

Environmentally Preferable Purchasing

Luke Dixon, Danielle Gould, Erin Lieg, and Enid Williams
GenBus 600
Professor Tom Eggert

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Characteristics of Sustainability

As Alliant is already aware, sustainability marries the concepts of environmental, social, and economic responsibility. To take Alliant's commitment to sustainability further, we recommend that Alliant improve the way suppliers are evaluated and make environmentally preferable purchases throughout its supply chain.

By encouraging its suppliers to reduce, reuse and recycle, Alliant encourages market growth in these areas, ultimately lowering its own costs. Social sustainability in the supply chain includes suppliers' paying equitable wages, supporting safe working conditions, and being a responsible member of the community by educating the public about any safety hazards associated with their industry. Alliant can support economic sustainability in its suppliers by patronizing businesses that provide good products while using sustainable practices.

Environmentally Preferable Purchasing

Our group assessed Alliant's current purchases of transformers, power lines, power poles, and wooden reels to address the supply chain currently in use at Alliant. We researched new innovations for these four products and companies attempting to improve the life cycle of these products. We have found new products and companies and would like to suggest our research to Alliant to improve their supply chain sustainability.

Why Be Environmentally and Socially Sustainable?

Alliant will benefit economically from sustainable practices, as socially and environmentally responsible investments become more popular and lucrative. Additionally, meeting and exceeding environmental regulations prevents incurring fees, fines and litigation. Reducing waste saves money directly by reducing disposal costs. Sustainable practices will attract innovative employees who are not afraid to come up with new and unusual solutions. Sustainable practices help ensure Alliant's future success by providing benefits now and in the future. The suggestions we have made will help Alliant to become even more environmentally and socially sustainable.

Transmission Power Lines

Recycling Power Line Metals:

The copper and aluminum that currently are used in power lines and transformers are very valuable metals and can be recycled from old and damaged power lines. We would like to use the case study of PG&E (Pacific Gas and Electric) Corporation to show the possible environmental and economic benefits of recycling these metals. In 1997, PG&E Corporation cited copper and aluminum from its downed and old power lines as the highest value recyclables in their recycling program. While the company does not separate the metals from composite wires, it does strip all metals from lines made entirely of copper or aluminum.

In 1997, during an electric transmission upgrade, the company replaced approximately 1,800 miles of line and 21,000 transformers. From this upgrade, PG&E obtained 1,424 tons of copper, 577 tons of aluminum, 2,800 tons of cable in conduit, and 5,300 tons of iron. In 1998, the company recycled 1,963 tons of copper and aluminum, which reduced the need to mine these two metals. From this recycling PG&E netted \$3.2 million in revenues. In 1999, the company approximates that it saved \$4 million. PG&E

uses a local metal recycler, Sims Recycling, to recycle all lines that contain less than 50 parts/million of PCB's. If lines are found to contain more than 50 parts/million, the wire is landfilled.

Alliant Energy recycles some of these metals, although they do not have a unified disposal system, nor a regular recycling client. We suggest that Alliant systematizes its efforts to recycle all metals from old and downed power lines and further, that it looks into the possibility of using physical separation methods to separate steel from copper in its composite wires, such as ACSR (aluminum-conductor-steel-reinforced) line.

Power Line Innovations Increasing Electricity Transmission

We suggest Alliant look into 3M Composite Conductors, the new power line currently being tested by 3M and Oak Ridge National Laboratory. This line is composed of 3M Nextel 650 ceramic fibers embedded in an aluminum and zirconium matrix (a composite-core) as opposed to traditional metal lines. The resulting fiber does not stretch as much as traditional fibers and resists deformation at high temperatures, thus reducing the problem of power lines sagging due to the heat produced by high current loads. This conductor makes possible the transmission of large amounts of electric current. Developers believe that its lack of sagging will make 3M's new power lines a solution for spanning large lakes, rivers, and canyons, areas which are otherwise difficult to traverse with conventional power lines. Additionally, the aluminum prevents rust. The lines can be used with current transformers, poles, and installation equipment. Since the conductor can withstand higher temperatures, it can transmit more energy. This is the most advantageous part of using 3M's new power lines; these lines can carry more energy than any other line currently available and significantly reduce energy bottlenecks.

