



**PURE at Work**  
***Power Up* Renewable Energy**  
**Co-Operative**



*“The Green Power Project;  
A Shelburne Community  
Energy Project”*

**Final Report December 31, 2005**



## *The Green Power Project*

### *A Shelburne Community Energy Project*

#### **Executive Summary:**

Reduce the Juice: A Shelburne Community Energy Pilot Project” was conceived by Power Up Renewable Energy Co-operative (PURE), a community organization created to encourage sustainable and responsible energy generation and use in the Dufferin County and Headwaters region. The **Green Power Project** was the first phase of the Pilot Project and was designed to catalyze, and to prepare the educational foundation for, **Reduce the Juice**, an energy conservation initiative aimed at encouraging the residents of Shelburne Ontario to reduce their use of electricity. By working with the teachers and students to install a renewable energy generation system at the high school in Shelburne, the **Green Power Project** was successful in achieving two important goals:

- to develop among the students at the school knowledge and skills concerning energy conservation and renewable energy technology
- to cultivate youth leaders committed to community action to encourage reduced energy use and promote renewable energy choices.

The **Green Power Project** was a collaborative effort between volunteers from Pure and Centre Dufferin District High School (CDDHS) in Shelburne. Randy Dryburgh, the Project Manager and technical advisors, Matthew Fairlie and David Lutka from PURE worked with Jeff Wellman, Assistant Head of the Science Department, and a large number of teacher and student volunteers from CDDHS to install a grid connected 1.5 wind-photovoltaic system on the roof of the school. Fairfield Group a member of PURE offered the school the basic components of the renewable generation system and received the strong support of the school principal, Doug Morell, who was able to get the approval for what was to become the first such energy installation at an Ontario school from the Upper Grand District School Board (UGDSB).

The renewable energy system was installed in two phases. In the first phase, working with PURE volunteers, students and teachers from Physics classes, Electrical classes and Construction classes at the school built and installed protective catwalks on the roof and supports for the solar panels, and wired the solar panels, the DC charger/regulator and the battery storage components of the system. The completion of Phase I was marked at CDDHS at a well attended public meeting at the end of 2004, which was moderated by four students from the school Environment Club.

The second phase involved installing the tower and wind turbine, connecting the renewable system to the school wiring and thus to the Ontario electrical grid and the installation of a school interval meter by Hydro One to monitor school energy conservation efforts. The tower installation was a challenge, which required the services



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of a local contractor and special engineering to ensure that vibration from the turbine would not damage the school structure and to enable teachers and students to lower the turbine for periodic inspections and/or educational purposes. Students from the school worked with PURE volunteers to wire the wind turbine, the inverter and grid connection. Student teams under teacher supervision also became experts at raising and lowering the wind tower to ensure that it functioned properly. Despite the interruption of March Break, late winter storms and a number of demanding inspections by the Electrical Safety Authority the April 22<sup>nd</sup> deadline was met.

On Earth Day, 2005, the complete installation of the generation components of the solar-wind system was celebrated at the high school and was again moderated by students from the Environment Club. In addition to members of the school community and people from Shelburne, partners and supporters of the project including the Fairfield Group, the Upper Grand District School Board, EcoAction, Canadian Hydro Developers, Hydro One and Fines Home Hardware sent congratulations or representatives. Donna Cansfield, who spoke for the Ontario Minister of Energy at the meeting, congratulated the **Green Power Project** for showing leadership, for building the first renewable energy system at an Ontario high school and for preparing the ground for **Reduce the Juice** which would begin hiring students from the school in a few months.

In early May a letter was distributed to neighbours of CDDHS to make them aware that on May 23<sup>rd</sup> the solar-wind system would be delivering energy to the school. Since the turbine would be operating 24 hours a day we wanted to ensure that any public concerns or complaints could be dealt with quickly and openly. The neighbours offered congratulations and not a single complaint. Also, the **Green Power Project** team, together with **Reduce the Juice** made presentations to the Town of Shelburne, the County of Dufferin and the Shelburne Economic Development Committee to inform them of both projects and to enlist their support. The response was further congratulations and offers of support from the community.

In October the project was presented at the CanWEA conference held in Toronto. The presentation can be found in Appendix A.

This report gives a high level description of the system installed, the issues addressed in the installation and the impacts on the school and community.



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#### **Acknowledgements:**

The project was made possible by the financial contributions and hard work of the following companies, agencies and individuals:

Centre Dufferin District High School  
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David Lutka  
Environment Canada – Eco-Action  
Fairfield Group Inc  
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Jeff Wellman, Shelburne  
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Theresa Sauren, Orangeville  
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Upper Grand District School Board



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## *The Green Power Project*

### *A Shelburne Community Energy Project*

#### 1.0 Introduction

“**Reduce the Juice**; A Shelburne Community Energy Pilot Project”, was conceived by Power Up Renewable Energy Co-operative (PURE), a community organization founded in Shelburne, May 2003 ([www.powerupenergy.ca](http://www.powerupenergy.ca)). PURE is a non-profit, primarily volunteer group created to encourage sustainable and responsible energy generation and use in the Dufferin County and Headwaters region. **The Green Power Project** was designed to complement the **Reduce the Juice** energy conservation initiative sharing the same goals to develop leadership in youth regarding energy and environment, and to educate the community at large about renewable energy and energy conservation.

The need for projects like **Reduce the Juice** is becoming increasingly evident because of Ontario electricity supply constraints and the dangers of climate change. The summer of 2005 was one of the hottest on record with a record number of smog days and extreme heat alerts. Peak electricity demand on these numerous hot days led to conservation pleas from the Minister of Energy, as demand often exceeded the province’s generation capacity.

The **Green Power Project** worked to make students aware of renewable energy generation and energy consumption and climate change issues.

This report gives a brief overview of the system and the impacts the systems has had on the school and community.

#### 2.0 System Overview

The discussion will refer to the presentation made in Appendix A.

The following components make up the Green Power installation at CDDHS:

- Whisper Wind Generator Model H-80 – 24V DC
- Twelve PV panels – Siemens 50W (circa 1992) – 24 VDC
- E-Z Wire Auto-charge regulator + dump load heater
- Four 6 V Crown Royal lead-acid batteries (225 amp-h)
- Battery disconnect
- Xantrex SW 4024 Inverter (24 V DC to 120 V AC)
- Xantrex Grid Tie Interface SW Series
- Interval Meter



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The cost of the components excluding the Interval meter is about \$15000 with cost breakdown as follows:

- Grid Tie and Inverter: \$5000
- Batteries: \$1000
- Turbine + PV panels + pole + regulator + dump load: \$9000

Wiring drawings along with price quotations for materials are given in Appendix B.

### 2.1 Project Plan and Execution

The Project was executed in two major phases. In Phase I the PV panels and DC power system were installed. The DC system was designed to operate on a nominal 12V bus. The system was installed by students and teachers and a certified electrician, David Lutka, co-ordinated by the Project Manager, Randy Dryburgh and the lead teacher Jeff Wellman. System design was provided by Fairfield Group.



In Phase II the turbine and grid-connect, consisting of inverter and grid-tie were installed and the voltage of the system was increased to 24 volts by re-wiring the panels and reconfiguring the charge controller. In the same time frame an interval meter providing a real time read-out of energy consumption of the school was installed by Hydro One. The





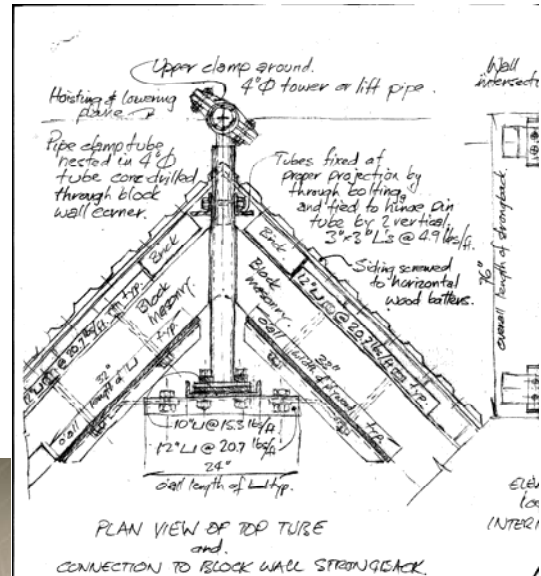
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second story had no superstructure and so a steel “strong-back”, as depicted in the figures below was used to re-enforce the corner of the masonry wall, and the turbine tower was bolted to the “strong-back”.



Outside View under Construction



Engineering Drawing of “Strong-back” Construction

Inside View Of “Strong-back”



### 2.3 Environmental Assessment

Because the project used federal funding, Eco-Action required an environmental assessment (EA). A copy of the materials submitted to Eco-Action is given in Appendix C. Along with the written submission a video of the school site was submitted, produced by students to record the environmental features on the school property.



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The EA was followed up by a community consultation where the students set up a table during a parent-teachers night, to discuss the project and take comments from the community. A mail-out followed the consultation to inform the community when the turbine would be operating full time.

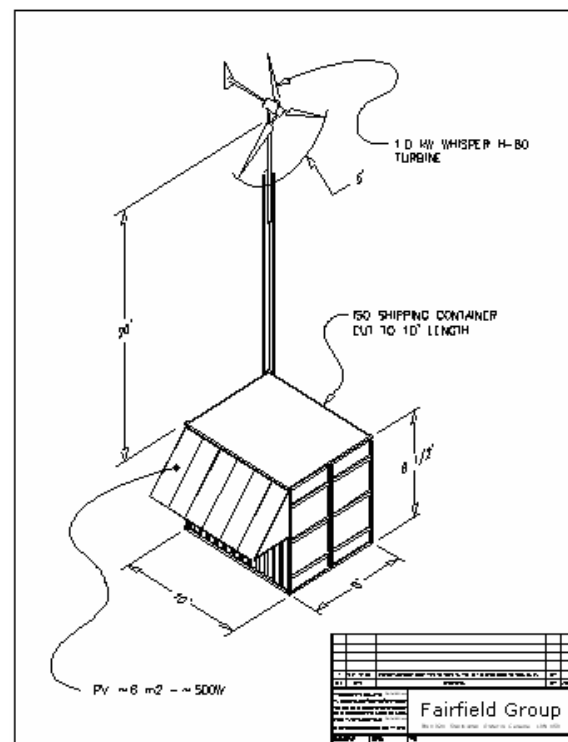
#### 2.4 Operating Manual

An operating manual was prepared consisting of the various sub manuals with a high level description of component settings. An outline of the contents of the manual is given in Appendix D. Two copies of the manual were made for the school. One copy is retained by Fairfield Group.

#### 2.5 Lessons Learned

The lessons learned in terms of future installations will be the subject of a future project. One of the key issues was the expense of the installation of the turbine on the school. It is recommended that future projects should consider the idea of a pre-engineered package that avoids the cost of a custom engineered installation. The package could come in kit-form that the students and teachers install.

