Contactor Take-Back Project

FINAL v1.0, 16th May 2012

Mark Leggate
Gabriela Lozada
Abhijith Neerkajee
Katherine Zhang

MIT Sloan School of Management
Table of Contents

I. Introduction .......................................................................................................................... 3

II. Project Objectives ............................................................................................................. 3

III. Background Information .................................................................................................. 4

IV. Cost-Benefit Analysis ........................................................................................................ 11

V. Customer Analysis ............................................................................................................ 13

VI. Recommendations ........................................................................................................... 18
I. Introduction

Founded in 1911 in Cleveland OH, Eaton Corporation has grown to become a leader in power management and hydraulic systems, with 72,000 employees and a market capitalization of $16.5bn. Eaton’s products are sold in 150 countries, with US sales accounting for 45% of its $16bn revenues in 2011.

Eaton has committed to pursuing sustainable business, with its Chairman Alexander M. Cutler expressing a desire for the firm to “do business right,” with the firm seeing sales-indexed reductions in CO₂ emissions, water use and energy use of 10% in 2011 alone. Its sustainability efforts have been recognized by organizations such as the Carbon Disclosure Project, which has included Eaton in the Carbon Disclosure Leadership Index of S&P 500 companies, and by the Ethisphere Institute and Corporate Responsibility magazine.

As part of its sustainability efforts, Eaton approached the MIT Sloan Laboratory for Sustainable Business seeking to complete a study on the potential business opportunity for product take-back within the Electrical Components Organization in North America. The MIT Sloan team is pleased to have been working with Eaton in completing this study.

II. Project Objectives

Under Eaton’s guidance, the project was focussed on the take-back of contactors, an electrically-controlled power circuit switch. The project assesses:

- **Operations** – understanding the product, its composition, distribution chain, end user applications, and competition.
- **Cost-Benefit Analysis** – analysis of costs associated with shipment and teardown of products, and value generated from scrap materials if recycled or sold in the aftermarket.
- **Benchmark Review** – covering known take-back system models already in place in both Eaton’s industry and other industries.
- **Policy and Corporate Social Responsibility Impacts** – high level review of existing and emerging policies, and intangible benefits such as goodwill.

---

3 Ibid., p.18.
These four topic areas were assessed by the team using Eaton staff and customer interviews, interviews from representatives of industry and environmental bodies, and the team’s own research and analysis.

Drawing on this analysis, the project provides recommendations for Eaton based on the cost-effectiveness of a product take-back program, and outlines future scenarios in which the business case could be strengthened.

**III. Background Information**

The team carried out secondary research and interviews with two NGOs to: a) identify success factors of existing take-back programs, b) determine whether Eaton’s competitors had a take-back program in place, and c) analyze US and international legal/policy frameworks regarding e-waste management.

References used to assess these points include: academic journals, company CSR reports, the Environmental Protection Agency (EPA), newspaper clippings and interviews with industry bodies.

**a) Eaton’s Contactors**

Contactors are electrically-controlled power circuit switches; they are used to control electrical loads in instances such as industrial plant, electric motors, lighting, and heating systems. Eaton’s contactor products range in weight from 1lb to 200lbs, and retail between $50 and $35,000. Contactors use silver cadmium on their internal contacts, a material whose use is regulated in other sectors, but widely regarded by the electricals industry as the most effective metal for this purpose. Product life ranges depending on usage, but can be in the tens of years; at the end of this product’s life, 80 – 90% of the silver cadmium in a contactor is corroded, making it of limited use during product take-back.

Eaton’s contactors are distributed via two channels: direct to OEMs, and through distributors. This project’s focus was on equipment sold through distributors for ‘aftermarket’ purposes (replacement of end-of-life components).

