

# **BEST PRACTICES FOR “E-WASTE” RECYCLING**

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## ■ CONTEXT SETTING

- “Waste” management hierarchy
- Where does the material go?

## ■ LAWS & REGULATIONS

## ■ “R2” RECYCLER CERTIFICATION

# NATIONAL POLICY APPROACH

- **THE WASTE MANAGEMENT HEIRARCHY**
  1. REUSE
  2. RECYCLING
  3. DISPOSAL
- **EPA'S REGULATORY AND VOLUNTARY PROGRAMS EMPHASIZE THIS HEIRARCHY**
- **ALTHOUGH NOT PREFERRED, "E-WASTE" CAN BE SAFELY DISPOSED IN NON-HAZARDOUS WASTE LANDFILLS**

# DISPOSAL vs REUSE & RECYCLING

- EPA: NO HAZARD IF PROPERLY LANDFILLED
- ALTHOUGH DISPOSAL IN U.S. SAFE, TREMENDOUS LOSS IN:
  - GREENHOUSE GAS SAVINGS
  - ENERGY CONSUMPTION
  - MATERIALS LOSS
  - AVAILABILITY OF AFFORDABLE, USED EQUIPMENT FOR BRIDGING “DIGITAL DIVIDE”
- EPA STRONGLY SUPPORTS REUSE & RECYCLING
- HOWEVER, RISKS FROM IMPROPER RECYCLING ARE MUCH GREATER THAN LANDFILLING

# EXPORT

- **YES, THERE ARE SOME PROBLEMS**
- **HOWEVER, THE MAGNITUDE OF THESE PROBLEMS IS VASTLY DISTORTED, and**
- **EXPORT MARKETS ARE ESSENTIAL TO COLLECTION EFFORTS IN THE U.S.**

# **REUSE & RECYCLING MARKETS for U.S. “E-Waste”**

- **MOST REUSE MARKETS ARE EXPORT**
  - LARGE FOR-PROFIT & NON-PROFIT MARKETS IN DEVELOPING COUNTRIES
- **MANY RECYCLING MARKETS ARE EXPORT**
  - STRONG FOREIGN DEMAND FOR RAW MATERIALS
  - NO U.S. SMELTERS FOR COPPER & PRECIOUS METAL RECOVERY FROM CIRCUIT BOARDS
  - NO CRT GLASS FURNACES IN WESTERN HEMISPHERE
  - PLASTIC RECYCLING MARKETS ALMOST ALL OVERSEAS

# EXPORT MARKETS

- **IT IS A MYTH THAT 50-80% OF U.S. EXPORTS OF “E-WASTE” ARE TO PRIMITIVE RECYCLING FACILITIES**
- **IAER 2006 Industry Report (2005 data):**
  - More than 500 U.S. recyclers handle 2.8 billion lbs
  - Nearly half (1.3 billion lbs) processed into recyclable materials in the U.S. (about half then exported)
  - In total, 74% of collected electronics exported in some form:
    - Processed recyclable materials
    - Working, whole electronics or parts for reuse
    - Non-working electronics
  - Less than 13% of collected electronics are exported in non-working condition (equates to less than 20% of exports)
- **NUMEROUS EXCELLENT FOREIGN PROCESSING & MANUFACTURING FACILITIES (metals, glass, plastics)**

# RECYCLING MARKETS

## CIRCUIT BOARDS

- **ONLY 5 COPPER/PRECIOUS METAL SMELTERS IN THE WORLD PROPERLY EQUIPPED TO MINIMIZE EMISSIONS OF DIOXINS & FURANS**
  - **ALL OECD COUNTRIES**
    - CANADA
    - BELGIUM
    - SWEDEN
    - GERMANY
    - JAPAN
- **NEARLY ALL SCRAP CIRCUIT BOARDS DERIVED FROM PROCESSING ELECTRONICS IN U.S. GO TO THESE SMELTERS**

# **RECYCLING MARKETS**

## **CRT GLASS CULLET**

- **NO CRT GLASS-MAKING FURNACES IN WESTERN HEMISPHERE**
  - About a dozen glass-making facilities worldwide
    - ASIA (10-12)
      - S. KOREA, MALAYSIA, INDIA, CHINA
    - POLAND (1)
  - NUMBER OF FURNACES CONTINUES TO SHRINK RAPIDLY
  - DEMAND REMAINS STRONG FOR CRT GLASS CULLET – HOWEVER, GOVERNMENTS TIGHTLY CONTROL IMPORT

# ASIAN FACILITIES



Chinese plastics recycler



Malaysian CRT manufacturer



Chinese metals refinery



# INDONESIAN TV & MONITOR MANUFACTURER – USED CRTs



# DOMESTIC MARKETS

- **NO NEW SMELTERS LIKELY FOR E-SCRAP**
- **NO NEW CRT MANUFACTURING FACILITIES**
- **U.S. MARKETS EXIST FOR:**
  - **MOST STEEL & ALUMINUM**
  - **ALL BATTERIES, MERCURY LAMPS/DEVICES**
- **SOME DEVELOPMENTS IN ALTERNATIVE PROCESSES & USES**
  - **NEW USES FOR PLASTICS & GLASS**
  - **EXTRACTION OF METALS FROM CIRCUIT BOARDS WITHOUT SMELTING**
  - **U.S. MARKETS MUST COMPETE WITH FOREIGN ONES**

