Ontario Hydro
Espanola Power Savers Project
Profile #16, 1992

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Executive Summary

The Espanola Power Savers Community-Based Conservation Project is a full-scale effort to extract as high as possible a reduction in electricity consumption from a geographically-concentrated area and to research the potential for this type of DSM approach in Ontario. In both the residential and commercial sectors Ontario Hydro's project is being carried out through concentrated marketing, comprehensive energy audits and inspections, and incentives up to the lesser of an efficiency measures' installed costs or its full avoided cost.

One of the most important elements of the Espanola Project is what its managers call its legacy. Key to the project design are means of maintaining the efficiency built into the community, to avoid attrition and "take-back" effects. Hydro believes this requires attitudinal changes and thus the project presents a wealth of approaches to not only implement efficiency in a hurry, but that attempt to capture long-term potentials.

By using the "market saturation" approach in Espanola, the project has already achieved record participation levels in audits with an average of 87% residential and commercial customers participating. Also impressive is the "customer uptake" level, a measure of the accepted measures to the measures recommended by the auditors. Seventy percent (70%) of the kW value of the measures recommended for all homes have been accepted. On average the customer contribution, based on job sites completed as of September 11, 1992, has been $2,260.76 for all-electric homes (Hydro's contribution has been $3,794,35), and $12.98 for non-all-electric homes (Hydro's contribution has been $158.25). The average saving for all-electric homes as of September 11, 1992 was 1.87 kW, and .114 kW for non-all-electric homes.[R#21] As of September 11, 1992 the community had spent $1.3 million on work completed, a remarkable sum for a northern Ontario community of this size.[R#3] Ontario Hydro has recently increased its commitment to the project, from $5.8 million to $9.4 million on the project. This is mainly due to an anticipated increase in customer uptake and an increase in economic measures identified by the auditors. Of this total, $5.9 million will be spent on the program costs (storefront, incentives, audits/inspections, evaluations); and $3.5 million will be spent on research and further evaluation.[R#20]

Espanola is an intriguing case, what many DSM analysts consider to be the most advanced demonstration of its kind since Hood River in 1983. The Results Center in conjunction with Ontario Hydro plans to prepare two profiles of the project. A second profile, slated for late 1993, will present the project's final results and further lessons learned from this cooperative effort in a small northern Ontario community.

Espanola Power Savers Project

Project Members:	Ontario Hydro, Town of Espanola, Espanola Hydro Electric Commission
Sector:	Residential/Commercial
Measures:	Insulation, window and door retrofits, residential and commercial lighting, block heater timers, heating and ventilation, water heater tuneup, air sealing.
Mechanism:	Energy audits performed and comprehensive measures installed as part of community-based conservation research and demonstration project.
History:	Measures installed 1991 and 1992, evaluations to continue through 1995.

Program Data

1st Year Energy savings:	7,424 MWh
Lifecycle energy savings:	259,840 MWh
Capacity savings:	1.759 MW
Total Utility Cost:	$9.383 million
Overall Participation rate:	87% for audits
Customer Uptake of Recommended Measures:	70% for capacity, 72% for energy

Conventions

For the entire 1992 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 International Monetary Fund's International Financial Statistics Yearbook: 1991.

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.

The Espanola Power Savers Project is a working partnership between the Espanola Hydro Electric Commission, the Town of Espanola, and Ontario Hydro. This cooperative approach was formalized through a legal agreement which outlined each party's responsibilities. For example, the marketing and promotion of the project are joint undertakings. The local utility will shoulder any revenue loss impacts that result from the project.[R#5] The Town of Espanola has offered itself as a test bed, and its citizens have given the project their time and attention, not to mention a remarkable amount of financial support.

"**We not only want to learn what energy savings are possible, we want to know what influences people to conserve.**" *Vicky Sharpe, Espanola Project Manager, Ontario Hydro*

ONTARIO HYDRO

Ontario Hydro is a "crown" corporation that was created in 1906 by a special provincial statute and operates under the Power Corporation Act to deliver electricity throughout Ontario. Ontario Hydro, or what is referred to as "Hydro", provides electric service to nearly 3.7 million customers in the province of Ontario. Besides providing electricity directly and through municipal utilities, Hydro provides steam and hot water as primary products and also has a regulatory role for Ontario's municipal utilities. In conjunction with the Canadian Standards Association, Ontario Hydro is responsible for inspecting and approving electrical equipment and wiring province-wide.

Hydro operates 81 hydroelectric, nuclear, and fossil-fueled generating stations, as well as a major transmission system. Just over half of Ontario Hydro's power generation, in terms of energy, is from nuclear generation (50.8%). Other power sources in 1991 were hydroelectric (24.4%), fossil fuel (21.6%), purchases (1.7%) and non-utility generation (1.5%). In 1991 the utility had a generating capability of 32,333 MW, over 35,000 employees, and had gross revenues of over $5.97 billion.[R#1]

In 1991, Hydro supplied a total of 139.1 million MWh including purchased power, a 1.3% increase over 1990 levels. (The recession in Ontario, as well as DSM initiatives, has slowed load growth.) Sales were made to three types of customers: municipal utilities, rural retail customers, and direct industrial customers. Revenues from each primary class are as follows: $4.074 billion from municipal utilities (70%), $1.168 billion from rural retail customers (19%), and $678 million from direct industrial customers (11%).[R#1]

Ontario Hydro's average rate for all customers in 1991 was 5.12 cents/kilowatt-hour. In 1992 an 11.6% rate increase went into effect at Ontario Hydro. This was not the first double-digit rate increase that the utility has experienced. In the mid-1970s customers' rates increased by double-digit percentages three times (up to 31%) as significant new blocks of generating capacity went into service.[R#1,15]

ESPANOLA HYDRO

In 1990, the Espanola Hydro Electric Commission provided electricity to 2,298 customers, 88% of which are residential, and 12% of which are commercial and industrial. Total energy purchases in 1990 were 49,067,095 kWh, 59% was bought by residential customers and 41% by commercial customers. The only industrial customer in the town is the E.B. Eddy Pulp and Paper Mill which is a direct customer of Ontario Hydro and is not participating in the project. (E.B. Eddy currently employs 31% of the town's work force, or about 719 of the total employed work force.)[R#17, 21]

THE TOWN OF ESPANOLA

Espanola is located about 43 miles (70 km) southwest of Sudbury, in Northeastern Ontario, about 300 miles (500 km) north of Toronto. It is governed by a Town Council, composed of a mayor and six councillors elected for three year terms. The total population of Espanola, as of the last Census in 1986, is 5,490. (Total population, as of the 1990 Census, is 5,312.) There are 1,910 households and dwellings in town, and 235 commercial buildings. The town is served by one weekly newspaper, one radio station, and a cable TV station. Community services include a hospital, five elementary schools, a secondary school, two separate schools, an arena, a ski club, a golf and country club, a police station, fire station, ambulance service, and a public library.[R#17]

The recommended community, Espanola, was selected on demographic and budgetary criteria, and was contingent on the acceptance by the municipality and the local utility. Civic pride and an interest in conservation were illustrated by the fact that the Espanola municipal utility was one of the first to sign up for Ontario Hydro's energy-efficient streetlighting campaign.

ONTARIO HYDRO 1991 STATISTICS

Number of Customers	3,696,000	
Energy Sales	136,966	GWh
Energy Sales Revenue	$5.97	billion
Winter Peak Demand	22,933	MW
Generating Capacity	28,896	MW
Reserve Margin	26	%
Average Electric Rates		
Residential	6.05	¢/kWh
Farm	6.14	¢/kWh
Commercial/Industrial	4.75	¢/kWh

[R#1]

Utility DSM Overview

In December 1989, Ontario Hydro released an impressive set of documents that set out the giant utility's resource acquisition plan for the next twenty-five years. The plan, titled, The Balance of Power: Demand/Supply Plan Report, relied on a mix of energy efficiency programs, non-utility generation, increasing the efficiency of the utility's transmission and distribution system, and massive power plant construction, in fact potentially the construction of 10 additional nuclear reactors and 36 combustion gas turbines. The plan also called for highly controversial hydroelectric plant construction on the northern rivers that feed into the James Bay. In terms of demand-side management, The Balance of Power called for 3,000 MW of DSM savings by 1999 and for 5,400 MW by the year 2014.

