

Electricité de France

Operation LBC

Profile # 1 19

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Executive Summary

The focus of this profile is the largest compact fluorescent lightbulb leasing effort ever undertaken by a utility, Operation LBC (Lampe Basse Consommation which means low consumption bulb). Implemented jointly by Electricité de France (EDF) and ADEME (Agence de l'Environnement et de la Maîtrise de l'Énergie or the French Environment and Energy Management Agency), Operation LBC sought to lower evening peak demand on the Caribbean islands of Guadeloupe and Martinique by cutting the demand for lighting. The program's success caught both EDF and ADEME by surprise.

In the late 1980s Guadeloupe's oil-fired power plant was nearing maximum capacity due to an increase in tourism. Environmental concerns caused ADEME to consider alternatives to building either a new plant or adding capacity to the existing one. ADEME then analyzed electric usage on the island and determined that a significant share of the evening peak demand was a result of lighting provided by incandescent lamps. A market survey was conducted which showed that compact fluorescent lamps (CFLs) could flatten the peak but that customers knew very little about them. ADEME went to EDF to see if utility would be interested in raising awareness about the benefits of CFLs and financing a CFL leasing program. They were and planning began. Then in September of 1989, just as the effort was gearing up, Hurricane Hugo hit Guadeloupe leaving 12,000 people homeless and many businesses destroyed, delaying the project as the island concentrated on rebuilding.

In May of 1992 EDF and ADEME launched Operation LBC on Guadeloupe. After an extensive television, radio, and print awareness-building campaign, EDF sent every customer on Guadeloupe a coupon good for up to 10 compact fluorescent lamps at no initial cost. Lease payments were designed to be the same as, or even less than, the projected monthly energy and bill savings, creating a revenue-neutral or even positive cash flow situation for participants. Initially 100,000 lamps were placed in 80 retail stores. The response was so overwhelming that 12,000 households snatched them all up in one and a half days, with an additional 32,000 households placing orders for 250,000 more. Ultimately 34% of all households redeemed their coupons for an average uptake of 7.8 CFLs each.

The success on Guadeloupe prompted EDF and ADEME to implement Operation LBC in 1993 on the island of Martinique where a startling 345,000 compact fluorescents were distributed in just a few months. The programs resulted in 7 MW of peak demand savings on each island, plus 29-33 GWh of annual electricity savings, while providing residents with a powerful means to reduce their bills.

ELECTRICITÉ DE FRANCE Operation LBC

Sector: *Primarily Residential*

Measures: *Lighting: 15-watt compact fluorescent lamps*

Mechanism: *Over 700,000 CFLs leased by residential customers of EDF on the French Caribbean islands of Guadeloupe and Martinique*

History: *Operation LBC was implemented on Guadeloupe in May 1992 and on Martinique in February 1993; Most recent year data below covers Guadeloupe only*

MOST RECENT YEAR PROGRAM DATA

Energy savings: 29,927 MWh

Lifecycle energy savings: 164,599 MWh

Capacity savings: 7 MW

Cost: \$457,500

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. ANNUAL SAVINGS refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. CUMULATIVE SAVINGS represent the savings in a given year for all measures installed to date. LIFECYCLE SAVINGS are calculated by multiplying the annual savings by the assumed average measure lifetime. CAUTION: cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

ELECTRICITÉ DE FRANCE OVERVIEW

Electricité de France (EDF) is the national electric utility that serves mainland France and all her Overseas Departments including the islands of Guadeloupe and Martinique, the subjects of this profile. EDF was formed in 1946 when the French Government nationalized most of the country's electric companies to help rebuild France's power systems after the Second World War. The company's mission was to develop generation and distribution capacity to bring electricity to all of France and to make the country more energy independent.

For three decades EDF fulfilled this mandate to power the homes, communities, businesses, and industry of France. The yearning for energy independence led to the development of nuclear power to ease the reliance on fuels such as coal, oil, and natural gas which the country had to import. The 1973 oil embargo further brought home this point. France embraced nuclear power as not only a way to be energy independent but also to be more competitive in the global economy. In 1973 France's energy independence ratio was 23%. By 1993, it was 52% due mainly to the increase in the use of nuclear power to generate electricity. [R#1]

In the past twenty years Electricité de France has invested \$100 billion in nuclear power and at the end of 1993 operated 56 nuclear plants including a newly commissioned 1.3 GW nuclear pressurized water reactor. France now generates over 75% of its electricity using nuclear energy and is the second largest producer of nuclear electricity in the world. (The U.S. is the largest; Japan is third.) Despite its 40% reserve margin it continues to plan and build nuclear power plants with three more due to come on line by 1997 and one currently in the planning stages expected to be operational by 1998. [R#1]

In 1975 France decided to extend its electrical services to its overseas departments of Guadeloupe, Martinique, French Guyana, and Réunion. Now Electricité de France serves 28 million customers including 24 million households and 600 major industrial companies. It employs 118,000 people and its total 1993 revenues topped \$28 billion. The company has received no subsidies from the French Government since 1981. [R#2]

At the onset of 1994 EDF, a winter peaking utility, had an installed capacity of 98,100 MW, including 57,650 MW of nuclear power, 23,300 MW of hydroelectric generation, and 17,150 MW of fossil-fuel units. Nuclear power, which accounts for just under 60% of EDF's total generating capacity, supplied 83% of EDF's total kilowatt hours in 1993, with 14% coming from hydroelectric and only 3% from coal and other sources.

ELECTRICITÉ DE FRANCE 1993 STATISTICS

<i>Number of Customers</i>	28 million
<i>Number of Employees</i>	118,000
<i>Energy Sales</i>	424,000 GWh
<i>Energy Sales Revenue</i>	\$28.1 billion
<i>Winter Peak Demand</i>	70 GW
<i>Generating Capacity</i>	98 GW
<i>Reserve Margin</i>	40 %
Average Electric Rates	
<i>Residential</i>	11 ¢/kWh
<i>Commercial</i>	7 ¢/kWh
<i>Industrial</i>	4 ¢/kWh

In 1973, nuclear power accounted for 8% of total generating capacity, less than hydroelectric at 32% and far behind fossil fuels which supplied 60%. Nuclear power's rise to prominence is also evident in the year-to-year production statistics. In 1993 the amount of electricity produced by EDF increased by 1.4%. Nuclear production, however, rose by 9% while hydro production fell 7% and fossil fuel use plummeted 59%.

Electricité de France's is the largest exporter of electricity of any utility in the world. In 1993 EDF produced 424 billion kWh (20% of all the electricity in Western Europe) and exported 62 billion kWh of electricity, 10 billion kWh more than in 1992. This is directly attributable to the higher availability of nuclear plants. Switzerland was the largest customer for the first time topping Great Britain; Italy came in third.