# LAWS & REGULATIONS

## ■ STATE PROGRAMS

- RoHS-LIKE LAWS
- LANDFILL BANS
- COLLECTION PROGRAMS
  - Advanced recovery fee (CA only)
  - Producer responsibility programs

## ■ FEDERAL LEGISLATION

- IF HAPPENS, MOST LIKELY AREAS OF FOCUS:
  - DISPOSAL BAN
  - EXPORT CONTROLS
  - FLEXIBLE PRODUCER RESPONSIBILITY PROGRAMS

## ■ FEDERAL/STATE ROLES

- WASTE MANAGEMENT NORMALLY A STATE & LOCAL RESPONSIBILITY
- EXPORTS ARE EXCLUSIVELY THE ROLE OF THE FEDERAL GOVERNMENT

# EPA RULES

- **GENERALLY, MOST E-WASTE UNDER EPA RULES IS EITHER:**
  - NON-HAZARDOUS WASTE
  - NON-WASTE
- **MOST WHOLE EQUIPMENT DOES NOT TEST HAZARDOUS**
- **SEVERAL HAZARDOUS WASTE EXEMPTIONS & EXCLUSIONS APPLY**
  - TO ENCOURAGE REUSE & RECYCLING

# RCRA EXCLUSIONS & EXEMPTIONS

- **RCRA: Resource Conservation and Recovery Act**
  - **FEDERAL LAW re HAZARDOUS WASTE**
- **Under RCRA, a material must first be a waste in order to have the potential to be a hazardous waste**
- **EPA regulations under RCRA have many exclusions and exemptions**
  - **EXCLUSION: It is not a waste**
  - **EXEMPTION: It is a waste, but not a hazardous waste**

# **RCRA INCENTIVES for REUSE & RECYCLING**

- **EQUIPMENT FOR POTENTIAL REUSE IS NOT WASTE**
- **WASTE CAN BE MADE NON-WASTE BY PROCESSING – i.e., raw materials/commodities can be produced**

# HAZARDOUS WASTE EXEMPTIONS

## ■ NON-HAZARDOUS WASTES:

- HOUSEHOLD WASTES incl any electronics from households
- SCRAP METAL FOR RECYCLING
- WHOLE CIRCUIT BOARDS FOR RECYCLING
- PRECIOUS METALS FOR RECYCLING

# HAZARDOUS WASTE EXCLUSIONS

- **NON-WASTES: (Products or commodities)**
  - MATERIALS OR EQUIPMENT FOR REUSE
  - PROCESSED SCRAP METAL FOR RECYCLING
  - SHREDDED CIRCUIT BOARDS FOR RECYCLING
    - Must be packaged to prevent release
    - Free of NiCd and Li batteries and mercury devices
  - PROCESSED CRT GLASS FOR RECYCLING
  - INTACT CRTs FOR RECYCLING
  - PARTIALLY PROCESSED CRTs FOR RECYCLING
    - CONDITIONS APPLY

# EPA POLICY

## ■ JUNE 2002 FEDERAL REGISTER:

- BECAUSE OBSOLETE ELECTRONICS ARE OFTEN CAPABLE OF REUSE, THEY ARE NOT CONSIDERED WASTES UNTIL A DECISION IS MADE THAT THEY CANNOT OR WILL NOT BE REUSED
- SUCH DECISIONS ARE MADE BY PERSONS WITH SPECIALIZED EXPERTISE (unless destruction specified)
  - i.e., resellers & recyclers
- THIS ALLOWS COLLECTION TO OCCUR WITHOUT REGARD TO WASTE RULES.

# HAZARDOUS WASTES

- **IF ALL FOUR ELEMENTS APPLY:**
  - **GENERATED BY NON-HOUSEHOLDS**
  - **GENERATED AT MORE THAN 220 lbs/mo**
  - **HAVE A HAZ WASTE “CHARACTERISTIC,”**  
e.g., **FAIL TCLP. EXAMPLES:**
    - **CRTs**
    - **SOME LAPTOPS, CELL PHONES, ETC.**
  - ***SENT FOR DISPOSAL***

# **SUMMARY**

## **COLLECTION, REUSE & RECYCLING**

- **PERSONS OR BUSINESSES THAT SEND USED ELECTRONIC EQUIPMENT TO RECYCLERS:**
  1. **ARE NOT WASTE GENERATORS**
    - Unless they require destruction
  2. **GENERALLY AVOID RCRA LIABILITY**
- **MUCH OF WHAT A RECYCLER COLLECTS IS NOT WASTE**
- **RECYCLERS' OUTPUT INCLUDES:**
  - Used and unused products
  - Recyclable commodities
    - Both non-wastes & non-hazardous wastes
  - Wastes requiring special handling or disposal