Eaton’s main competitors are Allen Bradley, GE, and Siemens. In the OEM market, contactors are sometimes regarded as a commoditized good; however, there is lower price competition in the ‘aftermarket’ for replacement components. Whilst Eaton contactors may theoretically be used to replace a competitor’s product, there can be variations in both the footprint of competitor products, and positioning of terminals. For this reason, ‘aftermarket’ customers tend to replace end-of-life products ‘like-for-like’, as it is perceived to be the simplest approach.
b) Existing Take-Back Programs

While take-back programs for bottles, cans and batteries have been around for decades, in the US, e-waste take-back programs have just recently begun to flourish in the past few years. In 2003, the EPA began the ambitious Plug-In to eCycling Program that groups and certifies electronics manufacturers, retailers, mobile service providers and recyclers. More than 20 partners in this program collected 360 M pounds of e-waste from 2003 to 2009. The amount of collected e-waste is a positive indicator; however, these programs hinge on voluntary consumer participation and are geared towards consumer electronics (mainly computers and TVs) not electronic components (such as Eaton’s contactor).\(^4\)

In conducting our research, we were not able to identify product take-back programs targeting business-to-business electrical components; we have therefore outlined three noteworthy examples from the consumer sphere below. Whilst these experiences are not directly translatable to Eaton due to the nature of the products, scale and consumer involvement, we can draw lessons from these cases to inform our study.

**Hewlett-Packard** was the first electronics manufacturer to provide consumer and business recycling options for HP branded hardware and printing equipment.\(^5\) The program first started informally in China in the 1990s, where manual disassembly (smashing) of products took place to rescue metals; this program was soon discontinued due to toxicity hazards. In 1995 HP commissioned Noranda to build a recycling facility for old printers and PCs near Sacramento. Technicians recovered reusable parts, the machines where then chopped up by shredders, smashed to bits by a granulator, and sorted by magnets and air currents. Precious metals went to Noranda; aluminium, glass, and plastic were sold to recyclers, and nothing went to landfills.\(^6\) Following this partnership’s success, HP opened a second recycling facility in Nashville, Tennessee in 2001 to scale its waste-recycling program.\(^7\)

Most of HP’s take-back operation is handled online and through mail, except for states with legislation requiring having onsite presence.\(^8\) HP provides free recycling for most of its products and charges shipment and fees ($13 to $34 per item) for other firms’ products. Take-back eligible items include: workstations, notebook PCs, tablet PCs, monitors, printers, scanners, controllers, and servers.

---


digital cameras, PDAs, smartphones, calculators and digital picture frames.⁹

**Dell’s** take-back program is the largest for consumer electronics in the US, and whilst the computer manufacturer embraced e-waste later on, it soon surpassed HP. Dell’s first post-consumer operations started in 2002, when it signed an agreement with Unicor, a recycling company owned by the Federal Prison Industries in Washington.¹⁰ Due to bad press, program only lasted a year; however Dell continued to scale its operations. Dell offered recycling, first to buyers of new equipment, then to anyone willing to pay $30, then $15, and then eliminated the fees completely.¹¹ Dell collects equipment through mail, at Staples or at Goodwill (in the latter, mostly for refurbishment).¹² For its recycling operations, Dell has a program named “Environmental Partners” that establishes strict guidelines and criteria to select e-waste management counterparts and is rolling the program out internationally.¹³

**Best Buy** runs the largest retailer take-back operation in America, mainly through its 1000 locations in the US. The store takes back its own brands (Insignia, Dynex, and VPR Matrix) and will pick up any TV or electronic equipment to be replaced with one from Best Buy for free. The retailer charges when taking back electronics of other brands; however, this payment serves as a rebate for a purchase of new equipment at Best Buy.¹⁴ While the program has environmental benefits, its main purpose is to attract customers who seek to replace electronics; advocacy groups criticize the retailer’s lack of transparency with its recycling standards and operations.

**Non-profit organizations** and advocacy groups for e-waste recycling that we reached out to include: Product Stewardship Institute (PSI), National Recycling Coalition, and Electronics TakeBack Coalition. For the most part, they investigate, and coordinate recycling centers and evaluate take-back programs. Specific NGOs that help with recycling are mentioned in a subsequent part of this report. Our main takeaway from our conversations is that successful take-back programs require government and consumer engagement, should have little or no cost to the customers and are easier when the recycled items have a value (i.e. expensive materials, are refurbishable or repurposable.).