Then in a dramatic change of plans spurred by changes in the provincial government, which called for a moratorium on nuclear construction, and by reduced demand growth for electricity in the province, Ontario Hydro released an updated 25-year Demand/Supply Plan, a simple ~25-page document in January of 1992. A number of changes led Ontario Hydro to update the plan: 1) A short term forecast of slower economic growth in the Province's demand for electricity. 2) Increased expectations for demand side management and increased contributions from non-utility generators. 3) A greater confidence in Hydro's ability to extend the life of existing fossil stations. 4) Suspension of planning for about 1,500 MW of hydroelectric potential in the Moose River Basin on the south shores of the James Bay to reflect the need for coplanning with aboriginal people.[R#15]

The Plan update marked a major turning point in Hydro's operations and plans. Now the utility will defer power plant construction by at least 7 years resulting in capital expenditures on the order of $7.5 billion less than originally projected between now and the year 2011.

A March 1992 report states the utility's commitment to make its demand side management plan, "the most comprehensive and ambitious in North America."[R#11] Through a combination of efficiency, fuel switching, peak load shifting and load management programs, the utility expects to save 5,200 MW by the year 2000. Furthermore, due to the initial success of its DSM initiatives, the company has upwardly revised its projections for energy savings to 9,600 MW by the year 2014, compared to the 5,570 MW estimated in the 1989 Demand/Supply Plan.

Utility DSM Overview	Annual DSM Expenditure (x1000)	Customer Impact (MW)	Net System Impact (MW)
1989	$55,639	100	87
1990	$87,761	203	133
1991	$149,327	250	200

[R#11,21]

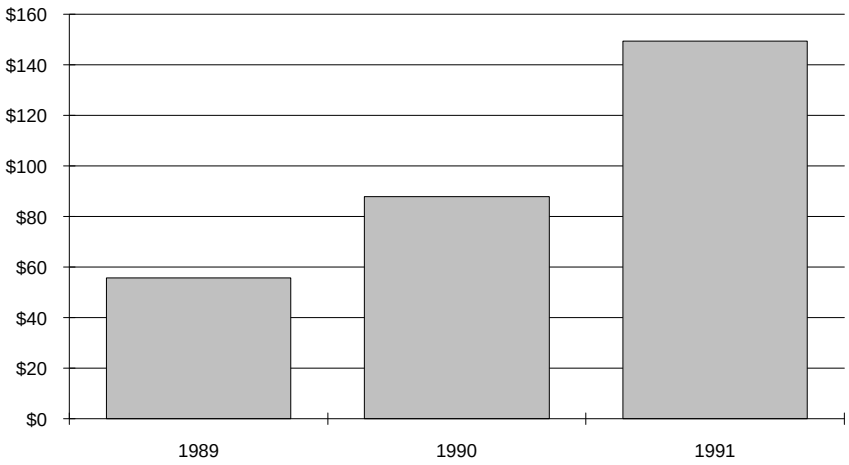
"**For the rest of this decade, Ontario Hydro's primary tool for meeting Ontario's electricity needs will be through demand-side management. Hydro will be spending $5 billion C to reduce demand by over 5,000 MW. This is nearly 16% of our peak capacity by the year 2000 and as such puts Ontario Hydro at the forefront of DSM targets in North America.**" *Marc Eliesen, Chair, Ontario Hydro*

CURRENT DSM PROGRAMS

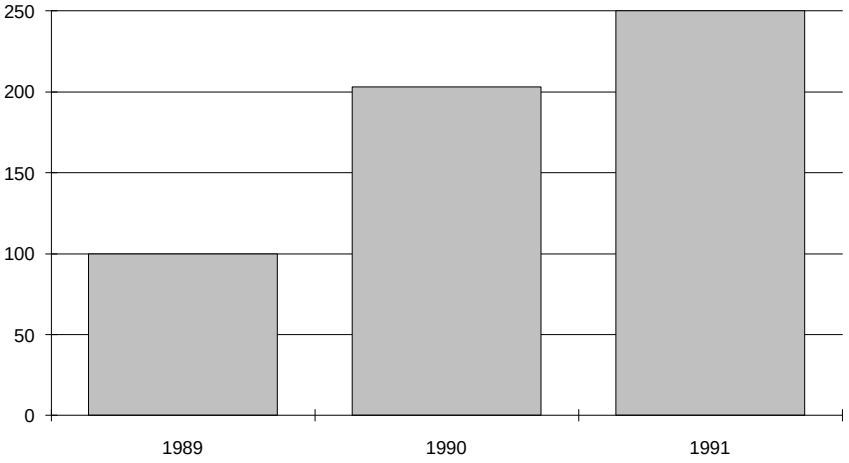
Ontario Hydro now has over 40 DSM programs and projects aimed at commercial, industrial, residential, and agricultural customers. Most of these programs are marketed under the name "Power Saver." Ontario Hydro offers an extensive audit program for each customer type, including free consultation audits for industrial customers, and large farm audits for agricultural customers who could benefit from specialized analysis of their processes.

Ontario Hydro's commercial and industrial customers are provided with numerous opportunities for energy efficiency, including lighting programs with both menu-type rebates and customized incentives, and a high efficiency motors rebate program. Ontario Hydro has several cooperative efforts designed to help commercial and industrial customers implement energy-efficient measures. Through the Guaranteed Energy Performance Program, energy service companies provide cost-free retrofits and recover costs and profits through the resulting energy savings. A Business Finance Plan (Enermark) allows customers to apply retrofit incentives toward the interest payments on certain bank loans, resulting in reduced interest loans. For residential customers a number of incentive-based programs exist, including a compact fluorescent coupon program, window incentives, and heat pump rebates.

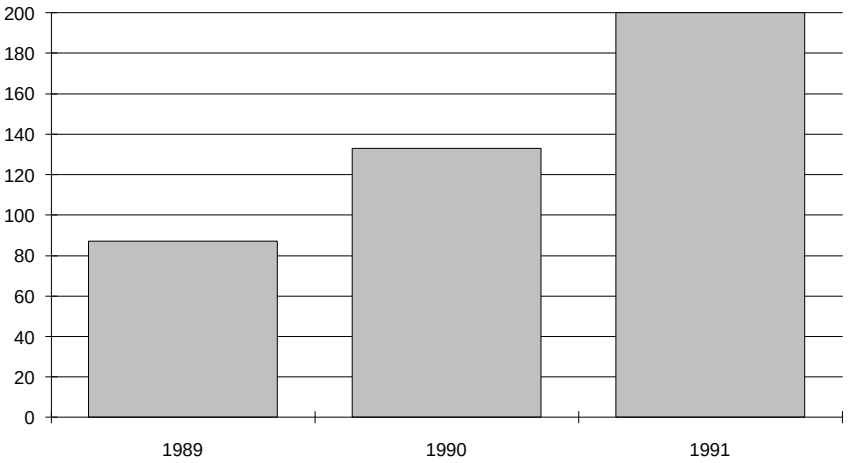
ANNUAL DSM EXPENDITURE ($1,000,000)



ANNUAL CUSTOMER IMPACT (MW)



ANNUAL NET SYSTEM IMPACT (MW)



SELECT ONTARIO HYDRO DSM PROGRAMS/PROJECTS

Commercial & Industrial
- Energy-Efficient Lighting
- High Efficiency Motors
- Guaranteed Energy Performance
- Business Finance Plan

Industrial
- Power Saver Audits
- Accelerated Paybacks
- Load Shifting
- Performance Optimization
- Feasibility Studies/Consultant Audits
- Compressed Air

Commercial
- Savings by Design
- Occupancy Sensors
- New Building Construction
- Street Smart Lighting
- Non-Profit Housing
- Multi-Residential Individual Metering
- Feasibility Assistance Plan
- Espanola Power Savers Research Project

Residential & Agricultural
- Home Power Savers
- Heat Pump Incentives
- R-2000 Homes
- Window Incentives
- Lower Wattage Incandescent Bulbs
- Compact Fluorescent Rebates
- Halogen Rebates
- Outdoor Timer
- Refrigerator Rebate
- Milk Heat Reclaimer
- **Espanola Power Savers Research Project**

In 1991, Hydro invested almost $150 million in DSM. Of that approximately $40 million was paid directly to customers for energy efficiency measures. Customer energy services advisors and energy management representatives worked with end users to spur 250 MW of customer savings for the year. Programs completed in 1991 resulted in savings of $23 million off customer's annual energy bills.[R#1]

Ontario Hydro sets its long term DSM targets and reports its overall DSM results in terms of what it calls the "net impact." The assessment of net impact on the system accounts for coincidence and diversity of the saved load, and also the forecast of when any efficiency improvements might have happened naturally, in the absence of utility demand management programs.