# WASTES REQUIRING SPECIAL HANDLING

- **UNIVERSAL WASTES ARE HAZARDOUS WASTES WITH SPECIAL CONTROLS TO FACILITATE TREATMENT/RECYCLING**
  - **Certain batteries**
    - **NiCd, Li, Pb acid**
  - **Lamps and other mercury devices**

# STATE HAZARDOUS WASTE RULES

## ■ REMEMBER:

- BE AWARE OF STATE RULES
- STATE RULES MAY BE MORE STRINGENT THAN EPA
  - SOME STATES CLASSIFY E-WASTE AS UNIVERSAL OR HAZARDOUS WASTE

# U.S. EXPORT RULES

## ■ EPA has export rules for:

- Hazardous waste – Generally, not e-waste
- Federal (not state-only) universal wastes
  - Hazardous waste batteries, lamps, and mercury devices
  - Notification and consent system
- CRTs and CRT glass – Rules effective 1/29/07
  - Export for recycling: Notification and consent system
  - Export for reuse/refurbishment: EPA notification

# **“R2” RECYCLER CERTIFICATION**

- **Can be a valuable alternative to a comprehensive federal regulatory program**
- **Third-party-implemented**
- **Accredited certifying bodies**
- **Consensus-based “standards”**

# **CERTIFICATION TO “RESPONSIBLE RECYCLER” (R2) PRACTICES**

- **OVER THE LAST 3 YEARS, EPA HAS SPONSORED THIS MULTISTAKEHOLDER EFFORT**
  - Involves EPA, OSHA, states, manufacturers, recyclers, environmental NGOs
- **PURPOSE: CREATE A MARKET MECHANISM THAT ENABLES “RESPONSIBLE” RECYCLERS TO DIFFERENTIATE THEMSELVES FROM “SHAM” RECYCLERS**
- **RECYCLERS WILL VOLUNTEER TO BE CERTIFIED AS TO CONFORMANCE WITH THE R2 PRACTICES**
- **“STANDARDS” COMPLETED IN OCTOBER 2008**
  - Sets a very high “bar” for environmental & worker protection
  - Supersedes existing EPA national guidelines on safe management
  - American National Accreditation Board (ANAB) now working toward accrediting certifying bodies

# OVERARCHING PRINCIPLES

- **VOLUNTARY PROGRAM, HOWEVER:**
  - Federal government will require use of R2-certified recyclers for federal government surplus
  - Many states and local governments will require use of R2 recyclers
- **PRIMARY FOCUS IS ON HUMAN HEALTH & THE ENVIRONMENT**
- **ELECTRONICS RECYCLERS MUST COMPLY WITH EXISTING FEDERAL, STATE, LOCAL & INTERNATIONAL REQUIREMENTS**
- **EPA WILL NOT DIRECT IMPLEMENTATION OF THE PROGRAM**
  - No EPA certification
  - Multistakeholder “R2” practices
  - Use of “third-party” auditors and certifying bodies (ANAB)

# ESSENTIAL “R2” CONCEPTS

- **REUSE & RECYCLING MUST BE MAXIMIZED—DISPOSAL ONLY USED IN EXCEPTIONAL CIRCUMSTANCES**
- **WORKER & ENVIRONMENTAL PROTECTION**
  - Ongoing hazards identification and assessment of risks, as well as monitoring
- **DOWNSTREAM DUE DILIGENCE (including export) FOR PRIORITY (“FOCUS”) MATERIALS**
  - Batteries, mercury lamps & devices, CRTs, circuit boards
  - Written “focus material” management plan for recycler & downstream vendors
  - However, not required for equipment meeting some “reuse” criteria
- **EVIDENCE OF LEGALITY OF EXPORT & IMPORT**
- **NEED FOR COMPREHENSIVE MANAGEMENT SYSTEMS (EH&S)**
  - Written programs using “Plan-Do-Check-Act” model for continual improvement
- **COMPLIANCE WITH ALL LAWS & RULES**

# OTHER “R2” PROVISIONS

## ■ DATA SECURITY

- Use of NIST Guidelines for Media Sanitation—800-88, or other generally-accepted standard or certification program

## ■ TRACKING THROUGHPUT & RECORDKEEPING

- Business records documenting all transfers of equipment and materials into and out of facility

## ■ STORAGE

## ■ TRANSPORT

## ■ RECYCLING FACILITY CLOSURE & FINANCIAL RESPONSIBILITY

## ■ FACILITY SECURITY

# **“R2” CERTIFICATION**

- **LIKELY TO BECOME INDUSTRY STANDARD**
- **VERY STRINGENT VOLUNTARY STANDARD**
  - **Very, very few recyclers can meet at present**
- **WILL BE REQUIRED BY MANY GOVERNMENTAL ENTITIES**
- **FIRST “R2” CERTIFICATIONS LIKELY LATER IN 2009**
- **“R2” WILL MAKE SELECTION OF RELIABLE RECYCLERS MUCH MORE SIMPLE**

# Contact Info

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