Latin American Experiences with Residential CFL Projects

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ABSTRACT

Residential compact fluorescent lamp (CFL) programs undertaken since the late 1980s in Argentina, Bolivia, Brazil, Costa Rica, Cuba, Ecuador, Guadaloupe, Jamaica, Martinique, Mexico, Nicaragua, and Peru are described. These CFL programs have already introduced about 10 million CFLs, reducing peak loads in the region by 250 MW to 500 MW.

The residential CFL programs have used various implementation and evaluation schemes. CFLs have been sold at utility offices, special outlets, fairs, retail stores, traveling salespeople, or door-to-door. Some CFLs have been subsidized, with rebates and/or financing; payments usually via the electric bill. Early programs evaluations focused on energy and peak load saving impacts. Recent programs have also evaluated environmental impacts and examined program processes.

Programs and policies promoting residential CFL use in Latin America still need to address the two main barriers of information and first cost. Consumers are mostly unaware of CFLs and their benefits. The cost premium of CFLs makes them unaffordable to the majority of households. The CFL programs described here show that these two main barriers can be overcome successfully by ensuring CFL affordability (either by reducing the price and/or providing financing) and availability (both of stock and variety of lamps). A targeted subsidy will be needed to make the CFLs affordable to lower income homes for the foreseeable future.

As Latin American electric sectors are privatized, it is unclear how efficiency programs will continue to be implemented. Some possible policy options are mentioned.

Introduction

The adoption of compact fluorescent lamps (CFLs) by households in Latin America is increasingly being promoted to reduce the growth in electric demand of this sector. Lighting is usually one of the three principal end-uses of electricity in Latin American homes (refrigeration, air-conditioning or water heating being the others). More importantly, lighting is usually a major contributor to the evening peak electric load prevalent in Latin America. The prevalence of incandescent lighting in Latin American homes makes CFLs an attractive option for reducing the residential sector electricity consumption and peak electric demand. Yet CFLs are mostly unknown by residential customers and cost about ten times more than incandescent bulbs; too expensive for most households. Policies and programs will be needed to overcome these two main barriers to CFL use in homes. A targeted subsidy will be needed for the foreseeable future to make CFLs affordable to lower income homes.

This paper describes the residential CFL programs that have been undertaken or that are underway in Argentina, Bolivia, Brazil, Costa Rica, Cuba, Ecuador, Guadaloupe and Martinique, Mexico, Jamaica, Nicaragua, and Peru. The programs objectives, implementation, evaluation and results are described to the degree possible. It updates a previous paper on the subject (Friedmann 1999). General recommendations for future similar endeavors are drawn

from the programs described; expanding beyond other works on this theme (Gordon 1999; Martinot & Borg 1998).

Residential CFL programs: description and results

Argentina

The first Argentinean residential CFL program began in November 1999 as part of the European Union's (EU) ALURE program. EDENOR, a private utility, did a pilot to evaluate offering CFLs to its customers. The pilot reached 5000 customers but sold only 2 CFLs. The high quality CFLs were too expensive, as the program got underway two months after a CFL price war and introduction of lower quality, cheaper CFLs to the marketplace. EDENOR also gave away about 200 CFLs to low income customers that had difficulty in paying their bills, and has included information on CFLs in bill stuffers.

CFL sales are growing with an estimated two million sold in 1998. The techno-economic potential is estimated at 11 million CFLs annually (based on 10 million electrified households and 10% discount rate). Good quality CFLs retailed in supermarkets for between $22 to $29 each, lower quality CFLs for about half as much.

The latest development in Argentina is the Efficient Lighting Initiative (ELI), a GEF/IFC project that is being implemented in seven countries, including Argentina and Peru. ELI hopes to transform lighting markets, including residential CFL uptake. ELI began in Argentina and Peru in 1999 with implementation of projects slated for 2000 to 2001.