Besides exporting electricity, Electricité de France is currently involved internationally in the growth of independent power in many different capacities. These include building and operating combined-cycle gasification plants and coal-fired plants, renewable energy projects, and aiding utilities who are reorganizing and updating their systems in Spain, Portugal, England, Greece, Mexico, and the Côte d'Ivoire. It has invested in countries experiencing rapid growth such as China where EDF helped build and test Daya Bay, China's first commercial nuclear power plant, and is assisting with the design and training for the Guangzhou 1,200 MW pumped-storage power plant. It has also invested in projects in India, Indonesia, Laos, Thailand, Argentina, South Africa, and Morocco. The utility is also assisting the restructuring of power systems in Central and Eastern Europe. In particular it is working on nuclear safety

Stakeholder Overview (continued)

in Bulgaria and Slovakia and is involved in studies to connect the grids of Central European countries (Albania, Bulgaria, Hungary, Poland, the Czech Republic, Romania, and Slovakia) with the Western European grid. Finally EDF is assisting in the transformation of electric utility management for utilities in Greece, Bulgaria, Lebanon, Côte d'Ivoire, Guinea, Guinea-Bissau, Tanzania, Ghana, and Gabon helping with internal reorganizations and improvements. [R#3]

ADEME OVERVIEW

Agence de l'Environnement et de la Maîtrise de l'Energie (ADEME which translates to Agency for Environment and Energy Management) is a state organization with the objective to "conciliate economic and social development with a rational utilisation of natural resources and the harmonious integration of the human being in his environment." The mission of ADEME encompasses the rational use of energy and raw materials; the promotion of clean technologies and renewable energy resources; the reduction, elimination, and recycling of waste products; anticipation of pollution and protection of the quality of the atmosphere; the fight against noise; and the avoidance of soil pollution.

To fulfill this mission, ADEME had a staff of 610 as of December 31, 1993 with offices in Paris, Angers, Valbonne, and in regional areas including Guadeloupe and Martinique. Staff initiates and implements programs in the product, process, materials, and equipment sectors working with local communities, businesses and the general public to help them make wise use of natural resources and take care of their environment. Internationally ADEME exchanges information with industrialized countries (especially Western Europe) and helps developing countries with technology transfer and consulting.

ADEME's funding comes directly from State financing and tax revenues. Financing from each source is allocated to clearly defined types of projects and is not transferrable. Therefore waste management and air treatment are the Agency's largest concerns as they are the most highly funded. Other areas of involvement include noise pollution, energy management, oil, industry, clean industrial technologies, transport, buildings, renewable energy sources, and green products. [R#27]

GADELOUPE AND MARTINIQUE OVERVIEW

The most northerly of the Windward Islands group in the West Indies is Guadeloupe which is 687 square miles in size and has a population of 390,000 people. Guadeloupe, whose English translation is "the double island," actually consists of two main islands, Grande-Terre and Basse-Terre along with several smaller islands. The capital is the town of Basse-Terre.

The other main town and commercial center is Pointe-a-Pitre on Grand-Terre.

Guadeloupe's economy is based on agriculture, tourism, and light industry but is heavily dependent on French aid and imports. While the biggest agricultural product is sugar, tourism superseded it in 1988 as the largest single source of income. Electricity is generated by diesel generators and combustion turbines with an installed capacity of 250 MW. The consumption is 780 million kWh. In 1988, 328,726 tourists visited Guadeloupe. In September 1989 Hugo struck and left 12,000 people homeless and businesses in ruins. [R#26,32]

Martinique is a Windward Island of 427 square miles with a population of 360,000. It is dominated by the volcanic peak of Mont Pelée; its capital is Fort-de-France. The prosperity of the island has historically been dependent on its sugar industry which produces both sugar cane and rum. Electricity is similarly generated by diesel generators and combustion turbines with an installed capacity of 230 MW. The island's annual consumption is 780 million kWh. In 1989 petroleum and petroleum products represented 6.7% of expenditures on imports. The biggest event of this century on Martinique was the 1902 eruption of Mont Pelée which destroyed what had been the capital city of St. Pierre and devastated the sugar crop. In 1990, 421,259 tourists visited the island. [R#26,32]

The average temperature of Guadeloupe and Martinique is 79°F and the official language is French but Creole Patois is common. Both islands were first occupied by the French in 1635 and became Departments in 1946 when their Governors were replaced by Prefects and elected General Councils were created. In 1974, Martinique, Guadeloupe, and French Guyana were given regional status as part of France's governmental reorganization. An indirectly elected Regional Council was created for each island with some control over the local economy. In 1982-83 Francois Mitterrand's government, which had pledged itself to decentralizing power in favor of the Overseas Departments, made further concessions towards autonomy by giving the local councils more control over taxation, police, and the economy. The first direct elections for the Regional Councils were held in February 1983.

Each island is currently represented by a Prefect and two councils with local powers. The 42-member General Council and the 41-member Regional Council are locally elected and serve 6-year terms. Each island also elects 4 deputies to the French National Assembly in Paris and sends two indirectly-elected representatives to the Senate. Both islands have representation at the European Parliament in Strasbourg. [R#26]

Electricité de France's approach to energy services has been driven by France's continuing quest for energy independence and a desire to help its customers make the best use of electricity, a customer service orientation that has not featured saving electricity but using it wisely as part of a national energy strategy. With only 3% of fuels used to generate power in France coming from foreign sources and an overall national energy independence ratio of 52%, the majority of the remaining 48% of imported fuels runs automobiles and trucks and is used in industry. Therefore, EDF has put considerable time and energy into the development of electric vehicles to further improve its energy independence. In a pilot program begun in 1991, EDF, PSA Peugeot Citroën, and the town of La Rochelle joined together to develop and test electric vehicles in the municipality. Volunteers began driving fifty AX Citroën and Peugeot 106 models there in 1993. The utility installed 10 recharging stations in the City and three more at gas stations for emergency recharging. [R#1]

EDF currently operates 450 electric vehicles, the largest fleet in the world. It is in partnership with several car manufacturers (such as Renault, Seer-Volta, and PSA) with a goal towards producing a range of urban electric vehicles as early as 1995 which would provide a 50% source-Btu energy savings over conventional internal combustion engines, eliminate atmospheric emissions, and significantly reduce noise pollution as well as further France's goal of energy independence. EDF is also in the process of establishing recharging stations in twenty pilot towns including Paris. [R#2]

Another energy services initiative that EDF implemented was the "Tempo" pilot program. This load management effort allows residential customers to manage their electrical costs by planning the use of their appliances for the time of day and season when rates are lowest. To participate, customers have special digital meters installed in their homes to record the time electricity is consumed, enabling them to program their appliances to operate when the lowest rates are available (at night, for instance). The program also has a seasonal component whereby the utility has identified 300 days as having the lowest rates (it is designated by the color blue on the rate schedule), 43 days that have medium rates (its color is white), and 22 winter days (red) that have the highest rates. A signal on the meters tells the customer which color (rate) is in effect presently and for the next day. [R#1]

Electricité de France has outlined four priorities to intensify its energy efficiency efforts due to several instances where the utility must sell electricity for less than it costs to produce. To ease this situation the utility is emphasizing the development of energy-efficient appliances, lowering low-voltage rates to make load management more attractive, concentrating on electricity uses in areas where either transmission or distribution upgrades would otherwise be necessary, and electricity uses in overseas regions like Guadeloupe and Martinique where electricity prices are far less than actual costs. [R#1]