Delivery of the project in this form could also avoid electrical inspection costs. The cost of inspections by ESA amounted to an **INCREDIBLE \$1700.** (see Appendix B).



#### 3.0 Project Impacts

Feedback on the impact of the project was obtained from various segments of the school community: Administration, Teachers, Students and the General Community. In early December 2005 students, teachers and the school principal were interviewed



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using a structured questionnaire to determine the impact of the **Green Power Project** on the CDDHS community. The results of each group of interviews with summary comments follow below.

### 3.1 Administration Feedback

Feedback from the school administration was obtained in an interview Q&A:

Q1/ To what degree are teachers aware of the Green Power Project?

A1 - Awareness is very high because it dovetails with the school board energy saving initiative and because of the partnerships with other community organizations

Q2/ Has the Green Power Project had an impact on the classroom - curriculum, project opportunities, etc.?

A2 - Yes in specific classes such as Science, Social Science/Geography and Technical Studies. There also has been some impact on Mathematics and this will increase as we install the software required by the system.

Q3/ What impact has the Green Power Project had on you in your role as an administrator?

A3 - It has been very positive. The profile of the school in the Board has increased. It has made the "energy conservation/energy use" message easier to communicate. There is a greater interest among teachers re attendance at the Board Energy Workshops.

- It has been "an amazing experience for the school." Students, teachers and members of the community were engaged and worked together on a common project. And the partnership achieved success! It offers us a great opportunity to highlight important energy issues that students will face in the future. There are only positives here!

Q4/ To what degree are students aware of the Green Power Project?

A4 - It is hard to miss the system on the roof of the school so it increases the awareness of energy use. The Environment club has really helped to make all



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students aware. But we need to engage the students much more in energy management. Changing habits will take time.

Q5/ What impact has the Green Power Project had on students?

A5 - It has been entirely positive. A lot of interest has come through the office – both students and parents ask about the turbine specifically.

Q6/ Do you believe that the Green Power Project has or will help make students more aware of energy issues, renewable energy technologies and/or the need for energy conservation?

A6 - Yes, but much more work is needed to raise awareness. It also offers a way for students and the school can reach out into the community. Now that we have this remarkable resource on site it is incumbent upon us – and especially upon me- to make effective use of it and to offer the leadership necessary to make that happen.

Q7/ Are there better ways to communicate the message that we need to be more aware of our energy systems and their environmental consequences such as climate change?

A7 - We really should (and need to) make energy awareness a school goal. We need to show leadership if the Green Power Project is to realize its potential. I am hoping to challenge the students in 2006 to raise money for additional solar panels – and I will match the funds they raise.

### 3.2 Teacher Feedback

At the time of writing, the **Green Power Project** had functioned for four months of the first semester of the 2005/2006 school year. During that short time the teachers of the Science, Geography and Technical departments at CDDHS have used both the **Green Power** infrastructure itself and the concepts of conservation and renewable energy it embodies to modify a number of courses and have begun to write new curriculum for the future.

In Geography, during grades 9 and 12, and in Science, primarily during grades 11 and 12, students are able to tour the Project, to observe and analyze the components and configuration of a small-scale system and to study the amount power generated by a small solar-wind system. A Geography teacher said that the on site system has a



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marked influence on her students and “strongly influences student project choices and model building” in the class. A Science teacher noted that the ability to become familiar with the components of the renewable system allows student to more fully understand concepts studied in the classroom. Specifically, he said, “Students feel capable and competent when they explain the Project to other students or visitors.”

Teachers in both areas are presently working on curriculum applications to allow them to make specific use of the **Green Power** system and the data it generates. The teachers noted that some appropriate curriculum materials are available in both subject areas with Science being stronger than Geography in this regard. A Geography teacher commented that materials available on the Internet from sites such as Environment Canada and the One Tonne Challenge are useful but that they are “not gathered together into a coherent package that a teacher can use with ease.”

The existence of the **Green Power Project** has also had considerable impact on the Technical Studies Department. A grade 12 Construction Technology teacher has decided to make the study and construction of wind turbines a major focus of the class. Students begin by studying the one kW turbine at the school and then examining the much larger 1.5 Mega Watt turbines outside of Shelburne at the 67.5-MW Melancthon Wind Project. Finally, in groups the students build scale models turbines and test them in the classroom. The teacher said, “The existence of the turbine at the school to show the students exactly how grid connected wind power works made our classroom application possible.”

The Tech Department also plans to build a Renewable Energy Demonstration Trailer modeled on the **Green Power** system to take to other schools and to community events. The equipment and components necessary to build the trailer have been purchased using funds from the Technological Education Renewal Initiative (TERI) through the Ministry of Education. The successful grant application to the fund was put together by the CDDHS teachers and PURE volunteers in June, 2004. Grade 11 classes will build the trailer which will include a small solar/wind system, inverter, energy monitors, switching boards and demonstration loads such as incandescent and CFL light bulbs and small motors. Students will be trained to explain the system and will invite interested elementary classes or members of the community back to CDDHS to see a fully functioning grid connected hybrid system.

Beyond the teachers and departments, which make direct use of the system, awareness of **Green Power Project** is high but understanding of the system is not. One teacher captured this well when he said, “Staff is split into those who are very aware and those who simply know it is there making energy.” However, the interest of



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teachers to know more is reflected by the many recommendations that educational packages be put together for teachers to explain the functioning of the Green Power system and how it might be used in their classes.

#### Centre Dufferin District Secondary School Questionnaire Re Green Power Project – Aggregate Teacher Feedback (8)

	None	Low	Med.	High	?	Comments of interest
1. Personal knowledge of GPP, components, purpose, etc.	0	0	3	5	0	
2. Assessment of general teacher knowledge of GPP outside of related areas.	0	6	2	0	0	“Staff is split into those who are very aware and those who simply know it is there making energy.”
3. Assessment of general impact of GPP on the classroom outside of related classrooms.	0	8	0	0	0	“Outside of Science, Geography and Tech. there is certainly lots of interest, but no classroom application.”
4. Has GPP sparked other projects.	0	0	2	0	6	
5. Impact of the GPP on his/her class.	0	4	1	3	0	See below for specific applications
6. Availability of related teaching materials.	3	0	3	0	2	
7. (a) Assessment of general student awareness of GPP.	0	4	4	0	0	“During construction there was lots of talk and attention. Since then students learn about in it some classes – otherwise the GPP is simply part of the school.”
(b) Assessment of student awareness of GPP in related classes (Science, Geography, Technical studies).	0	1	4	3	0	
8. Impact of the GPP on students as a whole ?	0	6	2	0	0	



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9. Assessment of potential of GPP to increase student energy awareness.	0	0	6	2	0	
10. Assessment of GPP role in developing student energy leadership.	0	0	6	2	0	<p>“It electrified the Environment club.”</p> <p>The members of the Club became “more confident”, “more committed”, “increased their profile in the school and the community”,. “They saw what a group of committed people can accomplish – and ran with it.”</p>
11. (a) Assessment of Community/Parents awareness of GPP.	0	4	2	0	2	
(b) Assessment of positive reaction to GPP by Community/ Parents.	0	0	0	8	0	

### 3.3 Student Feedback

A survey of 16 students from different parts of the school population was conducted. The results of this survey are below.



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Centre Dufferin District Secondary School Questionnaire Re Green Power Project – Aggregate Student Feedback (16)

	None	Low	Med.	High	?	Comments
1. Personal knowledge of GPP, components, purpose, etc.	0	2	9	5	0	
2. (a) Assessment of general student knowledge of GPP.	0	14	4	0	0	
(b) Assessment of student knowledge of GPP in related classes (Science, Geography, etc.).	0	0	13	2	1	
3. Assessment of general teacher knowledge of GPP outside of related departments.	0	16	0	0	0	
4. Reference to Green Power Project in classes other than related.	0	14	2	0	0	"We never hear of it outside of Science class" "Some teachers mention it because it makes our school different."
5. Use of GPP in his/her class curriculum.	0	4	8	4	0	
6. Assessment of potential of GPP to increase student energy awareness.	0	2	4	10	0	"Even though it is necessary it's pretty tough. You will have to hit them over the head with a brick to make them pay attention." "You will have to lead them to it. Teenage life is too busy." "The Environment Club has made a really good start."
7. (a) Assessment of Community/Parent awareness of GPP.	0	12	4	0	0	
(b) Assessment of degree of positive reaction to GPP by Community/ Parent.	0	0	0	16	0	



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- Suggestions:
- “It should be in people’s faces. How about a public display in the main foyer ... with pictures?”
  - “Bring the community in to see it. If it becomes a point of pride students will pay attention.”
  - “ The Enviro Club tries, but really the only way to get to kids is through classes. Tie it to marks and kids will get it.”
  - “We need a school wide commitment to energy awareness. The principal has to push it to make it happen.”

The most striking feature of the questionnaires concerning the impact of the **Green Power Project** on students is the identification of the leadership role played by the school Environment Club. This group of about 10 students has become the recognized leaders in the school with respect to energy awareness in general and with respect to energy conservation and the **Green Power Project** in particular.

Members of the Club worked closely with PURE and with Jeff Wellman, the lead teacher on the **Project**. During the construction of the system they volunteered their time when ever possible. They acted as moderators for the two major **Green Power Project** public events at the high school. They acted as student spokespersons for the **Project** at a number of Shelburne community events. They spoke about the **Green Power Project** at two Ministry of Energy events – “Schools for the Future” in April 2005, and an “LDC Conservation Briefing” in May 2005. They accepted a Certificate of Recognition for Energy Conservation Leadership and \$1000 grant from Upper Grand District School Board on behalf of the **Green Power Project**. Finally, they worked with the **Reduce the Juice** team leaders to explain the community conservation project to their fellow students and to encourage students to apply for the summer jobs as auditors.

These experiences and responsibilities allowed the students to develop leadership skills, understanding and confidence. As the head of the Guidance Department put it, working with the **Green Power Project** “electrified the Environment Club.” This leadership has continued into the 2005-2006 school year. The Club is more active than ever within the school and has extended its reach well beyond the school. Seven members of the Club organized a trip to Montreal to attend the Climate Change Summit in December in an effort to educate themselves and to help the Club be more effective in its work at the school. These young people embody perfectly the **Green Power** goal, “to cultivate youth leaders committed to community action to encourage reduced energy use and promote renewable energy choices.”

The questionnaires also indicate that the level of awareness and understanding of the **Green Power** system among the student body is similar to that of the teachers.



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Virtually all of the students in the school know that an energy system, which includes a wind turbine, produces some electrical energy for the school. In this sense the CDDHS student body undoubtedly has a higher appreciation and understanding of the capacity of renewable energy than any other group of students in Ontario.