3M Composite Conductors are an innovative development in electricity distribution. They have been awarded a 2003 R&D Magazine 100 award for the advancements the lines have made. Furthermore, 3M believes these lines will be an advance in environmentally conscious distribution of energy. According to 3M's equation: "No additional right of way needs + fewer tower modifications = lower environmental impact," the Composite Conductors will solve the problem of growing demand for energy necessitating the construction of more energy towers. 3M also believes that their lines will save energy companies money. The company states that an upgrade to Composite Conductors can have the following financial benefits:

Avoid the cost of new tower construction, avoid the delay of permitting and sighting for new lines and rights-of-way by using existing towers and rights-of-way, shorten the time to increase capacity allowing [energy companies] to sell more power faster, reduce bottlenecks and allow [companies] to reach more markets with available excess capacity using existing towers, help with [companies'] cash flow management with optional leasing alternatives.

Another company, Southwire, manufactures a variety of wire and cables for the energy industry. In 2002 they introduced a new product called the ACSS/TW conductor, similar to 3M's Composite Conductor, which provides more conductor area, better high-temperature reliability with less sag, and better utilization of space because the conductor sags less at any temperature energy companies can hang conductors closer together which

will produce shorter and fewer towers. Utilities companies upgrading to the ACSS/TW expect to save over \$100 million dollars in construction costs.

We suggest that Alliant research the possibility of upgrading new lines in high energy consumption areas to the 3M Composite Conductor or the Southwire ACSS/TW power line, as these power lines seem like a sound investment for energy transfer in busy areas. In addition to reducing resource use, they capitalize on previously existing equipment.

Wood Reels (Reel Recycling)

The wood reels that Alliant currently uses to receive, transport, and dispense their conductors present a large disposal cost, material waste, and environmental burden. According to the data we received, in 2002 Alliant used approximately 16,000 wooden reels and landfilled over 716 tons of used wooden reels. On average, Alliant's landfill costs, including dumpster rental and hauling, amounted to \$330 per ton. Therefore, disposal costs of used wooden reels amounted to more than \$236,000 in 2002. In addition to this cost, tons of still-useable material were wasted.

Alliant uses Reel Solutions, a company that recycles reels at little or no cost to the company. Reel Solutions comes to sites and collects used reels. The only requirement is a volume of at least one truckload of 30" or larger reels within four months. By using this approach, Alliant saves a considerable amount of money and help the environment with no additional cost or work. Alliant is currently using Reel Solutions at some sites, but they do not use them uniformly. We suggest Alliant try to use Reel Solutions at all of their sites. Additionally, Reel Solutions can be a source of wooden reels for Alliant's conductor suppliers such as General Cable, thereby cycling Alliant's resource use.

Poles

The use of traditional treated wood utility poles has recently come into question. Several lawsuits have been brought against companies producing and using treated wood poles, citing the dangers of the chemicals used to treat the poles.

In order to reduce Alliant's effect on the environment, legal liability, costs, and maintenance, we suggest the use of a new pole that is cost effective, more durable, and much more environmentally friendly than traditional wooden poles: Iso Truss. Iso Truss is a utility pole made from carbon, fiberglass, and environmentally safe resins. This new pole is extremely lightweight, yet with its lattice design, Iso Truss is stronger and more wind resistant than conventional poles. According to Joe Mauss, Alliant Sourcing Manager of Energy Delivery, the current cost of the average Alliant utility pole costs \$300 to \$600 with a 40-year life expectancy. Each Iso Truss pole costs only \$325 and comes with a 100-year guarantee. In addition to Iso Truss's extremely competitive initial cost, each pole is lightweight and maintenance-free yielding additional savings in transportation, set up, and replacement costs.

