

Appendix 1



TOWN OF FORT SMITH

Community Energy Plan

Prepared: March 2010



Town of Fort Smith
Appendix 1: Community Energy Plan

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Introduction

This Community Energy Plan is a component of the **Town of Fort Smith's Integrated Community Sustainability Plan (ICSP)**. It will provide the Town and the Community of Fort Smith with information to understand energy issues in the Town and suggest opportunities for alternate energy sources, environment protection and energy conservation and sustainability for the period 2010-2015.

This Plan will help Fort Smith understand its energy system and show how changes can bring economic, environmental and social benefits to The Town.

The Plan began with the appointment of an Environment and Energy Sustainability Subcommittee of the ICSP Steering Committee. The subcommittee members have a variety of energy-focused backgrounds; they are interested in energy issues and live in Fort Smith. They collected and analysed information from a variety of sources to understand how energy is used in the Town of Fort Smith. Consultants - Stand Alone Energy Systems Ltd. of Fort Smith and FSC Architects & Engineers based in Yellowknife - assisted the subcommittee.

The Committee's strong concern was to have a Plan that was connected with the whole community in order to work together to understand the use of Energy in Fort Smith and the environmental impacts of energy use and sustainability.

This Community Energy Plan includes energy strategies and actions that can be applied in Fort Smith to provide:

- Savings for the municipality, businesses, developers and residents;
- Improved environmental quality;
- Improved community quality of life, livability and sustainability.
- A local contribution to meeting larger greenhouse gas reduction targets.



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Getting Organized

The Town of Fort Smith's approach to the Community Energy Plan involved the following steps:

- Town Council approved the start-up of an ICSP Steering Committee
- Town provided a Fort Smith consultant to assist the Committee
- Terms of Reference for an Environment and Energy Subcommittee was approved by ICSP Steering committee
- Members appointed and Chairperson selected as a Fort Smith ICSP Energy and Environmental Sustainability Subcommittee (EESS).
- Members compiled, reviewed and analyzed available information on energy use in Fort Smith. (See information sources on page 17).
- A Household Survey was drafted and included energy related questions – sent out to all households, placed on the Fort Smith web site and available at the Open House
- Arctic Energy Alliance provided a community energy profile for Fort Smith and other energy related information at the Open House
- EESS held an Energy Roundtable and an energy booth at the Open House – February 5 & 6, 2010
- Energy Audit Update – Prepared February 2010 by FSC Architects & Engineers.

2.1 What we Heard

During the consultation phase of the ICSP process, Fort Smith residents identified a clean and healthy natural environment as one of their strongest held values. Energy conservation and alternative energy sources were discussed often throughout the process. Fort Smith residents are concerned about how energy is produced and consumed in the community. Residents are concerned about the high and unstable cost of energy and they are uncertain about the future of their energy system. Many want to be able to get "off oil". They felt that actions taken by the Town of Fort Smith could have a real effect on energy and energy-related emissions and sustainability in the whole community.

Like all Canadians, Fort Smith residents are becoming increasingly aware of their carbon footprints. They find it incomprehensible and unacceptable that carbon free hydro energy continues to be wasted from the Taltson system when it could be used to replace carbon rich heating fuel.



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Glossary of Terms

Certain terms¹ relating to energy and energy conservation require clarification so that everyone can relate to the issues.

Biomass: Biological material derived from living, or recently living organisms, such as wood or plant waste. Biomass is a renewable energy source, commonly plant matter grown to generate electricity or produce heat.

Community Capacity: The knowledge, skills, people power, time, energy, money, and other resources that a person, group or community has. Capacity can increase when we increase any of these resources.

Community Energy Plan (CEP): Is a process that helps communities find the best ways to use energy more wisely. A plan shows the process and information the community uses to decide what they want to do, how they want to do it, and who will do the work. Community energy planning is often described as an ongoing cycle. As projects are completed, the cycle can start again.

Energy Audits: Measure how a building uses energy and what can be done in the building to save energy.

Energy Efficiency: Using less energy to do the same amount of useful work.

Greenhouse gases: Gases that trap heat in the Earth's atmosphere (i.e. carbon dioxide, methane, nitrous oxide and others).

Kilowatts (kW) and Kilowatt Hours (kWh): A kilowatt is a unit of power, like horsepower. It measures capacity for doing useful work. A kilowatt-hour is a unit of energy. It measures how much useful work can be done in an hour.

Integrated Community Sustainability Plan (ICSP): A medium term plan that is developed by the community to identify and carry out sustainability objectives. Communities must develop an ICSP to receive gas tax funding. In the NWT and ICSP must include a community energy plan.

