Used Electronics in the United States; and,
4. Reduce Harm from US Exports of E-waste and Improve Safe Handling of Used Electronics in Developing Countries.

Under each goal, completed and upcoming key accomplishments are highlighted to demonstrate the variety of actions that have been and are being taken under the NSES to create a comprehensive strategy for electronics stewardship. While specific federal agencies are responsible for each action, most would not be accomplished without action by industry, non-governmental organizations (NGOs) or other stakeholders. Recent accomplishments range from the increased number of green design standards and electronics devices that meet them to the expanding the number of third-party certified recyclers and the increased amount and quality of used electronics export information. These initiatives have benefited the environment, public health, and the economy.

While this report focuses on the actions the federal government is taking, it also discusses how the NSES has proven to be a catalyst for other efforts, providing examples of complementary efforts that will lead to an even greater impact on the safe and effective management of used electronics in the US. As efforts under the NSES continue to progress, the benefits will continue to extend beyond the federal community, including a stronger recycling industry; improved recycling practices and worker safety; increased safe recycling options; and improved electronic devices for all electronics users.(3)

For a full copy of the report see https://www.epa.gov/sites/production/files/2015-09/documents/moving_sustainable_electronics_forward.pdf

Executive Order -- Planning for Federal Sustainability in the Next Decade

By the authority vested in me as President by the Constitution and the laws of the United States of America, and in order to maintain Federal leadership in sustainability and greenhouse gas emission reductions, it is hereby ordered as follows:

Section 1. Policy. Executive departments and agencies (agencies) have been among our Nation's leaders as the United States works to build a clean energy economy that will sustain our prosperity and the health of our people and our environment for generations to come. Federal leadership in energy, environmental water, fleet, buildings, and acquisition management will continue to drive national greenhouse gas reductions and support preparations for the impacts of climate change. Through a combination of more efficient Federal operations such as those outlined in this Executive Order (order), we have the opportunity to reduce agency direct greenhouse gas emissions by at least 40 percent over the next decade while at the same time fostering innovation, reducing spending, and strengthening the communities in which our Federal facilities operate.

It therefore continues to be the policy of the United States that agencies shall increase efficiency and improve their environmental performance. Improved environmental performance will help us protect our planet for future generations and save taxpayer dollars through avoided energy costs and increased efficiency, while also making Federal facilities more resilient. To improve environmental performance and Federal sustainability, priority should first be placed on reducing

energy use and cost, then on finding renewable or alternative energy solutions. Pursuing clean sources of energy will improve energy and water security, while ensuring that Federal facilities will continue to meet mission requirements and lead by example. Employing this strategy for the next decade calls for expanded and updated Federal environmental performance goals with a clear overarching objective of reducing greenhouse gas emissions across Federal operations and the Federal supply chain.

Sec. 2. Agency Greenhouse Gas Emission Reductions. In implementing the policy set forth in section 1 of this order, the head of each agency shall, within 90 days of the date of this order, propose to the Chair of the Council on Environmental Quality (CEQ) and the Director of the Office of Management and Budget (OMB) percentage reduction targets for agency-wide reductions of scope 1 and 2 and scope 3 greenhouse gas emissions in absolute terms by the end of fiscal year 2025 relative to a fiscal year 2008 baseline. Where appropriate, the target shall exclude direct emissions from excluded vehicles and equipment and from electric power produced and sold commercially to other parties as the primary business of the agency. The proposed targets shall be subject to the review and approval of the Chair of CEQ in coordination with the Director of OMB under section 4(b) of this order.

Sec. 3. Sustainability Goals for Agencies. In implementing the policy set forth in section 1 of this order and to achieve the goals of section 2 of this order, the head of each agency shall, where life-cycle cost-effective, beginning in fiscal year 2016, unless otherwise specified:

(a) promote building energy conservation, efficiency, and management by:

(i) reducing agency building energy intensity measured in British thermal units per gross square foot by 2.5 percent annually through the end of fiscal year 2025, relative to the baseline of the agency's building energy use in fiscal year 2015 and taking into account agency progress to date, except where revised pursuant to section 9(f) of this order, by implementing efficiency measures based on and using practices such as:

(A) using remote building energy performance assessment auditing technology;

(B) participating in demand management programs;

(C) ensuring that monthly performance data is entered into the Environmental Protection Agency (EPA) ENERGY STAR Portfolio Manager for covered buildings;