---


Key Findings from our analysis of take-back programs were:

- Most successful take-back programs target end-consumers (HP and Dell target businesses or individuals that are well identified for large and replaceable products, not intermediate components).
- The economics of these programs are limited, most of them account for goodwill and CSR to make a business case.
- Some charge a fee to the customer or have government support. Since 2001, California Government charges fee at purchase of an electronic for recycling services.
- Most take-back programs rely on outsourcing and/or partnerships to achieve scale (Staples, Wal-Mart, FedEx).

**c) Actions of Leading Competitors**

After carrying out secondary research of Eaton’s competitors - Rockwell (Allen Bradley) Square D (Schneider), GE and Siemens, we found none of these firms has a take-back program for contactors or other e-waste, with some exceptions for final consumer or industrial machines (i.e. not a component). The following paragraphs describe the most comprehensive take-back programs carried out by GE and Siemens.

**General Electric.** This company has large take-back/recycling programs; however, they target industrial toxic substances, packaging or consumer appliances.\(^{15}\) To illustrate, below are two examples:

- For electric appliances (i.e. refrigerators), GE partnered with the Appliance Recycling Centers of America (ARCA) and the EPA have teamed up to upgrade ARCA’s regional recycling center in Philadelphia. GE partnered with the Home Depot to send appliances from 12 states of the northeast to this recycling facility. The outputs of the recycling include foam pellets that replace coal, steel that is used for steel deck plates for GE locomotives and other materials (copper, plastic and aluminium), which are transported to other recyclers.\(^{16}\)
- GE adopted a different strategy with compact fluorescent light bulbs (CFLs). GE promoted autonomous recycling of CFLs due to their hazardous mercury content. In this case, the responsibility of disposal is placed on the consumer and the EPA created the

---


disposal framework with recyclers and retailers.\textsuperscript{17} GE participated by reducing actual mercury content by 50\%.\textsuperscript{18}

**Siemens.** In the US, Siemens focuses take-back programs on high-value medical equipment (i.e. ultrasound machines).\textsuperscript{19} In the European Union (EU), Siemens complies with the Waste Electrical and Electronic Equipment directive (WEEE) and has an important refurbishing program for equipment (i.e. X-ray generators). Additionally, Siemens will take back consumer electrical appliances in Europe.

**d) Corporate Social Responsibility**

Eaton has a broad-level desire to “to business right,”\textsuperscript{20} and a growing track record of successes in the sustainability space. Since Eaton first started including sustainability reporting in its annual reports in 2006, Eaton’s sales-indexed CO\textsubscript{2} emissions have fallen by 23\%, sales-indexed energy use has fallen by 27\%, as has sales-indexed waste, and sales-indexed water use has fallen by 44\%.\textsuperscript{21}

Interviews with Eaton staff indicated that there was a perception that sustainable business practices and products could be a sales driver, but that further education of their customers was necessary in order to unlock this market; this was corroborated by customer interviews, which suggested that responsible disposal of contactors at the end of the product’s life was not currently a concern of theirs.

Eaton also recognizes that sustainability initiatives can have a wider benefit in terms of earning stakeholder goodwill, assisting with recruitment, employee engagement, community and customer relationships; however at present there is not a valuation methodology for such benefits. Even if such a valuation methodology were to exist, it would be challenging to attribute a portion of this value to a specific project. As such, intangibles are not included in the economic evaluation of sustainability programs.

\textsuperscript{17} U.S. Environmental Protection Agency, “Compact Fluorescent Bulbs (CFLs),” \url{http://www.epa.gov/cfl/}, accessed 05/15/2012.
\textsuperscript{19} Siemens AG, “Environmental, Health, and Safety Policy,” \url{http://www.medical.siemens.com/webapp/wcs/stores/servlet/CategoryDisplay~q_catalogId~e_1~a_categoryId~e_1003303~a_catTree~e_100005,1003303~a_langId~e_1~a_storeId~e_10001.htm}, accessed 05/15/2012.
\textsuperscript{20} Eaton Corporation, “Sustainability: From the Chairman,” \url{http://www.eaton.com/Eaton/Sustainability/FromtheChairman/index.htm}, accessed 05/15/2012.
e) Legal and Policy Framework

The past decade has seen increasing regulatory efforts (both in the US and overseas) to control the disposal of electrical goods. Europe’s Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS) legislation was passed in 2003, and is regarded as a regulatory trendsetter with broader implications for supply chains. For example, many consumer electronics manufacturers that supply the US have switched to having RoHS compliance throughout their range, due to the added cost of managing different RoHS compliant and non-compliant production lines.