¹ Artic Energy Alliance; Community Energy Planning Toolkit, November 2006 and website



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Leadership in Energy and Environmental Design (LEED): A green building rating system tailored for Canadian climates, construction practices, and regulations.

Renewable energy: Energy that comes from things that are renewed by nature. Examples include the sun, wind, moving water and wood.

Conversion of Biomass and Electricity into Heat Energy:

1 Gigajoule (GJ) = 10^9 joules = 0.948 million Btu = 239 million calories = 278 kWh = 0.278MWh heat.

1 Cord = a stack of wood comprising 128 cubic feet (3.62 m^3); standard dimensions are 4 x 4 x 8 feet, including air space and bark ~ 3.6 m³.

1 cord contains ~ 2.5 m³ solid wood.

1 cord contains ~ 1 tonne oven-dry wood ~ 20 GJ.

Background Information

4.1 Energy Audits Update

The Town of Fort Smith conducted energy audits during the fall of 2005 for town facilities including: the arena, library, fire hall, water treatment plant, sewage lift stations, water tower, town hall, town garage, recreation complex and dog pound. These profiles provided the basis for analyzing the relative efficiency of each building and or any seasonal issues. As well, the team identified all lighting in the buildings for ease of changeovers. These energy audits were updated in February 2010 and information was provided to the Town and Subcommittee. It is clear that implementation of these energy audits is required and sizeable energy savings can be achieved.



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4.2 Community Energy Profile

An energy profile for the community of Fort Smith in 2007-08 was created by Arctic Energy Alliance in February 2010. The following table provides a summary of how Fort Smith consumes energy from the Energy Profile.

Energy Source	2007/08 % of Energy Consumed	Approx. Kilowatt Hours Consumed	Approx. Total \$Cost	Approx. \$Cost /KWh
Hydro Electricity	15%	22,101,000	3,059,000	0.14
Diesel Electricity	1%	1,473,400	133,000	0.09
Heating Fuel Oil	54%	79,563,600	5,985,000	0.08
Propane	1%	1,473,400	133,000	0.09
Wood and Wood Pellets	5%	7,367,000	266,000	0.04
Gasoline	18%	26,521,200	3,059,000	0.12
Diesel	5%	7,367,000	798,000	0.11
Estimated Total / AEA		147,340,000	13,300,000	

4.3 Community Greenhouse Gas Target

The Arctic Energy Alliance estimates that in 2007-08, the community of Fort Smith emitted approximately 12 tonnes of CO₂eq per person per year. This is approximately equal to the average per capita emissions for all Canadians. It is 30% below the average emissions of people in the NWT (17 tonnes CO₂eq per person per year). The NWT average is strongly influenced by Yellowknife where the per capita average is approximately 19 tonnes of CO₂eq per year.

Canada has signed a series of international agreements to reduce "greenhouse gas emissions". Canada's Kyoto Protocol commitment was to reduce greenhouse gas emissions to 6% below 1990 levels by 2012. The Government of the Northwest Territories (GNWT) has committed to lower greenhouse gas emissions from its own operations to 10% below 2001 levels by the year 2011.

Canada's newly announced greenhouse gas reduction target is to lower CO₂eq emissions by 17% from 2005 levels by 2020. The GNWT greenhouse gas emission reduction targets are currently under review.



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If Fort Smith adopts the Canadian target for the whole community, an emission reduction of 5,100 tonnes of CO₂eq (~1.82 million litres heating fuel) is required by 2020. The largest and easiest target for reducing greenhouse gas emissions in Fort Smith is in the amount of heating fuel used for residential and commercial space heating. The 17% reduction by 2020 community wide target could be accomplished by reducing the amount of heating fuel used in Fort Smith by 25% = ~1,820,000 litres/year.

Electric and biomass conversions already in progress will reduce heating fuel consumption by ~ 850,000 litres/ year yielding a reduction of 2400tonnes CO₂eq (8% from total greenhouse gas emissions). Therefore, to match Canada's target for greenhouse gas reductions, the community of Fort Smith must reduce consumption another 9% (2700tonnes CO₂eq) in the next decade. This would require a further reduction the equivalent of ~ 970,000 litres of heating fuel / year.

