Alberta Power Limited
Jasper Energy Efficiency Project
Profile #107

Executive Summary

The Jasper Energy Efficiency Project (JEEP) was recently completed in Jasper, Alberta and was a comprehensive, community-based effort that effectively used energy efficiency to reduce the demand for power thereby avoiding the need for more generating capacity. The project was also explicitly intended to research the potential for this kind of approach for other communities in Alberta Power Limited's (APL) service area and was the first project of its kind in western Canada. In both residential and commercial sectors JEEP was carried out through aggressive marketing and educational campaigns (including door-to-door energy audits, marketing, and sales), and incentives.

Community support for JEEP was deemed essential to its success and endurance. To this end Alberta Power established the Public Information Committee which was involved in all phases of the project from planning to marketing and implementation. Representatives from the general public, various interest groups, and Alberta Power were a part of this committee that met monthly and operated on a consensus basis. Alberta Power also hired and trained residents of Jasper, who really knew the community, to go door-to-door explaining, selling and installing energy-efficient products that were obtained by the utility through a local supplier ensuring that they would be available once the project was completed. APL forged close ties with the local media to further community awareness and excitement. Wilfred Golbeck, the Alberta Power project coordinator actually moved to Jasper during the project making the power company readily accessible and responsive.

JEEP has been highly successful on a number of levels. Over 70% of residential and 53% of commercial customers participated in the program which exceeded its goal of a 2 MW (almost 20%) demand reduction with an annual energy savings of over six million kWh. On average, residential customers have saved 0.73 kW of demand and commercial customers nearly 15 kW. APL invested almost $1,095,600 in the project, the community $630,000, and the federal government $70,000 for a total of $1,795,600. In addition and another indicator of the project's success, fully 38% of the residential program participants indicated in a follow-up telephone survey that they had undertaken additional energy-efficiency measures outside of the program. Corroborating this, the local hardware store reports having sold 1,000 additional compact fluorescent lamps since the project's completion. These indicators attest to the deep level of education achieved through JEEP and the program's success in terms of initiating a market transformation in Jasper, perhaps the project's greatest success.

ALBERTA POWER LIMITED
Jasper Energy Efficiency Project

Sector:	*Residential/Commercial*
Measures:	*Lighting, power saver cords, indoor/outdoor timers, hot water tank conversions, space heating conversions, HVAC, street light conversions*
Mechanism:	*Energy audits performed and measures installed as part of a community-based conservation project designed to lower peak demand in Jasper by 2 MW*
History:	*Initial project studies started in January 1991; Residential program launched in September 1992, completed in February 1993; Commercial program begun in March 1993, concluded in September 1994; Evaluations expected to be complete by summer of 1995*

PROGRAM DATA

Energy savings:	*6,321 MWh*
Capacity savings:	*2,110 kW*
Lifecycle energy savings:	*31,604 MWh*
Cost:	*$1,095,600*

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.

Alberta Power Limited (APL) is an investor-owned utility providing electric energy services throughout northern and east central Alberta, Canada. It is the largest unit within CU Power, the electric operations division of Canadian Utilities Limited, a subsidiary of ATCO Limited (best known for its relocatable shelters). Alberta Power is the largest single component of ATCO accounting for $1.5 billion of its $3.7 billion in assets.[R#1,11]

In 1927, the company that would eventually become Alberta Power Limited was formed in Vergeville, Alberta serving 380 customers. In 1928 the name Canadian Utilities Ltd was given to a group of small electric power systems, including the Vergeville company, in east central Alberta. This organization grew to encompass the largely rural northern region of the province and eventually expanded into the Yukon and Northwest Territories. In 1971 Canadian Utilities' electricity operations became Alberta Power Limited. ATCO achieved ownership of Alberta Power from the U.S. conglomerate, International Utilities Corporation in 1980 when it acquired a majority interest in the company.[R#1,11]

As the province of Alberta is blessed with abundant low-sulfur coal, more than 90% of the electricity used is produced by coal-fired plants. Alberta Power generates about 20% of the province's electric energy primarily from three major coal-fired stations: Sheerness (a 760 MW plant jointly owned with TransAlta Utilities); Battle River (741 MW); and H.R. Milner (150 MW), and a number of small gas and oil-fired generating stations with a gross generating capacity of 110.5 MW. APL also has one hydro station, Jasper's Astoria Hydro plant (1.4 MW), and 33.5 MW of isolated generating stations including Jasper's Palisades station, the largest isolated plant with a firm demand capacity of 14.3 MW. (Isolated generating stations are independent from the utility's grid.)[R#1,15]

Alberta Power's service area covers 160,000 square miles and serves 330 communities and 66 rural electrification associations. It encompasses more then 62% of the province and over 14% of its population. The company's customers include the energy intensive petroleum and forestry industries, small to midsized cities, farms, and isolated northern communities. Geographically, distances and climate present some interesting challenges in APL's transmission and distribution of power.[R#1]

The largest customer segment Alberta Power serves is residential (62%) which consumes 8.5% of the electricity with commercial coming in a distant second at 14% using 14.5% of the energy. The industrial sector, the smallest customer segment (5.1%) uses the most electricity (71%) while 18.2% of the utility's customers are farms demanding only 5.7%.[R#1]

ALBERTA POWER 1993 STATISTICS

Number of Customers	*151,000*	
Number of Employees	*1,400*	
Electric Revenues	*$397*	*million*
Energy Sales	*7,769*	*GWh*
Annual Peak Demand	*1,228*	*MW*
Generating Capacity	*1,416*	*MW*
Reserve Margin	*15*	*%*
Average Electric Rates		
Residential	*4.9*	*¢/kWh*
Small Commercial	*4.2*	*¢/kWh*
Large C&I	*3.5*	*¢/kWh*

During 1993 Alberta Power added nearly 2,000 new customers bringing the total to 151,000. Energy sales to retail customers increased by 4.5% to a total of 7,769 gigawatt-hours. This growth was primarily due to an increase of nearly 285 GWh in sales to the industrial sector. The company's gross revenues were up $24.3 million to $397 million.[R#1]

Alberta Power continued its restructuring process which it began in 1992 in response to lower levels of construction. By the end of 1993 the company had reduced its staff complement by 200 positions mainly through a early retirement plan, severances, and attrition.[R#1]

During 1993 Alberta Power invested nearly $72 million in capital projects to enhance and extend service to customers. One such improvement was to install additional gas-fired generating capacity to the Palisades generating plant in the town of Jasper, where the Jasper Energy Efficiency Project, the subject of this profile, was implemented. APL spent nearly $3 million on an additional 4,000 horsepower unit that provides almost 3 MW of peak capacity. It is a highly fuel efficient unit which will allow Alberta Power to reduce reliance on two of its less-efficient, turbine units at the plant thereby reducing costs and pollution.[R#13,14] ■

Utility DSM Overview

The move towards demand-side management at Alberta Power began in 1990 when the company projected that it would become capacity deficient and was thus required to commence purchasing capacity. Administered by the Marketing Department, the first program the utility implemented was the province-wide High Efficiency Motors Rebate program. (See Profile #38: British Columbia Hydro, Power Smart High Efficiency Motors and Drives program) Inversely, the company's latest program is Destination Conservation, a school curricula and facilities retrofit program now being implemented throughout Alberta Power's service area. (See Profile #82: Environmental Resource Center, Destination Conservation) In late 1993, APL found itself with surplus capacity which is expected to extend to the turn of the century and has therefore recently switched its focus from conservation and capacity reduction to emissions reductions and "value-added services" which are cost neutral for its customers. These value-added services include brokering between electricity customers and energy service companies (ESCOs) while staying out of the DSM business. As such Alberta Power's experiences with DSM have been minimal, a total of three energy-efficiency programs extending over a three and a half year timespan.[R#10]

Despite its limited need to implement a comprehensive set of energy efficiency programs, Alberta Power Limited has been an active member of Power Smart Inc. since 1991, an organization which certifies energy-efficient products and markets energy efficiency. In October of 1993 APL participated in "National Power Smart Month" to raise awareness of energy efficiency in its residential and farm sectors. Also through its membership, the company was able to get technical support in the creation and implementation of both the High Efficiency Motors program and the Jasper Energy Efficiency Project, the subject of this profile.[R#16]