Hydro's net impact for DSM is based on its 16-hour winter peak. Thus, for example, if an efficiency measure records savings of 100 kW for 12 hours a day, then the net impact of the measures would be 75 kW, because the measure only was responsible for savings 75% of the 16-hour winter peak.

Program Overview

The Espanola Power Savers Project is a community-based conservation project that has four primary objectives. 1) To assess the community-based delivery concept as an additional, aggressive approach to DSM marketing. 2) To determine the maximum attainable megawatt savings through the installation of cost effective retrofit and replacement measures, in the shortest timeframe. 3) To assess the transferability of the community-based delivery concept to the province. 4) To collect and evaluate data to augment existing residential and commercial databases.

Espanola, with a population of about 5,400, was chosen for a variety of reasons as a test bed for the project. The town has a municipal utility, is geographically delimited, and has a fairly diverse but relatively stable economy. Of the 1,600 residences, about 45% or 720 homes, are electrically heated. Additionally, it was quite clear that the citizens of Espanola would be receptive to a community-wide conservation program, and this has been proven correct.[R#7,21]

The project is being pursued in the framework of a partnership among Ontario Hydro, Espanola Hydro (the municipal utility), and the Town of Espanola. A detailed marketing plan has been developed which emphasizes cultivation of community interest and support. To this end, a community advisory committee was formed to provide input regarding successful promotional activities and to act as a forum through which feedback from the community could be directed.

"**The goal of the Espanola Power Savers Project is to obtain the most comprehensive energy conservation coverage of any community in Canada. It will achieve this goal in two ways. First, by completing an energy retrofit of every building in the town over an 18-month period. Secondly, by attempting to achieve a "culture shift" to wise electricity use to sustain those energy savings over the long term.**"
Vicky Sharpe, Espanola Project Manager, Ontario Hydro

Espanola is Ontario Hydro's first pilot project to demonstrate the community-based conservation concept as a comprehensive, efficient, and effective "fast-track" delivery mechanism for DSM. The pilot contains high levels of personal contact, and high incentive levels, in both the residential and commercial sectors. Engineering estimates indicate that the project will reduce the peak demand by more than 2 megawatts over 2 years, or 20% of the town's current peak demand.[R#5]

A key research objective of the project is to determine the maximum savings achievable from the installation of cost-effective retrofit and renovation measures.[R#9] One of the important elements of the Espanola Project is its "legacy". Integral to the project design are means of maintaining the energy efficiency built into the community in the short term to avoid "take-back" effects after the project is completed. For example, by saturating a specific geographic area, attracting high levels of interest and participation, encouraging community leaders to champion the project and by leaving the knowledge and skills within the community to promote sustained, wise energy use, Hydro believes it can increase the profitability of a long-term "culture shift". The challenge is to motivate all residents in the town to change attitudes and make energy-saving behavior a habit. Ultimately, this culture shift will be the true test of Hydro's success.

Ontario Hydro retained H. Gil Peach and Associates to produce a project design plan/report which was completed in October 1990. Executive approval to move forward with the project was given in December 1990. At that point Hydro and project staff embarked on an implementation process of refining the project and external consultants assisted in this process. Ontario Hydro launched the Espanola Power Savers Project and it became operational in June of 1991. The project's operations are scheduled to be completed in December 1992. An interim report is to be issued in January, 1993, with a final report to be issued by July 1993. Monitoring will continue until 1995.

MARKETING

A key to the success of the Espanola Project to date has been the high level of participation of the community from the outset. While leaving the legacy of knowledge, skills, and support for energy efficiency in the community to assure persistence in savings may be the most important aspect of the project, marketing the program to the community, and getting the community's total support for the project has been critical. Hydro has been highly successful with this aspect of the program and is hopeful that the community will continue to champion the effort long after the demonstration and its evaluations are complete.[R#15]

It was recognized in the concept stage that the project must have grass-roots, community-based credibility and support. Akin to "community campaigning," Hydro has used a wealth of public involvement mechanisms. Perhaps the most important has been the Community Advisory Committee. The objectives of the Committee are, first, to increase awareness, acceptance, and support of the project to achieve an 80% participation level. Second, to provide opportunities for community representatives to guide the design and delivery of the project. Third, to assist the community in making a culture shift to wise electricity use for long term savings. Fourth, to work closely with project partners. Fifth, to strive to meet resource requirements from within the community to enhance local awareness and benefit. Sixth, to instill a sense of pride and accomplishment in project participants that could provide a model for such programs in other parts of the province.[R#5]

The Community Advisory Committee is one of the cornerstones of the marketing/communications strategy in Espanola. It initially consisted of about 30 representatives from a cross section of groups and organizations within the town including the Student Council, Chamber of Commerce, Senior Citizens, and the Lions Club. Membership includes club chairpersons, local business owners, teachers, news and media people, as well as representatives from town council and the utility. The Committee was organized prior to the formal launch of the project and provides direct community feedback to the project team in the field. Feedback on such issues as scheduling, inspections, and contractor performance have all resulted in direct improvements to project delivery.[R#15]

The project team in Espanola has found that the Committee's members "open doors" for project activities in a variety of ways. The Committee has been instrumental in tasks ranging from increasing the comfort levels of seniors participating in the project, to scheduling presentations to various community groups and clubs. The Committee also helped to organize an energy saving tip contest, assisted in producing a newsletter, and helped to establish a recycling/reuse depot for project materials.[R#15] Subcommittees were formed to organize events such as Opening Ceremonies Community Picnic, Project Signage, Energy Conservation Week, and to set up an Energy Conservation Corner in the local library. One subcommittee was responsible for launching of the conservation theme at the schools.

"**I think we can achieve a culture shift, especially if we work through our youth. Children are much more aware of environmental problems. In elementary and high schools, kids have a real commitment toward conservation, unlike adults who may feel that enough is already being done.**" *Arlene Oderkirk, Advisory Committee Chair (Grade 2 Teacher), Espanola*

At the first community advisory meeting, participants decided that the project needed a logo, something the local community could relate to. The next morning a logo contest was announced on the local radio station. Within two weeks 58 logos had been submitted! The winning logo now appears on all print communication, stationary, uniforms, and giveaways.

In partnership with the Espanola School Board, Espanola Hydro, the Espanola Lions Club, and the Town of Espanola, Ontario Hydro has supported an innovative educational component in the project that is currently reaching 53 classrooms from grades one through six. The Energy Conservation Education Program is a $4,180 program; an "Energy Literacy Series" developed by the Society of Environment and Energy Development Studies (SEEDS), and is designed to help students develop an awareness of all forms of energy and their relationship to the environment. The materials consist of teachers' guides, each of which contains lesson plans and activity sheets, 30 reusable student booklets, as well as cassette tapes and filmstrips. SEEDS teaches children about the value of energy conservation so that they can continue to champion conservation after the project is completed, and motivates children who, in turn, have a positive influence on their parents.

"**The project has been a boon to the community. As you go about town you can see the cosmetic changes to the homes, the modernization of many.**" *Mayor Ron Hagan, Town of Espanola*

Customer information kits were produced to raise awareness and describe the purpose of the project. The kits contain information ranging from how to use electricity wisely, to descriptions of energy-efficient technologies, to conservation measures and incentive levels available through the project. The kit provides

a series of pamphlets, for example, "Humidity and Fresh Air in the Home"; "Energy Saving Tips"; "Choosing and Using Energy-Efficient Appliances"; and "How to Manage Your Electricity Bill".

The project's newsletter, The Espanola "Power Saver" News, has been an important tool for keeping the community informed of the progress and results of the project and has been particularly helpful for airing and addressing periodic issues that have arisen. For example, the newsletter tackled the reasoning behind the sliding-scale for customer contributions for low-E windows. The newsletter also helped gain customer acceptance for the fact that customers must pay for preparatory or "barrier work," the non-energy saving work required before efficiency measures can be installed, such as moving pipes out from basement walls prior to insulation.

Working with the local media has been another key to the Espanola marketing strategy. Radio stations have conducted interviews and have raised awareness of promotional events. The local newspaper, The Mid-North Monitor, runs an "energy tip of the month." The newspaper also ran an article on the audit process and interviewed pleased homeowners, which favorably impressed the community.