Unlike traditional wooden poles, Iso Truss poles contain no CCA, creosote, or Penta. Even without these harsh and dangerous preservatives, Iso Truss can stand up to the harshest conditions without rust, rot, or corrosion. In addition, woodpeckers and insects are not attracted to Iso Truss poles. Finally, if an Iso Truss pole is damaged, it can be 100% recycled, reducing landfill costs and environmental impact.

In conclusion, Alliant will see no additional costs to using Iso Truss poles. On the contrary, it will see a substantial environmental and economic savings. We suggest that

Alliant use Iso Truss poles to replace old wooden poles and in new power line installations.

Transformers

Alliant provided us with data about oil spills from transformers occurring between January 13, 1998 and October 21, 2003 (approximately 6 years). The following PCB levels were found in 1269 electrical equipment oil spills:

- 1.4%: unknown PCB level
- 25%: No PCBs
- 39.5%: PCBs < 1 ppm
- 34.1%: PCB's ranging from 1 to 940 ppm.(see Chart 1)

This large number of contaminated spills, even at low PCB concentrations, is costly to Alliant. Each 55-gallon drum of PCB-contaminated debris costs an extra \$20 to dispose of, compared to non-PCB debris. Estimating an average of 3 drums of debris per spill¹, 250 spills per year, and 74% of spills containing some level of PCBs, the added disposal cost is \$11,100 per year.

Range and average amount of oil spilled per instance:

Analyzing 383 lines of useable data² yielded an average of 638 oz. (approximately 5 gallons) oil spilled each instance. However, the range was from 0.1 oz. to 150 gallons, and more than 75% of the spills were 3 gallons or less, since most spills and leaks occur in the large number of small transformers (see Chart 2). Additionally, leaks are the main cause of spills (see Appendix). Because of this cumulative effect, it would be beneficial to invest in transformers with a low incidence of leaks.

Transformer Proposals:

First, we recommend Alliant start using more vegetable-derived oils, such as Cooper Power Systems' Envirotemp FR3. In October 2001, Alliant Energy of Cedar Rapids completed the first phase of a study to determine the impact of Envirotemp. Alliant general manager John Larsen spoke positively about this project at that time. Envirotemp has a higher initial cost, compared to mineral oil transformers, but is at least as efficient, has better fire safety, extends the life of paper insulation, and thoroughly biodegrades in soil and aquatic environments. Its disposal cost is significantly lower than mineral oil because spilled Envirotemp oil does not have to be completely removed from the environment, whereas mineral oil must be completely removed.

Second, investigate using "wrappers" for transformers that date from before 1979. Estimate the number of transformers now in use that were installed before 1979, and thus possibly contain PCB's. Evaluate the cost of refilling that number of transformers with non-PCB oil, and the rate at which they could be refilled. Or if these transformers are near their end-of-life, it may be cost-effective to put a wrapper around them, preventing PCB spillage. The overall rate of transformer failure can be found by dividing

¹ Many lines of data had units such as "1 container" or "1 truckload" and were not included in this analysis.

² Many lines of data were numbers without units, and were not included in this analysis.

the number of failures over time. For the six-year sample provided, we found 240 transformer failures, or 40/year. Approximately half of these (129) contained a measurable amount of PCB. Thus, it is important to investigate a way to prevent these costly spills.

Third, since the majority of spills were caused by equipment problems, it is worthwhile to invest in transformers with long lifespans and a reliable history. Ask your potential suppliers for data about leaks and reliability.

CONCLUSION:

One criticism of the movement for sustainable development is that it is hard to develop quantitative goals. Therefore, we encourage Alliant to set quantitative goals in their environmentally preferable purchasing. For example, set goals for mass of material saved from the landfill. This requires an accurate count of what is currently landfilled, and establishing a reasonable reduction rate. By actively recording this information, Alliant can track its progress in environmental improvements.