The High Efficiency Motor Rebate program (HEM) was aimed at hospitals, municipalities, the forestry sector, and oil and gas operators. Begun in 1991 it achieved a 154 kW demand reduction that year saving 770 MWh of energy, 320 kW in 1992 saving 1,559 MWh, and 522 kW in 1993 saving 2,849 MWh. The forestry sector had the highest program participation rate for two years in a row. Due to the program's success the cash rebate of $325 Canadian ($227 U.S.) per kW saved was reduced as of July 1, 1994 to $200 Canadian ($130 U.S.) per kW saved and the program was phased out all together in December 1994 as APL's focus shifted.[R#1,3]

Jasper Energy Efficiency Project has been Alberta Power's most visible and aggressive DSM program. JEEP was started in 1991 and completed in 1994. It was the first intensive, community-based program in western Canada and was to serve as a model for future comprehensive energy management efforts. Despite its withdrawal from the DSM arena, APL continues to reap value from JEEP in terms of lessons learned which are being passed on to customers. These include experience in determining cost-effective, energy-efficiency measures and choosing appropriate energy service companies. In the town of Drumheller, Alberta five municipal buildings are being retrofitted based on the JEEP experience as a customer service.[R#2,3].

The school curricula and facilities retrofit program, "Destination Conservation" designed by the Environmental Resources Centre is being initiated in 35 service area schools (including Jasper) with Alberta Power contributing both financial and human resources. Destination Conservation staff trains both APL employees as well as school principals, teachers, and school operations staff to work together to teach student groups how to develop conservation plans for their schools and then implement them over a three-year period.[R#25]

Besides its three specific energy-efficiency programs, in 1992, APL established a DSM Collaborative made up of customers to consider energy efficiency as an alternative to traditional supply-side options. In March 1993, the collaborative recommended a strategic framework to Alberta's Public Utility Board which included the financial treatment of DSM and the retrofitting of APL's own facilities to make them more energy efficient. By early 1995 the retrofitting of APL's facilities was well underway with an emphasis on emissions reduction. [R#3,6,15] ■

PROGRAM OVERVIEW

Jasper, Alberta is unique in many ways and thus served as an interesting test-bed for Alberta Power's first foray into community-based energy efficiency. Jasper (population 4,500) is situated in the breathtaking Athabasca River Valley of Jasper National Park in the Canadian Rockies located in west-central Alberta. Its energy needs are met by the recently upgraded 14.3 MW natural gas-fired Palisades Generating Station, completely isolated from the provincial grid. In the summer months power demand is supported by the 1.4 MW Astoria Hydroelectric plant, a plant "well-beloved by the community." (In winter when the river flow drops, Astoria's production falls to a level below 500 kW.)[R#12]

With 1,296 residential and 208 business and institutional customers the town's demand for power has nearly doubled in the last ten years from 6.2 MW in 1981 to 11.9 MW in 1991 mainly due to growth in the commercial and industrial sectors as the town's tourism industry has snowballed. The commercial sector, including hotels, alone comprises 70% of Jasper's electric profile. Peak electric demand occurs primarily around Christmas and throughout the winter months during high tourist season. This growth in population has changed the complexion of Jasper and has concurrently placed heavy demands on the town's ability to produce sufficient electricity.[R#6]

JASPER SYSTEM PEAK DEMAND	ACTUAL (MW)	PROJECTED* (MW)
1987	7.00	
1988	8.30	
1989	8.60	
1990	11.90	
1991	11.60	12.10
1992	11.90	12.40
1993	11.10	12.70
1994	10.80	13.00

**Projections based on 2.5% growth*

The Jasper Energy Efficiency Project was a community-based conservation project with five primary objectives. Clearly the most important goal was to reduce Jasper's demand by two megawatts. This was critical in order to avoid the need for the planned installation of a second generator that would have provided an additional 2.8 MW at a cost of $2.4 million at the Palisades station. The other option, which both the town of Jasper and Parks Canada were highly reluctant to exercise, was to build a $8.4 million, 50-mile, high voltage transmission line from Hinton to Jasper to connect the community with the provincial grid. This latter choice was neither an aesthetically pleasing nor environmentally friendly alternative. It would follow the Canadian National Rail Line into Jasper. In addition, connecting the community to the grid was the most expensive option considered.

Other objectives were important to APL for subsequent projects. JEEP would test the cost effectiveness of demand-side management compared to more traditional supply-side options. The project was also designed to serve as an educational tool to measure customer acceptance and product effectiveness. If successful, another benefit of employing energy efficiency in Jasper is that it would avoid the further environmental impact of power generation in one of Canada's largest National Parks. Finally, JEEP would provide expertise to Alberta Power staff in planning and implementing energy efficiency programs in other locations in the province.[R#6]

PRE-PROGRAM PLANNING

Jan. - Sept. 1991, Initial study period: In 1991, when the first analyses were done of Jasper for the JEEP program, Jasper had 1,465 customers who demanded 11,901 kW. The residential class was the largest with 1,257 customers (85.8%), however with a disproportionate demand of 2,169 kW (18.2%). The commercial sector had only 192 customers (13.1%) but had the greatest demand requiring 6,880 kW (57.8%). Lastly were the industrial customers who numbered 16 (1.1%) and used 2,852 kW (23.0%) of demand.[R#4]

Alberta Power decided to launch the Power Smart pilot project with an emphasis on demand reduction since energy consumption was not the limiting factor at the generating plant. At the onset of the project program planners believed that 500 kW of demand could be saved through the residential sector and 1,500 kW through the commercial sector. To support this assertion, Energy, Mines, and Resources CANADA (EMR) provided support to JEEP through a grant for the initial study. Then both EMR and Alberta Energy provided expertise in planning the ensuing energy efficiency programs.

Right from the outset of the project, Alberta Power established a Public Information Committee (PIC) to guide the project and provide local input. Representatives from the general public and various interest groups such as the school district, ☞

environmental groups, the Chamber of Commerce, and the Hospital Board met monthly and functioned on a consensus basis. Alberta Power chaired the committee and also provided administrative support. The last meeting of PIC was held on May 1, 1995 to review the long term impact of JEEP.[R#6,45]

Aug. - Sept. 1991, Residential survey & commercial audits: A door-to-door residential energy survey was conducted in August and September of 1991 to determine where potential energy savings existed and identify what types of programs could be implemented in the town. The residents were asked to fill out the survey and return it by mail once it was completed. Out of 911 surveys, 488 were returned.

Concurrently, the Alberta Department of Energy's Energy Bus was utilized to audit where and how energy was being used in the commercial sector. In the summer of 1991, a staff of three (one person each from Alberta Energy, the provincial energy department; Northwestern Utilities, the local gas utility; and APL) manned the bus and examined a cross-section of 14 Jasper businesses. The Energy Bus was a high tech motor home which was available to Alberta businesses and communities to perform energy audits. It unfortunately lost its funding and is no longer in use but served JEEP well as a research facility with a great deal of customer visibility.[#2,26,31]

Sept. 1991 - March 1992, Data analysis & residential economic evaluation: The results of the survey and the Energy Bus audits showed where potential savings existed and allowed APL to determine which programs were most appropriate for Jasper. For instance, in the residential sector it was determined from the survey that there were almost no compact fluorescents in use in Jasper, that only nine percent of homes had electric water heaters, and a significant number of homes had electric heat. In the commercial sector, fuel substitution and lighting were the two main areas of energy savings identified. Commercial fuel switching was expected to save about 768 kW and lighting 567 kW.[R#31]

Following the survey and audits, Alberta Power hired a consulting firm to develop a comprehensive community-based program for Jasper. The firm proposed two energy efficiency programs: The "passive" program was characterized by measures that pass the Ratepayer Impact Measure (RIM) test for cost effectiveness. This consisted mainly of public information. The "aggressive" aspect of the program was defined by measures passing the Total Resource Cost (TRC) financial test and was based on providing financial incentives to encourage customers to install energy-efficient products. Alberta Power selected to implement the more ambitious campaign.[R#6]

To raise public awareness of the benefits of energy efficiency the residential program was implemented first. The project team felt this would also make the commercial program easier to institute as many of the business operators live in Jasper and would have participated in the residential program. Project Manager, Wilfred Golbeck noted that, "By doing the residential program first, people got to see how these things worked in their own homes and that carried over into the commercial program."[R#15]

Prior to the start of the residential project the JEEP Team members underwent a one-week training session. The session, conducted mainly by Alberta Power personnel, covered topics ranging from product overview to safety and customer communications. An employee of Saito Sports and Hardware also attended the session in order to learn about the products.