4.4 Corporate Greenhouse Gas Target

The City of Yellowknife has set a corporate target of 20% below 2004 levels by 2014 for corporate emissions. If the Town of Fort Smith sets a corporate target equivalent to that of Yellowknife, a reduction of 152 tonnes CO₂eq (~54,000 litres of heating fuel) would be required. The corporate target of 20% by 2014 could be easily accomplished by converting the Water Treatment Plant from heating fuel to either electricity or biomass. Converting the Arena from heating fuel to biomass or electricity would be almost enough to meet the corporate target. Improving the efficiency of the transportation system could yield significant greenhouse gas reductions. Smaller and more fuel-efficient vehicles would use less fuel. No-idling zones would reduce wasted fuel and needless pollution. Mixing fuels with ethanol and/or biodiesel could yield some improvements.

Hybrid and electric vehicles could significantly reduce fuel consumption. Very little information is available on the Town's vehicle fleet and fuel use. More information is required to make more specific recommendations.

Reducing electricity consumption by switching to other energy carriers and efficiency conversions in town facilities are cost effective and should be implemented for economic reasons. However, they will not yield significant greenhouse gas reductions.



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4.5 Electrification

The Taltson Hydro plant is located approximately 64 kilometers north of Fort Smith on the Taltson River. A power facility built in 1965 at the Twin Gorges falls in the Taltson River provides electrical power to Fort Smith and other surrounding communities. In Fort Smith, the Northwest Territories Power Corporation (NTPC) provides, delivers and sells power to businesses and residents.

The amount of surplus electricity available from the existing Taltson hydro system during the heating season (between 01 November - 31 March) is approximately 21,600,000 kWh (3600hrs X 6MW) = 77,700 GJ = approximately the equivalent of 1,950,000 litres of heating fuel.

Existing electrification conversions will displace about 250,000 litres of heating fuel (approx. 700 tonnes CO₂eq). Therefore if all the remaining surplus could be captured and converted to heat, it could displace a maximum of ~ 1,700,000 litres of fuel x 2.8kg CO₂eq/litre = 4,760 tonnes CO₂eq.

If all of the available surplus electricity from the existing Taltson hydro system is used to generate heat that displaces imported heating fuel, Fort Smith could very nearly meet the target of reducing greenhouse gas emissions by 17%. This would meet the Canadian target and would keep Fort Smith greenhouse gas emissions equivalent to those of an average Canadian. In addition, this would replace approximately \$1.68 million dollars of imported heating fuel with a locally available resource. At \$0.03/kWh, this would represent an annual savings in Fort Smith of more than \$1 million while adding approximately \$650,000 to the revenues generated from the Taltson (@\$0.06/kWh it would add \$1.3 million to the Taltson revenues and still save customers in Fort Smith nearly \$350,000 (when heating fuel costs \$0.84 / litre)). This level of utilization is the maximum that can be expected from the existing Taltson system. Additional capacity from an expanded Taltson would probably be dedicated to other uses.

Savings from the conversion of JBT Elementary School and Breynat Hall from fuel oil to electric heat.

- Operating cost reduced by \$203,000 during their first year of operation.
- Greenhouse gas emission reduction was 511 tonnes.



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4.6 Biomass

Alternatively, the greenhouse gas reduction target could be met by displacing 1,820,000 litres/year of heating fuel with biomass. This would require the equivalent of 3,640 cords of firewood or ~3,640 tonnes of wood pellets. This would save customers in Fort Smith \$800,000 / year from the cost of an equivalent amount of heating fuel (@\$0.84 / litre for heating fuel and \$200 / cord for biomass). This would increase the total use of biomass in Fort Smith to about 5000 cords / year. This would amount to a \$1 million dollar biomass industry that could support 10-15 full time job equivalents. This would be nearly four times larger than the 2007-08-biomass industry level and would require a timber harvest of approximately 12,500 to 15,000 m³ per year.

Conversions already in progress are predicted to displace 600,000 litres of heating fuel with approximately 1200 tonnes of biomass pellets. These will nearly double the amount of biomass currently being used for energy in Fort Smith.

Assuming the availability of sustainably harvestable biomass, a local biomass industry could conceivably expand to displace a larger portion of the heating fuel imports. An additional expansion of 5000 cords per year could displace another 2,500,000 litres of fuel oil per year yielding an additional greenhouse gas reduction of 7000 tonnes of CO₂eq per year (bringing per capita greenhouse gas emissions to around 7 tonnes CO₂eq per person per year (a total reduction of 40%), as well as additional savings and jobs.

Assuming that all of these conversions are eligible for Renewable Energy Credits estimated at \$40 per tonne CO₂eq, 12,000 tonnes of reductions could generate an additional credit of \$480,000 in revenue or savings.

Savings from the conversion of Thebacha College, PWK/Rec Center and Fort Smith Health Center from fuel oil to wood pellets.