Other useful tools for goal measurement are supply maps and Life Cycle Analysis: trace the products Alliant uses (the three in this study and others such as paper or office equipment) back to their sources. Include Alliant's waste stream – spills, equipment failure, and broken reels – based on past statistics. Are waste streams generated in one place that could become supply streams elsewhere, or at another company? Include costs (materials, labor, and environmental damage) in this map, and compare a map using current products to one using the most environmentally friendly products. This process ties into Alliant's Hazardous Materials review procedure, where hazardous materials are prevented from coming into Alliant's system.

In addition to examining its supply cycle, Alliant should require its suppliers to:

1. Provide Life Cycle Analysis of their products.
2. Be ISO 14000 certified: this environmental management certification is a measure of what the company does to minimize the environmental effects of their activities, and is a good indicator of a company's dedication to reducing the environmental impact of their production processes.
3. Reduce waste in the construction process, and produce items that are as durable as possible. Reduce the amount of environmental damage from spills by containing leaks before they start. Reduce fuel consumption by transporting less waste mass over long distances.
4. Build reusability into the design. Make broken components easier to replace, and ultimately easier to take apart at the end of the product's life. Try to find markets for reused products, and educate the public and businesses about these options.
5. When all useable parts have worn out, the manufacturer should take back the components for recycling.

We have compiled a list of companies we would like to suggest to Alliant. These companies are located near Alliant sites, are environmentally conscious, and/or will improve Alliant's business diversity. In our appendix we have evaluated Alliant's current suppliers of conductors and transformers, and made suggestions of new companies that may serve as models and alternatives for Alliant's possible business partners.

Even if Alliant's own practices were completely sustainable themselves, the company cannot move forward without purchasing from sustainable businesses. Through our investigation of environmentally preferable purchasing we have found numerous examples of such businesses and products. We hope that Alliant will use these examples to found environmentally responsible business partnerships.

Appendix

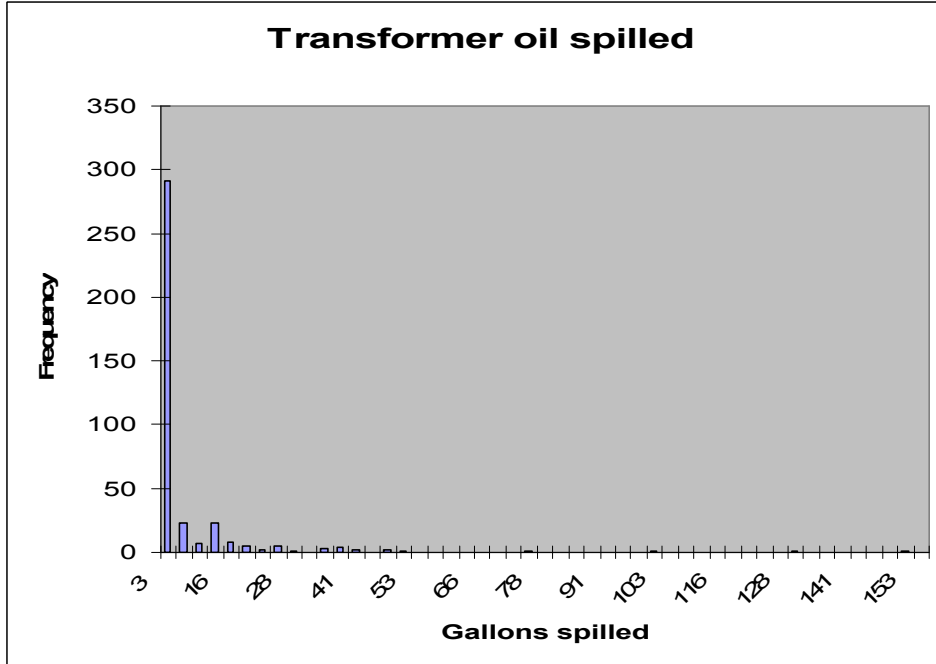


Chart 1

Causes of 1269 spills of oil from transformers:

- 56%: equipment problems: includes leaks (36.4%), failure (18.9%), and other
- 23.7%: nature: raccoons, squirrels, storms, wind
- 15.7%: human error: digging and vehicle collisions (11.4%), vandalism, handling (4.3%)
- 1.5%: pole failure
- 3.5%: other or unknown

