

## GHG Project Case Study

### General Electric Ecomagination “HighLights”: Cutting Emissions and Costs While Expanding Sales through Lighting Efficiency Retrofits

In recent years, natural gas and petroleum prices have spiked in the United States, sometimes rising 100 percent over 2000 levels. Over the same period, average electricity prices have climbed by 12 percent.<sup>1</sup> For General Electric (GE), this resulted in steadily increasing energy costs at most of its major facilities. With prices expected to continue rising, in 2004 GE imposed an energy cost reduction requirement on its business units.

After looking into several options to reduce costs, projects that replaced existing lighting with high-efficiency lighting seemed like a feasible option, especially because the lighting incorporated bulb and ballast products made by GE. The lighting projects were also a good fit with GE’s “ecomagination” campaign to promote cleaner technologies.<sup>2</sup> GE has made several commitments in order to prove not only that there were markets for clean technologies but also that the company could reduce its own impacts while profiting from these markets. With its ecomagination commitments and high energy costs, GE asked its corporate managers to find cost-effective ways to reduce energy consumption and GHG emissions.

#### The Lighting Projects

The retrofit projects gained considerable momentum after the launch of ecomagination. GE discovered that approximately two-thirds of its industrial business facilities were not using GE’s

lighting technology and that nearly all were equipped with relatively inefficient lighting fixtures.

The company surveyed its facilities’ lighting requirements and identified 148 locations where lighting retrofit projects were likely to exceed GE’s hurdle rate. But before the retrofits could commence, facility managers needed to sign off on each project. At first this proved to be difficult, as several managers were skeptical of the benefits that the project proponents promised. Energy audits were therefore conducted to give the facility managers before-and-after cost comparisons. The audits broke down the electricity load by activity and then compared it with after-retrofit energy cost estimates, which convinced the facility managers that such projects were indeed good business.

The majority of GE’s facilities are equipped with high-intensity discharge (HID) lighting fixtures which consume large amounts of electricity and generate a considerable amount of waste heat. These bulbs were replaced with GE’s T5 and T8 fluorescent bulbs, arrayed in six-bulb fixtures. The new fluorescent fixtures provided greater quantities of light while also enhancing the quality of the lighting (see figure 1)—a change that was immediately noticed by GE’s employees. In addition, the new bulbs last longer than the HID fixtures they replaced, and since they are set in six-bulb fixtures, they require less maintenance: if one goes out, there still is plenty of light.

**Figure 1 - Before and After Retrofit Images from one GE Facility**



Before retrofit image of a carousel and carton flow racks (Mascot, TN facility) – Image courtesy of GE

After retrofit image of a carousel and carton flow racks (Mascot, TN facility) – Image courtesy of GE

**Costs and Payback**

The costs and subsequent payback of individual lighting projects differ according to such variables as size, number of shifts, local energy cost, facility-specific lighting requirements, and total annual hours of operation. The aggregate data for GE’s nineteen projects illustrate the favorable characteristics of this type of energy efficiency project (see table 1).

anecdotal evidence suggests that the improved lighting conditions are increasing productivity and raising employees’ morale. By reducing energy consumption, the lighting projects also shield GE’s facilities from future energy price volatility.

<b>Table 1. Aggregate Data from Nineteen Retrofit Projects</b>		
	<b>Before Retrofit</b>	<b>After Retrofit</b>
Lighting type	HID	T5 and T8 fluorescent
Watts/fixture	465 W	220 W
Total lighting load	7.4 MW	3.7 MW

GE estimates that the completed lighting projects will reduce its indirect GHG emissions by as much as 18,000 metric tons per year. The new fixtures have other environmentally beneficial attributes as well, as they are certified as non-hazardous under the Environmental Protection Agency (EPA)’s Toxicity Characteristic Leaching Procedure (TCLP).

**Synergies with Ecomagination**

GE estimates that the total upfront cost of the retrofits, including bulbs, fixtures, and labor, was approximately \$4 million. But the retrofits have cut in half the total lighting load for these facilities, thereby providing an expected savings of \$2 million annually. Thus the average payback time for these projects is two years (see table 2). The facility managers at these sites have been pleased with the cuts in energy consumption, and

With nineteen retrofit projects completed, GE is now planning similar projects for more than 100 other plants worldwide within the next two years. With its thousands of facilities, GE has plenty of room for more projects, provided that they meet the relevant hurdle rate. These retrofit projects are helping GE fulfill several of its ecomagination commitments, such as improving energy efficiency and reducing GHG emissions. Ecomagination also is a platform for GE to expand its revenue from energy-efficient technologies. GE has been able to

**Table 2. Nineteen Facilities' Aggregate Simple Project Payback with GHG Savings**

	Year 1	Year 2	Year 3	Three-Year Cumulative
GHG reduction (tonnes)	18,000	18,000	18,000	54,000
Cost (\$)	4 million	0	0	4 million
Savings (\$)	2 million	2 million	2 million	6 million
Net cost (\$)				<b>-2 million</b>
GHG cost (\$/tonne CO <sub>2</sub> e)				<b>-37.56</b>

capitalize on these lighting projects by taking potential clients on tours of its own facilities. A media outreach campaign to showcase its technology is already underway. GE's use of its own products that improve the quality of lighting and save energy are a strong endorsement for its lighting technologies.

In addition to contributing to its environmental commitments, these lighting projects illustrate the value that can be generated when a company positions itself, through its own actions, to meet the increasing demand for efficient low-carbon products.

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<sup>1</sup> United States Energy Information Administration. Electric Power Annual 2005 <http://www.eia.doe.gov/cneaf/electricity/epa/epat7p4.html> (accessed March 20, 2006)

<sup>2</sup> For more information on GE's ecomagination commitments, see [www.ecomagination.com](http://www.ecomagination.com)