In the US, there have been state-specific implementations of e-waste legislation, notably including California’s Electronic Waste Recycling Act of 2004, New York State’s Electronic Equipment Recycling and Reuse Act of 2011, and Maine’s Electronic Waste laws. However, much of the focus of e-waste legislation in both Europe and the US is on consumer waste, and does not consider business-to-business products. Furthermore, existing legislation differentiates between components and finished goods, with the focus being on finished goods. Eaton’s contactors would typically be considered to be a component.

If in future a finished good that contains a contactor (e.g. a control panel) were to fall under waste management legislation which places the responsibility on the producer, the responsibility for safe disposal of that product would lie with the manufacturer/assembler of the finished good, not with Eaton. However the presence of such legislation in future could create opportunity for Eaton to make a value proposition to its OEM customers on the basis of an onward take-back scheme.

Eaton’s contactors currently contain silver cadmium, and it is possible that the first regulatory impacts felt by the contactor product line will be based on this use of silver cadmium, and not on wider e-waste laws. European Commission studies consider cadmium to be a carcinogen,

---

and to have a high potential for accumulation within humans, leading to pathophysiological changes.\textsuperscript{28}

A change in legislation was contemplated in Europe in 2010, calling for a total ban of the use of silver cadmium in contacts, with an exception for safety-critical, military and aerospace applications.\textsuperscript{29} Such a change in legislation could not be catered for through a product take-back program, but would necessitate the use of alternative alloys in the manufacture of contactors, a change which the National Electrical Manufacturers Association argues would result in less reliable products and more product failures.\textsuperscript{30}

In the most recent discussions, it was ultimately decided to not extend a ban to the use of cadmium in electrical contacts, with new restrictions following the 2010 report being limited to other products\textsuperscript{31} and an exemption remaining for contacts.\textsuperscript{32} However, it is not unreasonable to expect such legislative proposals to be revisited in the EU in future.

With reference to the US, whilst cadmium regulation has historically been focussed on setting minimum safe levels in a work environment and in water, attention is slowly turning to the prohibition of it within certain products; initially this focus has been on children’s products, with a ban being introduced in California in 2012.\textsuperscript{33} However, given that the use of cadmium in Europe has been restricted in some uses since 1992,\textsuperscript{34} with limited parallel action in the US to this date, the medium-term risk of legislation banning cadmium use in contactors in the US is lower than in Europe.

However, to protect against the risk of such regulatory changes, Eaton should consider readying alternatives to silver cadmium, such as silver tin oxide; indeed, one of Eaton’s contactor patents already includes provision for the use silver tin oxide in contactor design.\textsuperscript{35}

\textsuperscript{33} California Department of Toxic Substances Control, “Cadmium in Children’s Jewellery,” \url{http://www.dtsc.ca.gov/PollutionPrevention/ToxicsInProducts/Cadmium.cfm}, accessed 05/15/2012.
IV. Cost-Benefit Analysis

Our analysis uncovered a number of key drivers of successful take-back programs. We also found a number of barriers that constrain program success. The most important drivers are the economic benefits resulting from the residual value of the equipment that is recaptured for reuse and the ability to use product take-back as a marketing tool, and the desire to be better environmental stewards.