Marketing efforts included establishing a kiosk at a local mall and renting an information booth at the popular Sportsmen Show, and last but certainly not least, signage at the entrance to town showing the progress of the project. A phrase heard often around the Espanola Power Savers office is "keeping it local." Whether it be working with the local media or participating in local Chamber of Commerce events, field staff take advantage of opportunities to work within community networks to promote the project and its goals. [R#15]

DELIVERY: THE STEP BY STEP PROCESS

The signup process started early when interested citizens in Espanola "flooded" an ad hoc information booth set up days after the project was announced in January, 1991. They wanted more information and many were ready to participate. Hydro officials quickly responded by having these "early adopters" sign a log. They were told that Hydro would not forget them and that they would be recontacted as soon as the project got under way. [R#10]

Later the community residents were able to sign-up at the Sportsmen's Show, at the municipal utility's office, and at the project storefront. By the time the project formally began, nearly half of all the homes and businesses in town were signed up! Customers could also sign up for audits at informational evening meetings, the Monday "sign-up nights" in particular. Once a customer signs up to participate the following process begins:

> RADON TESTING: An important element of the project is the intent to conduct before and after radon tests on all-electric residential buildings receiving treatment. Ontario Hydro performed radon tests for all homes with electric space and water heating. These all-electric homes were tested using a short-term (48-hour minimum) test. If a home was found to have a high radon reading – defined as greater than 15 picocuries per litre (the Canadian standard is 22 pci/l), a long-term, six-month test was conducted. If the reading still exceeded the 15 pci/l level, the homeowner had to carry out radon "mitigation measures" to reduce the radon reading to an acceptable level. When the work is completed, the "after" radon reading is taken.

1. Energy Auditing: The audits are conducted by a two-person team made up of a qualified energy auditor and a representative of the general contractor. The auditor is responsible for introducing the Espanola Project goals and potential benefits to each house or building owner. In many cases the auditor will be the first face-to-face contact that residents will have with the project. The audit is designed to identify the most complete set of energy conservation upgrades that will result in the greatest electricity energy and demand savings.

Different audit forms are used for all-electric vs. non-all-electric buildings. The first audits were of non-all-electric homes. Hydro thought this would be a good way to get the contractors' "feet wet," and to relatively quickly address the non-all-electric building stock that did not require extensive shell improvements.

The all-electric audits are based upon a "whole-house approach," a full inspection of the building shell and the use of the space. The auditor checks for proper ventilation to meet Ontario Building Code requirements and for moisture problems (see Lessons Learned). Working together, the auditor and contractor's representative measure all windows, doors, and insulation levels, etc. which are eligible for retrofit or replacement. The auditor then makes a comprehensive list of recommended measures.

2. Signing the Contract: Under the original project design, the intent was to move the customer towards a decision (i.e. a signed contract) in the shortest possible time. A contractor's representative accompanies the auditor to the home to conduct the audit. At the completion of the audit, the auditor presents a set of recommendations of applicable energy saving measures to the customer. The contractor's representative then provides to the customer a quotation with both utility and customer contribution presented for all the measures recommended, plus any prepara-

tory work required before the installation of the measures. The representative is responsible to sign up the customer for all the work the customer eventually agrees to have done. As a "closer," the representative offers the optional Enermark/Power Savers Finance Plan. (This plan allows the customer to participate with no up-front costs.)

The initial expectation was that decision-making would proceed quickly and smoothly (one to two weeks). However, customers generally wanted more time to reflect on the proposed work order – especially where they would incur a significant portion of the cost. Initially, numerous visits by the contractor's representatives to the customers' premises were made. This approach did not prove effective, in part because the customers had further questions about measures. As a result, multiple sales visits were discontinued, and the onus for additional contact and follow up – and signup – was placed on the customer. In addition to regular office hours, Monday night signups at the project office were established. When ready to proceed, the customer would stop by the general contractor's office where an agreement form is signed.

3. Installing the measures: A general contractor, responsible for handling all the project's installations, was selected by Hydro through a competitive bid process that delineated the unit costs of specific retrofit measures. The general contractor, Acme Building and Construction Limited of Sudbury, Ontario, in turn, subcontracts to local and regional contractors. The contractor's tasks include coordinating and scheduling subtrades and assuring installations meet project specifications.

Installation of energy-efficient measures is conducted by qualified contractors. All tradespersons that work on the installations are certified by Ontario Hydro and the National Energy Conservation Association (NECA) to assure proper workmanship and on the job training is carried out daily to ensure quality workmanship. Furthermore, all work is covered by the Homeowners Warranty for Energy Renovations Act as set up by the Energy Conservation Contractors Warranty Corporation.

4. Inspecting the work: After the completion of the retrofits all major work was to have one final inspection. Very early in the project it was evident that this was not adequate. Therefore, a 7-point interim inspection process was designed in order to ensure long term energy savings for the customer and Ontario Hydro. The interim inspections are carried out by a qualified building science professional on the project team. The final inspection is carried out by Warnock, Hersey Professional Services who provide both the audit and inspection functions.

The inspector checks that each measure has been installed to specifications, that the cost of the package of measures is consistent with the quoted figure, and that any additional costs for extras and contingencies are reasonable. The inspector must also make sure that the owner is satisfied with the contractor's work and conduct. The auditor then completes a final inspection form. Immediately after work has been completed and inspected, a letter is sent to the homeowner or business owner, with a certificate of participation in the project, and a survey card. The card is used to solicit the customer's opinion of how well services were provided and to ensure that all work completed was to his/her satisfaction. To date, over 300 of these survey cards have been received, representing a 40% response rate.

When an installation has passed both inspections the customer signs a release form that allows Hydro to pay the general contractor for the work. Deficiencies spotted in either inspection are handled using a notice sent to the general contractor. "Major deficiencies" that are expected to result in losses of savings must be corrected by the general contractor before the customer signs the release form authorizing Hydro's payment. A re-inspection is required when a major deficiency is noted. Minor deficiencies are cosmetic in nature only and do not hold up the release form for Hydro's payment. In this case the general contractor has to satisfy the customer before the customer is required to pay his or her portion of the bill.[R#19]

MEASURES OFFERED/INSTALLED

All program participants are entitled to the free measures such as energy-efficient light bulbs, block heater timers, and hot water heater tuneups (including blankets for electric hot water heaters, pipe wrap, energy saving showerheads, tap aerators). Other measures on the list below are cost effective only in certain applications and this determines the customer's contribution and the respective utility incentive level. The all-electric customers are eligible for the most thorough treatments.

WATER HEATER TUNE-UP

- water heater blanket
- hot water pipe insulation
- energy-efficient showerheads
- water aerators
- water heater thermostat reset

CAR HEATERS

- block heater timers

BUILDING ENVELOPE

- air-sealing measures

INSULATION

- R20, R30, R40, R50 blown cellulose in attics
- 4" blown cellulose insulation, wall cavity
- R20, R30 blown cellulose insulation, floor and roof
- R20 spray polyurethane insulation, roof
- R20 spray polyurethane insulation, exposed wall cavity
- R20 spray polyurethane insulation, basement, crawlspace

- R20 batt insulation with framing to basement wall
- R10 rigid insulation in basement, crawlspace
- R10 rigid insulation to exposed floors

DOORS AND WINDOWS

- low-E windows
- insulated steel doors

EFFICIENT HEATING SYSTEMS

- dual fuel heat pump
- air source heat pump
- horizontal ground source heat pump

LIGHTING

- compact fluorescent light bulbs
- reduced wattage incandescent lightbulbs
- energy-efficient fluorescent lamps
- par halogen lamps

STAFFING REQUIREMENTS

All staff numbers shown below are expressed as full-time equivalents. Subtrades are usually made up of two-member crews that have specific tasks to complete. The numbers reflect individual workers, not crews.[R#10]

FULL-TIME EQUIVALENTS:	
Ontario Hydro head office staff:	6
Ontario Hydro field office staff:	7
subtotal	13
CREWS:	
Windows, siding, and doors:	32
Basements:	6
Clean-up, maintanance., quality control, adjustments:	4
Plumbing:	2
Electrical:	4
Air sealing:	2
Attic Insulation:	4
subtotal	65
OTHER	
Contractor Trainer/Inspector	1
Acme (general contractors)*:	11
Warnock, Hersey (auditors/inspectors):	4
Espanola Hydro:	0.5
Grand total	94.5 FTE

* Wayne Ruhnke, Deputy Project Leader, notes that the general contractor at the time of this writing (July/August 1992) has on the order of 65 employees. This will likely be increased to 75 to finalize installations on-time by December. Espanola Hydro estimates that one-half fulltime equivalent staff is designated to the project.[R#10]

TRAINING

When Hydro's project team first moved into Espanola in April, 1991, they shared offices with Espanola Hydro. On June 3, 1991 they moved to their own storefront office. Next door to the storefront was an old stucco house that was slated to be torn down. Hydro negotiated with the owner to leave it there until the completion of the project and to allow Hydro to use it for training sessions and retrofit and renovation demonstrations for local and other trades. All training of the trades was the responsibility of the general contractor. Ontario Hydro acted as a facilitator to effect the training. All subcontractors used by the general contractor were required to obtain the National Energy Conservation Association (NECA) certification. The community college provided the facilities and instructor(s), and NECA provided the training materials. Contractor training seminars held at night were regarded as one of the keys to their accreditation. The subtrades learned a variety of techniques, including how to properly apply one- and two-stage caulks, to install replacement windows, apply sidewall insulation, etc.