MARKETING

The Jasper Energy Efficiency Project was kicked-off with an official opening which was attended by 300 residents and by provincial media. At the ceremonies, Energy Mines and Resources presented the town of Jasper with Canada's first Energy Innovators Award. This served to develop the sense of pride in the project that later led to its success. In addition, an intensive advertising campaign was launched highlighting various aspects of the project and local residents who participated in it. Included were a series of lifestyle newspaper ads, bill stuffers, brochures, and an edition of the Alberta Power Smart Report. Signage was used, including a large compact fluorescent lamp sign in the center of town which tracked how many kilowatts were being saved. Finally, courtesy items such as pens, hats, t-shirts, and key chains all with the Power Smart

Inc. logo were distributed to residents. This well thought-out communications plan won the 1993 Gold Quill Award of Merit by the International Association of Business Communicators.

Also important to the effective marketing of JEEP was a good working relationship with the local media, which in turn provided excellent coverage of the project in terms of editorial content in the Jasper Booster, the local newspaper. Of particular importance were the Alberta Power Smart Reports that were used to convey the progress JEEP was making, including program descriptions, how to participate, and features on satisfied retrofit customers which raised further awareness of JEEP and energy efficiency in Jasper.

The production of the first issue of Alberta Power Smart Report was reportedly extremely expensive and was not produced locally. (The first issue of 4,000 copies cost about $5,600 or $1.40 each.) This cost was eliminated handily thanks to the Jasper Booster's willingness to produce the reports in Jasper. In fact, the last two reports were produced by the local paper at no cost to the utility, supplying additional credibility to the project as well. In turn, Alberta Power provided advertising support to the paper by selling approximately eleven advertisements for each report issue for $280 each to JEEP suppliers and other interested parties.[R#30]

The commercial program built on the momentum of the residential program and was promoted mainly through early awareness raised using the Energy Bus, later by word of mouth and by some advertisements in local papers outlining projected savings.[R#31]

RESIDENTIAL DELIVERY

In terms of delivery JEEP had two fundamental aspects, residential and commercial. While these were addressed in significantly different ways, APL recognized the synergy between these two program emphases.

The Residential Program was implemented on September 1, 1992 and was initially projected to finish on December 30, 1992. Due to high customer demand the deadline was extended to February 5, 1993. Monitoring and evaluation took place between January 1, 1993 and March 31, 1994.[R#4]

In the fall of 1992 Alberta Power Limited implemented the first phase of JEEP, a comprehensive residential program. APL and the Public Information Committee set a budget of $245,000 (for this aspect of the project and projected to get a demand savings of 453 kW. This was based on a maximum customer incentive level of 80% of the cost of the measures or up to $314/kW saved. Thus simple measures such as compact ☞

DEMAND SAVINGS BY MEASURE	NUMBER SOLD	NUMBER ON DURING PEAK DEMAND	PEAK DEMAND REDUCTION (kW)	PEAK DEMAND REDUCTION PER PRODUCT ON (Watts)
C.F. Lamps	4,701	3,108	161.60	52.0
Power Saver Cords	817	170	171.00	1,005.9
Timers	696	166	59.40	357.8
Water Heating	29	29	24.70	851.7
Space Heating	1	1	3.00	3.0
Streetlights	362	362	70.70	195.3
Total	NA	NA	490.40	NA

fluorescent lamps that were installed immediately were provided at a substantial discount; incentives up to $314/kW were offered for more complex measures. The program utilized an intensive door-to-door marketing approach with four local residents hired and trained by APL. Not only did this provide local employment but as these individuals were very familiar with Jasper and many of its residents, it made them more effective and increased JEEP's community acceptance. These four locals formed two "JEEP Teams" which visited homes in the Jasper area to explain, sell, and install energy-efficient products.

To participate, customers were informed through newspaper advertising, signage, and bill stuffers of how to set up an appointment at their convenience by calling or dropping in at the APL district office in Jasper. At the designated time a two-person JEEP Team would arrive and do an informal audit of the residence with the customer and make suggestions, explaining energy efficiency, describing products available through the program, and discussing which were most appropriate and why. For lighting, the teams had ten different types of compact fluorescent lamps on hand and they not only investigated which was best for each application but also installed them in specific applications to allow customers to judge their efficacy as well. In total, 891 home visits were conducted with an average visit lasting approximately one hour including travel time. About forty homes required a repeat visit.[R#31]

COMMERCIAL DELIVERY

The sign-up for commercial audits was conducted from March 1, 1993 through December 31, 1993, with implementation occurring concurrently and continuing until September 1, 1994. Two final projects were completed by the end of September due to extenuating circumstances. Monitoring and evaluation commenced in March 1994 and is scheduled to be completed by June 1, 1995.[R#25,26]

The four auditor/installer firms contracted to perform the commercial audits and retrofits were chosen based on previous interaction with APL and underwent a brief training with Alberta Power. They were encouraged to hire subcontractors locally. This proved to be tough to do as the local electricians were initially unwilling to commit the time necessary or undergo a training session. During the implementation phase of the commercial program two of the contractors dropped out and were replaced.[R#31]

Implementation for the commercial component of the program commenced at the beginning of March, 1993. Interested commercial customers were encouraged to contact Alberta Power to set up an audit of their facilities to find out what energy efficiency measures would be appropriate and cost effective for them to implement. Alberta Power provided up to $314/kW of peak demand reduction as an incentive for businesses to undertake these retrofits. "What this means is that Alberta Power paid 40-60% of the capital cost of an energy-efficient measure that reduced the peak demand load," according to energy management specialist Randy Shippit of Action Electrical Limited (a JEEP auditor/installer firm). "The numbers are based on giving an incentive that brings the customer's payback period down to between one and a half to three years." Thus the utility paid a rebate for the measures, and customers were responsible for providing the remainder of the cash balance.[R#13]

Participating commercial customers had to first fill out an application which was available at the APL Jasper office. A JEEP contractor was then assigned to perform an energy audit of the customer's place of business free of charge. He determined a cost estimate of the efficiency measures necessary to retrofit the building, the annual customer savings that would accrue as a result of the measures, and then Alberta Power figured out the incentive and payback period and summarized the audit and incentive for the customer.[R#31]

After the audit was concluded and evaluated the results and an action plan were presented to the customer by APL. If the go-ahead was given by the customer, the contractor who performed the audit proceeded with the agreed-upon work for the agreed-upon price. The retrofit was completed as quickly as possible to insure minimal business disruption for the customer. While each auditor/installer normally provides a 60-day warranty on workmanship, through JEEP and because of the volume of work which they were given, they supplied a one-year warranty as requested by the utility.

Alberta Power contracted with four auditor/installer firms to perform the audits and install the energy-efficiency measures. The contractors were paid by the company which then billed the individual commercial customers for their portion of the costs. A 90-day grace period was given to customers to allow them to see for themselves the savings on their electric bill.[R#31]

By the end of September 1993, 160 commercial customers had signed up for the energy audits. By the completion of the program in September 1994, 180 had participated in energy audits, and 110 were retrofitted with a peak demand reduction of just over 1,600 kW, surpassing the commercial sector goal.