Beyond this, the students who worked on the **Green Power** installation or who have had Science, Geography or Technical Studies classes that use the system have a relatively high appreciation of the actual functioning of a renewable energy system, the amount of energy it produces and the energy-demand relationship. As one teacher put it, working with the Green Power system, “Helps students become aware of what 1 kW of energy can do – and thus what is required to support their lifestyles.”

The general student body outside of this group has not had the opportunity to interact with the renewable system and thus has a limited understanding of how it functions, of renewable energy generation in general and of the energy awareness that accompanies such understanding. However, in the interviews most students (and teachers) believed that the potential of the **Project** to increase energy awareness was high. Most also believed that the school should highlight the system in some ways to increase their understanding and the understanding of the general public. Suggestions include a public display in the school central foyer, a school wide focus on energy mandated/lead by the principal and an Energy Trade Show to help members of the community more aware of energy conservation and renewable energy options.

### 3.4 Community Feedback

The **Green Power Project** has brought attention to CDDHS from others who are interested in exploring the possibility of a similar project and from groups who share an interest in energy conservation or renewable energy generation. CDDHS has been contacted by schools in Iowa, Alberta, Manitoba and Ontario requesting information about the system and suggestions about how they might do the same. The school has also been sent both congratulations and inquiries from organizations such as the Suzuki Foundation, the Conservation Council of Ontario and the Pembina Institute. In fact, the Pembina Institute awarded CDDHS its “Green Hero” award for the **Green Power Project** ([www.greenlearning.ca/heroes/localArch3.php](http://www.greenlearning.ca/heroes/localArch3.php)).

A number of Elementary and Secondary teachers closer to CDDHS have requested tours of the system for their classes. Some were able to attend the public meetings in November and April. Others have arranged tours at other times or have arranged for visits to their classrooms by PURE volunteers or members of the CDDHS Environment



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Club to explain the **Green Power Project** and how they might work on energy issues or energy conservation in their schools.

Community Colleges have also expressed interest in collaborating with CDDHS because of the **Green Power Project**. A group from the Centennial College's Integrated Energy Systems Program Advisory Committee visited the school to tour the system and to seek the advice of CDDHS teachers as they develop curriculum for their renewable energy related courses. Humber Community College, which is beginning to build a campus in Orangeville, has offered to collaborate with CDDHS teachers as they develop energy related curriculum and to arrange credit in their energy related courses for CDDHS graduates who take the appropriate courses as they develop.

However, as the Principal, expresses in his questionnaire, the teachers and the entire CDDHS school community are just beginning to make use of the renewable energy system. The demands for information, direction and collaboration from outside the school are often more than the school can deliver. It takes time to build energy awareness, to write curriculum to enable teachers and students to integrate the system into courses, to organize conservation initiatives and to build the expertise and the programs required to reach out to the community. As he said, "Now that we have this remarkable resource on site it is incumbent upon us ... to make effective use of it and to offer the leadership necessary to make that happen." The school has begun these tasks, but it is a process that will take years to reach fruition.

The impact of the **Project** as an impetus to school-wide conservation should become evident in the future as well. The amount the 1.5 kW renewable energy generator delivers to the school is a small portion its daily energy demand - the school uses between 2000 and 3500 kWh/day depending on the season and the student population. As the initiatives referred to above are developed a concomitant reduction in school energy will occur. In a few weeks the **Green Power Project** has certainly made a splash but to achieve the power of a tidal wave it will take many more months.



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#### [Appendix A: CanWEA Presentation 2005](#)

This paper was presented in the Small Wind Session of the Canadian Wind Energy Association Annual conference at the Toronto Congress Centre on Sunday October 16. The abstract and power point presentation are included in this appendix.

#### [Appendix B: Engineering Drawings](#)

The Electrical Schematics for the system are included in this appendix along with price quotations for the Green Power Energy system.

#### [Appendix C: Environmental Assessment](#)

Documentation submitted to Eco-Action to comply with Report of Environmental Assessment.

#### [Appendix D: Operating Manual for Green Power Energy System](#)

Overview of the manual documenting the system.



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# Appendix A



*The Green Power Project*  
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# Appendix B



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# Appendix C



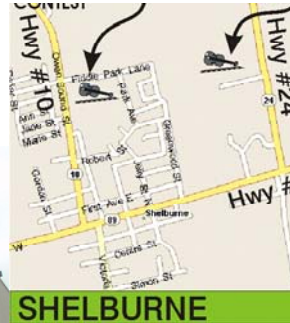
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# Appendix D



# PURE at Work

## *Power Up* Renewable Energy Co-Operative



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## *Reduce The Juice*

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### Executive Summary:

***Reduce the Juice*** was an energy conservation pilot project aimed at encouraging the residents of Shelburne Ontario to reduce their use of electricity. The Power Up Renewable Energy Cooperative (PURE) led the project with assistance from a variety of public and private funding agencies. The project employed a team of local high school students who carried out a door-to-door campaign throughout the town. Two university students who are local residents and who were trained in home energy conservation strategies led the team of high student auditors.

The project used door-to-door surveys, in-home energy audits, promotional events and word of mouth advertising to raise the “energy consciousness quotient” of the community. The project’s three goals were to encourage the citizens of Shelburne to reduce their use of energy by 5%, to raise awareness within the community of Shelburne about energy conservation and renewable energy technologies, and lastly, to develop a model of energy education and energy conservation that could be implemented in other rural communities.

The ***Reduce the Juice*** team called on 1190 homes, completed 327 detailed surveys and received 319 pledges from homeowners to reduce their use of electricity. The average reduction pledged by household was estimated to be 1440kWh per year. Residents were left with information on how to conserve energy in the home as well as prompts to help them remember such as door hangers and fridge magnets.

Analysis of town electricity consumption, following the ***Reduce the Juice*** campaign, indicates that the project was successful in that a 5% reduction in electrical load demand occurred in homes and small businesses in Shelburne following the period the project was run. The results are consistent with those obtained from pledges, during the door-to-door campaign.

Activities to influence the community extended beyond the borders of the Town, with the Reduce the Juice team participating in various conferences and meetings which included presenting a paper at the Canadian Wind Energy Association (CanWEA 2005) Annual meeting and being a UNFCCC observer at COP11 and MOP1 for implementing the Kyoto Protocol in Montreal in December 2005.

This report provides a detailed description of the work carried out and presents the qualitative and quantitative data collected during the course of the summer of 2005.



## *Reduce The Juice*

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Centre Dufferin District High School  
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Human Resources Development Canada  
Hydro One  
Matthew Fairlie, Shelburne  
Ontario Ministry of Energy  
Quantum Leap Co.  
Power Up Renewable Energy (PURE)  
Randy Dryburgh, Shelburne  
Richard Proctor, Shelburne  
The Town of Shelburne  
Theresa Sauren, Orangeville



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## *Reduce The Juice*

### *A Shelburne Community Energy Conservation Project*

#### 1.0 Introduction

“**Reduce the Juice**; A Shelburne Community Energy Pilot Project”, was conceived by Power Up Renewable Energy Co-operative (PURE), a community organization founded in Shelburne, May 2003 ([www.powerupenergy.ca](http://www.powerupenergy.ca)). PURE is a non-profit, primarily volunteer group, created to encourage sustainable and responsible energy generation and use in the Dufferin County and Headwaters region. **Reduce the Juice** was designed to compliment the **Green Power Project**, a 1.5kW solar and wind energy generation system installed at Centre Dufferin District High School in Shelburne. **Reduce the Juice** builds on the visibility of the Green Power Project to further its goals to develop leadership in youth regarding energy and environment, and to educate the community at large about renewable energy and energy conservation.

The need for projects like **Reduce the Juice** is becoming increasingly evident because of Ontario electricity supply constraints and the dangers of climate change. The summer of 2005 was one of the hottest on record with a record number of smog days and extreme heat alerts. Peak electricity demand on these numerous hot days led to conservation pleas from the Minister of Energy, as demand often exceeded the province’s generation capacity. **Reduce the Juice** was able to supply much needed advice to Town residents on how to maintain a comfortable home while reducing the strain on the electricity supply.

The consequences of climate change, although undeniable, will not happen uniformly, and the effects are expected to take decades to fully manifest themselves. What is clear, however, is that because of its geographical latitude Canada will feel the effects sooner than most other areas and the effects will be greater in magnitude. Recently the Arctic Climate Impact Assessment (ACIA) report noted that winter temperatures in Canada’s North have increased 3-4 deg C over the past 50 years. In a CBC interview commenting on the ACIA report University of Victoria Arctic researcher Terry Prowse said, "we often refer to the Arctic as the bellwether, or the canary in the coal mine. Well, that canary is coughing... We've got to keep our eye on it, because ... the Arctic is what we're going to get 30 years down the road."

The **Reduce the Juice** team worked to make the connection between electricity use and climate change. This connection provided a chance for Shelburne citizens to understand that by reducing their energy use they could both save money and help protect the environment, an argument for energy conservation the Project called “dollars and sense”. (see [www.reducethejuice.ca](http://www.reducethejuice.ca))



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Promoting energy conservation requires people to change behaviours, which have become routine. For example, helping people to simply turn off unneeded lights can produce measurable reductions in electricity consumption. However, changing such behaviours is a difficult task particularly when dealing with something as unconscious and habitual as energy use. The Project found that a one-on-one conversation in a person's home is the most effective tool to promote such changes. Such informal conversations allowed the student auditors to situate personal habits and practices of residents within the context of much larger issues and thus motivate the changes required to reduce their energy use. Determining the effectiveness of this approach is one of the primary goals of the Pilot project.

#### 2.0 Methodology

***Reduce the Juice*** project was based on a social marketing model using community channels. Two university students were responsible for the day-to-day operation of the project while local high school students carried out the door-to-door campaign. The project design was a collaborative effort with the Project Manager, the university students and members of PURE who offered some direction. The Project Manager, Theresa Sauren, provided oversight and was responsible for the overall execution of the project and project advisors from PURE provided technical input when requested.

The methodology follows the approach presented in the project proposal and was structured as follows:

**Phase I Market Research:** Determine the level of awareness in Shelburne community about personal electricity use, climate change and electricity supply constraints in the province of Ontario.

**Phase II Project Design:** Develop a plan of action including raising the ***Reduce the Juice*** profile, mobilization and fund raising and execution of "door-to-door" campaign. Develop materials and training program for high school students.

**Phase III Mobilization:** Recruit and train high school students.

**Phase IV Door-to-door Campaign:** Convince home-owners and business operators to commit to reducing their consumption of electricity.

**Phase V Results and Town Energy Analysis:** Provide summary of surveys, pledge commitments and results of program in terms of estimated energy reduction occurring over period of project.