By law EDF must supply electricity to all of France and her overseas administrative regions for the same rate. On the island of Guadeloupe and Martinique it costs more than twice as much to produce electricity (1.26 FF/kWh on Guadeloupe and 1.15 FF/kWh on Martinique) as EDF is allowed to sell it for (.71 FF/kWh under the three kilovoltage tariff and .61 FF/kWh under the six kilovoltage tariff) which means the utility loses money for every kWh sold. EDF loses \$102 million per year on Guadeloupe and just over \$61 million annually on Martinique making this a key driver for EDF's first substantial foray into DSM, Operation LBC. [R#12,27,32]

Operation LBC was implemented first on Guadeloupe in May 1992 and then on Martinique in February 1993. The largest such programs ever undertaken with over 700,000 CFLs leased, these programs have resulted in a combined peak demand savings of 14 MW. EDF implemented these residential and commercial efforts in partnership with ADEME, which provided the original planning and technical expertise for the projects, while the utility supplied the resources and customer information necessary to carry them out. Since most of the electricity generated for Martinique and Guadeloupe is done so using imported fuel sources, the programs also aid in reducing foreign fuel dependence. [R#16]

EDF and ADEME have since implemented Operation LBC on two more Caribbean islands, Réunion (where an early CFL program was implemented in 1989) and French Guyane in 1993 and 1994 respectively with similar success.

Program Design and Delivery

IMPLEMENTATION ON GUADELOUPE

In the late 1980s Guadeloupe, which now has a population of 390,000 people, experienced a large surge in tourism bringing much economic growth and an increasing demand for electricity. Electricity production was fast reaching capacity. Staff at ADEME believed that building another power plant was not an environmentally sound remedy to the situation and searched for alternatives. A study was conducted which showed lighting was the main consumer of electricity and was a predominant contributor to evening peak demand. ADEME felt that compact fluorescent lamps (CFLs) represented a credible solution to the peak power problem as they use only a fifth as much electricity as regular incandescent bulbs.

In 1988 ADEME conducted a marketing survey to explore the possibility of promoting CFLs and found that most electric customers didn't know much about CFLs. The ones who were aware of CFLs commented that the lamps were too expensive. Many respondents had misconceptions about their performance. With full knowledge of these barriers, ADEME devised a demand-side management program to address these issues and to place CFLs in homes and businesses on the island. The Agency then approached Electricité de France, the utility which supplies electricity to Guadeloupe, about jointly implementing the program. [R#8]

At the end of 1989 Hurricane Hugo ravaged Guadeloupe so the program was put on hold to allow people the time to rebuild their homes and businesses. Work on the program began again at the start of 1991 and was implemented in May of 1992. [R#6]

The concept behind the program was simple. To alleviate the lack of knowledge and misconceptions concerning compact fluorescent lamps there would be an extensive media campaign. To offset the pricing issue, the CFLs would be leased from EDF for no money down with payments coming out of the energy savings accrued by the customer. EDF then ap-

proached several CFL distributors and importers to see about getting 100,000 CFLs at a discounted bulk rate low enough to make this feasible. Osram 15-watt CFLs were selected in large part because Osram was the only company that could supply the quantity needed in a timely fashion. Retail stores on the island were then enlisted to carry the lamps. EDF and ADEME felt 100,000 lamps was a reasonable number based on the results of a similar program, Lampéco de la Réunion (on Réunion another French Caribbean island), where 100,000 CFLs were distributed over a three-year period. [R#8,10,16]

MARKETING AND DELIVERY ON GUADELOUPE

On May 13, 1992, an extensive media campaign was launched and all television, radio, and print media were inundated with information on CFLs and Operation LBC. The ads ranged from sexy to informative, appealing to people who like to be on the trendy cutting edge of technology, to people interested in saving money and energy while protecting the environment. One print ad asks, "What is a compact fluorescent lamp?" It then answers the question emphasizing that a CFL lasts eight times as long as an incandescent bulb and uses five times less electricity. The ad goes on to say that the technology of CFLs has come a long way both in terms of how they look and work. The marketing campaign also expresses that Operation LBC is a program without precedent which involves an extraordinary collaboration between businesses, public entities, and services. The goal of the program is to better manage energy usage for the good of Guadeloupe's economic future and it entices customers to become part of this effort. More technical pieces show a CFL with a chart comparing it to an incandescent bulb in terms of lumens, watts, lifetime, price, how much money and energy a CFL saves over its life. Yet another ad informs readers where the no-cost CFLs are available.

A coupon was mailed to each residential customer who could then redeem the coupon for 2, 4, 6, 8, or 10 CFLs. It emphasized that the lamps were available without putting one franc

down! Articles were placed in various local papers, ads on television asked, "How can you pass up the latest in high technology when it is here in your own backyard?" "Enter the future." "With a CFL, the future is in your hand." Another television ad emphasized what a good idea CFLs are as they last so much longer and use so much less energy than standard light bulbs. Even a comic strip was employed to publicize Operation LBC. [R#8,9,21,22,23,26]

Three months into the advertising campaign the utility sent every customer on Guadeloupe another coupon good for up to 10 compact fluorescent lamps. By bulk purchasing the lamps EDF was able to procure them for a price of 89 FF each (\$15.62 US), about one-third of their normal price of 240 FF (\$42.12). The high price of compact fluorescent lamps on Guadeloupe is attributable to the fact they were not in demand and prior to the program were only imported in small quantities as specialty items. Also in 1992 CFLs had not yet found their market niche. Only one manufacturer was able to supply EDF with 100,000 lamps for the program. By the following year when Operation LBC was implemented on Martinique the lamps were not as costly and several manufacturers were able to bid for the EDF order. By 1994 when a survey was done regarding CFLs on Guadeloupe the retail lamp cost was down to between 111-150 FF (\$17.66 - \$23.99). This drop off in price may be considered an induced program effect as well as a function of the maturing compact fluorescent market.