MEASURES INSTALLED

Almost all products sold by JEEP for the residential program were bought through a local supplier, Saito Sports and Hardware, part of the Home Hardware chain and a Power Smart Inc. trade ally. This was done to ensure the continuing availability of the products locally after JEEP ended and to provide a local warranty. Some of the products for the commercial program were also bought through Saito Sports. According to Alberta Power's Marvin Garton, the Supervising Engineer for Energy Management, "We also got manufacturers and vendors of the energy-efficient products involved. A problem with some DSM programs in other places is that they create a nova of interest but then there's no availability of the energy-efficient products after the program. In Jasper, Home Hardware is continuing to carry all these energy-efficient products. There's now both a supply established for the customers and a demand for the manufacturers that will be sustained."[R#15,31]

In the residential sector five specific measures were installed:

Compact fluorescent lamps: The JEEP Teams sold 10 different types of compact fluorescent lamps (CFLs) to ensure a wide array of choices. These CFLs were manufactured by Osram and Phillips and were sold at a discounted price of $2.10 or $3.50 depending on the type. After the first two days of the program it became apparent that a limit on the number of lamps a customer could purchase was needed as it quickly became obvious that people were buying additional CFLs to give as presents outside of Jasper. Thus the limit was set at eight lamps per home, five per apartment.

While compact fluorescent lamps have suffered to some degree because of their appearance, size, and weight, none of these problems surfaced in Jasper. (Earlier criticisms of CFLs included start time, initial flickering, and color quality.) Customers were reportedly very happy with both the way the bulbs looked and performed. Since the JEEP Teams actually installed the lamps before they were purchased, any potential dissatisfaction regarding looks or performance was addressed and ameliorated immediately. Project managers suspect that this socket-specific satisfaction may also be the reason why most of the lamps promoted through the program are still in use today.[R#6]

Power saver cords: Power saver cords are a technology that activate block heaters in vehicles when temperatures dip below 19° F, providing for easier starts and less wear and tear on automobiles and trucks in cold climates. (Without the cords, block heaters tend to be plugged in and left on regardless of ambient temperatures.) To promote this energy efficiency technology the JEEP Teams sold coupons for $5.25 for Temro automobile power saver cords which were redeemable at Jasper's service stations for installations. After installations Alberta Power paid the service stations $3.50 for each cord installed. JEEP's subsequent evaluations have revealed that fewer cords were sold than projected. Furthermore, over 20% of the coupons sold did not result in power saver cord installations.

Timers: Residents could purchase up to two indoor timers for lights for $2.80 each and two outdoor timers for $6.30 each. In addition to distributing the timers, the JEEP Teams also explained the operation of the Intermatic timers to customers, especially in regard to Christmas lighting.[R#6]

Hot water tank conversion: Originally, Alberta Power offered to pay a $280 incentive to any resident to convert his or her electric hot water tank to a John Woods 402 natural gas tank. In this scenario the customer had to have retained his or her own contractor. This approach, however, only resulted in three conversions and thus Alberta Power modified the program and retained a plumbing contractor to retrofit homes, ☞

a program modification that resulted in twenty-six additional conversions. In addition, retaining a single contractor to perform multiple conversions lowered the average conversion price from $630 to approximately $490 minus the incentive.

In an unusual twist and since Jasper lies within the Canadian National Park System, Parks Canada's building regulations also made it both awkward and expensive to install hot water tanks. For example, according to Parks Canada codes, the access panel to the gas water heater has to be secured with eight screws (instead of 2-3 more typically used), making it difficult for the homeowner to access the tank to adjust the thermostat or light the pilot light following installation. As well, there is a requirement of two air intakes into the housing of the water heater making the tanks more susceptible to freezing. [R#6,30]

Space heating conversion: The residence chosen for the program's pilot space heating conversion was partially heated by electricity and used three kilowatts of demand to do so. At the time, the owner was in the process of a renovation making the home conducive to the installation of a Carrier, natural-gas-fired forced-air system. After the pilot project, Alberta Power concluded that since such conversions are very expensive they should only be performed in conjunction with home remodelling undertaken by the owner.[R#6]

Commercial lighting retrofits: Before the commercial phase of JEEP was implemented, pilot audits involving four local commercial establishments (Sunwapta Apartment, Mountain Esso 86, Exposures Photo Shop, and the Whistler Inn) were performed to evaluate the feasibility of commercial retrofit measures. This was to determine the costs of installing recommended energy efficiency measures, the energy savings that would accrue, and the availability of the materials necessary to provide the best energy savings and customer satisfaction. Clearly the number one retrofit opportunity in the commercial sector was for energy-efficient lighting and the vast majority of the commercial retrofits did indeed involve lighting. Unlike the residential program, however, the commercial program didn't just screw in compact fluorescent lamps but retrofitted with hard-wired or permanent installations, insuring long-term savings in this area. Other measures included heating conversions, ventilation and air conditioning.[R#20]

Street light conversion: In addition to residential and commercial measures executed as part of the program, JEEP was fortunate to have the full support of the Canadian Park Service which converted all of Jasper's 362 street lights from mercury vapor to high-pressure sodium lights. The total cost of this conversion was $41,913 and was fully covered by the Parks Service while the 70.7 kW of savings contributed to the project's overall savings goals. (The Parks Service did realize a 2.3-year payback for the retrofits.)[R#6]

STAFFING REQUIREMENTS

A JEEP office was set up in the existing Alberta Power district office in downtown Jasper, both to focus all customer-related inquiries to one location and to minimize administrative costs. For purposes of the project, this office was staffed by Project Coordinator Wilfred Golbeck who worked full time on the project and part-time project administrative help, the four JEEP Team members (residential), and one quality control supervisor (commercial).

While the project's administrative and implementation functions were carried out in Jasper, its managerial component remained at Alberta Power's head office in Edmonton where Project Manager Marvin Garton worked half-time on the project, assisted by a communications supervisor who also worked part-time on JEEP. Thus a total of 6.5 full-time equivalent staff were devoted to the residential and 3.5 full-time equivalent staff to the commercial project by Alberta Power.

In addition to Alberta Power staff, auditor/installer firms contracted to implement the commercial phase of JEEP were hired from Edmonton as there were no local firms with enough expertise. Finally, program evaluators from Power Smart Inc. were used to determine the efficacy of the project overall.[R#6] ■

MONITORING

The monitoring of JEEP was accomplished in several ways. The usage of energy efficiency measures in both the residential and commercial programs were confirmed through installation of the measures by APL contractors and by follow-up telephone surveys and site visits.

APL developed a statistical analysis software package to track the progress of the residential program. The JEEP Teams filled out a Home Visit Report capturing the results (number of products installed, wattages, etc.) achieved in each home. The information was then entered into the data file, allowing the progress to be updated and monitored on a daily basis. There was no end-use metering installed due to its expense and a lack of confidence in the reliability of the method.

BILLING ANALYSIS

Energy savings have been confirmed through analyzing electric bills. One year of post-retrofit commercial bills will be analyzed in the Spring of 1995. One drawback to this method for residential customers is that APL's current residential billing system measures actual consumption only every other month. Estimates are used for the other months which reflect the customer's previous annual consumption, thus not registering any new energy efficiency measures. In fact, this problem was so acute that less than 33% of participants noticed a reduction on their power bill after their retrofits!

Furthermore, over 30% of Jasper residents are voluntarily involved in the equalized monthly payment plan, levelizing winter and summer bills to avoid seasonal rate shocks. Therefore, many customers did not see any immediate post-retrofit bill reduction which created some concern. Clearly, because of these billing system situations, bill analysis does not provide clear signals for savings in Jasper, making both energy and dollar savings much harder to measure. Alberta Power is working to correct this situation through the upgrading of their billing system and its plans to install automatic meter reading throughout their service area over the next ten years. This will allow a customer's meter to be read remotely through power lines.[R#1]

RESIDENTIAL PROGRAM EVALUATION

In June of 1993 APL retained an independent research company to poll Jasper residents who participated in JEEP. The telephone survey reached 358 residents out of 891 participants. The JEEP Team performance in product knowledge, ability to answer energy-efficiency questions, and overall friendliness and courtesy was rated very satisfactory by 96% of the respondents. This contributed greatly to the success of the educational component of JEEP which raised awareness and increased the understanding of energy efficiency in both program participants and non-participants. The literature the teams handed out, however, didn't fare as well. Although 80% of customers read it, 70% didn't find it particularly informative. (This may have been due to the great job the teams did in explaining and answering questions, thus minimizing the import of the literature!)