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#### 3.0 Phase I: Market Research

##### 3.1 Initial Surveys

Initial market research took the form of informal polls on street corners and an online survey. The questions were designed to gauge people's knowledge and interest in energy issues and climate change. Responses from these surveys were a key factor in determining the approach to the door-step surveys helping to focus the educational component of the interview. The poll data is discussed in section 7.1.

##### 3.2 Reduce the Juice Website

The website was designed and maintained by the team leaders. The acquisition of the domain name "reducethejuice" was beneficial to the visibility and the marketing of the program. It received many hits and proved to be a very valuable tool for disseminating our message. The website will remain active and can be accessed at [www.reducethejuice.ca](http://www.reducethejuice.ca).

##### 3.3 Community Energy Conference

The Community Energy Conference was utilized as an awareness building event for the project and as its official launch. Three speakers presented a well-rounded program providing a general justification for the **Reduce the Juice** project. Alistair Miller, a well respected researcher in climate change issues and the nuclear industry, spoke eloquently on the science of climate change and what is predicted to happen over the next 20-50 years. Bill Tharp, a principal partner at Quantum Leap Company, a Toronto investment bank in the renewable energy sector, provided an insightful presentation on the capital investment market and emerging viable renewable energy technologies and energy conservation projects. Finally, Ken Nakahara, a Senior Policy Advisor at the Ministry of Energy, gave an overview of how the provincial government is attacking this issue and what their plans are for helping create a conservation culture. In the second half of the program the **Reduce the Juice** team presented their project plans for the summer and the team leaders presented their "dollars and sense" argument. The complete presentations offered by these speakers are available on the RTJ website at [www.powerupenergy.ca/reducethejuice/conference20050604.html](http://www.powerupenergy.ca/reducethejuice/conference20050604.html).



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#### 3.4 Targeted Community Outreach

The **Reduce the Juice** team made several presentations to community groups both prior to the official launch of the project and during the early days of the project to form relationships with community leaders. Initial presentations were made to the Town of Shelburne council and the County of Dufferin council to give them the opportunity to learn about the project, its potential benefit to the community and to gain their support. The **Reduce the Juice** team leaders also made a presentation to the Shelburne Lion's Club that outlined the project and was useful in gaining support from community leaders.

The **Reduce the Juice** team was invited to have a display table at the Victoria Day weekend sale at the local Fines' Home Hardware Store. This community outreach event provided valuable promotion for the project. The team conducted surveys of customers building on the data base from the "man on the street" and online surveys.

At the request of a Centennial Hylands' teacher, the **Reduce the Juice** team leaders visited three Grade 1 classes at the Shelburne based public school. The project goals of **Reduce the Juice** were explained to the students and they were told how they could all help around the house and spread the message of energy conservation.

#### 3.5 Publicity from Major Media

During the course of the project, **Reduce the Juice** provided regular press releases to local and national media to keep them apprised of progress and upcoming events. This PR effort yielded success as the project received good coverage in the local papers, the Orangeville Banner and the Shelburne Free Press and Economist. It helped to raise awareness of the program, to identify the **Reduce the Juice** team in the community and helped spread the conservation message. Targeted press releases proved to be the most successful in engaging radio and TV, with **Reduce the Juice** being featured on two different television networks, The New VR (now A-Channel) and The Weather Network and on CBC radio. Small towns like Shelburne are always interested in seeing local stories make it onto the news, and the coverage was very useful in raising **Reduce the Juice** profile.

### 4.0 Phase II: Project Design

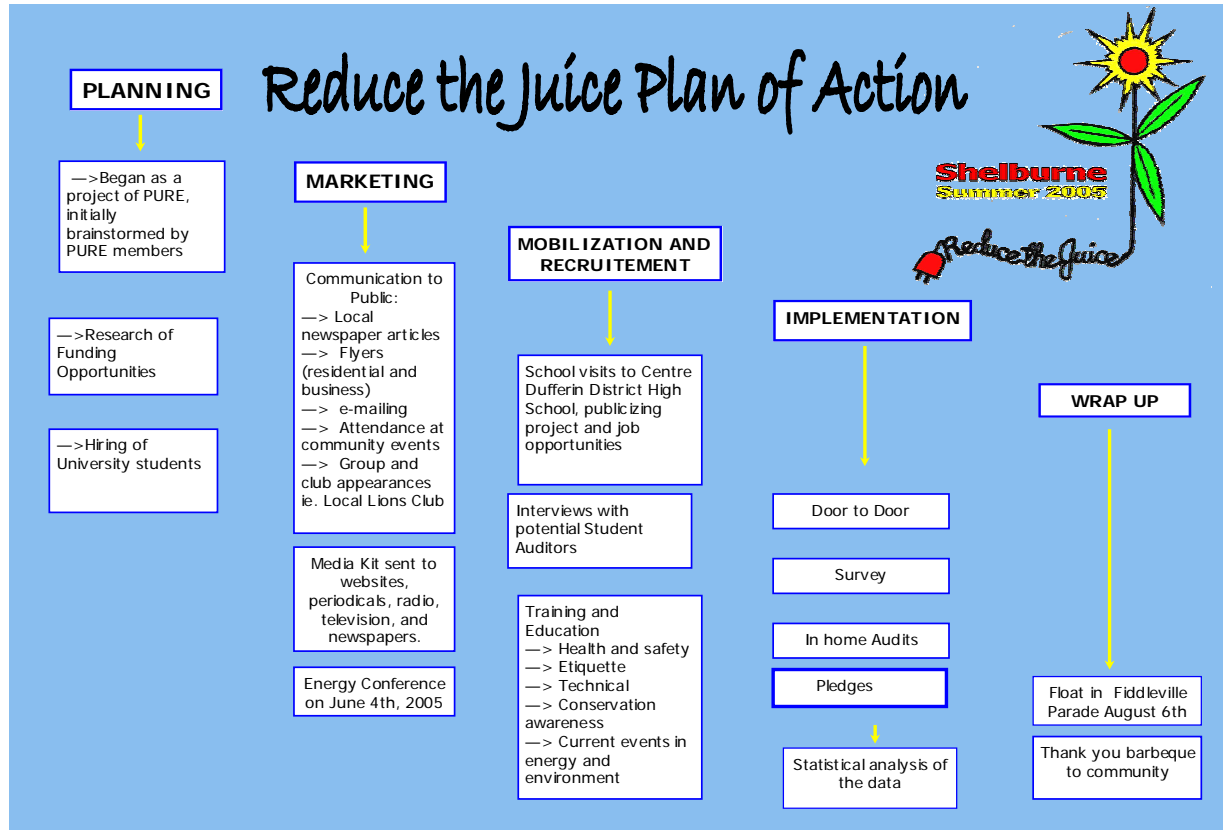
#### 4.1 Plan of Action

The plan of action is shown in the figure below.



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### 4.2 Design of Community Interaction

In preparing its plan, the team used the Shelburne Community Profile, available on the Town's website, as a starting point for determining the demographics of the community. The following information was used to design the project:

- The average household income in town is \$60,700 per year
- From the labour force of 2000 residents over the age of 15 the workers are divided among the following industries:
  - 530 are in sales and service
  - 390 are in processing and manufacturing
  - 350 are in Trades Transport and Equipment
  - 255 are in business finance and administration
  - 180 are in Management
  - 85 are in health



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- -The top 5 employers in the town are:
  - KTH (manufacturing plant)
  - Johnston Controls (manufacturing plant)
  - Dufferin Oaks Home for Seniors
  - All Elementary Schools
  - Centre Dufferin District High School

In order to determine what streets to target in our door-to-door campaign, the Town Clerk provided the Project with a detailed map as well as his knowledge of the demographic breakdown of the neighbourhoods in Shelburne. Based on this information and the judgement of the **Reduce the Juice** team, new sub-divisions, which were felt to have a larger proportion of young families, older subdivisions (40+ years old) and geared to income housing were all targeted.

#### 4.3 Project Promotion

The team created a flyer that was delivered by the students to each house in neighbourhoods they were planning on visiting. This advance notification for residents was hoped to build anticipation for the student visit, increase the response rate and create a buzz in the town about **Reduce the Juice**.

#### 4.4 On the Door Step

The team created a script for the students to use on the door step. The students used the scripts as a training tool that increased their confidence when going door to door.



#### 4.5 Marketing Materials and **Reduce the Juice** Branding

The team utilized many different tools to spread the message and gain awareness in the community. The logo, which was created by a student at Centre Dufferin District High School, was an integral part of our project.

A 50 gallon drum (called the Shelburne Blue Barrel) was used to depict the typical CO<sub>2</sub> emissions from common sources. On this basis energy reductions could be equated to emission reductions. For example, one Shelburne Blue Barrel was equivalent to 0.4kg of CO<sub>2</sub> and hence 1 kWh of coal-fired electricity, which emits 1 kg of CO<sub>2</sub> is equivalent to 2.5 barrels. This was a valuable tool that allowed the students to help people



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visualize the extent of their impact on the environment. For more details see presentation in Appendix B.

The Project created door hangers and fridge magnets as giveaways that could be used as prompts to reinforce the energy conservation message, and the desired behavior change behind it. They were left at each house along with the various brochures on home energy conservation that were supplied by our partners, Hydro One and the Ministry of Energy. The Project also created a lawn sign that was offered to each homeowner that pledged to reduce their electricity usage. The lawn sign was used to signal to other members of the community that the homeowner was supporting **Reduce the Juice** and reducing their energy use. Blue was chosen as our project colour based on the Town's use of the same colour and it is also the colour of the water tower. The blue colour was re-enforced by the Shelburne Blue Barrel, the lawn signs, the forms, the door hangers, fridge magnets and t-shirts.



As the summer of 2005 was extremely hot the project attempted to attract attention for our project by offering a renewable energy cooling service to residents by giving away sno cones made with solar power. The cart used two PV panels and batteries to power a small sno cone maker. The solar cooling centre made a few trips around town, and of course the sno cones were blue.

#### 4.6 Office Space and Location

Crewson Insurance of Shelburne donated office space at the back of the Green Dragon Dojo on Main Street. The office provided the unique situation of sharing a space with a martial arts studio, and helped to re-enforce the provincial message of “aggressive conservation” The office opened onto an alley behind the storefront which limited its visibility to the public, although some people did stop in to chat.

#### 5.0 Phase III: Mobilization

##### 5.1 Hiring the Team

The team leaders spent several days at Centre Dufferin District High School recruiting interested students for the Student Auditor positions with Reduce the Juice. After a diligent interview process, four outstanding students were hired. The project sought



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students who would represent **Reduce the Juice** in a positive manner, keep the momentum of the project alive all summer, and work well in a team-oriented atmosphere.