- Displaced fuel oil would total 600,000 litres / yr.
- Operating costs would be reduced by \$420,000 based on an oil cost of \$1.20 per litre.
- Greenhouse gas emissions would decrease by 1600 tonnes (~\$64,000 worth of carbon

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4.7 Own Facilities

Converting the Town's Water Treatment Plant, Arena, and Garage to either electric or biomass heat would displace approximately 240,000 litres of heating fuel per year. It would reduce the Town facilities greenhouse gas emissions from heating by about 88% (672 tonnes CO₂eq/year). This would reduce the whole Town greenhouse gas emissions by 2% / year. Together with the announced heating conversions already being implemented by GNWT in Fort Smith, these would represent a 10% reduction from current levels. To meet the 17% community target, another 7% reduction would need to be found from other government facilities, commercial facilities, residential buildings, efficiency measures and/or from transportation fuels by 2020.

4.8 Greenhouse gas targets in other municipalities

"Whitehorse city council agreed to greenhouse gas reduction targets of six per cent for the community and 20 per cent for its own operations, by the year 2013. The targets used 2001 baselines."²

Partners for Climate Protection program, has over 175 member municipalities from across Canada. The results of their recent analysis show that municipalities are significantly reducing GHG emissions in Canada.

- 1.4 million tonnes of GHG reductions.
- the equivalent of removing about 325,600 light vehicles from the road.
- over \$56 million in savings to date.³

Municipalities are also proving that their influence goes far beyond their own operations: they have reported reducing GHGs by 308,100 tonnes within the industrial, commercial, institutional (ICI), residential and transportation sectors in their communities.

The Province of BC has established the target of 33% reduction of GHG by 2020 below 2007 levels. BC has a Climate Action Charter, which commits the Cities to working towards carbon neutrality in their operations by 2012. Carbon neutrality for local governments means that emissions are reduced as much as possible before 2012, and that offsets are purchased to capture the remaining emissions. Emissions will have to be reported on an annual basis after 2012, and offsets paid based on the annual inventory

² http://gmf.fcm.ca/Search/PDF/GMEF2156_CS_e.pdf

³ http://www.sustainablecommunities.fcm.ca/files/Capacity_Building_-_PCP/PCP-Reporting/2009_Measures_Report_EN_FINAL.pdf



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reports. There is currently a carbon neutral initiative ongoing throughout the East Kootenay, Central Kootenay and Kootenay Boundary regional districts.⁴

The city climate catalogue lists 3,228-greenhouse gas target commitments made by 2,857 local governments worldwide. These range from 12% below 2008 levels by 2012 (Mexico City) to 80% below 1990 levels by 2050 (Toronto).⁵

4.9 Conclusion

Conversion of the three major heat consuming Town facilities to either electric heat or biomass heat could help meet national and territorial greenhouse gas reduction targets and would yield large economic and environmental benefits in Fort Smith. The choice of electricity or biomass depends on the reliable availability of each resource. The Town should formally approach the NWT Power Corporation to determine the availability of surplus electricity and the conditions under which it might be available. The Town should also approach the GNWT Department of Environment and Natural Resources to determine the availability of local sustainable biomass resources and the conditions under which they could be available. GNWT can also help by providing community woodlot planning, developing best practices for feedstock generation, transport, drying and storage.

At this point in the analysis, it seems that if both electricity and biomass are available under acceptable conditions, the environmental benefits of electricity might be greater than biomass. If, biomass conversions rely on imported wood pellets, the economics would also favour electrification. However, if a local biomass industry is created, the economic benefits of biomass would be greater.

⁴ http://fmv.fcm.ca/files/Capacity_Building_-_PCP/PCP_Members_Inventory_Action_Plans/Kimberley-action_plan.pdf

⁵ <http://www.climate-catalogue.org/index.php?id=6860>



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5. Goals, Strategies, Projects and Tasks

The Strategic Plan defines protection of the environment and energy alternatives as important Fort Smith values. These values state:

- We will set goals for the use of energy and provide alternate energy sources
- We will set goals for improving and enhancing our natural environment

Goals

- Expand the use of surplus electricity from the Taltson Hydro Generating station to replace heating fuel.
- Develop the local application of geothermal energy and heat pump technology.
- Diversify and expand the local energy economy by using and promoting local biomass.
- Implement all cost effective efficiency measures and technology upgrades in the Town of Fort Smith corporate facilities.