Bolivia

The first residential CFL project in a developing country took place in Bolivia in 1986. The predominance of 100 Watt incandescent residential lighting, subsidized residential electric tariffs (then about 4.5 US cents/kWh) and electricity supply shortages (residential demand was increasing by over 9% per year), led the Empresa Nacional de Electricidad (ENDE) to promote CFLs in urban households and public offices. The Dutch Government donated 150,000 Philips SL-18 CFLs to the Fondo de Inversión Social (FIS, Social Investment Fund). ENDE was in charge of the commercialization of the CFLs despite being a generation utility with no end-user marketing experience. Most of the CFLs were to be commercialized in the Santa Cruz area. CFLs sold for about US$ 11 each, still too expensive for most of the population. Many of the CFLs ended up being sold to Santa Cruz hotels through the Cooperativa Rural de Electricidad de Santa Cruz. As of 1990, only about 40% of the CFLs had been sold (Floor 1990). It is unknown how many CFLs were eventually sold or given away, nor how many ended up in homes. No program evaluation is available.

Brazil

Five residential CFL projects were carried out in Brazil between 1993 and 1998 by four public utilities (CEMIG, CESP, CPFL, and COELCE). They are described in detail elsewhere (Friedmann & Jannuzzi 1999; Jannuzzi et al 1997) and only briefly below. The

projects had different motivations and thus, also implementation schemes. They can all be considered to have been pilot-scale projects.

CESP combined a marketing and information effort with a 30% discount given by the manufacturers. A discount coupon ($5/CFL) was included in the electricity bill. Although four manufacturers participated, only one type of CFL (9 Watt, magnetic ballast, at $ 11 each) was offered and no limit was placed on the number of lamps purchased. The project sold 3,111 CFLs during 70 days in 1993, among 77,000 potential customers in four cities of the State of São Paulo. CESP wanted to understand consumer behavior towards the CFLs, and focused evaluation on customers' satisfaction with the CFLs, the marketing campaign, reaction to the CFLs prices, and reasons for customer participation.

CPFL did two projects to reduce demand growth to defer costly distribution upgrades. Project (I) tested during one month in 1994, three rebate levels (30%, 60%, and 70%) in three cities (154,000 customers); using the same information and marketing campaign. Three rebate coupons were mailed directly to the customers. Thirteen different types of lamps (15W to 32 W, electronic or magnetic ballast) were marketed for between $ 4.8 to $ 29 per CFL. About 27,000 CFLs were sold with high rebates leading to brisk sales. Project (II) promoted 50,000 CFLs of seven types to 43,000 customers. Project (II) ran for six months in 1995 to 1996. Customers paid between $ 10 to $25 per CFL (after a discount of US$2), in four monthly payments. There was no limit to the CFLs purchased by a customer.

CEMIG faced electricity supply and financial constraints to expand its transmission system in a region where low-income households and electric consumption predominate. CEMIG used a CFL give-away, direct install program for one year between 1995 and 1996. About 89,000 CFLs (9Watt magnetic ballast) were installed in 52,000 homes with monthly consumption up to 50 kWh. Savings were estimated at 1.8 MW peak and 857 MWh per year.

The COELCE pilot project in part of the city of Fortaleza, sought to evaluate marketing strategies, various CFL technologies, and customer satisfaction, to eventually institute a citywide project of 150,000 CFLs. Customers could purchase up to 3 CFLs that could be financed in 10 installments with no interest over one year. There were two rebate levels of about US$ 4 and US$ 8, with the higher rebate being given to low income customers (these received a special lower electric tariff and were thus identifiable by their electric bills). The project took place over four months in 1997 to 1998. Slightly over 12,000 CFLs (15 W to 25 W, magnetic and electronic ballast) were sold to 4,173 customers.

The highest participation occurred in the give-away project followed by the CPFL (I) (where customers were limited in the CFLs they could buy). Price was an important factor for CFL purchases; cheaper circular, magnetic CFLs sold more.

Evaluations were mostly post impact assessments. Only CEMIG did ex-ante measurements to better design its program, while only COELCE evaluated process and impacts. CEMIG defined clearly the project and evaluation objectives in parallel. The CESP evaluation focused on verifying campaign recall, CFL sales, lamp usage pattern, consumer satisfaction and reaction to lamp prices, socioeconomic profile of program participants and non-participants. CPFL (I) evaluated the participant rate, information campaign, lamp usage patterns, customer satisfaction with the CFLs and implementation campaign, and costs and benefits to the customer and utility. The energy and demand savings were estimated from CFL sales and customers declarations. CPFL (II) customers filled a questionnaire at point-of-purchase. A second

questionnaire was applied to samples of participating and non-participating households when the lamp sales period ended.

