Safe Battery Collection & Recycling
Sustainable Material Management Web Academy
USEPA

Carl E. Smith, CEO / President
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OVERVIEW: the Call2Recycle® Program

• Non-profit founded in 1994 by industry to address the emergence of EPR legislation.

• In the U.S., funded primarily by rechargeable battery stewards and, more recently, fee-based services.

• In the U.S., we’re primarily a voluntary program except in certain states (e.g., Vermont, Minnesota, New York) where collections of some (but not always all) chemistries are mandated.

  ▪ Collected over 144 million pounds of consumer batteries since from over 30,000 publicly accessible sites; collected over 30 million pounds of lithium ion (Li-Ion) since inception.
How We Are Funded

1. 300+ product and battery manufacturers pay a fee based on sales (in weight) by chemistry into the marketplace.

2. All fees must be approved by a Board of Directors whose majority are battery manufacturers (stewards) including Panasonic, Sony, Energizer & Duracell. Fees have been frozen since 1/1/16.

3. Call2Recycle® program manages 30,000 collection sites, educational efforts, reverse logistics and collections based on these fees.

4. In 2017, the program introduced fee-based services for specialty operations (e.g., online box sales, DDR kits).
What Are Our Responsibilities?

Program Management Services

1. **Reverse Logistics Management.** Manage collection, pick-up, transport, sorting and processing.

2. **Education & Promotion.** Beyond educating consumers, collection sites and businesses on why and how to recycle, we convince opinion leaders that we do things right.

3. **Administration & Performance Reporting.** Regulatory submittals, voluntary reporting, certifications, downstream verification, etc.

4. **Customer Service.** Inbound and outbound call center that manages 10,000 inquiries per month.
Our Third-Party Credentials

Permits and Certifications

1. **USDOT Special Permit 14849.** Allows the management of small quantities of batteries in our patented box.

2. **USDOT Special Permit 16563 for DDR Batteries.** Supports collection, transport and disposal of damaged, defective and recalled lithium-based batteries.

3. **R2 / OHSAS 18001 / ISO 14001 Certifications.** Affirms the integrity and diligence of our quality control processes and systems.

4. **Certification of E-Steward Qualification.** Affirms our commitment that waste batteries aren’t disposed in third world countries.
Types of Lithium-Based Batteries

- Lithium-based batteries are not the only batteries that could cause safety issues; other rechargeable chemistries must be uniquely handled to comply with USDOT regulations.
- Two distinct lithium-based battery types: Primary: lithium metal and Rechargeable: lithium ion.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Lithium Primary</th>
<th>Lithium-Ion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-chemistries</td>
<td>CR, Lithium Iron Sulfide, Non-Consumer Uses</td>
<td>NCA, NMC, LCO, LMO, LFP, LTO, Coins</td>
</tr>
<tr>
<td>Primary Uses</td>
<td>AA/AAA, Medical Devices, Security, Back-up Power</td>
<td>EV, Grid Storage, Electronics, E-Bikes, Power Tools</td>
</tr>
</tbody>
</table>
The Dynamic Lithium Battery Market

5.6 Billion Lithium Ion Cells Sold in 2016

- Panasonic (Japan)
- CATL (China)
- BYD (China)
- LG Chem (South Korea)
- Samsung SDI (South Korea)

Sources: Cairn ERA; US Department of Energy

Battery cost
Worldwide, $/kWh

Battery energy density
Watt-hours per litre

FORECAST

*Includes Tesla gigafactory
1. **Cobalt Prices.** Over the last three years, the price for cobalt (LME) has tripled to $34 / pound.

2. **Nickel Price / Use.** One key formulation has upped the presence of nickel, whose price is much more stable.

3. **How Do You Know?** You often don’t. Tesla = nickel. Apple = cobalt.

4. **Reconditioning.** The more lucrative market is reconditioning Li-Ion where prices can be 10x better than when recycling.