By hiring local subtrades, the project has effectively leveraged further community involvement. Wherever the local subcontractor's bid pricing and experience were at least equal to those of a competitor, they were awarded the work. The result has been about a 50/50 split between local and regional contractors. The project has also given a boost to private sector companies marketing conservation products and services.

PROGRAM TRACKING

A computer software program was developed for the project called the Community-Based Conservation System (CBCS). CBCS helps administer the project in three ways. First, it allows data entry of customer and vendor information, work orders, and supplemental data. Second through standard reports and ad hoc reporting capabilities it assists project management to monitor the status of work performed for the customer, and it allows for scheduling work activities. Finally, it helps to track and evaluate costs and energy savings as well as other key parameters such as participation.

SELECTING ESPANOLA

Ontario Hydro was careful in the selection of Espanola as the test site for its community demonstration and utility research project. The community had to meet a number of selection criteria. First, a population of between 1,000 and 20,000, preferably less than 10,000. Second geographic isolation from southern urban markets, but a relatively stable economy. Third, demographic similarity to the "average" provincial community in the same population range (i.e. in terms of housing, building type, population, and income mix). Fourth, the presence of a municipal utility. Fifth, the willingness of both the town and local utility to participate. Sixth, maximum opportunity to deliver energy savings (MWs) at a budget of about $5.8 million within 24 months. Seventh, a high percentage of electrically-heated homes and businesses, but also a mix of fuel sources. Eighth, both residential and commercial customers. Ninth, the opportunity to employ local resources. Out of an initial screening of 99 towns, 40 towns were assessed and Espanola was chosen.[R#21]

In addition to collecting and analyzing traditional demographic data, the assessment of Espanola, like the other towns assessed, attempted to discover the formal and informal networks and power structures within the community. Key variables included local socioeconomic characteristics, community beliefs and attitudes, government structures, the employment base, community facilities and services, the types of retail businesses, community groups and organizations, and the local media and the significant local issues.[R#5]

A customer attitude survey was conducted in Espanola prior to the project to provide a baseline for research and evaluation purposes. The same survey was conducted in a similar reference community where no specialized conservation activities are scheduled to take place. The control community is similar in size and geographic location. Some buildings were also submetered in both the residential and commercial sectors in both the test (Espanola) and control communities.[R#5]

MONITORING

The project is being metered at three levels: First is the micro level, using remote interrogation metering (RIM) for all-electric homes only. These RIM systems measure the total load, water heater load, space heat load, the load associated with a major appliance, and this data can be downloaded at night by Hydro, without affecting the customer at all, from its offices in Toronto. Second, the project is being metered through billing data in conjunction with Espanola Hydro and compared with the control community. Third, the project is being tracked with respect to the total utility load and monitoring how much less energy Hydro is selling to Espanola Hydro as a result of the project. The control community load is also being tracked along with the mean utility load of all 30 municipal utlities in northern Ontario.[R#10]

EVALUATION

An integral part of the Espanola Power Savers Project is the in-depth evaluation of the project which encompasses a broad array of issues related to the design, implementation, results, and transferability of the community-based project. The Evaluation Plan for the Espanola Power Savers Project, completed in December 1991, was designed to address five major evaluation issues:

1. the development of the project's design
2. the efficiency and effectiveness of project operations
3. the extent of long-term shifts in attitudes and behaviors
4. the net benefits and costs of the project, and
5. the project's transferability to other communities.

To evaluate all aspects of the project operations and the impact, feedback from different perspectives is required. There are numerous stakeholders and key players involved in the project, including residential and commercial customers, auditors, inspectors, contractors, a community advisory group, local schools, the local utility, community groups and the town council. The evaluation plan has a broad reaching mandate, requiring numerous research tasks to obtain input from each of these groups on all of the issues.

An Evaluation Committee was developed, comprising various individuals from load analysis, program screening, program evaluation and finance, market research as well as representatives from program design. An interim evaluation report will be issued in January of 1993 and a final evaluation report for the entire project will be released in mid-1993.[R#10]

CUSTOMER IMPACT

Not only are community-value attributes considered important by Ontario Hydro, they are also being carefully evaluated with baseline, interim, and post-project market research attitudinal analyses. Attitudinal surveys have been and will be conducted in both Espanola and the control community.

COMMUNITY IMPACT

The community impact, while perhaps not measurable for years, can be characterized by features such as the employment ramifications of the project. Prior to beginning the project, Hydro analyzed the economic base, employment and income levels, and culture within the community to develop a socioeconomic profile of Espanola. These factors will be reassessed at the end of the project, and reported as part of a socio-economic sub-study.

A social/economic study will assess the economic multiplier effect that is taking place in Espanola and the region thanks to jobs created by the research project. Another aspect of the monitoring process is that in the 1993-1995 period, Ontario Hydro will also

measure the persistence (i.e. long-term impact) of the measures installed to determine the "takeback" effect of the project.[R#10]

ENVIRONMENTAL IMPACT

The environmental substudy underway – the first such study to be undertaken for a Hydro demand management project – will identify key waste management issues related to the project.

LOAD IMPACT

Load monitoring equipment has been installed in a sample of over 100 electrically-heated residential and commercial buildings in Espanola and the control community. Before and after installation of measures, hourly consumption data for total load, space heating, water heating, and an appliance will be utilized to determine changes in consumption by major end uses. Monthly customer billing data will be combined with customer survey data, project research data (e.g. blower door tests) and the project database on measures installed to quantify savings at the customer level and to evaluate the impacts by measures or bundles of measures. Total load of the municipal utility will be analyzed to compare monthly and yearly differences with the control community and thirty other northern communities.

PROCESS EVALUATION

Modifications to the project design have been ongoing, based on feedback from the various groups involved. Tracking of these changes was incorporated into an issues binder. In addition to evaluating records and the like, numerous telephone interviews with key staff and agencies will uncover what worked, what didn't, and why.

BENEFIT/COST ANALYSIS

Based on the costs and energy impacts identified through the evaluation, a benefit/cost analysis will be conducted to determine the cost effectiveness from the perspectives of the customers, participants, Espanola Hydro, and Ontario Hydro. Each measure was screened for cost effectiveness individually. The test was designed to be a high water mark and hence Ontario Hydro pays up to the full avoided cost or full incremental cost, whichever is less so the benefit/cost ratio is 1.0.

TRANSFERABILITY

All the analyses above will determine the degree of success achieved in Espanola. These measures will be used, in relation with other community based projects, to evaluate the program's effectiveness. Attempts will be made to evaluate what motivates participation, to determine the types of communities where this approach to demand-side management will be most appropriate, to identify the key elements for a successful program and the successful tools developed and refined in Espanola which can be used again, to estimate the potential savings available in the Province of Ontario using this type of an approach, and to estimate the costs involved to do so.

DATA QUALITY

• The data quality for Espanola is quite exceptional because Hydro has funnelled significant resources into monitoring and evaluation, including the use of highly respected consultants, some of whom had extensive involvement in the Hood River Conservation Project.

• If anything, it seems that Hydro may be erring on the side of conservatism with their savings data. Wayne Ruhnke noted, "We're pretty close to the mark, but Hydro would rather be on the low side."[R#10] Total system net savings are based on engineering estimates which have been derated by varying degrees up to 26% to account for interactive effects with mechanical ventilation (3%), supplementary heating system such as wood-burning stoves (15%), and the cumulative effects of combined thermal envelope measures installed (8%) in the all-electric buildings.

• In the mid to late 1980's Ontario Hydro conducted a highly comprehensive home study, "The 1,000 Home Study," to analyze and forecast the energy use of all-electric homes in the province and the potential for energy conservation. The $3 million study paid attention to detail, and a lot of analysis led to "clean statistics" for baseline energy use as well as a supply curve of measures that were all determined to be cost effective retrofits. This study served as the "jumping off" point for the engineering estimates used in Espanola.[R#10,16] Savings as a percent of the baseline energy use are being carefully analyzed by Hydro and will appear in the update of this profile.