EDF placed 100,000 lamps in 80 retail stores. All a customer had to do was take his/her coupon to a participating vendor, determine how many lamps to acquire, and obtain up to ten lamps with no money down. The number of lamps selected was then entered on the coupon by the salesperson, after which the customer signed the coupon confirming the number of lamps stated and that they accepted the lease arrangement. The vendor then turned the coupon over to EDF for 5 FF (88¢). The coupon had on it all the customer information necessary for EDF to figure out who obtained the CFLs, how many they got, and how much their lease payments would be. [R#8,12]

The response was such that all 100,000 compact fluorescent lamps were snapped up by 12,000 customers in one and a half days, with an additional 32,000 households placing orders for over 250,000 more. This was way beyond the expectations of EDF and ADEME whose staff then scrambled to obtain more CFLs to fulfill the continuing demand. At that point they obtained 258,200 more lamps which were subsequently "sold out" in one month. The program was an overwhelming success with 37% of all households obtaining an average of 7.9 lamps each. To put this in perspective, before Operation LBC only about 1,000 CFLs were sold annually on Guadeloupe. [R#8,12]

IMPLEMENTATION ON MARTINIQUE

EDF was losing about 1.4 million francs per day or just over \$100 million per year on electricity sales in Martinique because of its unique restrictions on the regulated price of electricity the company can charge in its overseas departments. EDF and ADEME joined forces again, this time working with the Regional Council of Martinique to explore the feasibility of a leasing program based on the Guadeloupe experience. Therefore just as on Guadeloupe they conducted a marketing study. It showed that there were about 3,000 CFLs and 180,000 fluorescent lamps in use on the island. The residential sector used 73% incandescents, 25.5% fluorescents, and 1.4% CFLs. The potential for saving energy by switching to compact fluorescents was on the order of 10 MW (6 MW residential, 4 MW commercial). [R#16]

The study further disclosed that the challenges to overcome for CFL acceptance in the residential sector were that no one knew about them and were therefore skeptical about their money and energy-saving potentials. Besides compact fluorescents were very expensive. In the commercial sector the challenges were that little was known about them and there was a fear that the lamps would not be aesthetically pleasing, (that the lamps themselves would be ugly, wouldn't supply as much light, and that the light they did supply would be cold,

Program Design and Delivery (continued)

hard, and less than flattering!), and would not actually save money or energy.

To meet these challenges it was decided to implement a program based on the Guadeloupe effort as the situations were nearly identical. To overcome the price barrier and thanks to greater availability of CFLs at lower prices, the lamps were leased for a total of 76 FF (\$12.09) paid through six lease payments over 18 months just like on Guadeloupe. To overcome the lack of knowledge issue, an intensive media campaign was launched introducing the CFLs and explaining how they work which also helped to overcome the skepticism regarding energy and money savings.

On Martinique, EDF and ADEME decided to use a distributor for the compact fluorescents using a two-fold criteria for selecting the appropriate organization. The first criteria pertained to the scope of the distribution network; the other was the price of the lamps that could be supplied in bulk to the program. La Societe Blandin was chosen based on their unit lamp price of 76 FF (\$12.09) and their proposed distribution through 50 vendors. The specifications for the compact fluorescent lamps were that they be 15 watts designed to replace 75-watt incandescents. The manufacturer retained to supply the lamps was la Societe Mazda Philips which provided their Mazda Eureka 2 Electronique 15-watt lamp. Blandin imported the compact fluorescents, distributed the lamps to the chosen vendors both before the program began and as needed during the program, billing EDF. [R#16]

MARKETING ON MARTINIQUE

The advertising campaign on Martinique began in February of 1993. It consisted of a personal direct mailing to all 107,000

residential customers, a different direct mail piece to all 13,000 commercial and 700 industrial customers, and a television, radio, and print ad "blitz" that accompanied the mailings.

The residential mailing consisted of a coupon good for 2, 4, or 6 compact fluorescents complete with an explanation of the campaign plus a list of all the vendors stocking the compact fluorescent lamps. The limitation of six lamps per household, instead of ten as on Guadeloupe, was the result of a market study performed before the implementation of the program. The study showed that residential customers on Martinique have an average of four lamps on for four hours each day during the targeted evening peak demand. Therefore selling more lamps per customer would neither further lower the demand nor be cost effective for the customer as their lease payments are a function of the assumption that in order to be cost effective the lamps must be located in high duty factor applications. [R#16,25]

The commercial and industrial direct mail piece did not contain a coupon as the needs of these customer classes are different and varied. It instead discussed the payback period of the measure (2.2 years) to convince the financial officers at the targeted companies and to clear up any misunderstandings concerning the savings accrued by compact fluorescents. No incentive was offered for these customers. Note, however, that although there was no monetary incentive for businesses, as residential customers business owners and workers were sent coupons at home and therefore had an opportunity to test the CFLs, experiments that program designers assumed would spill over into the commercial and industrial sectors. [R#24]

The advertising campaign used three different messages to get the point across. One appealed to the idea that the compact

fluorescents were a new generation, very modern and high tech! One emphasized that CFLs require no special adaptors; that you just use them as you would a normal lightbulb. The final message discussed the money saved as the lamps use five times less electricity and last eight times as long as a regular bulb. [R#24]

On the radio, two different types of spots were used. One alerted customers to the arrival of the direct mail pieces and warned them not to throw them out. The other used the three messages outlined above. [R#24]

DELIVERY ON MARTINIQUE

The marketing of the Martinique program began in January of 1993. The program was formally launched February 2, 1993 with a big public relations push. It was expected to run through April 15, 1993. By February 4th, however, 100,000 lamps had been distributed. In less than one week 200,000 had been sold and in less than 2 weeks 270,000. A total of 345,856 compact fluorescents were distributed during the course of the program. The average number of lamps sold was 5.8 per customer to 59,600 customers. The first week of the effort saw numerous shortages of lamps as 80,000 extra had to be ordered to cover the demand. The estimated allocation for hardwired as opposed to screw-in lamps (75%/25%) was way off and resulted in a shortage of hardwired lamps and left some screw-in ones on the shelves. More of the hardwired lamps needed to be imported but due to the uncertainty of how they would be taxed this did not occur and the program was halted prematurely due to the lack of this product. The tax had been waived on the lamps that were originally imported. This had been a primary reason for the involvement of the Regional Council of Martinique in the program. [R#16]

Monitoring and Evaluation

Data Alert: This section is pertains only to Guadeloupe's program as no extensive monitoring and evaluation has been completed on Martinique.

MONITORING

Fundamentally Operation LBC has been monitored by the feedback loop created through the program design. All customers are sent coupons, those that turn them in are listed on the back of the coupon along with the number of lamps redeemed with the coupon. This data is recorded by EDF which then attached a line item (energy service charge) on customers' bills to recover the lease fees.

EVALUATION

The process evaluation of Operation LBC on Guadeloupe was performed by a consulting firm by the name of Caraibe Expansion and completed in December 1994. It sought to determine the effects of the program to help EDF and ADEME prepare for further energy efficiency efforts on the island. Of particular interest was information it provided on the effect of the educational media campaign – how well known it was and the impact that it has had on the acceptance and use of CFLs after the program ended. Also of concern was whether people were aware of the advantages of CFLs and what they thought of their price. [R#5]

To this end, Caraibe Expansion conducted two surveys, one involving people who had bought compact fluorescent lamps and one with people who did not own them. With the CFL owners, the goals were to identify the most convincing arguments of the campaign and thus the advantages attributed to lamps, to learn what they did with the CFLs (whether they were used, stored, given away) and where they put them. The survey also identified the customer's level of satisfaction with the lamps and why, and determined if they would now purchase CFLs on their own. Caraibe Expansion did interviews with a cross-section of 300 CFL owners. [R#5]

For the non-CFL owning group (the control group) the goals were to understand why they didn't buy the lamps during the effort and what would motivate them to do so, such as a lower price or more information. Caraibe Expansion did phone interviews with 300 non-CFL owners. From this, Caraibe Expansion

drew conclusions in terms of the strengths and weaknesses of Operation LBC from both the participants and the non-participants points of view and based on that offered some insights on how best to introduce subsequent programs. [R#5]

From the compact fluorescent lamp owners it was learned that 96% had heard of Operation LBC and felt it was an EDF program designed to save energy. They did not know of ADEME's involvement. Of the owners, 92% bought their CFLs during the program with 58% having purchased them during it's first day and a half. Since the program's inception, 82% had bought additional lamps. The survey found that participants generally use seven of the average of eight lamps redeemed, saving the eighth in reserve.