Inflation and the Reias devaluation significantly increased post-1998 CFL prices from the previous US$ 2 to US$ 3.5 for 9Watt Chinese plug-ins and US$ 7 to US$ 17 for 15Watt electronic OECD CFLs. The price increases will difficult continued CFL sales growth beyond the estimated 7 million in 1997 and 8 to 8.5 million in 1998. PROCEL was considering a national residential CFL program to resolve this situation (Travessa 1999). The program is on-hold due to uncertainty about PROCEL's future and high personnel turnover, as a result of the ongoing Brazilian electric sector restructuring.

The newly privatized electric utilities are required to spend at least 0.25% of their revenue on DSM programs. Although 17 private utilities proposed CFL programs (involving 400,000 CFLs) in 1999, none of these programs took place. In 2000, utilities filed 19 residential CFL programs with the regulatory agency ANEEL.

Costa Rica

Interest in residential CFL projects for Costa Rica was spurred on by the early 1990's drought that severely impacted the water levels in the Arenal dam, the country's largest source of electric power. The residential sector consumed 50% of national electric demand, 20% for lighting (Muñoz & Bolaños 1999). Lighting was mostly with incandescent lamps, as CFLs were unknown and had a high initial cost.

The Instituto Costarricense de Electricidad (ICE) and the Compañía Nacional de Fuerza y Luz (CNFL), Costa Rica's main utilities, after being unable to secure funding from the Inter-American Development Bank, used their own funds for the implementation of programs to reduce electric consumption and peak load demand. The objective of the programs was to increase awareness among residential users of the benefits of CFLs, reduce residential electric consumption and peak load demand, and help foster a market for CFLs in Costa Rica.

ICE began a pilot project in the community of Alajuela before scaling up the project to the whole country. In early 1996, 375,000 CFLs (Philips SLS-20 Watt, electronically ballast) were bought for about US$ 4.2 million. These CFLs were distributed among the eight Costa Rican utilities in proportion to the number of residential users each had. The CFLs were sold to residential users at cost, for ¢2,500 each ($ 11.6/CFL), to be paid in the electric bill over one year and with a one-year warrantee. The initial cap of two to four CFLs per user has been increased to six. Sales began in late November 1996. CNFL sold the CFLs in its eight public service modules (Pérez 1999). A national publicity campaign and training of utility personnel has been done. By December 31, 1998, 74% of the CFLs had been sold, reducing peak load by 15.3 MW, saving 32.85 GWh (1.45% of residential electricity consumption in 1998) and 8,752 Tons CO2. The investment will be recuperated two years and two months after program initiation. The program was to end in 1999.

Cuba

Initiated in January 1998, this US$ 22 million Cuban government financed program will introduce 4 million CFLs in 2.7 million homes by the end of 2000 to deal with serious

electricity capacity and fuel constraints. A 1998 study showed that replacement of kitchen, living and dinning room lights were cost-effective. Homes with at least 2 incandescent lamps in these areas were given coupons that lowered the price of CFLs from their cost of $4 each to only 10 pesos (50 cents/CFL) about the price of an incandescent bulb. Outreach was done with distribution utilities, municipalities and community organizations. Only Chinese 20-Watt, 4,000-hour useful-life CFLs were offered to minimize initial capital outlays. Peak load savings are estimated at 70 to 80 MW. A second phase, slated to begin in late 2000, will sell CFLs of various sizes at stores. The 20Watt CFLs will be priced at $ 1.5, slightly above a 100 Watt incandescent that costs $ 1.3. Plans call for annual sales of one million CFLs for 5 years (González Vale 2000).

Ecuador

The Empresa Eléctrica Regional Centro Sur began a CFL program in November 1998 among its 180,000 clients in the province of Azuay (Guillen 1999). The main objectives of the project were to reduce electricity consumption and peak demand during the months of November to January, when water levels at the Central Paute are low. Initial studies on end-uses of electricity showed that over 95% of lighting was incandescent, making it the main contributor to the utility's peak load between 18:00-21:00 hours.