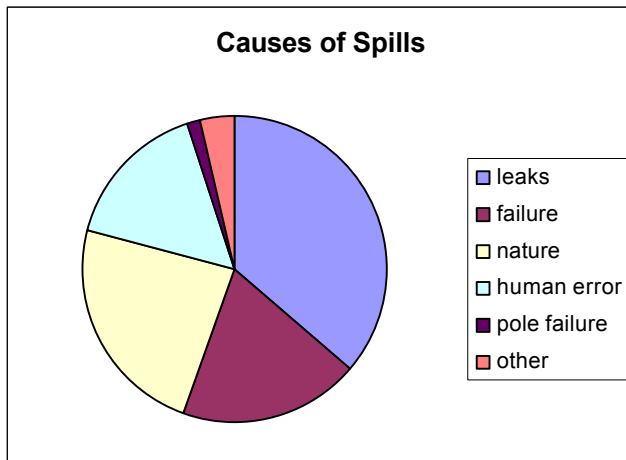


Chart 2

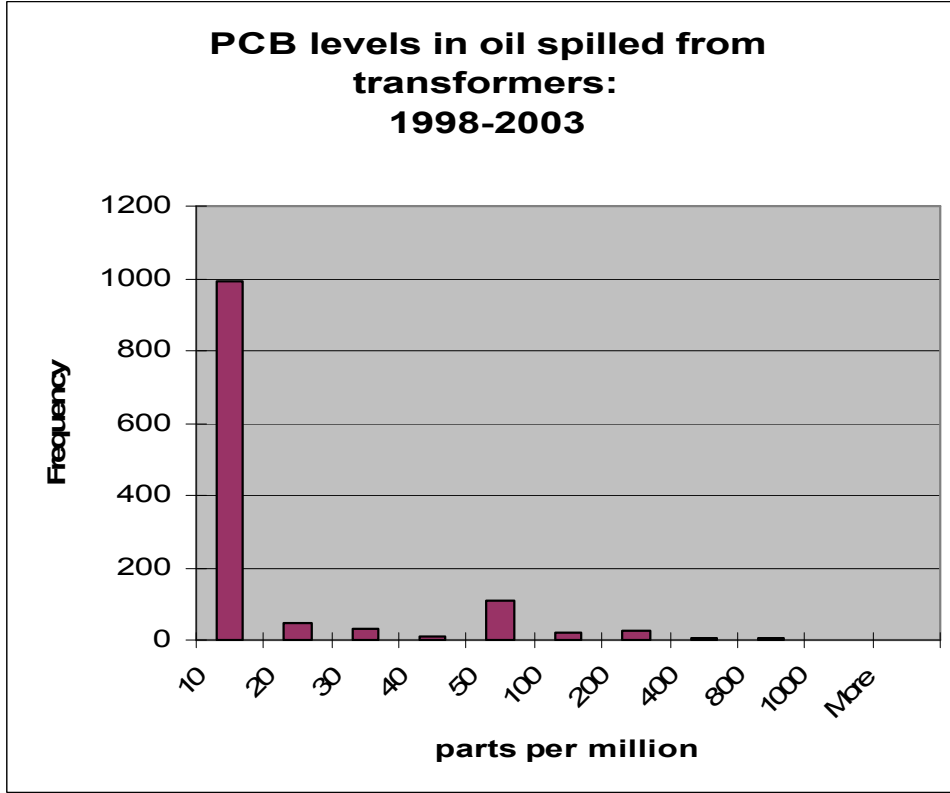


Chart 2—causes of transformer oil spills

Suggestions of Companies Making Transformers and Conductors

The following is an evaluation of Alliant’s current suppliers of conductors and transformers, recommendations for ways that Alliant can assist these companies in fostering more sustainable development, and other model suppliers currently dedicated to sustainable innovation. Alliant currently purchases from General Cable and Cooper Industries. Upon evaluation of the utility product companies actively involved in environmental innovation it became apparent that all had ISO certification. ISO, the International Organization for Standardization, is a voluntary non-profit organization that develops and implements international standards for products and environmental management issues. This certification provides a good framework for evaluating suppliers. We believe that if Alliant chooses to continue purchasing from General Cable and Cooper Industries, that it is in a unique position to influence their production processes to ask that these companies become ISO certified and to change their unsustainable business practices.