A mail-in survey of nonparticipants garnered just a 12.2% response rate and found that 34% of the respondents claimed they didn't participate because they hadn't heard of the program or didn't know how to arrange for a home visit despite all the marketing efforts made. Nearly 38% of the participants and 42% of nonparticipants have taken energy-efficiency measures (mainly simple conservation steps versus aggressive energy-efficiency upgrades) outside the program with 17% of participants and 34% of nonparticipants buying compact fluorescent lamps on their own.[R#6]

The compact fluorescent lamp aspect of the program was found to be most impressive. On average 6.8 lamps were bought by 92% percent of the homes visited; 14.2% more than anticipated. Customers were very happy with both the way the compact fluorescents looked and performed. The one place lighting fell short was in energy/demand savings targets. This was due to an error in a report which formed the basis ☞

for those targets. It was estimated that 4,100 CFLs would be installed (4.3 per home) with a 75% participation rate by residential customers and would result in a peak demand reduction of 211 kW. The target for peak demand saving was based on a consultant's report which indicated that the lamps would replace about 52 watts per bulb. This number was derived by subtracting the average wattage of the compact fluorescents (17 watts) installed from the average expected wattage of the bulbs replaced (69 watts). The report erred in that it did not build in a peak coincidence factor yet still indicated the 52 watts per lamp saving as a coincident peak demand savings per lamp. This error caused Alberta Power to inflate the peak demand savings and is the reason that although 14.2% more CFLs were sold than originally projected the lighting program was unable to meet its targets. This same error in the power saver cord program caused the savings to be underestimated. [R#21]

The Power Saver cord program was less effective as fewer cords were sold than targeted and over 28% are not in use in Jasper. Approximately 20% were never installed and 8% of cars with cords installed left town. On the up side, the customers who did have the cords installed were extremely happy with their performance and energy/demand savings targets were exceeded, albeit due to the same consultant's error.[R#6,17,21]

The indoor timer program was not a triumph for either customer or utility. Though 335% more timers were sold than expected, evaluations found that 52% are being used rarely or not at all. Of those actually in use, less than 20% are controlling appliances that will help lower energy consumption during peak periods or at all. These timers were sold mainly to control block heaters and indoor Christmas lights and thus were not expected to be in use year round. The outdoor timer program was successful with 363% more timers sold than estimated, savings targets were exceeded, and customers very happy with their performance. On the downside 25.6% are not in use and 8% have been given away.[R#6,21]

The water heater conversion program achieved 58% of the conversions originally targeted due to a lower than expected number of home visits and a 52% instead of 70% conversion rate.[R#6,21]

COMMERCIAL PROGRAM EVALUATION

APL hired Power Smart Inc. to do an independent process and market evaluation for the commercial program which was conducted between May and July 1994. The evaluation included planning, participant and non-participant surveys, site audits, stakeholder interviews, and an interim report. An impact analysis and final report will be completed by them in the Spring of 1995 when enough time has passed to compare pre- and post-retrofit electric bills.[R#17]

Program records, documentation, and tracking systems were analyzed; site visits of participant buildings were performed; and phone interviews conducted with participants, drop-outs, and a control group; as well as in-depth interviews with APL staff, the local supplier of energy-efficient products and external stakeholders.[R#17]

The telephone surveys of JEEP commercial participants were handled by two Jasper residents trained and hired through Power Smart Inc. and conducted during regular business hours. An attempt was made to complete the local interviews before the peak summer tourist season. Therefore only businesses whose retrofits were complete by mid-May of 1994 were contacted for the survey. APL provided all customer contact information including each customers' costs, estimated savings, and date of participation. Out of 82 attempts, 65 participant business contacts were made for a response rate of 79%. The survey found that the main reason for participation in JEEP was to save money (57.6%), followed by environmental concerns (12.1%), energy conservation (10.6%), financial incentives (6.1%), to support community efforts (6.1%), and other (7.5%).[R#18]

The program itself was very well received by 84% of the respondents, as was the knowledge of the APL staff, the performance of the energy-efficiency products (some found the energy-efficient lighting was superior in quality and light level), the amount and method of incentive payment, and quality of the auditor/installer. Other benefits perceived were decreased maintenance costs due to the longer-lasting lamps, improved aesthetics, and satisfaction in supporting a community effort.

The main drawbacks of the commercial program involved the amount of time it took APL to approve the applications and that the auditor/installer firms sometimes made changes to the original retrofit plan without the approval of the business involved or after consulting the facilities manager and not the person in charge, resulting in a discrepancy between the audit estimate and the final bill the concern received. Quite often Alberta Power was held accountable for these discrepancies.[R#18]

Eight large commercial site visits were performed and only one had made any significant changes to the energy efficiency equipment and that was temporary. The main objective of the site visits was to identify and address potential issues for the JEEP commercial final report in the Spring. To that end respondents were asked to identify any potential business or building changes likely to occur in the next year.[R#18]

The "drop-out" survey for those businesses which received an audit but did not opt for a retrofit had a response rate of only 40% with only sixteen out of forty attempts completed. The main reasons for not going forward with the recommended measures were largely money related. The customer didn't have enough capital to self-finance the retrofits or APL didn't allow them enough time to secure third party financing. Some found the costs just plain too high and the payback period too long or had a lease which would expire before the payback period ended. Other reasons included some skepticism or dissatisfaction with lighting measures (they had looked at other retrofits and had not liked the quality or decreased level of the lighting) or the building was new or newly renovated and further changes were not considered necessary.[R#18]

ESTABLISHING A CONTROL GROUP

A control group was sought to better understand the impact of JEEP. The criteria for choosing this analogous town were that its business community must be similar to Jasper, it must not have been unduly influenced by JEEP, and it had to be located in APL's service territory. This last stipulation was necessary to access contact information for the telephone survey and billing histories for the impact analysis. Grande Cache, located two hours northwest of Jasper, was chosen and thirty-nine attempts to reach local businesses there yielded thirty-one contacts for a response rate of 79%. Results of the survey revealed that the cost of electricity in relation to the overall operating costs was just as important to the control group (66%) as it was to JEEP participants and that 39% have taken steps to conserve energy in the absence of any DSM programs.[R#18]

STAKEHOLDER INTERVIEWS

Interviews with stakeholder representatives were conducted over the phone and in person in June and July. They included eleven APL staff; staff from Natural Resources Canada, Parks Canada, and Jasper National Park; JEEP auditor/installer firms; and the owners of Saito Sports and Hardware Ltd. (the local supplier). There was agreement that the high level of community participation and support and the program coordinator were its strongest attributes. There was an uncertainty as to whether JEEP had obtained its demand reduction goals and that the lack of an evaluation plan at the program design stage was problematical.[R#18] ■

Program Savings

Fundamentally JEEP exceeded its peak demand reduction goal of 2 MW by saving 2.1 MW of capacity. (This figure was based on engineering estimates of measures installed.) The residential sector provided 490.4 kW of peak capacity savings and the commercial sector 1,620.2 kW. On average, each participating residential customer saved 0.55 kW of demand while the average commercial customer saved nearly 15 kW.