The biggest advantages of the CFLs reported were that they use less energy and last much longer than incandescents. When asked what prompted them to buy compact fluorescents, "money savings" was the overwhelming answer. The compact fluorescents were used most often outside (29%), in the bedroom (23%), on the terrace (23%), in the bathroom (23%), and in the toilet (23%). The living room (18%), the kitchen (12%), hallways (12%), and in gardens (6%) were less popular. Most people felt they did not leave their new compact fluorescents on any longer than the incandescents they had replaced and had noticed the lamps burned cooler. When asked if they had problems with the lamps, 71% said no. Of those who had problems, it was mainly because the lamps burned out or were broken. [R#5]

The overwhelming majority of compact fluorescent lamp owners (82%) were satisfied with their lights because of their longevity. Most customers have finished their loan payments on the lamps and do not perceive that they are using less electricity. However they are happy with the long life of the lamps, the color of the light, intensity, the looks, the lease arrangement, the coupon system, and the price. The majority would replace their current compact fluorescents with new ones when they burn out. Less than half the customers noticed a money savings from the lamps. [R#5]

Of the 55 out of 300 owners who were dissatisfied, the main reason was the lack of money saved with 21% of this subset saying they would not buy CFLs again because of that. However the majority (71%) said they would buy the lamps again because they did save money and an important inducement

would be a low price followed by a guarantee that they would save money. If there was another leasing program launched, 72% said they would buy more lamps at that time. [R#5]

When asked if they knew how much they had paid for the compact fluorescents during the program, 53% did not. Of the 47% that did, the majority (55%) were correct that it was between 71-90 FF. When asked if they knew the cost today without the program, 69% said no. Of the 31% that said yes, a slim majority thought it was between 111-150 FF, which is accurate. Most (63%) did not know where more lamps could be purchased. Many customers (61%) wanted more information on how to use the lamps. [R#5]

The survey of non-compact fluorescent lamp owners discovered that a whopping 89% had not heard of the campaign, but those that had, thought it was being conducted by EDF to save energy and did not know about ADEME's involvement. When asked why they did not buy a lamp during the campaign, there was quite a diversity of answers. The most popular by a very small margin was that the stock of lamps had run out and none were available with "not having enough time" coming in a very close second. When asked to pick another reason they didn't purchase CFLs during the campaign from a list, the most popular reason was that the cost was too high followed by a huge doubt that they would save any money. Not having enough time to get the lamps ran third and not having enough information was fourth. Finding the compact fluorescents out of stock came in close to the bottom.

The advantages of a compact fluorescent over an incandescent were thought by 51% of the respondents to be that the CFL used less energy with 44% having no idea. Regarding compact fluorescents saving money, 44% thought they would. By a slight margin, most thought the lamps looked fine but didn't know anything about the quality of the light they emit, whether the lamps burned cooler than incandescents, whether or not they were easy to install, how long they lasted, or of the lease arrangement with EDF. The majority of respondents said if the price was lowered and if they had a guarantee that the lamps would save them significant money they would buy one. When asked what the average price of a CFL was, 37% didn't know with 18% saying 71-90 FF. (They were sold during the program for 89 FF.) When asked what was the most they would pay for a lamp 32% said they didn't know followed by 13% saying between 31-50 FF. When asked if the lamps would save them 300 FF over five years on average what would they

pay the answers stayed the same with 23% saying they didn't know and 18% saying 31-50 FF.

When asked if they knew people who had bought the lamps, 74% said yes and 22% thought their friends were very satisfied with them while 21% thought their friends were mainly satisfied, and 36% didn't know. Of the satisfied friends most thought it was due to the long life of the lamps followed by the money savings. While of the unsatisfied friends most thought it was because there weren't any savings, followed by not being happy with the force and intensity of the light. When asked if they believed in buying CFLs, 69% said yes because they save money and energy. When asked why they hadn't so far the answer varied greatly with 13% saying because the price is too high. [R#5]

SURVEY CONCLUSIONS

Caraipe Expansion drew the following conclusions from the surveys: The publicity campaign was extremely effective with almost everyone on Guadeloupe having heard of Operation IBC. Although most thought it was solely a effort by EDF and did not know of ADEME's involvement, respondents did know it was a program designed to save electricity. One important point was that 44% of the people who did not buy CFLs during the campaign didn't because the lamps were out of stock, they didn't have the time, or didn't know about them. It was not because they didn't believe in them or weren't interested. The main advantages of compact fluorescent lamps were perceived to be that they use less electricity and save money and secondly that they have a much longer life than an incandescent. The main concern for program participants as to whether or not to purchase additional CFLs was centered around money savings. Customers placed the compact fluorescents in excellent high usage locations in their homes and therefore ought to be saving energy and money. [#5]

As far as the price of the lamps, Caraipe Expansion's recommendation for a new program was to sell the lamps for no more than the original program and a price between 40-50 FF would be the most effective. This latter recommendation was simply not possible on Martinique. The major reasons owners have not yet bought additional lamps and that non-owners are waiting to buy compact fluorescents are identical. They are waiting for the price to drop, a guarantee that they will save money, and a new CFL campaign to be launched. [R#5]