#### 5.2 Training

Extensive training was provided for the students, as they needed to be thoroughly comfortable with the subject matter to be prepared for their one on one interviews with the residents of Shelburne. The student auditors were given an understanding of current events, an awareness of the issues surrounding climate change, and most importantly, a technical background in energy and electricity conservation. Student auditor's were also trained in health and safety issues and given strict rules about conduct and safety in regards to entering people's homes for the in home audits. Discussion sessions amongst the group, mock doorstep surveys and self-education helped prepare the students for their door-to-door campaign and to feel confident when answering questions.

#### 5.3 Launch of "Door to Door Campaign"

The official launch of the student door to door campaign was a fun filled event at the Canada Day Festival at the local arena. The **Reduce the Juice** team handed out information, interacted with the public and entertained the group with solar powered music using a PV power system contributed by PURE.

#### 6.0 Phase IV: Door to Door Campaign

The primary objective of the project was to conduct a door-to-door campaign in Shelburne and engage as many residents as possible in a one on one conversation about energy conservation. Performing the 10-15 minute door-step interview, **Reduce the Juice** was able to use the donated Hydro One survey to ask questions, offer information on energy conservation and leave the homeowner with brochures on further steps to save electricity within their home. The students were trained to use certain questions as avenues to open discussion on broader topics such as the impending wide-spread use of Smart Meters and climate change issues and how they are connected to energy use.

Homeowners were then encouraged to take the Shelburne Conservation Challenge, a pledge to reduce energy use in their own home by 5%, the stated goal of the project. The initial visits also included a description of the **Reduce the Juice** home audit, and an invitation for the homeowner to call and book one for their home.



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#### 6.1 Participation

Table I and II give information on the size of the Town sample, Table III and IV report participation rates on pledges and surveys. Of the homes that participated almost 78% pledged to reduce their electricity consumption.

**Table I: Ground covered by *Reduce the Juice* team**

	#	% of town
Homes <sup>1</sup>	<b>1414</b>	<b>100</b>
Homes visited by <i>Reduce the Juice</i>	<b>1190</b>	<b>84.2</b>

<sup>1</sup>Homes defined as: zoned residential buildings with property boundaries and/or an assigned street number on the town map.

**Table II: Participation among visited homes – Cold Calls**

	#	% of visited houses	% of town
Cooperative homes <sup>1</sup>	<b>344</b>	<b>28.9</b>	<b>24.3</b>
Uncooperative homes <sup>2</sup>	<b>67</b>	<b>5.6</b>	<b>4.7</b>
No Response <sup>3</sup>	<b>779</b>	<b>65.4</b>	<b>55</b>

<sup>1</sup>Cooperative homes defined as: homes that completed survey, pledge or both upon cold call visits.

<sup>2</sup>Un-cooperative homes defined as: homes at which the homeowner did not wish to participate upon cold call visits.

<sup>3</sup>No-Response from the home defined as: a home at which the homeowner did not answer the door.

**Table III: Participation for pledges and surveys in town**

	#	% of visited houses	% of town
Pledges	<b>319</b>	<b>26.8</b>	<b>22.6</b>
Surveys	<b>327</b>	<b>27.5</b>	<b>23.1</b>

**Table IV: Pledge and survey participation among responsive homes<sup>1</sup>**

	% of responsive homes
Pledges	<b>77.6</b>
Surveys	<b>79.6</b>
Uncooperative	<b>16.3</b>

<sup>1</sup>Responsive home defined as: homes at which we encountered a homeowner

#### 6.2 Hydro One Survey

Hydro One supplied the Project with 500 copies of their residential survey to use in the door to door campaign. It was a survey sent out to all Hydro One customers earlier this



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year. Some alterations were made to the survey as some questions were not applicable to the project.

#### 6.3 Pledge Form

Pledge forms were created that detailed nine different ways that homeowners could reduce their own energy use. Each action provided a percentage amount (calculated using the average residential electricity usage in Ontario) that a homeowner would save on their hydro bill.

#### 6.4 In-home audits

The in-home audit was offered at the first door-to-door visit as an opportunity to further explore areas where the homeowner could achieve greater conservation. The home audit was a more comprehensive discussion of the electrical energy use throughout the home. The audits were approximately 45 minutes long and were performed by a two-person team consisting of one student auditor and one team leader. The team leaders created a home audit calculator, which allowed them to measure the wattage of various appliances throughout the house using an electronic energy meter to calculate the possible savings for the homeowner. The savings were expressed in a dollar amount as well as Shelburne Blue Barrel savings re-enforcing the “dollars and sense” arguments for energy conservation. The team concentrated their efforts in five key areas; lighting, phantom loads, major appliances (primarily refrigerators and freezers), air conditioners, electric hot water heaters and pool/hot tubs if applicable.

After completing the audit, the team recommended the EnerGuide audit to those homeowners interested in pursuing conservation further. As the ***Reduce the Juice*** audit was focused solely on electrical energy use, it was not able to provide any recommendations on the thermal envelope of the house. The team would then prepare a written report, which would be delivered to the homeowner for future reference.

#### 6.5 Follow-up survey

A few weeks following the first door-to-door visit, student auditors and team leaders returned to the streets to visit homeowners who had pledged. This follow-up visit was significant as it reinforced the initial relationship between the students and the homeowners. Each follow-up visit was comprised of a four to six minute questionnaire that included questions such as: how have you and your family changed your daily habits when it comes to electricity and energy usage? And has the ***Reduce the Juice*** program helped you this summer? After speaking with homeowners about their pledges



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the students encouraged a **Reduce the Juice** home audit and/or an EnerGuide audit. Homeowners were offered **Reduce the Juice** lawn signs as tokens for their support of the program. Homeowners, who had pledged energy reductions, were also entered in a draw that gave them a chance to win a free EnerGuide home audit, ZeroDraft gift packages, lunch for two at Jelly Craft Bakery (a local restaurant) and **Reduce the Juice** t-shirts.

#### 6.6 Frequently asked questions

The team recorded many of the questions asked and compiled a frequently asked question list. This will help the Project team design future projects and tailor materials more efficiently. Here is a partial list of the questions most frequently posed to the student auditors:

- Where do I get renewable energy systems for my home, ie wind turbines?
- Where is the power generated in Ontario coming from? Why are prices going up?
- General discussion surrounding the increase in smog days
- Most people were decidedly negative on nuclear power generation when it was discussed and many believed that our nuclear plants weren't producing any power at all
- The connection between the hot summer and climate change was explored
- Many felt that CFL's (compact fluorescent light bulbs) weren't bright enough to warrant switching – many were not familiar with the new technology and the significantly lower prices available for CFL's

#### 7.0 Phase V : Results and Town Energy Analysis

##### 7.1 Poll Data

The polls were conducted during the market research phase of the project and are based on a sample of 63 respondents.

*How conscious are you of daily energy use?*

Very: 21%    Sometimes: 57%    Not Very: 8%    Never: 13.5%

*What would be your largest motivation to conserve energy?*

a) To save money on my electricity bill. (44%)

b) For the benefit of the environment. (51%)



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c) The possibility of future business opportunities. (2%)

*Thinking of the issue of global warming (sometimes referred to as the greenhouse effect) how well do you feel that you understand this issue?*

Very well (36.5%) Fairly well (43.9%) Not well (12%) Not at all (7%)

*Do you think climate change will pose a serious threat to you and your way of life within your lifetime?*

Yes (80%) No (20%)

*In your opinion is climate change as big of a threat as smog?*

Yes (80%) No (20%)

## 7.2 Hydro One Survey

Results are based on 327 completed surveys. Questions were selected from Hydro One survey (questions have same numbers as Hydro One form).

*Survey results are listed below as percentages of those who responded to the questions.*

2) *When was your home built?*

1965>	1965-1986	1987-1990	1991-1993	1994-1998	1999 or later
<b>32.5</b>	<b>33.9</b>	<b>4.8</b>	<b>2</b>	<b>1</b>	<b>26</b>

5) *What type of space heating do you have?*

Electric baseboard	<b>3.5</b>
Electric Furnace	<b>3.6</b>
Natural gas	<b>87.9</b>
Oil	<b>2.49</b>
Wood	<b>2.49</b>
Other	<b>0</b>

6) *What type of water heater do you have?*

Electric	<b>9.8</b>
Oil	<b>0.5</b>
Gas	<b>89.5</b>



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7) What type of Air Conditioning do you have and how old is it?

Type	Age			% total
Central AC	10>	10-15	15+	<b>50.29</b>
	<b>91.7</b>	<b>6.5</b>	<b>1.7</b>	
Window AC	10>	10-15	15+	<b>11.95</b>
	<b>100</b>			
No AC				<b>38.7</b>

8) b) Do you adjust you thermostat for night time?

yes	<b>76.5</b>
no	<b>23.4</b>

b) Do you adjust your thermostat for when you are not at home?

Yes	<b>74.7</b>
No	<b>25.2</b>

9) Information about people's electrical equipment.

Appliance	Age		
Fridge	10>	10-20	20+
	<b>80</b>	<b>15.8</b>	<b>4</b>
2 <sup>nd</sup> Fridge	10>	10-20	20+
	<b>29.8</b>	<b>49.4</b>	<b>20.6</b>
	% total		<b>25.5</b>

Appliance	# in the household			
Computer	0	1	2	3+
	<b>19.9</b>	<b>69.4</b>	<b>6.7</b>	<b>3.8</b>
Television	0	1	2	3+
	<b>3</b>	<b>11</b>	<b>46</b>	<b>39.6</b>

10) a) What type of light bulbs do you primarily use inside?

Incandescent	<b>79</b>
CFL	<b>20.9</b>
halogen	<b>0</b>
fluorescent	<b>0</b>



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b) Do you use any other types of light bulbs inside your home?

incandescent	<b>19.8</b>
CFL	<b>7.5</b>
halogen	<b>6.9</b>
Fluorescent	<b>10.4</b>

10) What type of holiday lights do you use?

location	type			
Indoors	Regular	Mini	LED	None
	<b>35.6</b>	<b>35.6</b>	<b>14.2</b>	<b>14.2</b>
Outdoors	Regular	Mini	LED	None
	<b>47.7</b>	<b>21.8</b>	<b>16.1</b>	<b>14.2</b>

14) Would you be interested in an in home device that tracks and displays your ongoing electricity use?

Yes	<b>37.4</b>
No	<b>48.8</b>
Don't Know	<b>13.65</b>

15) How interested are you in taking the following measures?

Compact Fluorescent Light bulbs	Very	Somewhat	Not at all
	<b>79.4</b>	<b>14.4</b>	<b>6.16</b>
LED Christmas Lights	Very	Somewhat	Not at all
	<b>64.82</b>	<b>18.9</b>	<b>16.2</b>
Increased Dimmer Lighting Control	Very	Somewhat	Not at all
	<b>32.8</b>	<b>14.5</b>	<b>52.6</b>
Increased Insulation	Very	Somewhat	Not at all
	<b>31.4</b>	<b>12</b>	<b>56.4</b>
Window and door replacement	Very	Somewhat	Not at all
	<b>76.3</b>	<b>23.7</b>	<b>7.19</b>
Energy Star Appliance	Very	Somewhat	Not at all
	<b>76.9</b>	<b>20.4</b>	<b>13</b>

### 7.3 Pledge Results

The following table summarizes the commitments made by households based on 319 completed pledges. Please note that for pledge#1 (upgrade an appliance) a correction



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in energy savings was made from 7% as it appeared on the pledge form to 3.5%. The results below reflect this correction.