In order to ascertain the economic benefits and costs of the contactor take-back program we interviewed key stakeholders both within Eaton and outside. The stakeholders within Eaton were the aftermarket manager, sales manager and product line manager for contactors. Outside the organization we interviewed a sample of distributors and OEM manufacturers. There is currently a small-scale take-back program in place to manage warranty returns of products; in the current process roughly 5% of the take-back volume consists of contactors. Roughly 60/70% of these contactors are repurposed due to their relatively young age. Most of the repurposed contactors go through a process of refurbishment and reuse and hence is very profitable for Eaton. It is noted that Eaton gets most of its stock for repurposing from their distributors. The rest of the contactors that are taken back from Eaton are recycled by a third party.

Eaton can employ multiple disposal strategies through which it can manage the end of life contactors. These strategies include:

- Utilize its elements of forward supply chain to perform the take-back of the contactors which have reached the end of life.
- Incentivize the customers to send the end of life contactors to Eaton or a third party recycling unit.
- Incentivize the OEM and AMC contractors to directly transport the end of life contactors to Eaton or a third party recycling unit.

An examination in detail of the various disposition strategies in the context of both financial and nonfinancial considerations has led us to develop the below framework for the reverse supply chain. The framework proposed can be used as a means to evaluate not just contactors but all other products in the Eaton product line, such as breakers. It can also be used as a tool to educate the customers (OEMs), distributors and various stakeholders within Eaton.
The columns of the cost benefit analysis table consist of the various disposal strategies; the rows comprise of line items divided into three sections: revenue line items, cost line items and non-financial consideration.

The first section tracks revenue drivers, such as tax deductions, revenue generated from repurposing activities, revenue generated from recycling contactors and reduction in land fill costs.

The second section details the cost drivers, such as warehousing costs, traceability costs, transportation costs, labour and equipment costs, inspection costs and customer education costs. In a take-back program transportation and warehousing are significant costs. It is evident from the framework above that the per unit transportation and warehousing costs could be reduced if a targeted take-back program is performed with known high volume customers. Examples could be parts that are retired by power utilities and nuclear power plants during
their annual maintenance shutdown. Collaborative logistics could further reduce transportation and warehousing costs, through freight consolidation. Third party logistics providers specialize in collaborative logistics, whilst NGOs such as EDF can provide support to establish lean collaborative supply chains.

The third section uses a heat map to support Eaton in considering the risk/benefit to brand image through running a take-back program. It also considers the regulatory risk (compliance) of running such a program. The heat map provides a simple visual representation of the risk for the line items in the nonfinancial section. The heat map is developed by taking the product of likelihood and severity of unintended event.

In order to categorize the risk, a method of analysis known as ALARP (As Low As Reasonably Possible) is utilized. ALARP is standard practice in determination of safety integrity levels in engineering domain. The ALARP principle helps to define the tolerable risk target for a facility or operation in terms of the social, political and economic factors and predefined consequences relevant to a company. A high likelihood and severity is depicted by red indicating high risk. If, either likelihood or severity is moderate or low, then the cell is colored yellow indicating medium risk. If likelihood and severity is low then the cell is colored green to indicate low risk. This semi quantitative analysis of non-financial aspects provides the visual representation that can serve as a common communication tool between the various teams and management at Eaton.

V. Customer Analysis

From our conversations with customers, we believe that there are three key issues that would need to be addressed in order to build a successful take-back program. In its current proposed form, the program faces the following challenges:

1. Lack of volume
   Due to the contactors’ long replacement times, most customers discard very few (if any) each year. Thus, the proper disposal of these components is not top-of-mind for the majority of customers.

2. Lack of incentives for the end-customer to recycle
   There are currently no regulatory requirements for proper contactor disposal. In addition, most customers simply throw away used contactors, which is a zero cost operation for them.

3. Lack of connection with the end-customer
Non-direct sale customers receive Eaton contactors through OEMs and distributors, who also often offer their own servicing. Customers are therefore unused to dealing directly with Eaton.

To address these issues, Eaton would need to consider changing the take-back program in the following ways:

1. *Build volume by broadening recycled components and providing clear recycling reminders*

   Eaton could increase the volume of take-back by offering to take additional components or entire pieces of electrical equipment (e.g., motor starters, control panels). Clear labels pointing out recycling options on the contactor casing may also serve as a way to remind customers to recycle.