The project expected to sell 60,000 CFLs among the 70,000 clients that use more than 100 kWh/month by May 1999. CFLs were economically viable only for these larger residential clients due to their higher, non-subsidized electric tariffs. The utility did not contemplate subsidizing the CFLs to smaller users as a way of reducing the sales of subsidized electricity. The CFLs were sold in lighting retail outlets for 52,000 Sucres (initially about $ 10/CFL, but with ensuing devaluation of the Sucre, only about 4.2 $/CFL). The price of CFLs was authorized to increase to 68,000 Sucres on March 8, 1999 to ensure that retailers continued to sell them. The models offered were 15 and 20-Watt Osram and Sylvania CFLs of Power Factor 0.63, and THD 140%. Utility measurements showed that if one incandescent bulb was on, THDs decreased to only 40% for the home. Utility ads instructed users to install the CFLs in high peak-coincidence fixtures. To avoid harmonics and PF problems, a maximum of four CFLs per home were sold. CFLs were sold through the collaboration of the utility with retailers. The customer filled out a questionnaire at the point-of-sale allowing the utility to track sales. The retailer directly financed the buyer, while the utility collected payments via the customer's monthly electric bill over the next six months with a 4.2%/month interest charge.

The project was successful. Over 45,000 CFLs had been sold to 12,000 users by March 1999. Peak load was only 92 MW instead of the projected 104 MW (some reduction may have been due to electric tariff increases). Consumer satisfaction with the project was very good in surveys done in January 1999.

Guadaloupe and Martinique

Two impressive residential CFL projects took place in these Caribbean Islands (Mills 1992; Borg 1993). Electricité de France (EDF) who serves both islands, wanted to save electricity there because the retail electricity price of about 11 cents/kWh covered only about half the costs of production; resulting in a loss for EDF of about $ 93 million for Guadaloupe

alone. A residential survey in Guadaloupe showed 11 incandescent lamps per home, with four equivalent lamps (six actual) on during the peak load times of 18:30 to 21:30 p.m. In view of this potential, EDF bought 100,000 Osram (15-Watt electronic) CFLs. Only OSRAM was able to deliver the CFLs in the time required. EDF in cooperation with lamp importers and distributors placed these lamps in 80 retail stores. Customers were given rebate coupons for up to 10 CFLs at a price of about $ 18/CFL (about 1/3 the retail price). The customers could pay the CFLs over 6 utility bills (18 months). The payments were set equal to the savings obtained if the CFLs were used more than 4 hours/day. The retailers received a rebate of $ 1/CFL sold. Intensive advertising took place.

In May 1992, over a 1.5-day period, all the CFLs were sold out to 12,000 users (average of 8 CFLs/household). Another 32,000 users ordered 258,000 CFLs; that were sold once more CFLs were imported. The cost per kWh saved was about $1/8^{th}$ EDF's cost of electricity production in Guadaloupe.

A similar program was carried out in Martinique during the first fifteen weeks of 1993 (Borg 1993). In this program, the customers got up to six CFL rebates. The Guadaloupe experience showed that 10 CFLs per home were too many to maximize peak-load reductions. The CFLs were sold at $ 13 each and were paid over the next 1.5 years in the electric bill. The CFLs were cheaper in this program because Philips competed against OSRAM in this tender. Over half of the 110,000 households participated and bought 350,000 CFLs. EDF claims the program reduced the evening peak-load by 7 MW.

Jamaica

In 1994, the Jamaica Public Service Company (JPSCo) began a four-year DSM pilot to test and demonstrate the market, technical, financial, and economic feasibility of doing cost-effective energy-efficiency measures in the commercial and residential sectors, and create an infrastructure for larger-scale DSM endeavors (JPSCo 1998). Sponsors were JPSCo, the Global Environmental Facility/World Bank, the Inter-American Development Bank, the Rockefeller Foundation, and the Canadian Trust Fund. Residential lighting accounts for about 18% of total residential consumption in Jamaica and contributes significantly to the evening system peak.