Prior to the project, Jasper anticipated a peak demand of 13 MW by 1994/95, awfully close to the 14.3 MW firm output of the Palisades generating station. Measured peak demand during the 1994-1995 Christmas/New Year's holiday period (the traditional annual peak demand) was recorded at 10.8 MW, revealing program success on the order of 2.2 MW.[R#2,26]

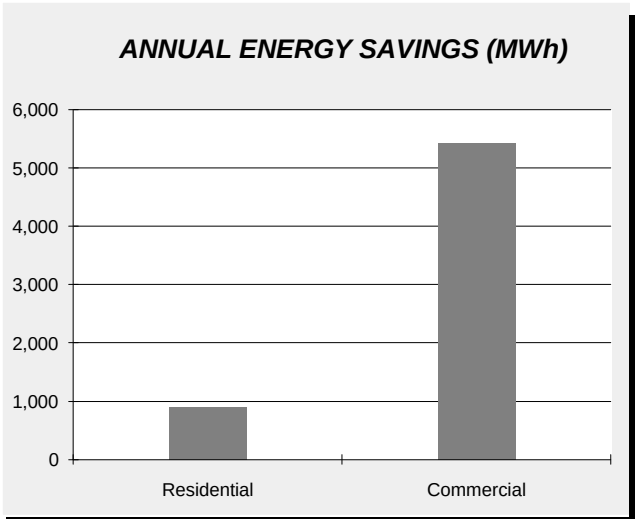
In addition to capacity savings – the primary benchmark of project success – JEEP also resulted in commercial and residential annual energy savings of 6.3 GWh. Of this, commercial sector energy savings provided 5.4 GWh, or 86% of the savings, while residential annual energy savings were 0.89 GWh, 14%. Despite this, the town of Jasper's overall energy consumption increased by 2.6% due to Trans Mountain Pipe Lines (a large industrial customer in Jasper) increasing its consumption by 34.4% due to increased pumping.

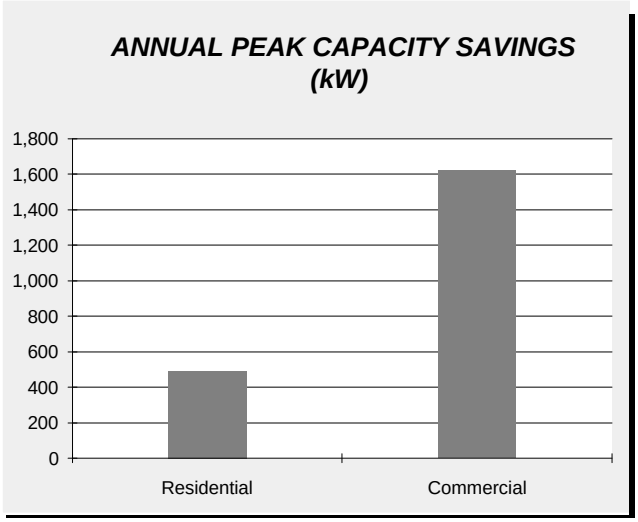
Of the measures installed in the residential sector, lighting measures were by far the most popular with 4,701 compact fluorescent lamps sold and installed with a demand savings of 161.6 kW. Of those lamps, 3,108 are being used during peak demand with a 52-watt reduction per lamp. Compact fluorescent lamps replaced mainly 60 and 100-watt incandescent bulbs. Although fewer Power Saver Cords were sold (817) they saved slightly more demand at 171.0 kW with only 170 being on during peak demand periods saving 1,005.9 watts per cord. Other measures combined saved 87.1 kW of peak demand. The street light conversions are figured into the residential savings at 70.7 kW of peak demand.

PARTICIPATION RATES

At of the end of September 1994 the implementation of JEEP was completed with 67% of both the residential and commercial sectors participating. On the residential side, 891 homes out of 1,296 were visited by JEEP Teams, each purchasing an average of seven compact fluorescent lamps, one Power Saver cord, and a timer (indoor or outdoor). Time was the limiting

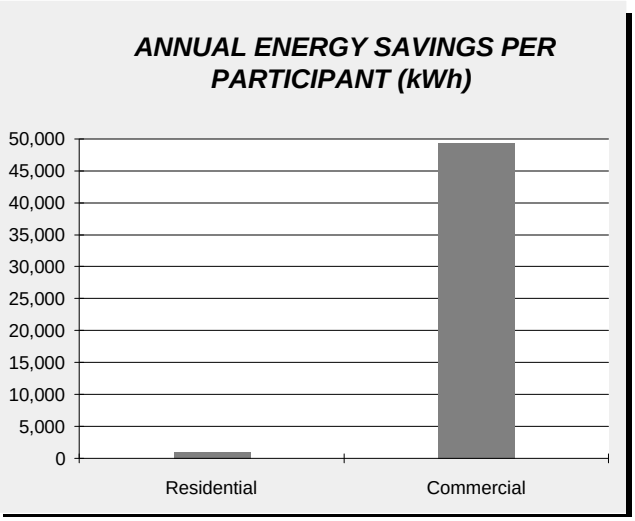
SAVINGS OVERVIEW	ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	PEAK CAPACITY SAVINGS (kW)
Residential	892	4,460	490
Commercial	5,429	27,144	1,620
Total	6,321	31,604	2,110





PARTICIPATION	PARTICIPANTS	PEAK DEMAND SAVINGS PER PARTICIPANT (kW)	ANNUAL ENERGY SAVINGS PER PARTICIPANT (kWh)
Residential	891	0.55	1,001
Commercial	110	14.73	49,352
Total	1,001	2.11	6,314

factor on the number of participants as the project goals were accomplished prior to soliciting a greater number of residential participants. Commercial audits were performed on 180 of the 210 businesses in town with 110 proceeding through the retrofit process.



FREE RIDERSHIP

Free ridership was considered very difficult to track accurately by Alberta Power as JEEP placed such an emphasis on energy efficiency education that it would be difficult to sort out actions taken in the absence or as a direct effect of the program. Thus free ridership was not explored for the residential aspect of the program but was considered for the commercial segment despite the fact that it followed the residential emphasis and educational campaigns, making it that much more difficult to gauge for business owners.

Despite these inherent limitations on accurate assessment of free ridership, the Power Smart Inc. evaluation of the commercial program did make an attempt to estimate free ridership through participant and control-group telephone surveys. Out of sixty-five participant respondents, five suggested they were already planning to remodel, three had old equipment which needed replacing, plus open comments indicated that about 14-16% of the businesses were at least partial free riders. Sixteen percent of the Grande Cache business control group noted that they were undergoing energy efficiency retrofits on their own supporting the conclusions from the participant survey. Free ridership, however, was not factored into the savings figures above.[R#18]

MEASURE LIFETIME

Alberta Power did not assign an average measure lifetime for measures installed through JEEP. In order to calculate lifecycle energy savings (and the cost of saved energy in the next section) The Results Center has used an average measure lifetime of five years based on the fact that lighting predominated the measures installed. ■

Cost of the Program

Costs Overview	Planning (x1,000)	Residential Program (x1,000)	Commercial Program (x1,000)	Evaluation (x1,000)	Total Program Cost (x1,000)
1991	$80.8	$0.0	$0.0	$0.0	$80.8
1992	$38.4	$190.6	$0.0	$0.0	$229.1
1993	$0.0	$67.0	$290.9	$18.7	$376.5
1994	$0.0	$0.0	$400.5	$26.3	$426.8
1995	$0.0	$0.0	($17.6)	$0.0	($17.6)
Total	$119.2	$257.6	$673.8	$45.0	$1,095.6

DATA ALERT: The Cost of Saved Energy (¢/kWh) chart assumes levelized cost figures with 30% of the planning and evaluation costs attributed to residential and 70% to commercial.

Alberta Power Limited completed the Jasper Energy Efficiency Project under their projected $1.5 million Canadian (unlevelized) budget spending a total of $1,399,660 Canadian (unlevelized) on the project including extensive evaluations whose costs will be theoretically amortized over a stream of future projects. In addition to APL's project costs, participants contributed $900,000 Canadian (unlevelized) of their own money.