**Table V: Pledges and actions committed**

	Pledge	total	Pledge to Do	Already Doing	No Commitment
1	Upgrade and old appliance to an energy star appliance	#	<b>56</b>	<b>206</b>	<b>67</b>
		%	<b>17</b>	<b>63</b>	<b>20</b>
		kWh	<b>37296</b>	<b>137196</b>	-
2	Install a low flow shower head and an aerator on you kitchen sink.	#	<b>70</b>	<b>207</b>	<b>52</b>
		%	<b>21</b>	<b>63</b>	<b>16</b>
		kWh	<b>77700</b>	<b>229770</b>	-
3	Hang your clothes out to dry for the rest of the summer and set your washing machine to a cold water rinse.	#	<b>60</b>	<b>194</b>	<b>75</b>
		%	<b>18</b>	<b>59</b>	<b>23</b>
		kWh	<b>46620</b>	<b>150738</b>	-
4	Change 4 light bulbs in your home to compact fluorescents.	#	<b>188</b>	<b>133</b>	<b>8</b>
		%	<b>57</b>	<b>40</b>	<b>2</b>
		kWh	<b>125208</b>	<b>88578</b>	-
5	Put your computer and its peripherals on a power bar and turn it off for 11 hours a day.	#	<b>158</b>	<b>96</b>	<b>62</b>
		%	<b>48</b>	<b>29</b>	<b>23</b>
		kWh	<b>70152</b>	<b>42624</b>	-
6	Put an insulating jacket on your hot water heater.	#	<b>179</b>	<b>62</b>	<b>88</b>
		%	<b>54</b>	<b>19</b>	<b>27</b>
		kWh	<b>59607</b>	<b>20645</b>	-
7	Switch to LED Christmas lights (3 strands.)	#	<b>153</b>	<b>87</b>	<b>89</b>
		%	<b>47</b>	<b>26</b>	<b>27</b>
		kWh	<b>50949</b>	<b>28971</b>	-
8	Turn up you Air Conditioning by 2 degrees.	#	<b>46</b>	<b>106</b>	<b>177</b>
		%	<b>14</b>	<b>32</b>	<b>54</b>
		kWh	<b>10212</b>	<b>23532</b>	-
9	Turn down the temperature on your hot water tank by 2 degrees.	#	<b>104</b>	<b>113</b>	<b>112</b>
		%	<b>31</b>	<b>34</b>	<b>34</b>
		kWh	<b>23088</b>	<b>25086</b>	-

Table VI shows pledge commitments as percentages of the totals.



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**Table VI: Average commitment per pledge form**

	Pledge to do it	Already doing it
Average % of bill	<b>6.5</b>	<b>10.1</b>
kWh	<b>1445.7</b>	<b>2244.0</b>
\$	<b>130.13</b>	<b>201.96</b>
Shelburne Blue Barrels	<b>3614.2</b>	<b>5610.2</b>

**Table VII: Town of Shelburne's commitment to pledges**

	Pledge to do it	Already doing it
kWh	<b>479964</b>	<b>745032</b>
\$	<b>43196.76</b>	<b>67052.88</b>
Shelburne Blue Barrels	<b>1199910</b>	<b>1862580</b>
% of towns electricity use	<b>3.86</b>	<b>6</b>

#### 7.4 Town Energy Analysis - Analysis Done by Students in September

Two analyses were performed, one by the students using information obtained from the Internet Meters (because contacts in Hydro One were on-strike over summer) and the second using data supplied by Hydro One in December 2005. Section 7.4, below, describes the analysis by students, which was presented in the Preliminary Report. Section 7.5 presents analysis of data supplied by Hydro One.

##### 7.4.1 Establishing a Baseline

A historical baseline of per household electricity use was calculated for the years 2002-2004, the period that Town meters were connected. The following data is taken from the web-enabled data-base provided by Hydro One. The numbers are the cumulative readings for all Shelburne meters.

**Table VIII: Average Annual Electricity use of town**

Year	Average Power Consumption (kW) <sup>1</sup>	Average Annual Consumption (kWh)
2002	<b>3249.64</b>	<b>28466851.79</b>
2003	<b>3351.04</b>	<b>29355096.59</b>
2004	<b>3540.53</b>	<b>31015065.85</b>
2005	<b>3760.00</b>	<b>32937567.51</b>

<sup>1</sup>average consumption calculated as the average of the hourly readings throughout the indicated year



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Note: Calculation based on:

- A population of homes and small businesses, 1500 in 2002 & 2003, and 1700 in 2005. (the number of households and businesses are based on water bills distributed by the Town of Shelburne).
- Values are corrected by subtracting the power consumption of industry, which is taken to be difference between average weekday and average weekend demand. Shelburne auto plants work on a five day week.
- The Blue Barrels calculations are based on 1 kg per kWh – coal fired generation.
- Cost of power based on 9 cents/kWh.

On this basis the average annual electricity consumption per household was calculated.

**Table IX: Electricity use per household**

Year	kWh	\$	Shelburne Blue Barrels
2002	<b>17459.58</b>	<b>1571.35</b>	<b>43648.75</b>
2003	<b>18051.62</b>	<b>1624.65</b>	<b>45129.00</b>
2004	-	-	-
2005	<b>18035.64</b>	<b>1623.17</b>	<b>45088.20</b>
<b>AVERAGE</b>	<b>17848.82</b>	<b>1606.40</b>	<b>44622.04</b>

\* A correction factor of 260 kW (to correct for industrial plants) was applied based on the average difference between weekdays and weekends.

\*\* Note also that the year of 2004 had incomplete readings from its smart meter data and was therefore discarded from calculations.

#### 7.4.2 Temperature Compensation

To compensate for the increase in temperature and electricity consumed during hotter periods, data from previous years was used to estimate a temperature correction factor. The temperature factor was calculated as a % correction factor for a given temperature.

The correction factors were calculated by rounding temperature values and then averaging over a 3-degree window. Over the temperature range of interest the correction factor worked out to approximately a 1% increase in electricity consumed per degree centigrade.



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**Table X: Average Electricity Consumption by Temperature for Homes/Small Businesses**

Temperature (°C)	Average Consumption Per House		
	kWh/day	\$	Barrels
28	52.23622	4.70126	130.5906
27	51.84895	4.666405	129.6224
26	51.187	4.60683	127.9675
25	50.20665	4.518599	125.5166
24	48.40678	4.35661	121.0169
23	46.65784	4.199205	116.6446
22	45.81741	4.123567	114.5435
21	44.97303	4.047573	112.4326
20	44.48781	4.003902	111.2195
19	43.77416	3.939674	109.4354
18	43.36503	3.902853	108.4126
17	43.23956	3.89156	108.0989
16	42.7692	3.849228	106.923
15	42.72704	3.845434	106.8176
14	42.78342	3.850508	106.9586
13	43.01498	3.871348	107.5374
12	43.07559	3.876803	107.689
11	43.62422	3.92618	109.0606
10	44.42665	3.998399	111.0666
9	45.12575	4.061317	112.8144
8	46.19667	4.1577	115.4917
7	46.72301	4.205071	116.8075
6	47.8662	4.307958	119.6655
5	48.73912	4.386521	121.8478
4	50.52115	4.546904	126.3029
3	51.67805	4.651025	129.1951
2	53.04864	4.774377	132.6216
1	53.5202	4.816818	133.8005
0	54.60891	4.914802	136.5223
-1	56.02812	5.04253	140.0703
-2	57.85505	5.206955	144.6376
-3	59.31286	5.338157	148.2821
-4	59.93907	5.394516	149.8477
-5	60.2017	5.418153	150.5043
-6	60.38622	5.43476	150.9656
-7	61.64774	5.548297	154.1194
-8	62.83193	5.654874	157.0798
-9	63.78874	5.740987	159.4719



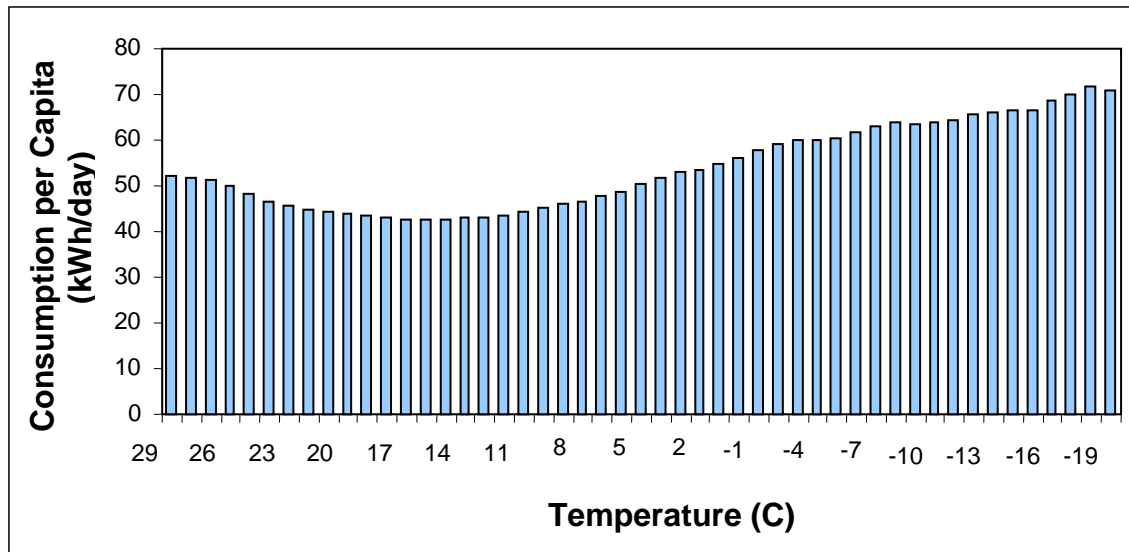
## Reduce The Juice

### A Shelburne Community Energy Conservation Project

-10	63.3158	5.698422	158.2895
-11	63.78506	5.740655	159.4626
-12	64.53035	5.807731	161.3259
-13	65.57956	5.902161	163.9489
-14	66.24095	5.961686	165.6024
-15	66.40595	5.976536	166.0149
-16	66.73576	6.006218	166.8394
-17	68.85423	6.196881	172.1356
-18	69.85377	6.28684	174.6344
-19	71.70883	6.453795	179.2721
-20	70.83555	6.3752	177.0889

Plotting the temperature correction factor.