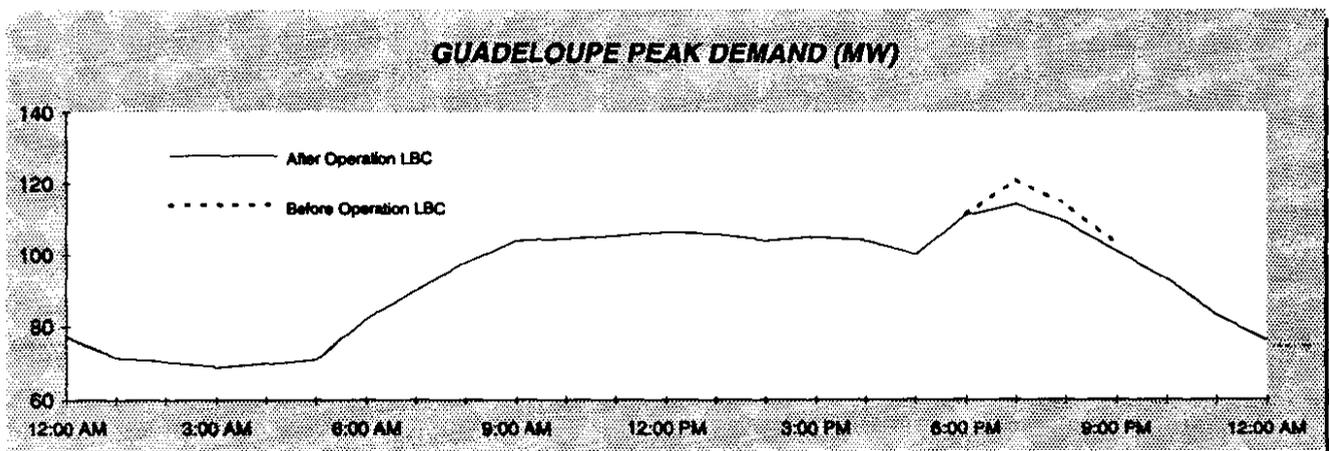
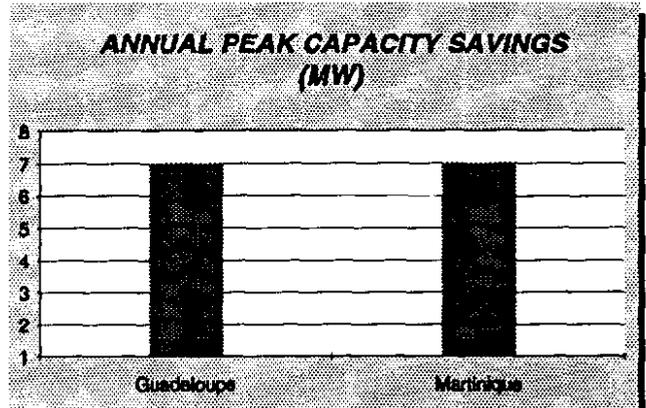
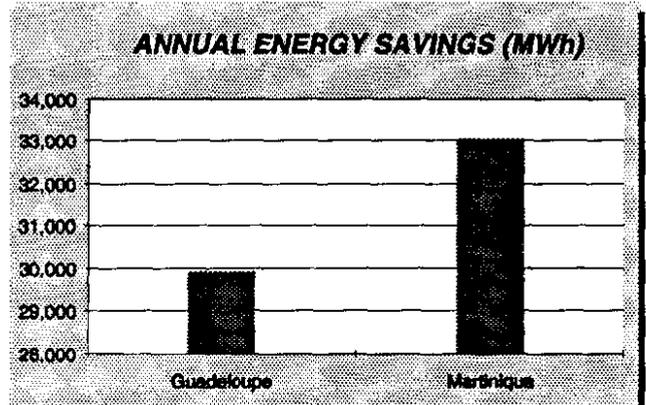
Program Savings

The primary objectives of Operation LBC were to reduce evening peak demand and to reduce uneconomic power sales in Guadeloupe and Martinique. As the load profile of Guadeloupe below shows, the program was successful in dipping evening peak demand. In fact, the programs on Guadeloupe and Martinique resulted in savings of 7 MW each. Since each lamp saves 60 watts, the actual load reductions have shown that 33% of the lamps distributed and 37% of the lamps installed were peak coincident, operating during the peak period. Similarly, on Martinique 34% of the lamps distributed were peak coincident.

The program also resulted in significant energy savings, although estimates vary widely. Using EDF's assumptions of savings based on the number of lamps distributed and the number of lamps installed, plus an average duty factor per lamp of four hours each evening and 9% credit for transmission and distribution losses, the Guadeloupe program resulted in annual energy savings of 29.93 GWh while 33.02 GWh were saved on Martinique. Using EDF's assumption of an average lamp's lifetime of 5.5 years (EDF assumes the lamps will last only 8,000 hours), the lamps will result in lifecycle energy savings of 164.60 GWh on Guadeloupe and 181.63 GWh on Martinique.

EDF conservatively estimates that the annual energy savings per island is far less, between 6-10 GWh. However, based on the 7 MW of savings per island, and a duty factor per lamp of four hours per day, each program has resulted in at least 11.12 GWh of energy savings without considering non-peak coincident energy savings, some of which invariably occurred. Please note that due to the low power factor and high harmonic distortion of the compact fluorescent lamps distributed there are energy losses at the power plant which affect the utility savings, EDF's primary explanation for its conservative estimate of annual energy savings.

SAVINGS OVERVIEW	ANNUAL ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	ANNUAL CAPACITY SAVINGS (MW)
Guadeloupe	29,927	164,599	7
Martinique	33,024	181,632	7
Total	62,951	346,231	14

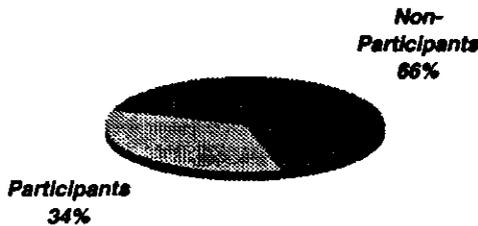


PARTICIPATION TABLE	PARTICIPANT	LAMPS DISTRIBUTED	LAMPS INSTALLED	LAMPS PER PARTICIPANT	LAMPS INSTALLED PER PARTICIPANT	ANNUAL SAVINGS PER PARTICIPANT (kWh)
Guadeloupe	44,000	358,200	313,425	7.8	6.8	649
Martinique	59,600	345,856	345,856	5.8	5.8	554
Total	103,600	704,056	659,281			

PARTICIPATION RATES

Participation was tracked based on the number of coupons redeemed. Of Guadeloupe's 128,000 customers – fully 102,676 of which are residential – 44,000 purchased lamps through Operation LBC, resulting in a program participation rate of 34%. Martinique has a total of 120,700 customers of which 107,000 are residential. There, the program had 59,600 participants resulting in a participation rate of 49% – nearly half the island!

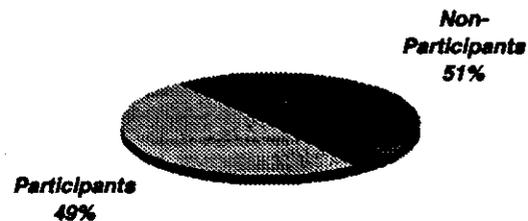
GADELOUPE PARTICIPATION



On Guadeloupe the maximum number of CFLs distributed per coupon was ten and on Martinique it was six. Thus more customers on Martinique bought fewer lamps, an important program modification. Therefore though Martinique had a participation rate that was 15% higher than the rate on Guadeloupe, the total program energy savings and number of lamps sold were almost the same.