• Hydro has not calculated an average lifetime to the measures installed in the project. In order to determine both lifecycle savings and the cost of saved energy, Hydro officials and The Results Center have assigned a 35-year average lifetime to determine lifecycle savings, and both a 35-year and 44-year average lifetime to determine the cost of saved energy, the same lifetimes used by evaluators of the Hood River Conservation Project. (In future months Hydro will determine its own composite, or average lifetime of the measures.)

• Hydro has taken special care in sorting out the actual number of facilities, both homes and commercial properties in Espanola. Originally the utility relied on Espanola Hydro's billing data but found it unreliable. In some instances a commercial building might have as many as six meters. Using billing data, each meter would appear to be a facility. Hydro has been extremely diligent in sorting out the actual number of facilities by carefully checking bills and addresses for redundancies.

As of September 11 1992, 87% of all homes and commercial buildings in Espanola had been audited and approximately 75% of the work completed, largely in the residential sector. Of the total homes and buildings audited, the percentages varied by sector and building type. Over 96% of the all-electric homes and commercial buildings have been audited, while 80-84% of non-all-electric homes and commercial buildings had received an audit. The original projection of (demand) savings for the project was 1.6 MW. In April 1992, with over 90% of all buildings audited and about 40% of the work completed, a budget increase was sought and approved for the project. Based on higher-than-expected levels of participation and uptake on the measures, the projected savings was revised to 2.7 MW.[R#20,21]

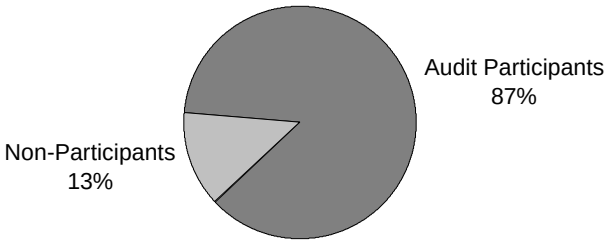
Energy and Capacity Savings Table	Energy Savings (MWh)	Lifecycle Savings (MWh)	Capacity Savings (kW)
Residential			
All-Electric	4,797	167,895	1,313
Non-All-Electric	925	32,375	100
Subtotal	5,722	200,270	1,413
Commercial			
All-Electric	1,125	39,375	240
Non-All-Electric	577	20,195	106
Subtotal	1,702	59,570	346
Total	7,424	259,840	1,759

[R#3,21]

As of September 11, 1992, the economic potential identified by project auditors was 2,500 kW and customer uptake (the ratio of all measures accepted to measures identified/recommended) was 70%, representing savings of 1,760 kW. A total of $5.0 million worth of measures have been committed to (issued), of which Hydro's contribution is $3.3 million, and the customer's contribution is $1.4 million plus the Goods and Services Tax (GST) of $0.3 million. A total of $3.8 million of work has been completed, representing savings of 1,277 kW. Ontario Hydro's contribution is $2.4 million and the customer's contribution is $1.1 million plus $0.3 million GST. Of the total savings from work completed, 753 kW have resulted from insulation measures at a total cost of $1.8 million; and 235 kW have been saved by replacing and treating windows and doors at a total costs of $1.4 million.[R#3] The above results are expected to change as some economic potential and uptake measures for large commercial customers is not included here.

PARTICIPATION

One way of defining project participation is to assess the number of customers or identified "job sites" which have participated in an audit. As of September 11, 1992, of a possible 2,035 identified customer/sites in the community, 87% have received an audit. In the residential sector, over 96% of the all-electric homes,

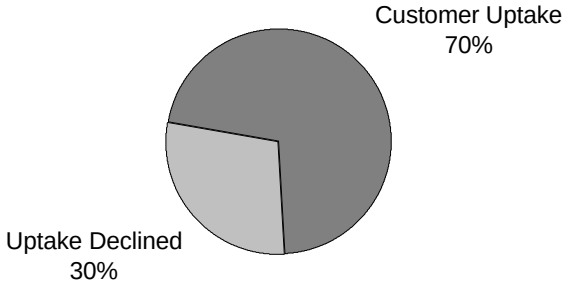


and 80% of the non-all-electric homes have had an audit. Of the commercial buildings, at least 96% of the all-electric, and 84% of the non-all-electric buildings, have had an audit.[R#3,21]

Participation Table	Eligible Sites	Sites Complete	Percent Complete
Residential			
All-Electric	728	702	96%
Non-All-Electric	1093	876	80%
Subtotal Residential	1,821	1,578	87%
Commercial			
All-Electric	80	77	96%
Non-All-Electric	134	112	84%
Subtotal Commercial	214	189	88%
Total Commercial & Residential	2,035	1,767	87%

CUSTOMER UPTAKE

There are a number of ways of assessing customer uptake. One is to identify the number of measures accepted by participants as a percentage of all the measures recommended by the auditors. This can be expressed in kW and kWh savings. Another way is to define the dollar contribution/expenditure by customers for the accepted measures compared to the total Ontario Hydro contribution/incentives on the recommended measures. Seventy percent of the kW savings potential of the recommended measures, or 1,760 of 2,500 kW, have been accepted (contracts signed). Again, "customer uptake" varies according to building type. In the residential sector, 78% of the kW savings potential of recommended measures for all-electric homes have been accepted. Ninety-seven percent of the kW savings potential for non-all-electric homes have been accepted. In the commercial sector, customer uptake is 51% and 44% for all-electric and non-all-electric buildings respectively.



Expressed in terms of kWh savings, customer uptake is 79% for all-electric homes and 98% for non-all-electric homes; and in the commercial sector, uptake is 54% and 44% for all-and non-all-electric buildings respectively.[R#3,21]

SAVINGS PER PARTICIPANT

The average demand and energy savings per participant can be broken down in several ways depending on the type of building. Of the work (measures) accepted/issued as of September 11, 1992, all-electric residential properties produced annual average savings of 1.87 kW and 6,833 kWh. For non-all-electric homes, the annual average savings was 0.114 kW and 1,056 kWh. All-electric commercial buildings produced an annual average savings of 3.12 kW and 14,604 kWh. For non-all-electric commercial buildings, the average annual savings was 0.946 kW and 5,153 kWh.[R#21]

Customer Uptake Table	Economic Potential (kW)	Customer Uptake Savings (kW)	Customer Uptake (kW) as a % of Economic Potential	Economic Potential (kWh)	Customer Uptake Savings (kWh)	Customer Uptake (kWh) as a % of Economic Potential
Residential						
All-Electric	1,688	1,313	78%	6,045,962	4,797,113	79%
Non-All-Electric	103	100	97%	943,907	925,260	98%
Subtotal Residential	1,791	1,413	79%	6,989,869	5,722,373	82%
Commercial						
All-Electric	468	240	51%	2,063,727	1,124,512	54%
Non-All-Electric	241	106	44%	1,323,820	577,086	44%
Subtotal Commercial	709	346	49%	3,387,547	1,701,598	50%
Total	2,500	1,759	70%	10,377,416	7,423,971	72%

MEASURE LIFETIME

As stated in the previous section, Ontario Hydro to date has not calculated an average lifetime, or a weighted average lifetime, for the measures installed. Assigned lifetimes were used in the process of determining the cost effectiveness of the measures. As stated earlier, Ontario used a modified version of the DSStrategist model to screen measures first using the total resource cost test and then for the utility cost test. One limitation of the model is that it only allowed Hydro to assign measures with a maximum lifetime of thirty years. Many of the measures installed as a result of the project, such as insulation, likely have lifetimes in excess of 40 years. For this profile 35-year and 44-year lifetimes are used (see Data Quality section).