The residential project had two phases. In Phase I, five CFLs, a low-flow showerhead, and two faucet aerators, were installed in the homes of 100 customers. An evaluation of Phase I's processes and impacts guided the design of the Phase II, particularly its promotion, the design of three service packages, and revision of impact estimates. Phase II, begun in February 1996, hoped to introduce 100,000 CFLs in 30,000 users, with a savings target of 1 MW and 4.4 GWh/year. Three distinct packages were offered under Phase II. Customers could pay cash or finance the packages over one year in their electricity bills. Package 1 (for low usage customers) offered three CFLs, for a cost of J$ 1,920($ 26) and annual savings of J$ 860 ($13). Package 2 (for customers with electric water heating) offered three CFLs and a low-flow showerhead for J$ 2,400 ($ 34) with annual savings estimated at J$ 1,980 ($ 28). Package 3 (for high-usage customers), consisted of a free home audit, an operations and maintenance package, and equipment installation, including five CFLs and faucet aerators. The package's market value, including installation, was estimated at J$6,680 ($ 95), with expected annual bill savings of about J$6,060 ($ 86). JPSCo contributed $ 1 for package 1, -

$ 4 for package 2 (i.e., net revenue gain), and $ 10 for package 3. Packages 1 and 2 were purchased at the local JPSCo offices and installed by the user. Package 3 was delivered and installed by a JPSCo contractor. CFLs cost $ 1.17 million ($ 11.7/CFL). The CFLs used were 15, 20, and 25-Watt quads from Panasonic.

The project was successful. Institutionally, it created an experienced DSM unit within JPSCo. Total net energy savings were estimated to be 5.4 GWh/year (after accounting for 93% installation rate, 99% retention rate, 26% free riders and 7% of free drivers and 15% line losses), and 1.72 MW net peak power savings. Package 1's 28,000 participants saved an average of 169 kWh per year; Package 2's 1,550 participants saved an average of 447 kWh per year; and the 450 Package 3 participants saved an average of 1,267 kWh per year. About 45% have paid for the measures in cash. Over 76% of participants were willing to pay more for the CFLs. Many CFLs were installed in bedrooms, where savings were lower than hoped for. Total JPSCo cost was $ 294,300, with participant costs of $ 601,421. The net present value of the Total Resource Cost (TRC) test was slightly over $ 5 million, with a Benefit Cost ratio (B/C) of 6.64 for TRC, 1.04 for Rate Impact, 20.22 for Utility Cost test, and 9.17 for the Participant Cost test. Surveys of participants show that saving electricity was the main reason they participated in 90% of the cases. Permanence and satisfaction was also high. Lower income customers did not participate as extensively as hoped for, either because the program was too expensive and/or promotion might not have been sufficient. Also, participants recommended that program prices be lower, with a larger mix of measures offered, and more education about program benefits. The evaluation consultant mentioned that the program "could benefit considerably from more direct involvement by trade-allies," and "that incentive levels might be lowered gradually without significantly reducing participation levels" (for the water heating measures).

Future plans to expand the residential pilot to full-scale, offer energy audit services for a fee, and solar water heating equipment financed by JPSCo are dim. With privatization of the electric sector, the energy efficiency unit within JPSCo is being shut down.

Mexico

Mexico has carried out the most varied and largest-scale residential CFL programs in Latin America to date. Almost ten million CFLs have been introduced to Mexican homes by a variety of programs and policies since 1990. A series of increasingly more complex projects up to 1995, set the stage for major programs in the later half of the decade. Indeed, Mexico seems to have the most experience and infrastructure in place for carrying out CFL projects in Latin America. CFLs are manufactured locally. The utilities and FIDE, a public/private non-profit, have been strongly involved in implementing nationwide residential CFL programs.

Between 1990 and 1995, eleven pilot to demonstration scale projects were done by the Programa de Ahorro de Energía del Sector Eléctrico (PAESE) with some cooperation from the Subdirectorate of Distribution, both of the main public utility, CFE. These projects resulted in the direct adoption of over 120,000 CFLs in homes in nine urban areas of Mexico. The CFLs were given away initially to verify that they indeed could save electricity. Later on, the utility began to explore various marketing options, such as cash or pay-in-your -bill, and using local traveling salespeople or selling the CFLs at utility local offices. These Mexican

experiences are not described further here, as adequate information is readily available (see for example Blanc & De Buen 1995, Friedmann 1998).