**Graph I: Average Consumption by Temperature**



#### 7.4.3 Analysis of Data from 2005

The average daily temperatures over the test period are shown in Table XI. Temperature values are rounded to nearest degree and daily per household energy use is calculated using the town meter readings, backing out the industry component and dividing by the number of water bills (1700).



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**Table XI: Conservation Trends for July 15<sup>th</sup> to September 15<sup>th</sup> 2005**

Date	Temperature	Consumption	Difference	%
July 15	26.3	50.84106	-0.34595	-0.68%
16	26.8	49.04323	-2.80571	-5.41%
17	26.2	49.08794	-2.09906	-4.10%
18	28.2	52.71547	0.479248	0.92%
19	25.5	49.55865	-1.62836	-3.18%
20	23.2	45.92276	-0.73507	-1.58%
21	27.6	50.90471	-1.33152	-2.55%
22	25	47.57835	-2.6283	-5.23%
23	23.9	43.78429	-4.62248	-9.55%
24	22.2	43.21012	-2.60729	-5.69%
25	28	48.64635	-3.58987	-6.87%
26	25.2	47.89241	-2.31424	-4.61%
27	18.8	42.933	-0.84116	-1.92%
28	18.9	41.43094	-2.34322	-5.35%
28	20.5	40.45082	-4.52221	-10.06%
30	20.5	40.09706	-4.87597	-10.84%
31	22.3	40.12	-5.69741	-12.44%
August				
1	26.4	42.218	-8.96901	-17.52%
2	25.8	50.54918	-0.63783	-1.25%
3	27.4	52.39759	0.161365	0.31%
4	27.5	51.89006	-0.34616	-0.66%
5	21.8	44.92412	-0.89329	-1.95%
6	20.8	43.61759	-1.35544	-3.01%
7	23.4	46.29424	-0.3636	-0.78%
8	25.1	48.58582	-1.62083	-3.23%
9	26.8	51.85941	-0.37681	-0.72%
10	26.9	50.68047	-1.55575	-2.98%
11	23.8	45.99835	-2.40842	-4.98%
12	23.5	43.63388	-4.77289	-9.86%
13	23.6	45.41276	-2.99401	-6.19%
14	20.2	43.43918	-1.04863	-2.36%
15	21.1	43.40706	-1.56597	-3.48%
16	21.10	43.8743	-1.10268	-2.45%
17	21.40	43.85265	-1.12038	-2.49%
18	21.00	43.05788	-1.91515	-4.26%
19	19.70	43.10771	-1.3801	-3.10%
20	21.30	43.19653	-1.7765	-3.95%
21	22.10	42.84953	-2.96788	-6.48%
22	21.70	42.12912	-3.68829	-8.05%

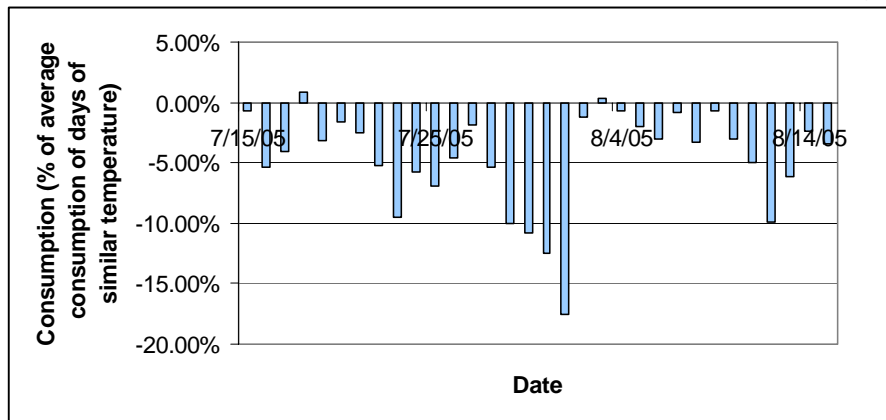


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23	18.00	40.76635	-2.5986	-5.99%
24	17.80	40.77071	-2.5943	-5.98%
25	19.70	41.43535	-3.05245	-6.86%
26	19.40	41.119	-2.65463	-6.06%
27	21.30	42.00912	-2.96391	-6.59%
28	21.10	43.31329	-1.65974	-3.69%
29	22.90	43.79394	-2.86389	-6.14%
30	24.10	44.24094	-4.16583	-8.61%
31	21.10	44.30135	-0.6716	-1.49%
Sept. 1	21.80	46.16788	0.350474	0.76%
2	20.9	44.96635	-0.00668	-0.01%
3	20.40	43.29112	-1.19669	-2.69%
4	20.10	41.47029	-3.01751	-6.78%
5	18.00	40.35582	-3.00921	-6.94%
6	17.90	39.03759	-4.32744	-9.98%
7	19.70	43.32865	-1.15916	-2.61%
8	21.20	44.27835	-0.69468	-1.54%
9	18.90	43.44588	-0.32828	-0.75%
10	19.30	41.64247	-2.13169	-4.87%
11	16.90	41.56841	-1.67114	-3.86%
12	19.50	42.59806	-1.88975	-4.25%
23	24.30	46.34823	-3.85842	-7.69%
14	24.70	46.721	-3.48565	-6.94%
15	24.10	45.565	-2.84178	-5.87%

**Graph II: Conservation Trends for The period July 15<sup>th</sup> to August 15<sup>th</sup>**



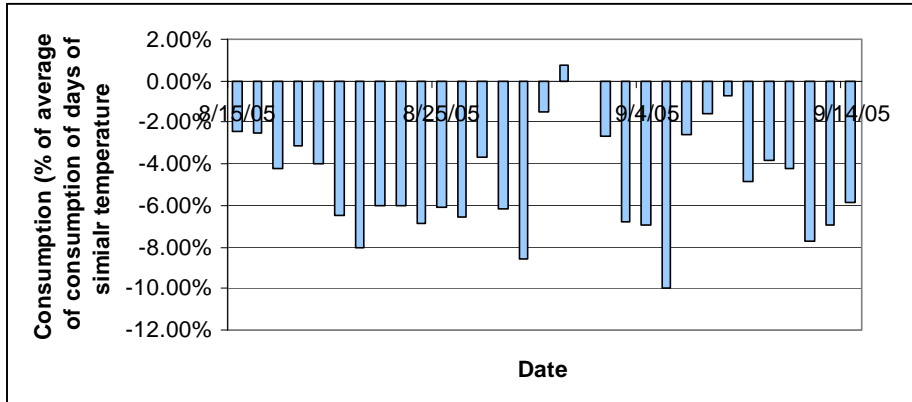


## Reduce The Juice

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The graphs of conservation trends plot daily trends of the variance in energy consumption in 2005 compared with previous years over the test period.

**Graph III: Conservation Trends for the Period August 15<sup>th</sup> to September 15<sup>th</sup>**



The data in these graphs are summarized in Table XII.

**Table XII: Conservation Trends Summary**

	July	August
Average % Conservation	<b>-4.62</b>	<b>-4.72</b>
Household savings (kWh /day)	<b>-2.14</b>	<b>-2.22</b>
Town savings (kWh /day)	<b>-3785.47</b>	<b>-3643.69</b>
Town Savings (\$/day)	<b>-340.692</b>	<b>-327.932</b>
Town savings (Barrels/day)	<b>-9463.67</b>	<b>-9109.22</b>
Town Savings (kWh/month)	<b>-121135</b>	<b>-112954</b>
Town Savings (\$/month)	<b>-10902.1</b>	<b>-10165.9</b>
Town Savings(Barrels/month)	<b>-302837</b>	<b>-282386</b>

**On this basis the program was successful in achieving a 5% reduction over the test period. It is recommended that this result be checked by Hydro One, which should be able to produce a more accurate analysis by reading the residential meters.** The analysis is subject to a number of errors including the fact that numbers reflect residential, small business and town use, and the temperature correction factor most likely does not accurately reflect extremes experienced during the summer of 2005, one of the hottest in the Province's history.



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#### 7.5 Town Energy Analysis - Analysis Prepared using Data Provided by Hydro One

Hydro One, the local distribution company for electric power in the Town of Shelburne, provided hourly power readings from four meters, which when added together, constitute the total town load. Data was compared during the period leading up to, during, and following the project. The total town load runs approximately 3 – 4 GW. The meters are labeled MS2, MS3, MS4 and KTH. KTH measures electric power of the car parts factory and is about one third of the town load. This value is about five times higher than the estimate in the RTJ Preliminary Report. The MS meters each measure a region in town and are made up of both residential and light business loads.

Time integrated power readings, calculated by summing the power readings over the month, provide a measure of energy consumed. For example for the months of June and November of 2005 the time integrated power reading values and breakdown as a percentage of total load for the month were:

**Table XIII: Monthly Loads and Breakdown by Meter  
For June and November 2005**

Meter	June Load [kWh] @ 22.6C	November Load [kWh] @ 5.6 C
MS2	857,000 (22%)	1,089,000 (28%)
MS3	648,000 (17%)	657,000 (17%)
MS4	948,000 (25%)	992,000 (26%)
KTH	1,392,000 (36%)	1,148,000 (29%)
Total	3,845,000 (100%)	3,886,000 (100%)

A non-interrupted recording of hourly power demand was available from two of the town meters MS2 and MS3 and this data forms the basis of the analysis. These meters measure load demand in the south-central and west-central parts of town and constitutes about 40% of the total town load.