COST COMPONENTS

Of the total spent by APL on JEEP ($1,095,600) $119,200 was spent on the planning of JEEP and $45,000 on the evaluation. The residential segment, including all administrative, marketing, and incentives cost a total of $257,600 ($12,600 beyond the projected budget of $245,000) while the commercial component cost more than twice as much for a total of $691,400. This figure includes approximately $17,600 more for two participating businesses that have not yet paid their portion of the costs, bringing the actual total expenditure down to $673,800, making the commercial component under budget. Overall Alberta Power paid out $517,741 in incentives ($78,899 residential and $438,842 commercial) and spent $459,992 on all other aspects of JEEP.[R#2]

COST PER PARTICIPANT

In addition to APL incentives, JEEP participants spent $630,000 on their energy efficiency retrofits or an average of $800 each with an expected payback of between one and a half to three years for each measure. Alberta Power spent an average of $1,100 per participant. APL's average cost per residential participant was $290; $6,125 per commercial project.[R#2,26]

COST EFFECTIVENESS

Despite its high administrative and marketing costs JEEP was indeed the most cost effective solution for the town of Jasper's capacity situation. At $519/kW saved (approximately $851/kW including customer and Natural Resources Canada expenditures), JEEP compares well with the capital cost of approximately $978/kW for a new generating unit. (JEEP's cost, however, will provide savings for at least five years; the persistence of measures installed after that date and thus the cost of future capacity is still in question.) The residential program was more expensive at $626/kW saved than the commercial segment which cost $487/kW.[R#6,26] ■

COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
Residential	7.41	7.62	7.84	8.05	8.27	8.50	8.72
Commercial	3.19	3.28	3.37	3.47	3.56	3.66	3.76
Total	3.83	3.94	4.05	4.16	4.27	4.39	4.50

CASE STUDY: CHATEAU JASPER - COMMERCIAL

The 119 room, four diamond (the Canadian equivalent of 4 star) hotel, Chateau Jasper, was initially hesitant about participating in JEEP, concerned that energy-efficient products would be ugly and not provide the high quality of lighting and comfort in which the hotel takes pride. The Chateau was convinced to proceed with an audit performed by Action Electrical Limited, one of the four JEEP contractors. The measures recommended as a result of the audit were discussed in great detail and approved by APL, Chateau Jasper, and Action Electrical before work began to ensure it met the hotel's high standards.

To this end, custom oak lighting fixtures were made to fit the decor such as in the hallways and the bathrooms. Originally the bathrooms used three and four-foot bath bars with 6-8, G25 incandescent, 40-watt bulbs. They were replaced with custom four-foot bars utilizing two 32-watt fluorescent lamps instead of the 240-320 watts required for the old configuration. The fluorescents dramatically improved the lighting levels as well as emitting a softer, warmer light which made the guests feel and look better. The new custom oak hallway fixtures replaced two 60-watt incandescent bulbs with single 13-watt compact fluorescents which actually raised the lighting levels due to the old fixtures' design which had trapped light.

Other measures undertaken included replacing the electric dishwasher booster heater with a natural gas model that only operates when the kitchen is in use. The staff residence got new exit lighting, replacing 15-watt incandescents with 7-watt compact fluorescent lamps, while 60-watt globe fixtures in hallways and common areas were changed to 13-watt and 15-watt compact fluorescent lamps respectively. The Beauvillon dining room, however, was not retrofitted because it has an exterior glass wall causing lighting levels to vary significantly during the day. As it was felt there was no reliable dimmer switch technology for energy-efficient lighting, this room was not retrofitted.

The projected monthly bill savings for July - November of 1994 at the Chateau were $1,216.22 and the actual savings were $1,196.26. These bill savings resulted despite the fact that the Chateau installed 16, new 2 kW air conditioners after the retrofit was complete in May of 1994. The monthly energy savings were 34,614 kWh with a demand savings of 98.47 kW. The total cost of the retrofit was $64,166, minus the APL incentive of $28,478 making the total cost to Chateau Jasper $35,688 with a projected payback of 2.4 years.

General Manager Malcom Anderson is pleased with the retrofit indicating that the money and energy savings have been significant and the guest response positive. Furthermore, the retrofit is expected to cut maintenance costs as compact fluorescents are expected to last 10,000 hours as opposed to incandescent lamps' expected lifetime of 1,000 hours.[R#27]

CASE STUDY: THE BERGERON/TETREAULT RESIDENCE

Daniel Bergeron and Diane Tetreault own a mobile home in Jasper and participated in the JEEP residential program. At the time of the JEEP team home visit it was recommended that they install eight compact fluorescent lamps, change from an electric to a gas water heater, have an energy-efficient, block-heater cord put in their vehicle, and use an electrical timer for their outdoor Christmas lights.

They replaced their 100-watt and 60-watt incandescent lamps with 23-watt and 15-watt compact fluorescents respectively and had an efficient block-heater cord installed that is only activated when the outdoor temperatures reach below 19^0 Fahrenheit. Their home was the first in Jasper to convert from an electric hot water heater to gas through JEEP. A 40-gallon natural gas water heater replaced the older 25-gallon electric water tank. The electrical demand for hot water had been 1.5 kW.

The total retrofit costs were $560 of which JEEP incentives paid $385. Household electricity consumption dropped dramatically from January of 1993 when consumption was 1,349 kWh, to a post-retrofit level of 489 kWh in February, the following month. The electricity bill reduction was comparable, plunging from $76.46 in January to $31.97 in February. On the other hand, their natural gas consumption increased by more than $8/month, resulting in a net monthly benefit of nearly $40. Furthermore, the quality of lighting in their trailer remained the same and they now report plenty of hot water![R#27]

Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON: 6,321,000 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%	13,628,000	323,000	65,000	7,000
B	10,000	1.20%	14,532,000	125,000	42,000	31,000
	Controlled Emissions					
A	9,400	2.50%	13,628,000	32,000	65,000	1,000
B	10,000	1.20%	14,532,000	13,000	42,000	2,000
C	10,000		14,532,000	83,000	42,000	2,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	14,532,000	38,000	21,000	10,000
B	9,400	2.50%	13,628,000	32,000	26,000	2,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	14,532,000	26,000	4,000	10,000
B	9,010		13,072,000	9,000	3,000	1,000
Gas	**Steam**					
A	10,400		7,927,000	0	18,000	0
B	9,224		6,884,000	0	43,000	2,000
	Combined Cycle					
1. Existing	9,000		6,884,000	0	26,000	0
2. NSPS*	9,000		6,884,000	0	13,000	0
3. BACT*	9,000		6,884,000	0	2,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	11,473,000	174,000	21,000	19,000
B	10,400	2.20%	12,168,000	172,000	26,000	13,000
C	10,400	1.00%	12,168,000	25,000	21,000	7,000
D	10,400	0.50%	12,168,000	72,000	26,000	4,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	15,227,000	30,000	47,000	3,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	18,078,000	47,000	61,000	14,000

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 accomanying page is to allow any user of this profile to apply Alberta Power Limited's level of avoided emissions saved through its Jasper Energy Efficiency Project 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.

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. ■

*** Acronyms used in the table**

TSP = Total Suspended Particulates
NSPS = New Source Performance Standards
BACT = Best Available Control Technology

LESSONS LEARNED

Fundamentally JEEP was a success as it exceeded its demand reduction goal of 2 MW. At a utility cost of $519 per kW saved, the program was a cost-effective solution for the short-term deferral of traditional supply-side options with an average construction cost of $978/kW and because remote diesel plants cost 17¢/kWh or more in fuel alone to operate.[R#4]

With a 75% participation rate goal, JEEP obtained a 67% participation rate overall. Yet it is hard to view this shortfall as any sort of failure as the savings per participant were greater than expected and JEEP exceeded its demand reduction goal, the primary focus of the program. Perhaps one lesson here is that the demand reduction goal was easily met with a 18% smaller participation. Part of the reason for the shortfall was timing. Not enough time was allowed to fulfill the 75% participation goal. The residential program achieved the 70% participation rate only by running three months overtime due to customer demand. Greater participation was possible, yet considered unnecessary.

One of the chief lessons learned in Jasper is that APL's billing system must be modified to allow participants to see their actual monetary and energy savings. If the more expensive compact fluorescent lamp doesn't apparently save energy and/or money, then from a customer perspective the point of energy efficiency investments is moot. Due to APL's current residential billing system (2 months actual/estimated cycle), which reflects the customer's previous annual consumption and not any new energy efficiency measures, less than 33% of participants noticed a reduction on their power bill. Furthermore, over 30% of Jasper is involved in the equalized monthly payment plan. Many customers therefore did not see an immediate bill reduction which created some concern.