5. **“Damaged, Defective & Recalled (DDR).”** Increasingly, Li-Ion are damaged, making them more dangerous and requiring special treatment.
## Our “DDR” Solution

<table>
<thead>
<tr>
<th>Kit</th>
<th>Small Kit</th>
<th>Large Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kit Contents</td>
<td>Overpack box</td>
<td>Overpack box</td>
</tr>
<tr>
<td></td>
<td>Metal can with affixed labeling</td>
<td>Metal bucket with affixed labeling</td>
</tr>
<tr>
<td></td>
<td>Metal lid and locking ring</td>
<td>Metal lid and locking ring</td>
</tr>
<tr>
<td></td>
<td>Vermiculite</td>
<td>Vermiculite</td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Tape</td>
</tr>
<tr>
<td></td>
<td>Plastic bags</td>
<td>Plastic bags</td>
</tr>
<tr>
<td></td>
<td>Permit and caution labels</td>
<td>Permit and caution labels</td>
</tr>
<tr>
<td></td>
<td>Return shipping label</td>
<td>Return shipping label</td>
</tr>
<tr>
<td></td>
<td>Instructions</td>
<td>Instructions</td>
</tr>
</tbody>
</table>

**Note**

US & Canadian Special Permit allows for no more than 4.4 lbs. (2kgs) of lithium cells and batteries to be contained in a single package. However, a single cell or battery may be shipped within one package provided the cell or battery has a mass of 5 kg or less.
What Do We Do With Li-Ion Batteries?

Lithium Ion Batteries Generated in the US

1. Sorters.
   - Battery Solutions, Howell, MI
   - INMETCO, Ellwood City, PA
   - Battery Solutions, Mesa, AZ
   - Wistron GreenTech, McKinney, TX

2. Processors.
   - Glencore / Xstrata, Sudbury, ON
   - Toxco / Retriev, Trail, BC
   - UMICORE, Hoboken, Belgium
   - SungEel Hitech, South Korea
   - Recycling Coordinators, Akron, OH
   - Retriev Technologies, Lancaster, OH
How Can You Identify a Lithium-Based PRIMARY Battery?

Lithium Metal (Primary)

- They **MAY** come in the following sizes: 9v, AA, AAA, C, D, Coin/Button cell
- They **MAY** be marked: ‘Lithium’ or ‘Lithium cells’; marked as (CR###)
How Can You Identify a Lithium-Based RECHARGEABLE Battery?

Rechargeable (Lithium Ion)

- It **MAY** be Marked “Rechargeable”
- It **MAY** Have a Battery Chemistry Name (Lithium Ion) or Abbreviation (LI-ION, Li-ion, LiPo (lithium polymer); Button/coin Cell (LIR####))
- It **MAY** Just Have Battery Seal or Other Mark
- Or **MAY** Not!
Recycling Lithium-Based Batteries

Four Important Lessons

1. **A Spent Battery Isn’t.** Used lithium batteries can often maintain 80%+ of their original charge.

2. **Don’t Remove Non-Removable Batteries.** Lithium polymer batteries, without hard cases, are susceptible to damage.

3. **Tape or Bag.** The positive terminal must be protected either by tape or place in a clear and sealable bag.

4. **Curbside Is Seldom Wise.** While some municipal governments have effective programs to mitigate safety issues, most do not. Find a dedicated collection container / site.
The Charge Up Safety™ Campaign

Four Main Objectives

1. **Foster Employee Leadership.** Improve our knowledge, culture and commitment to safety to enable us to serve as leaders and influencers with customers.

2. **Improve Collection Site & Sorter Performance.** Increase visibility, accountability and behaviors surrounding safe handling, storage and transport of batteries.

3. **Drive Consumer Awareness.** Improving the visibility and knowledge of safe practices.

4. **Engage Stakeholders.** Build relationships with other like-minded organizations to influence public and government debate on relevant safety issues.
Charge Up Safety™: Operational Changes

- Flame Retardant Box.
- Terminal Protection Guidelines.
- Box Anomaly Reports (BAR).
Charge Up Safety™: Consumer Education

• Safety Video.
• Safety Portal.
• Consumer Outreach Events.
Charge Up Safety™: Site Education

- **Shipping Guidelines.**
- **Required Safety Training.**
- **Stakeholder Engagement.**

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Sites Trained</th>
<th>% Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional “Free” Collection Sites (Includes Best Buy, The Home Depot, Lowe’s, Sears/Kmart, Staples, Stewards, Muni’s, etc…)</td>
<td>12,559</td>
<td>85% compliant</td>
</tr>
<tr>
<td>Fee-based Collection Sites (Sites purchasing boxes via eCommerce or through a contractual arrangement)</td>
<td>5,980</td>
<td>75% compliant</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>18,539</td>
<td><strong>82% compliant sites</strong></td>
</tr>
</tbody>
</table>
thank you!

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