Alliant currently purchases conductors from General Cable. Dedicated to technological innovation, General Cable is a leader in aluminum and fiber optic wire and cable products for both the communications and energy industries. However the company is not yet committed to sustainable innovation, by taking take into account the full life cycle of products. The company has begun to provide customers with the option

of reeless packaging, but Alliant would be required to purchase molded plastic or tubular steel reels to store the coils separately. General Cable does not have ISO certification.

Cooper Industries is a provider of medium and high voltage electrical equipment. In May of 1990 their Environmental Policy was instituted which emphasizes reducing waste, complying with government regulations, and respecting the environment. Cooper Industries has begun developing environmentally conscious technologies such as the “Envriotran” transformer. This transformer is filled with “Envirotemp FR3,” which is an edible seed oil-based dielectric coolant and so oil spills are less hazardous. We would strongly recommend continue to purchase Cooper Industries products because of their local location in Waukesha, WI and for the potential they have to adopt more sustainable practices.

We would like to recommend the following companies to Alliant: ABB is an innovative technology-based supplier of utility products. According to their mission statement, “Building on our core strengths of technology leadership, pioneering spirit and a sustainable approach to business, ABB helps our customers to become more profitable while lowering environmental impact.” They are headquartered in Norwalk, Connecticut, but have manufacturing sites and facilities all over the country. They are involved in 300 million dollars worth of research annually to enhance their technologies and minimize their environmental impact. They have an ISO 14001 certification and recently won an environmental excellence award in Bogotá, Columbia. ABB pays specific attention to the life cycle of products through their, “Life Cycle Assessments,” (LCA) which takes into account everything that goes into producing their products from the raw materials to the recycling. They have a number of transformers that have been certified through this LCA. They are currently involved in a wide range of environmental activities.

Alcan is a supplier of aluminum cable products in the United States. They have ISO 9000 certification. Alcan Cable established a “scrap-on-reels” program that combines the recovery of scrap conductors and the recycling of wooden reels. “Alcan is particularly proud to provide our customers assurance that no byproducts from the processing of scrap conductors find their way into the waste stream; all components have secondary uses,” stated Rusty Reagin, Alcan Cable’s Manager of Investment Recovery. Holding with Alcan’s strong commitment to product stewardship, the company has begun taking back reels with a \$500 refundable deposit per reel. Alcan Cable is responsible for the distribution and collection of reels. Their plants are located in Oregon, Missouri, and Pennsylvania.

Southwire recently partnered with Duke Energy and developed Enviro-coils packaging, as a substitute for wooden reels used for cable packaging. This system works by shipping the cables in coils and then placing the coils on reusable tubular stems, thus eliminating the need for large wooden reels. This system also recently won the industry excellence award from Southeastern Electric Exchange. Southwire has a strong environmental policy, believes in product stewardship and believes strongly that the market price of their products should reflect the true costs of production (externalities associated with production, such as waste management).

Company contact information and Information Sources:

- 3M Composite Conductor Program
3M Center, Bldg. 60-1N-01
St. Paul, MN 55144-1000
Fax: 651-736-0431
www.3m.com
- Alcan
www.alcan.com
- Cooper Industries
www.cooperindustries.com
- IsoTruss
www.isotruss.com
- PG&E Corporation
www.pgecorp.com
Phone Interview Contact: Jim Larson
- Reel Solutions
www.enreel.com
- Sims Recycling
30104 Industrial Pkwy. S.W.
Hayward, CA 94544
Tel: (510)471-6600
- Southwire
www.southwire.com