In terms of penetration within participating households, each participant on Guadeloupe bought an average of 7.8 lamps and installed an average of seven, keeping one lamp in reserve. On Martinique each participant bought an average of 5.8 lamps of which all lamps were assumed to be installed. (This was the result of purposeful program modifications to assure that all lamps distributed were indeed installed and generating savings.) Guadeloupe's energy savings per customer was 649 kWh, significantly higher than the average savings of 554 kWh on Martinique. [R#29]

MARTINIQUE PARTICIPATION



FREE RIDERSHIP

Free ridership was estimated by ADEME and EDF to be about 9% based on a number of factors including the level of CFL sales before the program. This was neither a concern of ADEME nor EDF since both organizations wanted to stimulate the market on the islands for the efficient lamps and wanted as many CFLs in as many households as possible. The savings figures presented above have not been adjusted for free ridership. [R#4]

MEASURE LIFETIME

Average lifetime used by Electricité de France and ADEME is 5.5 years. This lifetime average was determined by the lamp lasting an average of 8,000 hours and assuming it is on 1,460 hours a year (4 hours/day) which comes to 5.5 years. [R#9]

PROJECTED SAVINGS

Program goals on both Guadeloupe and Martinique were significantly exceeded. An expectation of selling 100,000 CFLs was overwhelmed by the 358,200 sold on Guadeloupe. On Martinique 345,856 were sold. Based on The Results Center's calculations, over the lives of the lamps the programs will save an impressive 165 GWh and 182 GWh on Guadeloupe and Martinique. Using EDF's estimates of the programs' savings, the program will result in lifecycle savings of 33 GWh and 55 GWh respectively. [R#16]

Cost of the Program

GADELOUPE COST OVERVIEW	MARKETING AND ADMINISTRATION (x1,000)	FINANCING CFLS (x1,000)	NET PROGRAM COST (x1,000)	COST PER PARTICIPANT
EDF	\$158.1	\$249.2	\$407.3	\$9.26
ADEME	\$50.2	\$0.0	\$50.2	\$1.14
Total	\$208.3	\$249.2	\$457.5	\$10.40

Data Alert: This section is primarily based on the costs of the Guadeloupe program unless specifically attributed to Martinique.

The total cost of Operation LBC on Guadeloupe was \$6,052,634. Most of this program total was the cost of the lamps purchased, or \$5,595,134. This amount represented 93% of the gross program cost, but of course this was directly recovered from participants through the lease fee repayments for each lamp of \$15.62. The net program cost of \$457,500 includes both EDF and ADEME's costs. Of this EDF paid \$407,329 or 89%, while ADEME contributed \$50,171, 11% of the net cost. [R#27]

The net program cost for EDF after lamp lease fees were recovered from program participants was \$407,329. This includes the 87¢/coupon paid to local stores to collect the coupons and distribute the lamps. Of this, \$249,220 or 61% was

used to finance the cost of the lamps, with \$158,108 for marketing and administration. These costs covered the cost of extra sales people in shops (to assist both customers and shopkeepers), display cases, postage, bill-stuffers, plus advertising, central to the program's success.

In addition to EDF's net costs, ADEME's cost was \$50,171 of which \$11,149/month was paid for a program manager for Operation LBC for 3 months (\$33,448); plus \$1,858/month for a support staff person for 9 months (\$16,723). Thus the net cost per lamp on Guadeloupe for both EDF and ADEME, essentially the cost to market, administer, and deliver the lamps through Operation LBC was \$1.28, about 8% of the purchase cost of the lamps.

COST EFFECTIVENESS

The Results Center calculates that the net cost of saved energy of Operation LBC on Guadeloupe – from a utility perspective

COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
Guadeloupe	0.31	0.32	0.32	0.33	0.34	0.35	0.36

– is about a third of cent per kilowatt hour, in fact 0.32¢/kWh when analyzed using a 5% real discount rate. This is a fraction of the loss experienced by EDF as it sells expensive power for the prices which it is legally able to charge consumers. In fact, it costs EDF 23¢/kWh to generate and distribute power on Guadeloupe while it can only charge 11¢ and 12¢ for each kilowatt-hour.

Thus the distribution of 358,200 lamps through Operation LBC will ultimately result in cost savings for EDF of \$18,105,890 based on the program's lifecycle energy savings of 164,599 MWh and the loss the utility experiences each time it sells a kilowatt hour at 11¢. Thus EDF's cost of \$407,329 is only 2% of the savings that it experiences over the lifetime of the lamps installed.

COST PER PARTICIPANT

From a participant standpoint, the program required essentially no capital outlay for those that properly installed their lamps in high-use applications. Their lease fee payments were offset by the energy and cost savings realized. For customers that used their lamps for four hours per day, seven days a week, for the lease-fee period of three months, and are part of the 75% of residential customers with a three kilovoltage tariff of 12¢, a positive cash flow was experienced. While they paid \$2.60 every three months, or about 87¢ a month, they experienced \$2.75 in bill savings, about 92¢/month. For those 25% of residential customers who were in the six kilovoltage tariff of 11¢, which is a cheaper rate, a slight negative cash flow was experienced. They saved \$2.43 and spent \$2.60 in lease payments. (Naturally, in order to influence positive cash flow for such customers, EDF would only have to extend the repayment period perhaps from 1.5 years to 3 years. Five years has been used to depreciate lamp costs in U.S. programs, assuring positive cash flow with less required hours of operation.) Note that

because EDF was able to buy less expensive lamps for the Martinique program, the periodic lease fees were only \$2.02 there for a total of \$12.10 after six payments. There, all customers (no matter whether they had a 3 or 6 kilovoltage tariff) experienced a positive cash flow for the 18-month period. [R#12,16]

Environmental Benefit Statement

AVOIDED EMISSIONS: Based on 62,951,000 kWh saved annually						
Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur In Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
Coal						
Uncontrolled Emissions						
A	9,400	2.50%	135,722,000	3,220,000	651,000	65,000
B	10,000	1.20%	144,724,000	1,246,000	420,000	312,000
Controlled Emissions						
A	9,400	2.50%	135,722,000	322,000	651,000	5,000
B	10,000	1.20%	144,724,000	125,000	420,000	21,000
C	10,000		144,724,000	831,000	415,000	21,000
Atmospheric Fluidized Bed Combustion						
A	10,000	1.10%	144,724,000	381,000	208,000	104,000
B	9,400	2.50%	135,722,000	322,000	260,000	20,000
Integrated Gasification Combined Cycle						
A	10,000	0.45%	144,724,000	256,000	42,000	104,000
B	9,010		130,183,000	93,000	31,000	6,000
Gas						
Steam						
A	10,400		78,941,000	0	180,000	0
B	9,224		68,554,000	0	429,000	20,000
Combined Cycle						
1. Existing	9,000		68,554,000	0	263,000	0
2. NSPS*	9,000		68,554,000	0	125,000	0
3. BACT*	9,000		68,554,000	0	17,000	0
Oil						
Steam-#6 Oil						
A	9,840	2.00%	114,256,000	1,731,000	204,000	194,000
B	10,400	2.20%	121,181,000	1,717,000	257,000	125,000
C	10,400	1.00%	121,181,000	245,000	206,000	65,000
D	10,400	0.50%	121,181,000	720,000	257,000	40,000
Combustion Turbine						
#2 Diesel	13,600	0.30%	151,649,000	302,000	469,000	26,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	180,040,000	464,000	611,000	136,000

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the accompanying page is to allow any user of this profile to apply Electricité de France's level of avoided emissions saved through its Operation LBC to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

• Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources.

