

Final Report

Survey of Active Solar Thermal Collectors, Industry and Markets in Canada (2008)



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Reda Djebbar
Natural Resources Canada

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For more information on this survey report and related inquiries, please contact:

Reda Djebbar
Natural Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4
Tel: (613) 996-8828
Email: rdjebbar@nrcan.gc.ca

EXECUTIVE SUMMARY

This report is a summary of a survey of the Canadian solar thermal industry conducted in the period February to April 2009, covering the 2008 calendar year. Thus survey is the most recent in a series that goes back to 2002.

The survey results show continued strong growth in the Canadian solar thermal industry, with 2008 total revenue (domestic plus export) of \$18.8 million, an increase of 44% over the \$13.1 million reported in 2007. Of the five solar collector types included in the survey, four showed that domestic sales at least doubled from 2007 (by collector area). The fifth type – liquid evacuated – reported a 55% decline in domestic installations.

Some key findings of the survey:

- One a *per capita* basis, industry revenue from solar thermal heating systems increased from \$0.22 in 2007 to \$0.38 in 2008 (73%).
- Total domestic sales of solar thermal collectors in 2008 was 139,159 m², more than twice the highest value previously reported in this series of surveys.
- Canada continues to export considerable volumes of solar collectors: over 45,000 m² worth \$5.7 million in 2008. The bulk of exports are to the United States, although exports to Europe are increasing.
- 2008 was the first time that Canadian vendors clearly reported export sales of all five types of solar thermal collectors.
- In 2008, survey respondents were very optimistic about future sales, predicted that short term revenue growth would increase by 84% per annum. (This compares to the 2007 survey, when respondents predicted a 38% growth rate for 2008, and achieved 52%, according to this survey.)
- In 2008, solar thermal systems operating in Canada caused 49,854 tonnes fewer of greenhouse gases to be emitted into the atmosphere.
- Solar thermal collectors sold by the Canadian industry in 2008 are expected to result in GHG emission reductions of 330,000 tonnes over their operating life: 252,000 tonnes in Canada, and an additional 78,000 tonnes due to export sales.

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1 INTRODUCTION

This report provides results of a survey of active solar thermal collectors, industry and markets in Canada. The survey was commissioned by Natural Resources Canada (NRCan), and was undertaken by SAIC Canada. The survey covered the 2008 calendar year. This survey is a continuation of a series of surveys going back to 2002.

NRCan's Renewable Energy Deployment Initiative (REDI) was launched in April 1998 to stimulate the demand for cost-effective renewable energy heating and cooling systems, and to help create a sustainable market for those systems. In 2006, the REDI program was superseded by the ecoENERGY for Renewable Heat program. Active solar thermal systems, including air and water heating, represent two of the types of renewable energy technologies presently supported by Natural Resources Canada's ecoENERGY program¹. Solar thermal systems have the potential to play a considerable role in the implementation of a greenhouse gas emission reduction plan for Canada.

In part, this survey was undertaken in support of Canadian contributions to the solar heating market survey of the Solar Heating and Cooling Program of the International Energy Agency (IEA).

Solar thermal collectors are the key component of active solar energy systems. These collectors absorb energy from the sun's rays and convert it into thermal energy that can be used for water and space heating and cooling. Collectors are designed to meet the specific temperature requirements and climate conditions of each use.

The purpose of this study was to survey the Canadian active solar thermal collector industry to obtain data for the 2008 calendar year. The main objectives of the study were:

- To capture comprehensive and reliable information on market size and industry trends, including Canadian sales and revenues, import and export, and employment figures.
- To estimate delivered thermal energy and displaced CO₂ emissions of all active solar thermal systems operating in Canada.
- To analyze and report obtained data for publication and wider dissemination.

The Canadian solar thermal industry is a diverse, growing industry active across Canada, with roots going back to the mid-1970's. Five distinct types of solar collectors were sold in Canada during the surveyed period:

1. Unglazed, liquid collectors;
2. Unglazed, air collectors;
3. Glazed, liquid collectors;

¹ For more information, visit the ecoENERGY for Renewable Heat website, <http://www.ecoaction.gc.ca/ECOENERGY-ECOENERGIE/heat-chauffage/index-eng.cfm>

4. Evacuated tube liquid collectors, and;
5. Glazed, air collectors.

Survey respondents were asked a series of questions, some about total sales of any type of solar thermal collector, and some questions seeking more detailed information on the breakdown of sales by these five types of collectors.