The overwhelming majority of residential and commercial participants were very satisfied with the implementation and the results of JEEP. APL learned that customers are willing to fully partake in an energy-efficiency program if a credible firm is implementing the measures, price is not a barrier, technical details are simplified, and the implementation of the measures is hassle-free, especially regarding product selection. The main reason for participation in JEEP was to save money, followed by environmental concerns, and supporting the community.

Key elements of the success in Jasper included a Public Information Committee to guide the program and hiring locally as much as possible to implement the project. Both helped to garner support and tailor the project to fit the needs of the community. A strong educational component was seen as vital to encourage persistence of savings and lessen resistance to the program. Working closely with the local media for visibility and positive press was also important, as was using a local supplier for energy-efficiency products to ensure their continued availability after JEEP was complete. Perhaps most important was the basic project design that provided participants with a turn-key operation that was hassle-free, all facilitated by having the project coordinator located in town.

It took APL a long time to decide to go-ahead with JEEP. Once this decision was made, the program delivery was begun before all its elements had been defined causing delays as these details were sorted during the process. Some of the financing elements were not worked out until well into the program. At first APL offered to finance retrofit loans for commercial customers and then withdrew the offer. This may have contributed to the lower than projected participation rates. The contracts with the auditor/installer firms were signed while JEEP was well underway and only minimal training was provided. As a result some of the contractors were not up to expectations both in subject knowledge and customer service causing several poor audits that were not reflective of customer needs, the selection of a few unsatisfactory products (such as some of the electronic ballasts which were actually on the Power Smart Inc. approved product list but performed very poorly in the field), and also contributed to inadequate and slow warranty support in certain cases.[R#30]

It was initially difficult to determine the number of actual Alberta Power customers in Jasper. This was due to the fact that some customers have more than one meter (eg. three

meters in the hardware store), while others have one meter for multiple customers (eg. one meter for the thirty-nine unit Sunwapta Apartments). It was also difficult to identify the person responsible for some commercial concerns, especially for national chains with a branch in Jasper.[R#2]

Since JEEP was a turn-key operation run by Alberta Power, the company became the focal point of the project, and therefore was viewed as responsible for all aspects of the program, even some outside its control. Many people assumed that the products were guaranteed for life or that APL would replace them even if they were damaged. Some residents wanted the utility rather than the retailer to honor the warranty on any defective compact fluorescent lamps. At the conclusion of the commercial program APL sent every participant a letter outlining the warranty and the name of the firm responsible. However in reality many customers continue to contact APL for even the most minute warranty points.[R#30]

Using the local hardware store as a supplier for the energy-efficiency products has worked out well but in the beginning often caused delays as the suppliers could not keep up with the new and overwhelming demand JEEP instigated.

Hiring locally raised a couple of issues. Many more people applied for local JEEP Team and staff positions than there were jobs, causing some hard feelings among those not hired. Also much of the JEEP commercial work was done by Edmonton tradespeople instead of local electricians because the local trades weren't initially willing to commit themselves to carry out the work without interruption due to the fact they are mainly in the service industry. Wilfred Golbeck felt that a greater effort to involve the local tradespeople would have been beneficial.[R#8,30]

On balance the media attention JEEP garnered was a tremendous force in the success of the program. However the press actually became overwhelming on occasion causing time to be taken away from the implementation of JEEP to deal with interviews. Towards the end of the project Alberta Power hired a local resident as communications representative. This made communications easier to implement and also less costly. Before this the communications representative had been in Edmonton and not in Jasper.

On the residential side incentive levels for the energy efficiency products may have been too high (excluding water heaters) as many customers thought the prices were inexpensive. Also some potential savings areas identified in the residential survey were not accurate. For example, the survey results indicated a substantial number of homes with electric space heating. However in checking these conclusions it was determined that many residents mistook their gas-fired, hot-water, radiant heating system for electric.[R#30]

In the commercial arena some projected savings have not been achieved. In one instance this was due to the fact the commercial establishment was so small that it just barely used enough electricity to fulfill its minimum demand charge. Once it had been retrofitted its energy usage went below the minimum and therefore no monetary savings accrued.[R#2,30]

One major threat to the success of a community-based energy efficiency project is a sudden increase in peak demand due to a new customer or an expansion by a current one. For instance, Pacific Gas and Electric implemented the Model Energy Communities program (see Profile #81) or what is commonly called "The Delta Project," a community-based program. The project was conceived to test the opportunity to use DSM as a localized least cost resource, thereby deferring the need for the capital expansion of transmission and distribution systems at the Lone Tree substation. Upon completion of the program the Los Vaqueros pumping station moved into the substation service territory and effectively negated the energy savings acquired by the Delta Project, exacting the substation expansion after all.

In JEEP's case two potential threats appeared. One was Jasper's industrial customer and its proposed pipeline extension. This extension will require an increase in electrical power usage of between .3 MW and .5 MW of peak demand, a sum more than compensated for by the success of JEEP. As of June ☞

1994 the National Energy Board approved the $17.35 million pipeline project which includes $159,000 worth of modification to the Jasper pumping station based on the Trans Mountain's commitment to installing high efficiency motors and variable speed drives at the Jasper Station. The company is also doing energy-efficiency work on company-owned houses and participating in JEEP by having an interruptible rate which means Trans Mountain can be asked to lower its demand for electricity significantly or can be switched off entirely for a period of time. This will provide another 1,000 kW of potential peak demand reduction.[R#7,9]

The other situation is the Jasper Park Lodge's planned expansion to twice its current size. With a peak demand of 1.5 MW, the addition is expected to add another 1.5 MW of demand. Thus between the pipeline project and the possibility of the lodge expansion, within a year of JEEP's completion there is a potential demand increase in Jasper of nearly 2 MW. Due to JEEP, Jasper's peak demand fell to 10.8 MW in 1994, from 11.1 MW in 1993 (when the JEEP residential program was in progress) and 11.9 MW in 1992. With a firm demand capacity of 14.3 MW the additional 2 MW can be accommodated and still maintain a comfortable margin of 1.5 MW, proving the value of JEEP as a community-based energy efficiency project.

Without JEEP, and with these two "wild-card" demand increases, the Palisades generating station would have a margin of only 0.4 MW, if conservatively assuming that peak demand did not increase at all from its 1992 level of 11.9 MW. Thanks to the Jasper Energy Efficiency Project, Jasper has been able to defer the need for additional capacity or connecting to the grid even with the Trans Mountain and Jasper Park Lodge expansions, a truly remarkable accomplishment.[R#2]

TRANSFERABILITY

Community-based energy efficiency programs offer an intriguing set of lessons learned and implementation experiences that cannot be ignored by utility program planners nor by individual communities keen on cutting costs and providing for economic stability and energy sustainability. Community-based programs, which focus intensively on a specific geographic area such as a small to mid-sized community, can provide comprehensive savings with high customer participation rates. For an overview of successful community-based programs see The Results Center Special Report: "Community-Based Energy Efficiency Programs: An Effective DSM Option?" For profiles of specific programs such as the celebrated Hood River Conservation Project please see The Results Center Profile #12, for Osage (IA) Municipal Utility Comprehensive DSM Program Profile #5, the Ontario Hydro, Espanola Profile #16, the Midwest Resources Rock Valley Energy Efficiency Research Project Profile #43, and Pacific Gas & Electric's Model Energy Communities Program Profile #81.

The Jasper Energy Efficiency Project was designed as a pilot and model for APL to explore the viability of a community-based approach to energy efficiency. Therefore transferability was a key issue as much of APL's service territory involves small isolated towns not unlike Jasper. The Results Center has found a series of essential ingredients for community-based success that were integral to JEEP: garnering community input and support, developing a strong educational foundation, providing adequate incentives for customers coupled with turn-key retrofits, getting supplies through the local businesses, hiring locally, and fostering good media relations. ■

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