Lessons Learned / Transferability

LESSONS LEARNED

The overall success of the CFL leasing programs on Guadeloupe and Martinique was beyond the expectations of both Electricité de France and ADEME. Program goals were surpassed in terms of capacity and energy savings. This was a function of good program design but also a tribute to the awareness building and educational campaign that was at the core of the program. Not only were far more compact fluorescents distributed than expected but the surveys conducted on Guadeloupe indicate that Operation LBC was very successful in terms of customer satisfaction and in customer education. Most participants are using their compact fluorescents as intended in the places where lights are on most frequently.

For EDF, Operation LBC was a clear winner: Because of the unique nature of EDF's overseas operations, Operation LBC was a clear financial winner for the giant French utility. The program cost EDF very little to implement and resulted in dramatic savings. Given the peak demand problem on Guadeloupe, saving 7 MW of peak capacity allowed the utility to defer construction of additional generating capacity. In addition to this, since EDF loses money on every kilowatt-hour sold in its foreign departments, energy savings from the programs have resulted in large capital gains. For Guadeloupe, the program cost EDF only 2% of the financial savings achieved!

For customers, the programs were also clearly beneficial: Customers also enjoyed tremendous financial gains from the program. Over the life of a CFL, Guadeloupe program participants under the three kilovoltage tariff saved almost \$45 while having to pay only \$15.62 in total lease payments, a net gain of nearly \$30 per lamp. On Martinique the savings for participants under the three kilovoltage tariff saved more than \$47 while having to pay only \$12.10 in total lease payments, a net gain of nearly \$35 per lamp.

Operation LBC has fundamentally transformed the market for CFLs on Guadeloupe and Martinique: The importance of the campaign that preceded Operation LBC cannot be underestimated. Both programs influenced customers dramatically, shifting their perspectives from total lack of awareness and concern over first cost, to nearly universal awareness and an appreciation of their lifecycle economics.

Lighting vendors (the program's trade allies), have been very pleased with the programs as well. Not only did Operation LBC open up the CFL market for them for future sales but they were integral to the program and were compensated with 87¢ per coupon that they turned in to the utility. On Guadeloupe it was reported that one vendor made over \$9,000 from coupons redeemed on the first day of the program.

Use of local distributors can facilitate the program and assist in market transformation as well: It was decided to use a distributor on Martinique who would handle the purchase and distribution of the lamps to shops and be responsible for keeping abreast of the inventory. On Guadeloupe this was handled mainly by EDF. The advantages of the distributor were that they are already in the business and are therefore better equipped to handle this aspect of the program so it runs more smoothly. Better yet, by shopping around for a distributor, ADEME and EDF managed to purchase compact fluorescents for less money, lowering the total lease payments and moving customers closer to positive cash flow. Despite this transition, maintaining adequate stock of CFLs still plagued the program on Martinique.

By limiting the number of lamps the utility can be assured that the lamps are properly located and that the customer will offset the lease fee through energy and bill savings: The main change made in the program from the implementation on Guadeloupe to Martinique was the number of lamps each customer was allowed to buy. On Guadeloupe the maximum number was ten, on Martinique it was six. Program staff identified one reason why many participants on Guadeloupe had not noticed any dollar savings: participants in general had too many lamps and not enough of them were in places where they are saving sufficient energy to offset the lease payments, decreasing their potential savings for the utility as well. Because of this, on Martinique part of the preliminary study done prior to the program launch was to assess how many compact fluorescent lamps are necessary for optimal energy savings. [R#28]

Despite successful programs, staff still suggest that utilities must stress proper lamp placement to customers to maximize savings and create the best win-win situation for customers and utility alike: If the lamps are not employed in high usage areas customers may not realize significant money savings on their bills. This is central to the pro-

gram, and fundamental to EDF which had specific load shaping and energy-saving objectives. Despite a highly successful awareness building campaign and the placement of many more lamps than originally anticipated, capacity savings data suggests that many lamps were not properly placed. [R#5]

Low power factor (<0.5) and high harmonic distortion of the compact fluorescent lamps explains why utility savings were not as large as could be expected: There was a major difference between the watts (W) saved and the volt-amp (VA) saved. A 20 W CFL may save 80 W when replacing a 100 W incandescent. However in VA, a 20 W CFL replacing a 100 W incandescent may present a demand of 40 VA (due to the low power factor and high harmonic distortion) and thus saves only 60 VA at the power plant. A low power factor needs more current to perform the same work and can overload wiring or cause greater resistive losses in wires which means more transformer capacity gets used. High harmonic distortion can cause interference with equipment and may cause hazardous currents in the neutral wiring of a building. [R#28,31]

The study ADEME performed on CFLs to determine which ones to use for Operation LBC was aware of the poor power factor and high harmonic distortion of the lamps but considered this of little consequence in the residential sector but something to consider for commercial and industrial applications. Efficiency was the major criteria used for choosing the CFLs. [R#30]

TRANSFERABILITY

Operation LBC is basically a very simple program in its concept and execution and as a result is highly transferrable. Two basic strategies were employed which made the program so effective. One is an intensive educational media campaign preceding the program. The other is making the compact fluorescents easily accessible in terms of where they are available and also in price. The simplicity of the use of coupons for customers to gain the lamps and also for EDF to track who got how many is easily transferred. The use of lease payments recovered from energy savings and charged through customers' bills is becoming a rather standard energy efficiency program option and practice, especially as utilities see the educational value of leasing programs – teaching customers about their economic benefits from investing in efficiency – and that

seek to maximize customer copayments to reduce energy service program costs.

There are several similar compact fluorescent lamp leasing programs throughout Europe and in the United States. In fact, EDF and ADEME have implemented Operation LBC on two more Caribbean islands, Réunion in 1993 and Guyane in 1994, with comparable results. Leasing programs have also been implemented in Mexico and Sweden and other countries. Now the program design is being considered for a number of applications, even a program on Sri Lanka.

The Results Center has profiled two exemplary American CFL leasing programs: Burlington (VT) Electric Department's Smartlight program and a residential/commercial program implemented by Taunton Municipal Lighting Plant in Massachusetts. (See Profiles #3,42) The Vermont program was based on the Taunton effort and distributed many more lamps than anticipated, paving the way for a range of further efficiency initiatives in town. The Taunton program was the first CFL leasing program in the U.S., a model program that received much attention as an alternative to conventional rebate and giveaway programs. These efforts have also become models for financing small residential efficiency improvements rather than providing direct financial incentives.

As utilities become more competitive and seek means to reduce their DSM costs, leasing and other financing programs will likely become that much more viable and desirable as a means to overcome the first-cost hurdle associated with energy efficiency. (See The Results Center Special Report: Financing Customer Energy Efficiency) Utilities are not only leasing lamps but also heat pumps and other technologies, using attractive financial mechanisms to complement raised awareness of customers' benefits in investing in efficiency. Providing enhanced energy services through educational emphases, technical services, and finance appears to be fundamental to the future delivery of energy services; leasing programs can be core components of this future paradigm.

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