PROJECTED SAVINGS

Original projections were for savings of 1,600 kW and participation of 80%. In March, 1992, the savings projection was reevaluated at 2,700 kW. As of September 11, 1992, with some $5.0 million committed to energy efficiency retrofits and $3.3 million spent by Hydro, savings of 1,760 kW have accrued. This represents 65% of the current projected capacity savings.[R#3,21]

Capacity Savings Table (kW)	Residential	Commercial	Total
Insulation	867	72	939
Windows and Doors	275	32	307
Lighting	56	211	267
Block Heater Timers	79	7	86
Heating / Ventilation	76	19	95
Water Heater Tuneup	58	6	64
Air Sealing	2	0	2
Total	1,413	347	1,760

[R#21]

Ontario Hydro estimates that if an Espanola-type project were done in all small communities in Ontario the potential savings would be on the order of 900 MW over 10 years, about the amount of capacity from one of Hydro's nuclear reactors, or as Hydro characterizes it, enough capacity to furnish the City of Hamilton, Ontario with electricity.[R#4]

Savings by Measure	Unit of Measure	Number of Measures	Quantity of Measures	Customer Uptake per Measure (kWh)	Percent of Total Savings
Insulation	Square feet	1,453	1,177,399	2,927,085	39.43%
Windows	Square feet	1,443	61,107	746,356	10.05%
Doors	Each	527	738	169,501	2.28%
Lighting	Each	5,514	53,206	1,530,069	20.61%
Block Heater Timers	Each	1,279	1,986	643,557	8.67%
Heating and Ventilation	Each	118	119	267,229	3.60%
Water Heater Tuneup	Each	914	1,002	1,135,372	15.29%
Air Sealing	Each	2	0	4,807	0.60%
Total		11,250	1,295,557	7,423,976	100.00%

[R#3,21]

Total Project Costs 1990-1995	Measures and Incentives (x1000)	Audits and Inspections (x1000)	Program Delivery (x1000)	Evaluation (x1000)	Research (x1000)	Subtotals (x1000)
Program Costs	$4,012	$365	$1,120	$362	$0	$5,859
Research Costs				$242	$3,282	$3,524
Total	$4,012	$365	$1,120	$604	$3,282	$9,383

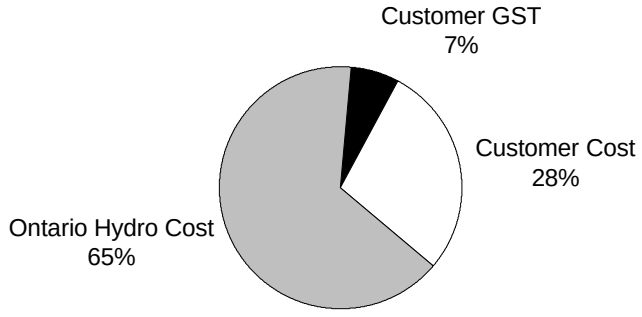
In December 1990 $5.8 million was approved for the Espanola Power Savers Project. Of this $3.9 was earmarked for the Demand Management (DM) program component, and $1.9 million was slated for research. By March of 1992, $3.7 million had been spent and it was clear that additional funds would be required for several reasons. First, unprecedented uptake of the measures recommended and higher than expected participation levels had extended Hydro's commitment to program delivery costs and a more comprehensive evaluation plan. Second, because of the leading edge nature of the project, the wide ranging impact of results on other DSM programs, and the design of new programs to meet aggressive DSM targets, additional funds were sought for the research component of the project. In March, 1992, the project's managers sought and received a $3.6 million budget increase for the project, an additional $1.9 million to support the program activities, and an additional $1.7 million for research.[R#20]

Total Cost by Customer Class	Recommended Cost (x1000)	Customer Uptake (x1000)	Percent Customer Uptake (x1000)
Residential			
All-Electric	$5,552	$4,252	77%
Non-All-Electric	$156	$150	96%
Commercial			
All-Electric	$796	$445	56%
Non-All-Electric	$441	$196	45%
Total	$6,945	$5,043	73%

[R#3]

COST PER PARTICIPANT

As discussed previously, each participant is required to pay a portion of the total cost and the GST for the retrofit's entire cost. (see adjacent box)



Based on job sites audited as of September 11, 1992, the average cost per participant (customer contribution), when considering only the cost of the measures installed, was $2,260.76 for all-electric homes and $12.98 for non-all-electric homes.[R#7,21]

FREE RIDERSHIP

Free ridership was considered for the program and various factors were assigned for each measure. These factors were used in the determination of cost effectiveness.

COST EFFECTIVENESS

Each of the measures used in the project was screened using the DSStrategist model. Approximately 5% of the measures failed Hydro's criteria, but when bundled with other cost effective measures, the result was a positive total project benefit/cost ratio.[R#7]

Hydro evaluates all measures based on the Total Customer Cost Test (TCCT). This not only looks at the benefits and costs to the utility, but also takes into account the participants' costs/customers' savings. If a measure passes the TCCT, it is then screened using the Utility Cost Test (UCT), a definition of cost effectiveness that only takes into account the utility's financial situation. Measures that

Cost of the Program (continued)

Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	**5%**	6%	7%	8%	9%
35 years	3.67	4.23	4.82	5.44	6.10	6.77	7.47
44 years	3.25	3.84	4.47	5.13	5.82	6.54	7.27

pass the UCT are clear winners for the utility, and thus are installed at no charge to the customer. For measures that do not pass the UCT, but which did pass the TCCT, a customer contribution is required. Ontario Hydro's March, 1992 documentation suggests that the project has a Total Customer Cost Test (TCCT) benefit/cost ratio of 1.2, and an Ontario Hydro/Utility Cost Test (UCT) benefit/cost ratio of 1.0. [R#20]

Note that the determination of cost effectiveness, presented in the adjacent table, finds the project costs, including all DM program costs, to be on the order of 4.4-4.8 cents/kilowatt-hour using a 5% real discount rate. In terms of demand (capacity) savings, Ontario Hydro finds that the cost for each kW saved in Espanola is approximately $2,168/kW. According to the Participant Cost Test, which compares the benefits received by customers (i.e. bill reductions, financial incentives) with the program costs incurred by them, the project's net benefit to participants is greater than $4.2 million. [R#20,21]

The Goods and Services Tax (GST) In the Province of Ontario all goods ad services have been taxed in the past two years by the "GST" or Goods and Services Tax, a flat 7% tax. Ontario Hydro, as a Crown Corporation, does not pay the GST. Hydro's customer do, for the entire amount of the energy efficiency measures that the general contractor installs, even when the measures cost the customer nothing.

Cost per Measure	Unit of Measure	Quantity of Measures	Average Cost per Measure	Total Utility Cost per Measure	Measure Cost as Percent of Total
Insulation	Square feet	1,177,399	$1.76	$2,069,635	44%
Windows	Square feet	61,107	$22.74	$1,389,044	30%
Doors	Each	738	$459.02	$338,940	7%
Lighting	Each	53,206	$7.94	$473,748	10%
Block Htr Timers	Each	1,986	$41.80	$83,025	2%
Heating/Ventilation	Each	119	$2,193.09	$260,978	6%
Water Htr Tuneup	Each	1,002	$83.61	$83,777	2%
Air Sealing	Each	2	$1,859.48	$3,720	0%
Total		1,295,559		$4,702,868	100%

[R#3,21]

Costs by Measure	Number of Measures Installed	Utility Cost of Installed Measures	Total Cost of Installed Measures	Average Utility Cost per Measure Installed	Average Total Cost per Measure Installed
Insulation	1,453	$1,810,485	$2,224,775	$1,246.03	$1,531.16
Windows and Doors	1,970	$806,729	$1,848,956	$409.51	$938.56
Lighting	5,514	$459,643	$506,910	$83.36	$91.93
Block Heater Timers	1,279	$83,025	$88,836	$64.91	$69.46
Heating/Ventilation	118	$68,560	$279,247	$581.02	$2,366.50
Water Heater Tuneup	914	$83,777	$89,642	$91.66	$98.08
Air Sealing	2	$3,720	$3,981	$1,859.90	$1,990.33
Total	11,250	$3,315,939	$5,042,346	$294.75	$448.21

[R#3]

Environmental Benefit Statement

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%	16,006,000	380,000	77,000	8,000
B	10,000	1.20%	17,068,000	147,000	50,000	37,000
	Controlled Emissions					
A	9,400	2.50%	16,006,000	38,000	77,000	1,000
B	10,000	1.20%	17,068,000	15,000	50,000	2,000
C	10,000		17,068,000	98,000	49,000	2,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	17,068,000	45,000	24,000	12,000
B	9,400	2.50%	16,006,000	38,000	31,000	2,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	17,068,000	30,000	5,000	12,000
B	9,010		15,353,000	11,000	4,000	1,000
Gas	**Steam**					
A	10,400		9,310,000	0	21,000	0
B	9,224		8,085,000	0	51,000	2,000
	Combined Cycle					
1. Existing	9,000		8,085,000	0	31,000	0
2. NSPS*	9,000		8,085,000	0	15,000	0
3. BACT*	9,000		8,085,000	0	2,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	13,475,000	204,000	24,000	23,000
B	10,400	2.20%	14,291,000	203,000	30,000	15,000
C	10,400	1.00%	14,291,000	29,000	24,000	8,000
D	10,400	0.50%	14,291,000	85,000	30,000	5,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	17,884,000	36,000	55,000	3,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	21,233,000	55,000	72,000	16,000

Avoided Emissions Based on 7,424,000 kWh Saved (first year only)

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 previous page is to allow any user of this profile to apply Ontario Hydro's level of avoided emissions saved through its Espanola 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 includes 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

• Perhaps the most important lesson learned in Espanola is that a community based marketing approach can work to enlist significant change in a short period of time. Hydro, with the support of the community, has taken a relatively unenlightened, northern Ontario community and has transformed the way people think about and use energy.