Loads from the current year, 2005, were compared with the previous year 2004. Temperature data provided by Hydro One measured at Toronto airport were used to calculate an average temperature for the month, and loads between years were corrected to a common temperature, based on the correction factor that a 1 degree C change in temperature will result in a 1% change in load. This is the same relationship derived in the preliminary report and is a reasonable assumption according to the Hydro One load analysis group.<sup>1</sup>

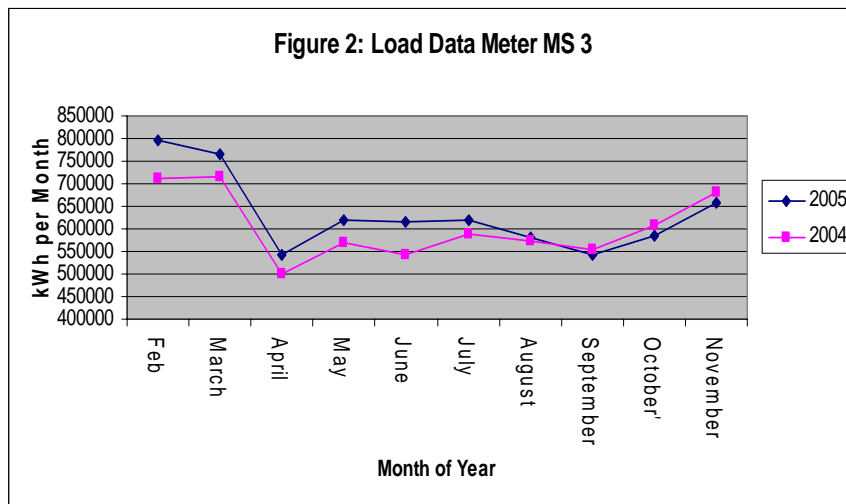
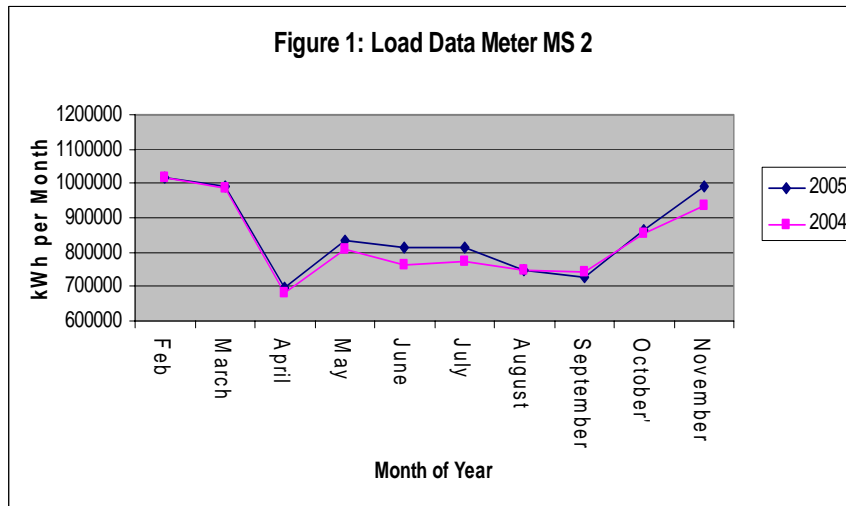
<sup>1</sup> Clement Li, Hydro One, e-mail to Theresa Sauren, December 8, 2005



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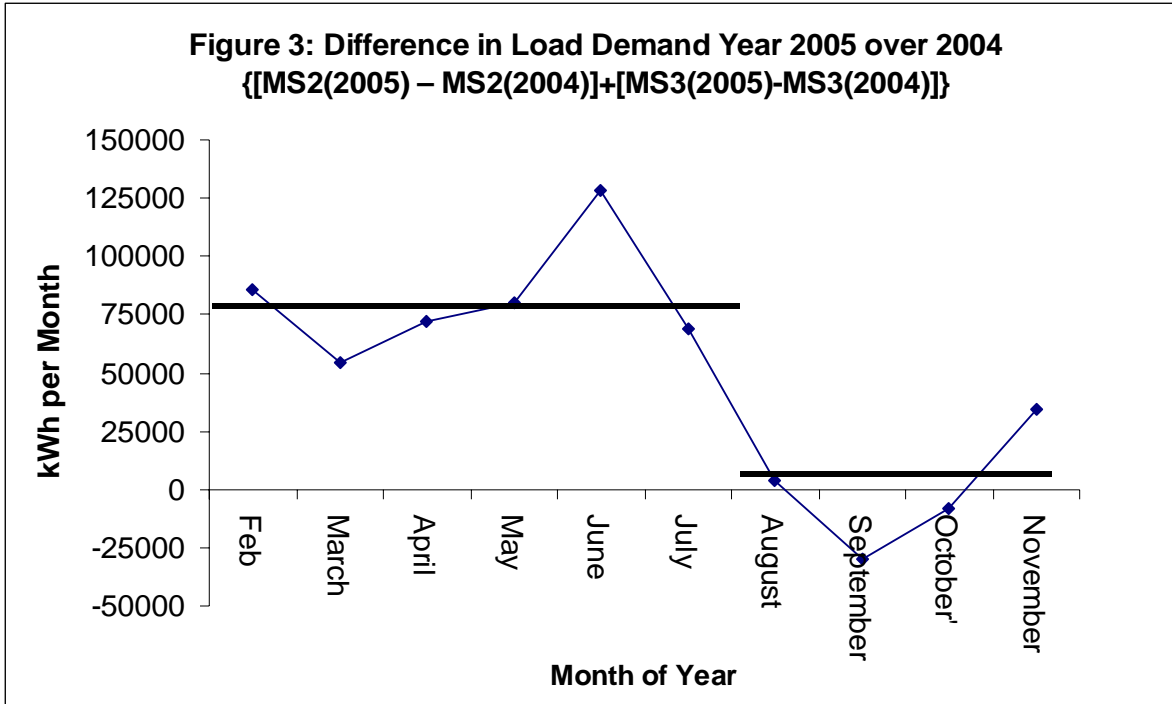
The results for monthly readings for the meters MS2 and MS3 appear in Figure 1 and Figure 2 respectively. As can be seen in the graphs over the period of the project the curves invert with 2005 readings dipping below 2004 starting in July, the first month of the program, and running through September. By subtracting the integrated meter readings for 2004 from 2005, for each month, i.e.  $\{[MS2(2005) - MS2(2004)]\}$  in Figure 1, and adding the results for the two meters a measure of the change in Town load demand can be determined, Figure 3. The change in monthly load demand for the resulting  $\{[MS2(2005) - MS2(2004)] + [MS3(2005) - MS3(2004)]\}$ , starting at the beginning of the program, measured by the difference between the bold horizontal lines, is about 75,000 kWh or about 5.8% of the load,  $\{MS(2005) + MS(2004)\}$ , in the summer months.





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The results in Figure 3 indicate the same change as the student analysis above. The structure of the data shows that the decline in demand occurred at the beginning of the project July 1. Further investigation will be undertaken to verify that it is due to a 5% reduction in residential demand as targeted in the project. As in the section above to verify these results it is recommended **“These results be checked by Hydro One which should be able to produce a more accurate analysis by reading the residential meters.”**

Assuming the reduction in demand occurred at this level over the entire town, and that MS4 would show similar behaviour, if data was available, this would amount to a load drop 60% greater than the result in Figure 3 or 120,000 kWh per month for an estimated annual load reduction of about 1.4 Giga-Watt-hr. These numbers are of the same magnitude as those shown in the Conservation Trends in Table XIII. To break this down further, according to Hydro One records, there are approximately 1600 residential customers with an aggregate billing of 15,140,000 kWh in 2004 and 222 business service customers with an aggregate billing of 31,500,000 kWh. If the load drop was due to residential users only, this would amount to a 9% reduction, and if the load drop is equally spread across the non-KTH customer base it would amount to a 3.2% reduction.



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The estimated annual reduction is consistent with pledged rates, which would amount to 1.7 GWh, if a 75% pledge rate of 1400 kWh per home extended over the residential load base only.

In conclusion more structural information is required to carry out a complete analysis but it seems that a significant load drop, of the order of 5% in residential and light business loads, occurred over the period of the project.

#### 7.6 Survey on Program Effectiveness

Results from a follow up survey of the Shelburne community appears below:

#	Question		Very Much	Somewhat	Not at All	Don't Know
1	So you feel you are more aware of how much energy you consume and have you changed your habits?	#	53	45	31	4
		%	40	34	23	3
2	Do you feel that you are succeeding with your pledges?	#	76	48	2	7
		%	57	36	1	5
3	Do you think that after the summer you will continue to monitor your bill?	#	119	14	0	0
		%	89	10	0	0

#### 8.0 Action on Climate Change – Observer Status at COP 11

Beyond the door-to-door campaign, the project attempted to influence a broader community. Two specific actions were taken to gain wider attention to the program.

The first action was to attend the COP 11 conference in Montreal and report back to local media. Through the Climate Action Network (CAN), members of the Reduce the Juice team were able to attend as observers to the UNFCCC. As observers they attended the high level meetings and various contact groups. The series of three articles published in the Orangeville Banner appear in Appendix D: Media file

The second action was directed to raising awareness of climate change in professional hockey in a campaign to “Save Pond Hockey”. A copy of the letter sent to Don Cherry is included in Appendix D: Media File.



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### [Appendix A: Field Trips](#)

### [Appendix B: Presentation of \*\*Reduce the Juice\*\* to Ontario Conservation Bureau](#)

See attached power point presentation

### [Appendix C: \*\*Reduce the Juice\*\* Marketing Plan](#)

See attached power point presentation.

### [Appendix D: Media File](#)

See attached press clippings.



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# Appendix A



## *Reduce The Juice*

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### **EnerGuide Audit of Home of David Tilson, MP**

**Reduce the Juice** relied on creating reciprocal relationships with other community groups with similar goals to further our access to the media and to the public and to help spread our message. One of these relationships was with Caledon-Dufferin REEP (Residential Energy Efficiency Program), the local agency offering EnerGuide for Houses audits. They offered to provide some training for the students in home efficiency guidelines and presented the team the chance to participate in a full home audit. This was arranged to take place at the home of the local MP, Mr. David Tilson. He graciously invited the entire **Reduce the Juice** team as well as the EnerGuide auditor into his home for the duration of the audit. The students had the opportunity to give him the project survey and ask him to pledge to reduce his energy use.

The students gained an insight into the techniques used to audit homes, which they could then disseminate to the homeowners in Shelburne. They also had a full three hours in which to engage Mr. Tilson in conversation about the issues surrounding energy such as climate change and smog. Mr. Peter Livingston, the EnerGuide auditor, was very helpful and offered them many tips from his years of experience in this field. It was our intention to promote the EnerGuide program to interested residents who wanted to further their energy efficiency beyond electricity use.

Mr. Tilson's office released the story with photos to the local press which ran the story and the photo providing **Reduce the Juice** with more much appreciated press coverage. Please see Appendix C for a copy of the story.

### **Test Marketing *Reduce the Juice* in Toronto**

The **Reduce the Juice** team took the marketing plan on the road to Toronto to present it to two interested parties, the Ministry of Energy and Quantum Leap Company. The Ministry of Energy and in particular, Donna Cansfield, Parliamentary Assistant to the Minister of Energy, was an avid supporter of the project and interested in our progress to date. We arrived at her office in the Hearst Block with our Shelburne Blue Barrel (a 50 gallon blue drum) in tow as we presented our marketing plan (see Appendix D). She provided enormous support for our initiative by offering to send letters of congratulations to all residents who pledged, by giving us access to her communications staff for media relations assistance and by giving us insight into what other programs around the province are doing.



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Our meeting with Quantum Leap Company was equally successful. Our intent was to test market some of our ideas on a team of professionals in the energy arena. They provided valuable insight into the realm of renewable energy and conservation projects on a large scale and gave us some examples of other programs that we could use as models such as the Milton Hydro Energy Drill program which has met with considerable success. It was also interesting to see what renewable projects were on the horizon and how rapidly this field is growing.



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# Appendix B



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# Appendix C



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# Appendix D