2. *Provide incentives for customers to recycle*

   Changes in the regulatory environment may provide customers with a recycling incentive. Eaton can also offer discounts and logistical support to incentivize customers, which could also be used as a lever to encourage customers to replace a competitor’s product with an Eaton product.

3. *Partner with OEMs who have similar sustainability commitments and/or provide logistical support for OEMs and distributors*

   Seek out OEMs who also have sustainability goals to find partners that can reach out to the end-customer. As the first line of contact with end-customers, OEMs and distributors will also need logistical support to make the program more attractive to them.

All three of the above objectives could be achieved by carefully selecting one or two initial organizations with whom to pilot the program.

*Volume*

One of the key benefits of Eaton contactors is their reliability and durability. OEMs interviewed varied greatly on replacement time, but generally noted that contactor defects are nearly unheard of and contactors failures from daily usage are rare. Average replacement time ranged from once per year for welding machinery to once every 10-20 years for industrial control panels. One OEM customer noted that “I’ve been here for 18 years and in that time, I’ve only seen maybe 15 contactors need replacing, and we use them by the thousands in our equipment each year.” Another OEM pointed out that when contactors are replaced, it is not because the
components themselves fail, rather “failures in our equipment are often caused by water damage, poor installation, shorting, mechanical cracks, or loose wires, not by contactors.”

The long replacement times creates two challenges for take-back: volumes of discarded contactors are very small for each end-customer, and by the time a contactor needs to be replaced, the customer is unlikely to remember disposal instructions provided at the time of purchase many years ago. One OEM interviewed stated that “since I can’t imagine [customers] need to replace it very often, they just throw the one or two contactors into the trash pile.” A distributor of motor starters who also stocks replacement contactors told us that “my customer may have bought the starter 4-5 years before it needs replacing, so when that time comes, it’s hard for him to determine where he bought it from.”

There are three ways Eaton can create more volume for take-back to become feasible for customers:

1. Expand the take-back program to other components. Three out of the four interviewees suggested that light bulbs of various kinds would be a high-volume, often replaced component.

2. Expand the program to take-back entire pieces of electrical equipment, which are discarded for reasons other than a faulty contactor. The starter distributor noted that he occasionally receives requests to return used starters, but this is difficult for him to do as they are often custom built for the end-customer. However, “if Eaton called mechanical and electrical contractors across the country, you’d probably get a ton of requests to take old starters and pieces of equipment that they’ve been storing up.” However, in adopting such an approach, Eaton would need to be careful in managing its own risk – by agreeing to take back old equipment, regardless of nature or origin, Eaton would be in a position where it is legally liable for the safe disposal of products with ‘unknown’ contents. This could be mitigated by limiting the products / age that are accepted.

3. Clearly print or label take-back information on the component itself so that the customer is reminded of recycling options. The distributor mentioned that he puts a label with their contact information inside every starter he makes, so that the customers can contact him with issues and replacement requests years later. This method could also be useful for Eaton components.
**Customer Incentives**
Currently, contactor disposal incurs no cost for the end-customer. None of the interviewees had received inquiries about recycling of components from their customers, and all stated that discarded contactors are simply tossed in the trash today. In the rare cases that a contactor is defective, the part is sent back to the OEM or distributor on warranty.

The development of regulations surrounding the disposal of contactor materials would likely be the most effective way to incentivize customers to recycle. In the absence of regulations, however, there are still two ways Eaton can incentivize customers. The most obvious method is to offer a discount for future components, although it was unclear to our interviewees how much discount a customer would need. In addition to discounts, Eaton needs to keep recycling as close to zero cost as possible by offering logistical support such as pre-paid mailing boxes to return the part. Offering to take-back whole equipment as mentioned in the previous section would also be a way to incentivize customers by offering them an integrated waste disposal service and taking away the work of removing the contactor.

**Connection with End-Customer**
Customers who do not purchase their equipment directly from Eaton often use OEMs or distributors as their first point of contact. At least one of the OEMs interviewed also offered servicing for their products, and all interviewees noted that contactors are usually replaced by third party servicing companies or the customers’ internal maintenance staff. This structure presents two challenges for Eaton. First, Eaton may damage its relationships with OEMs if it offered its own service to replace contactors, and second, any take-back program will need to involve these OEMs and distributors as they hold the end-customer relationship.