Fort Smith Community Targets

- Dedicate half of the available surplus electrical capacity from the Taltson dam (~3MW) to space heating in Fort Smith.
- Fort Smith will double the use of locally available heat energy products (biomass and electricity) by 2013.
- Fort Smith will reduce Greenhouse Gas Emissions by 17% below the levels measured in 2007-08 by the year 2020. (This matches the Canadian Target).
- Per capita greenhouse gas emissions in Fort Smith will remain at or below the Canadian average, 30% below the average for the NWT.
- In 2015, greenhouse gas emissions will be approximately 10 tonnes CO₂eq per capita.

Town of Fort Smith Corporate Targets

- The cost of energy in Town of Fort Smith corporate facilities will be reduced by 25% from 2007-08 levels by 2015.
- The Town of Fort Smith will reduce Greenhouse Gas Emissions from its corporate facilities by 20% below levels measured in 2005 by the year 2015. (This is close to the corporate target set by Yellowknife).
- Reduce solid waste disposal at the Town landfill by using biomass waste for energy.
- Continually improve corporate conservation, efficiency and alternative energy strategies.

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The following table provides a schedule of actions that will be undertaken by the Corporation of the Town of Fort Smith to attain the goals and targets of the energy plan. These will be reviewed each year as new information becomes available.

Goal	Strategies	Actions / Tasks
Implement cost effective efficiency measures and technology upgrades in the Town of Fort Smith corporate facilities.	Establish a Community Sustainability Board as a permanent Advisory Board of Council. <ul style="list-style-type: none"> • Implement the cost effective efficiency measures identified in the 2005 Fort Smith facilities Energy Audit • Review the Town vehicle fleet and identify opportunities for using smaller, more fuel efficient vehicles • Investigate the benefits of using hybrid and electric vehicles. 	Review Sustainable Development Board Bylaw and recommend amendments <ul style="list-style-type: none"> • Adapt Terms of Reference for the Energy and Environmental Sustainability Subcommittee. • Submit to Town Council with recommendations • Members appointed • Assist with implementing the Community Energy Plan with the Town of Fort Smith • Board to review audits and recommend priorities to Town Council
Expand the use of surplus electricity from the Taltson Hydro Generating station to replace heating fuel.	Negotiate a bulk rate for interruptible electricity in Fort Smith Investigate opportunities for using “smart metering” and “smart grid” technologies to improve the efficiency of electricity use in Fort smith	Council and Administration will initiate discussion with NWTPC. Board will advise Council Board will develop Terms of reference for a “Smart Meter” study. Administration will develop a contract for study.
Develop the local application of geothermal energy and heat pump technology.	Demonstrate a residential scale geothermal heating system in Fort Smith	Board will identify a suitable geothermal project. Board will develop Terms of Reference for an RFP. Administration will develop contract for project.



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Goal	Strategies	Actions / Tasks
Diversify and expand the local energy economy by using and promoting local biomass.	Investigate the feasibility of a district heating system in the core downtown area of Fort Smith	Board will develop Terms of Reference for Feasibility Study.
	Develop a biomass fuelled heating system for at least one of the Town's facilities.	Administration will develop contract for feasibility study.
	Promote the use of wood for heat in Fort Smith, by producing educational materials for the community about; the history of wood use in fort smith; the use of modern high efficiency wood burning appliances; and local – traditional knowledge and best practices for using wood for heat.	Board will identify priority target facility for biomass heat system. Administration will develop contract.
	Work with GNWT Forest Managers to determine sustainable harvest levels; improve access to forest resources; improve community woodlot planning; and developing best practices for feedstock generation, transport, drying and storage.	Board will open discussions with GNWT.
	Reduce solid waste disposal at the Town landfill by using biomass waste for energy.	Board will develop Terms of Reference for a "Biomass Energy" education campaign. Administration will find partners and develop contract for campaign. Board will assist in developing terms of reference and setting targets. Board will develop Terms of reference for a feasibility studies. Administration will develop contracts for studies.



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Goal	Strategies	Actions / Tasks
Continually improve corporate conservation, efficiency and alternative energy strategies.	Develop “no-idle zones” in core areas of the Town Integrate energy and environmental sustainability concepts in all Town plans, programs and facilities development. Review progress in implementing the Community Energy Plan annually.	Board will review similar bylaws from other jurisdictions. Board will draft appropriate bylaw and make recommendations to council. Town Council will consider and adopt a bylaw. Board will report to Council on a regular schedule. Board will report to Council on implementation of energy plans annually.



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Information Sources

Arctic Energy Alliance. 2010. Fort Smith Energy Profile 2007-08.

Arctic Energy Alliance. 2009. NWT Community Wood Pellet Study: Supply and Transport Options for Wood Pellets.

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