• Second, a utility such as Hydro can learn from previous utility experiments, Hood River in particular, and develop a far more effective program that clearly represents an evolution in program concept, design, and implementation.

• Of all the means of enlisting the community, the most important element of the community-based approach was to get the community leaders "on board," to give them "a piece of the action," to make them responsible for the project's success. The Community Advisory Committee has clearly opened critical doors to success.

The downside of intimate involvement of community based committees is that if committee members are not sufficiently aware of the explanation of an issue, then "home-cooked" answers can lead to misinformation and confusion. They [the community committee members] become widely recognized as spokespersons and hence sounding boards for good ideas, but also complaints. Information travels fast in small communities "and because bad news travels twice as fast as good news, as we have learnt, there has to be a timely response to gossip that can rapidly build negativity among some residents. Saturation marketing is particularly vulnerable to community mood swings based on misinformation. Likewise, our real mistakes are made in the public arena and are open for scrutiny.[R#5]

• Although the partnership theme has proven successful to date, it is acknowledged that it takes time to build trust and to develop strong working relationships. Furthermore, the partner that is contributing most of the funding (Hydro) and the project's organization will inherently be seen as "senior" partner, and is ultimately responsible for the project.[R#5]

Creating partnerships with customers has not been easy. Assuring open lines of communication with the community, while critical, has been a significant drain on staff time. Staff has been involved in lengthy discussions on energy issues, and the community expects the Hydro team to be readily available. On the positive side, this has meant acceptance of project delivery changes. On the debit side, the field office is open for long hours restricting time for more technical work, requiring increased staffing of the research team.[R#5]

• One of the significant challenges to the project was raising the awareness level and abilities of contractors. Taking contractors from a low level of knowledge and ability to a relatively sophisticated position in a short time and getting them certified was challenging. The standards that Hydro required for retrofits were way beyond, "what they'd ever seen, ever read." Hydro found that local contractors were generally behind the times. Contractors were, for example, still filling window and door jams with loose fill fiberglass insulation instead of using non-expanding foams. Furthermore, most of the contractors had no idea of the interactive nature of their trade with other trades in terms of energy use.

• Hydro has found that the use of block heater timers has not been as extensive as expected. The main reason for this appears to be that many customers who received these timers were not given enough information.

• In retrospect, the project might have been even more successful had it incorporated waste management issues from the outset. Retrofitting an entire community has major landfill implications. Now Hydro has hired a consultant to study the solid waste implications of the project.

• One of the successes of the project was the arrangement between the company hired to audit and inspect retrofits, and the general contractor. According to Wayne Ruhnke, the two contractors, Warnock Hersey as the auditor/inspector, and Acme as the General Contractor, are "definitely at arm's length." "This is a good thing," claims Ruhnke, "keeping them both honest as there is a line clearly drawn in the sand."

• Hydro had envisioned that few homes would have moisture problems. They found instead, that many homes had moisture problems. The project newsletter served to educate the citizens about moisture problems and thus the issue took less time for auditors to explain. (Customers are responsible for 100% of the mitigation measures required to retard moisture problems.) A conventional DSM program might consider the issue too risky to raise. Espanola, with its community support in place, was able to tackle these potentially crippling feedback effects of energy efficiency.

• Thermal envelope upgrades are difficult to implement but provide durable savings that are strongly cost effective. For these retrofits, Sharpe et al find that about 3 million square feet of insulation represents 1,450 kW. One-and-a-half million square feet of advanced window treatments coupled with replacing 695 doors results in savings of 1,071 kW. Residential lighting is marginally cost-effective and requires considerable effort. To capture 58 kW of savings has required the installation of over 35,000 reduced wattage incandescents and compact fluorescents.[R#5]

• Hydro worked much closer with the media than it has

in the past. Simply put by Espanola Project Manager, Vicky Sharpe, "The positives are obvious."

• The identity of the control community is being kept confidential to keep attention away from it to make the test/ control as valid as possible.

• At the onset of the project, Hydro sought the participation of both the local gas company and the town's water department. Hydro offered each of them the opportunity to participate and to pay as little as the incremental costs of the gas and water efficiency measures. Since Ontario Hydro would be sending crews around to each home and business, why not install gas and water efficiency measures at the same time, essentially piggybacking on the electric program? Both utilities, however, refused to participate and an opportunity for cost sharing and enhancing the project was missed.

Hydro has taken a small but important step in researching conversions of some electric heating systems to natural gas, what we at The Results Center regard as an important thermodynamic efficiency step. A law has recently been passed in Ontario that allows Hydro to promote and pay incentives for fuel switching. Bill 118 allows utilities to get incentives for installing gas efficiency measures.[R#11]

Wherever cost effective in Espanola, Hydro will install high efficiency gas furnaces and pay a significant share of the conversion to natural gas. Hydro will only pay for conversions to gas after they meet certain criteria: Studies are conducted to look at the feasibility of fuel switching under different conditions. Screening is done using the DSStrategist. Hydro will only pay for conversions to gas when they are deemed cost effective, using the Total Customer Cost Test. For homes with forced-air ducted systems Hydro will install high efficiency gas furnaces and pay a significant share of the conversion to natural gas. Homes with electric baseboard heaters, that have no plenums for forced hot air, are not eligible for conversions. To date, Hydro has committed to pay for 63% of these conversions.[R#10] (There are only 50 homes in Espanola that have electric forced hot air heating.) Further, if an electric forced hot air furnace is new, say less than five years old, Hydro's auditors will not recommend replacing the unit. Finally, those homes that are recipients of thermal envelope upgrades, at Hydro's cost, must sign a form that states that they will not convert to natural gas for at least two years and cannot take advantage of Hydro's thermal improvement incentives.

Other gas technologies that are included in the list of eligible measures are bivalent heat pumps, combinations of gas and electric and horizontal ground source heat pumps that use gas. Less than 5 have been installed, so far. Incentives received for these measures range between 22-50% of the total costs (dual fuel: 33%; air source: 22%; ground source horizontal: 50%; and ground source vertical; 37%).[R#10]

Like many towns across North America, water supply is an issue in Espanola. The town gets its water from a higher elevation lake and capacity is short. In the summer, the Town's residents cannot water their lawns. Ontario Hydro recommended to the water department that they too piggyback on the program and install ultra-low flush toilets and other water-efficient hardware but the town chose not to and is now building a new water plant. Ontario Hydro is working with the water department to make sure that the facility is equipped with high efficiency motors and the like.[R#10]

TRANSFERABILITY

Ontario Hydro's project managers have an exciting task in their hands. They have designed a program with high visibility that must deliver savings. More importantly, the project must provide lessons learned for the utility's broader agenda. How can such a program be successfully transferred within Ontario, and ultimately through North America and even to different parts of the world?

According to Wayne Ruhnke, he and his colleagues have been trying to make the approach used in Espanola as flexible as possible so the project's basic tenets can be integrated into areas with varied population and demographic mixes. The intent of the program, or at least the hope, is to be able to transfer the program to northern and southern communities, from small to large, potentially including areas within metropolitan Toronto.

"**Hopefully by the time we're done we'll have good criteria to apply to a community of 6,000 people or even to the Toronto area which is in excess of three million people! We hope to have identified the key factors and to have strong indications of what worked and why.**" *Wayne Ruhnke, Deputy Project Leader, Ontario Hydro*

While Hydro recognizes that different approaches will have to be used in areas as disparate as Espanola and Toronto, Hydro's project research staff believe there are key elements or ingredients that can be learned in and then transferred to a far broader range of communities. The Results Center believes that the core ingredients that make the Espanola project special, a strong educational component, tapping community leadership and garnering community support, with attractive direct installation incentives for customers, can indeed be transferred to other areas.

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