Since 1995 three major projects (Ilumex, ASI, and FIDE's CFL incentives) have been undertaken with the objective of introducing 9 million CFLs to homes. Ilumex, a $ 23 million project ($ 10 million each from the Mexican utility CFE and GEF and $ 3 million Kingdom of Norway), sold 2.5 million CFLs to Jalisco and Nuevo León States homes between 1995 and 1998 (Vargas 1999). Ilumex was evaluated intensively, particularly on greenhouse gas emissions, as it was a showcase for the GEF. It is estimated that it will save 55 MW peak, 1.4 TWh and 904 thousand tons of CO2 equivalent emissions.

The ASI program is part of an integrated household efficiency program (including AC, roof and wall insulation and weatherstripping) instituted in the Mexicali area to reduce high electric consumption levels and deal with increasing customer complaints of high bills, despite subsidized summer tariffs. The program aims at introducing 500,000 CFLs over five years, starting in 1998.

The resounding success of ILUMEX has led to a nationwide effort to introduce six million CFLs between 1997 and 2000. The project is being implemented by the FIDE (an energy efficiency trust fund). Over 100 points of sale in over 60 cities had sold over three million CFLs by late 1999. Both the ASI and the FIDE programs are replicating the ILUMEX commercialization schemes.

The Luz y Fuerza del Centro (LyFC, the other public utility, serving the greater Mexico City area), has been considering a 1 million CFL program in its territory, for implementation in 2000. It is not certain whether this program will take place.

Future efforts are uncertain, partly due to the potential restructuring being proposed for the currently public electric sector. If CFE and LyFC are privatized, it is very unlikely that the new private entities will do any DSM projects unless required to do so by regulatory agencies as has happened in Brazil.

Nicaragua

This project being implemented during the first six months of 2000 will be funded with a $ 200,000 loan from the IADB (Mendoza 2000). The project's 29,100 CFLs (15 Watt, electronic, utility friendly, $6/CFL) were to be sold to homes in Managua to replace primarily 60 and 75 Watt incandescent lamps. It is a collaborative effort between the Empresa Nicaragüense de Electricidad (ENEL), the Comisión Nacional de Energía (CNE), and the Instituto Nicaragüense de Energía (INE). The pilot will examine in-situ performance of the CFLs, the ensuing power, energy and greenhouse gas emissions savings and customer acceptance. If successful, it will lead to a larger project that could reduce electric sector investments and operation costs.

Based on a 1992 OLADE sponsored survey of Managua homes and current billing data, INE determined that the residential sector contributed 51% of the peak evening (19:00-21:00) demand, of which lighting was 37%. A 1.7 MW peak load reduction is expected.

The project began in the Delegación Central served by ENEL (34,450 users). Households received a bill stuffer with information on the project. CFLs were sold at ENEL agencies. Households using less than 200 kWh/month can buy 2 CFLs, while higher consumers up to 3 CFLs. Customers using less than 400 kWh/month can opt for financing via

five monthly payments in their electric bill while larger customers need to pay cash. INE and the CNE will evaluate the project, including environmental impacts.

Between January 17 and April 7, 2000, 13,440 CFLs have been sold among 6,103 clients; 2,144 clients opted to finance 4,556 CFLs. Only 335 CFLs have had to be replaced. Sales outlets have been expanded beyond Managua due to customer demand.

Peru

The residential CFL project was part of a National Energy Saving Campaign whose objective was to reduce peak demand (occurring between 18:00 and 23:00), by 100 MW during 1995 and 1996 (about 5% of expected peak load) (Romaní-Aguirre 1996). Demand had grown quickly in 1993 and 1994 due to an economic boom, yet the hydropower potential was severely constrained by a drought in 1994. About 40% of peak demand consumption had been determined to be residential and 56% of this due to lighting. Electricity prices were not subsidized, providing an incentive to households to save electricity.

The residential savings program had two components: 1) a campaign to change habits through intensive advertisement and education; and 2) a campaign to induce users to adopt CFLs. Only the CFL component is described further here.

The initial proposal was for a free CFL give-away program of 1 million CFLs that would save about 60 MW for a cost of $ 8 million. The funds would come from debts owed the State by mass-media companies (Aguinaga 1999). The Ministry of Energy and Mines turned down this proposal due to the government's policy of promoting market forces. CFLs were not even exempted from import tariff duties.

It was decided to focus efforts to promote CFLs on Lima households, as these comprised half of the two million residential electric users and consumed 65% of total residential demand. Initially, only upper-middle-class Lima households would be targeted to ensure affordability of the CFLs ($ 17-20 instead of only $ 0.5 for incandescent lamps). Later on, sales would also be promoted in the rest of the country and would include an installment plan option to be paid back in the electric bills over 2 years.