(D) incorporating, where feasible, the consensus-based, industry standard Green Button data access system into reporting, data analytics, and automation processes;

(E) implementing space utilization and optimization practices and policies;

(F) identifying opportunities to transition test-bed technologies to achieve the goals of this section; and

(G) conforming, where feasible, to city energy performance benchmarking and reporting requirements; and

(ii) improving data center energy efficiency at agency facilities by:

(A) ensuring the agency chief information officer promotes data center energy optimization, efficiency, and performance;

(B) installing and monitoring advanced energy meters in all data centers by fiscal year 2018; and

(C) establishing a power usage effectiveness target of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers;

(b) ensure that at a minimum, the following percentage of the total amount of building electric energy and thermal energy shall be clean energy, accounted for by renewable electric energy and alternative energy:

(i) not less than 10 percent in fiscal years 2016 and 2017;

(ii) not less than 13 percent in fiscal years 2018 and 2019;

(iii) not less than 16 percent in fiscal years 2020 and 2021;

(iv) not less than 20 percent in fiscal years 2022 and 2023; and

(v) not less than 25 percent by fiscal year 2025 and each year thereafter;

(c) ensure that the percentage of the total amount of building electric energy consumed by the agency that is renewable electric energy is:

- (i) not less than 10 percent in fiscal years 2016 and 2017;
- (ii) not less than 15 percent in fiscal years 2018 and 2019;
- (iii) not less than 20 percent in fiscal years 2020 and 2021;
- (iv) not less than 25 percent in fiscal years 2022 and 2023; and
- (v) not less than 30 percent by fiscal year 2025 and each year thereafter;

(d) include in the renewable electric energy portion of the clean energy target established in subsection (b) of this section renewable electric energy as defined in section 19(v) of this order and associated with the following actions, which are listed in order of priority:

- (i) installing agency-funded renewable energy on site at Federal facilities and retaining corresponding renewable energy certificates (RECs) or obtaining equal value replacement RECs;
- (ii) contracting for the purchase of energy that includes the installation of renewable energy on site at a Federal facility or off site from a Federal facility and the retention of corresponding RECs or obtaining equal value replacement RECs for the term of the contract;
- (iii) purchasing electricity and corresponding RECs or obtaining equal value replacement RECs; and
- (iv) purchasing RECs;

(e) include in the alternative energy portion of the clean energy target established in subsection (b) of this section alternative energy as defined in section 19(c) of this order and associated with the following actions, where feasible:

- (i) installing thermal renewable energy on site at Federal facilities and retaining corresponding renewable attributes or obtaining equal value replacement RECs where applicable;
- (ii) installing combined heat and power processes on site at Federal facilities;
- (iii) installing fuel cell energy systems on site at Federal facilities;
- (iv) utilizing energy from new small modular nuclear reactor technologies;
- (v) utilizing energy from a new project that includes the active capture and storage of carbon dioxide emissions associated with energy generation;
- (vi) implementing other alternative energy approaches that advance the policy set forth in section 1 and achieve the goals of section 2 of this order and are in accord with any sustainability, environmental performance, and other instructions or guidance established pursuant to sections 4(e) and 5(a) of this order; and
- (vii) including in the Department of Defense (DOD) accounting for alternative energy for this subsection, fulfillment of the requirements for DOD goals established under section 2852 of the National Defense Authorization Act for Fiscal Year 2007 as amended by section 2842 of the National Defense Authorization Act for Fiscal Year 2010;

(f) improve agency water use efficiency and management, including storm water management by:

(i) reducing agency potable water consumption intensity measured in gallons per gross square foot by 36 percent by fiscal year 2025 through reductions of 2 percent annually through fiscal year 2025 relative to a baseline of the agency's water consumption in fiscal year 2007;

(ii) installing water meters and collecting and utilizing building and facility water balance data to improve water conservation and management;

(iii) reducing agency industrial, landscaping, and agricultural (ILA) water consumption measured in gallons by 2 percent annually through fiscal year 2025 relative to a baseline of the agency's ILA water consumption in fiscal year 2010; and

(iv) installing appropriate green infrastructure features on federally owned property to help with stormwater and wastewater management;

(g) if the agency operates a fleet of at least 20 motor vehicles, improve agency fleet and vehicle efficiency and management by:

(i) determining, as part of the planning requirements of section 14 of this order, the optimum fleet inventory with emphasis placed on eliminating unnecessary or non-essential vehicles from the agency's fleet inventory;

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