Eaton creating its own service to replace contactors is likely unfeasible. Not only would it damage customer relationships, but as mentioned above, the volume of contactors is simply too small for such a program to be attractive to an end-customer. A customer who has one or two maintenance vendors servicing all its equipment will not want the added complexity of calling up Eaton simply to replace one or two components every five years.

There is potential, however, to involve OEMs and distributors in the recycling process by seeking out sustainability-oriented OEMs and providing logistical support. One OEM interviewed mentioned that they have their own goals to reduce the amount of landfill waste their company produces, and “when I asked the parts manager if he was interested in a take-back program, he said no, but I think that it could work if we made it part of our larger sustainability program.” Having salespeople reach out to find these types of OEMs can develop partners who may be willing to take-back parts from end-customers for recycling. In addition,
the distributor interviewed noted that Eaton would need to address logistical issues for these intermediate parties. These issues include not only shipping logistics, but also logistics surrounding discounts, as “it would be difficult for us to figure out whom to give the credit against. We don’t always know if a part came from us, and it would be extra work for us to figure it out.” A potential solution may be a coupon type system where end-customers can redeem a coupon with a distributor who in turn sends the coupons back to Eaton to be credited against their own account.

**Next steps: Selecting a Partner Organization**

Given the challenges and potential solutions proposed above, the best course of action for Eaton would be to pilot a take-back program with one or two partner companies. The selected partner companies should have the following characteristics:

- **High volume of contactor replacement:** Select companies in industries that mandate or require frequent contactor replacement at high volumes (e.g., where proactive replacement occurs in nuclear power plants, mining)
- **Close existing relationship with Eaton:** Select companies which already have close sales ties with Eaton; companies who also have service contracts with Eaton would be optimal. These companies will already have a strong collaborative relationship with Eaton and will be more amenable to changing their contactor disposal procedures and negotiating a mutually beneficial take-back procedure.
- **Commitment to sustainability:** Select companies who also seek to be sustainability leaders in their industries and need to fulfill their own sustainability goals. This criterion may not be necessary if the combination of the first two criteria allows Eaton to create a cost-effective program with its partner.

Piloting the program with these companies will allow Eaton and its partners to achieve some “quick wins” with the program that can be advertised to gain more interest from other customers. In addition, take-back program design and supply chain challenges can be worked out during the pilot program before a full program launch.
VI. Recommendations

The case for a product take-back scheme for contactors is challenging, on the basis of low volumes, existing low disposal costs for customers, and a lack of valuable material that can be recovered from the product. Furthermore, the size and weight of some of the products in Eaton’s contactor line would make shipping of such products for disposal costly.

If Eaton were to pursue a contactor take-back program, it should first focus on strategic partnerships, as outlined in Section V, where the partner has high replacement volumes, a strong relationship with Eaton, and a commitment to sustainability.

In order to build volumes of product take-back up to more economic levels, Eaton should look to broaden the components that it considers for a take-back scheme. These products should be evaluated using the matrix identified in Section IV, targeting products which are:

- Lightweight
- Frequently replaced
- Contain precious or regulated materials

In order to proceed with such an analysis, Eaton needs to baseline its existing product take-back operations, so that the full costs associated with it are understood; it could also consider the development of an internal metric for quantifying intangible cost associated with sustainability programs, and the investigation of collaborative reverse supply chain options.

Take-back of products provides an interesting mechanism to switch customers from a competitor’s product to Eaton’s, however compliance issues regarding take-back of ‘unknown’ materials would need to be overcome, potentially by limiting the specific products that are accepted.

Whilst OEMs were out of scope for this study, an OEM partnership also presents an interesting avenue of future enquiry, due to the volumes used. In addition, regulatory changes in future – whilst remote at present – could place a burden onto OEMs for the recovery of Eaton’s products, and a partnership for product take-back could provide Eaton with a strong value proposition to OEMs considering the use of its products.