The project began with a four month publicity campaign for "energy saving light bulbs" in June 1995. Over 431,000 CFLs were sold during 1995, 366,000 CFLs in Lima. It was estimated that another 250,000 CFLs were sold in 1996. Only 49,000 CFLs were sold with the installment plan. A survey conducted in January 1996, had 79% of customers knowing about CFLs, 25% buying them, 68% believing they saved energy, and 66% expressing an intention to buy them.

It is estimated that the CFL program reduced peak demand by at least 20 MW. The entire program kept peak-load demand unchanged; thus saving about 80 MW of expected growth. Average residential consumption decreased from 136 kWh/month in 1994 to 109 kWh/month in 1996. Total electric consumption decreased from 3.185 TWh to 3.15 TWh between 1994 and 1995 while residential users increased from 1.952 million to 2.307 million. The Peru program was thus able to significantly reduce residential demand without needing to subsidize the cost of the CFLs, and instead, focusing on sales to affluent customers through intensive media campaigns. The promotion of CFL among Peruvian homes is contemplated in the ongoing ELI project. Implementation details are still being defined.

Lessons Learned from Past Residential CFL Experiences

Residential CFL programs save electricity and reduce peak load demand

All the projects described saved electricity and reduced peak load demand. These savings usually have been cheaper than expanding electricity supply. This is not surprising considering that residential electric demand is a significant portion of national electric demand, and that residential lighting (mostly with incandescent bulbs) is usually the main component of evening peak electricity demand in Latin America.

Establish an Adaptive Infrastructure

Institutions that promote, design, implement, and evaluate CFL programs are needed. Also required are institutions that can be repositories and disseminators of information and experiences gained. These latter institutions can also help reduce transaction, start-up, and learning-curve costs and times. The infrastructure will also include networks among private and public agents involved in the CFL programs. Under the current privatization schemes being implemented in many Latin American countries, it is important that the incipient institutional and information infrastructure is not dismantled. Furthermore, regulatory policies need to be enacted that will ensure at least a level playing field for demand-side options to future energy sector development. The organizational infrastructure and the programs need to develop incrementally and be flexible so they can evolve as the field develops and circumstances change.

Marketing is crucial

Too often initial residential CFL pilot projects have stressed technical aspects and not enough marketing components. The majority of Latin American household incomes are too low to expect them to buy CFL at current retail prices. Due to the small market for CFLs, these tend to carry high mark-ups typical of specialty items, rather than mass-sale commodities. Thus, projects to disseminate CFLs are most successful when they combine information, with marketing that ensures both the availability and affordability of the CFLs for the target households. Providing a variety of pricing, financing and technical options has been shown to give the best results. The giveaway strategy appears to be the best for emergency savings needs and/or for very low-income households. Financing seems to be the best option for dealing with the higher first-cost of the CFLs. Using trade allies can greatly improve the marketing of the CFLs and enhance the transformation of markets to more efficient product offerings.

Learn while doing

The fast pace of change of Latin American countries makes it imperative to design learning into projects. This can be done through constant tracking and evaluation of the project. This also requires recognition of mistakes, which are culturally unpopular. Foreigners, particularly multi-lateral development banks and other international aid agencies,

need to modify their disbursement procedures to allow for learning-while doing; i.e., go to more process projects rather than blue-print projects where in-depth feasibility studies are conducted before funds are disbursed (Picciotto & Weaving 1994). Begin with pilot projects to: better characterize energy end-use patterns, identify savings opportunities, test marketing options, evaluation procedures, and institutional requirements.

Evaluate process and impacts

To allow for learning-while-doing, it is imperative to evaluate early efforts carefully, both for process and impacts. This will permit the definition of more effective marketing strategies, differentiate target clients, and clarify the technical requirements and characteristics of the CFLs to be promoted.

Integrate CFL programs to other efficiency or development actions

CFL programs can be part of a broader introduction of household efficiency measures (as was done in Jamaica and Mexico). For example, can combine rural electrification or public housing programs with CFLs and other efficient equipment. This can reduce the costs of doing such measures separately.

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