The survey results show continued strong growth in the Canadian solar thermal industry, with 2008 revenue of \$18.8 million, an increase of 44% over the \$13.1 million reported in 2007.

1.1 Comparisons to 2007 and earlier surveys

Throughout this report, comparisons are made to data from the 2007 and earlier surveys. While these comparisons accurately compare the survey results between this and other years, the reader should be cautioned that the response rate from the 2008 survey was considerably higher than previous years (e.g. 32 respondents in 2008, vs. 19 in 2007), and hence the quality of the data is improved. In past survey reports, the authors compensated in areas where the response rate was known to be poor, but such compensation was cautious and conservative. As a result, it is likely that some of the earlier reported values were actually lower than actual sales. Thus the rates of growth shown in 2008 may be somewhat exaggerated, not because the 2008 data is inflated, but because the 2007 (and earlier) data was more conservative.

2 SURVEY PROCESS

2.1 Survey Development and Distribution

In February 2009, a bilingual survey questionnaire was sent to over one hundred companies in Canada thought to be active in the solar thermal industry. This time, for the first time, the questionnaire was distributed by e-mail, and could readily be completed and returned by e-mail. The majority of the companies were then contacted by phone (at least twice; many times in a few cases), to ensure they had received the questionnaire, and to encourage them to respond.

A copy of the questionnaire can be found in Appendix A.

2.2 External Data Sources

In addition to the data received from survey respondents, data from external sources was sought, either to supplement or verify the survey data.

2.2.1 Energy Information Agency and Pool & Spa Marketing

Both the U.S Energy Information Agency (EIA) and Canadian Pool & Spa Marketing (PSM) magazine have regularly reported on solar collector sales in Canada. Both focus on pool type unglazed collectors, albeit for different reasons. PSM is, quite naturally, only interested in solar equipment as it affects swimming pools and hot tubs. The EIA is interested only in the activities of the U.S. solar thermal industry, and their exports. Since over 97% of U.S. collector exports are unglazed solar collectors, it is reasonable to conclude that virtually all of the collectors reported as exported to Canada are unglazed.

From 2006 to 2007, the EIA and PSM data show distinctly different trends. The EIA reports exports to Canada held steady at 47,649 m². Meanwhile PSM reported a precipitous plunge of 75% from \$14.2 to \$3.5 million, between the same two years. The EIA data for 2008 will not be available until late this year. In April, PSM reported solar pool heater sales for calendar 2008 of \$3.7 million, a modest 6% increase from 2007, but still well below their 2006 report. There is no explanation for the precipitous drop in sales that PSM reported between 2006 and 2007.

2.2.2 ecoENERGY for Renewable Heat

Officials with the federal ecoENERGY for Renewable Heat program made limited data available on commercial solar heating projects that have applied to them for financial support. This data does not accurately record the date of sale of solar collectors, so it is not directly comparable to the data obtained by the survey. Nevertheless, it is expected that systems partially subsidized by the ecoENERGY program form a significant percentage of the total domestic sales of solar collectors, and thus some limited correlation can be expected.

Table 1 Collector areas from ecoENERGY applications²

Collector Type	Collector Area (m ²)	
	2007	2008
Air-glazed	nr	nr
Air-unglazed	21,493	43,249
Liquid-evac.	36	2,026
Liquid-glazed	1,888	2,054
Liquid-unglazed	771	2,975
Sum	24,188	50,304

nr - Not reported, to protect confidentiality

As with the data from the survey, the ecoENERGY data shows considerable growth between 2007 and 2008, for the four collector types concerned. For two of the collector types (air-unglazed and liquid-evacuated), the values derived from the ecoENERGY data actually shows a higher volume of sales than the domestic sales as reported by survey respondents (compare to Table 2). This discrepancy may be either because some companies with substantial sales did not respond to the survey, or because of errors in assigning the various ecoENERGY projects to the correct year, or a combination.

2.3 Estimated Data Capture Rate

When this survey series began, it was clear when comparing survey responses to other public data – and when factoring in the number of recipients of the survey questionnaire who did not complete the questionnaire – that the survey did not capture all of the Canadian solar thermal industry. To compensate for this incomplete data set, the report authors estimated data capture rates for the various industry segments, and then modified some of the survey data accordingly. The estimated data capture rates were included in each report.

For the 2008 report, the highest number of recipients has responded, and no public data could be found that would indicate that the responses to the survey missed any substantial part of the solar thermal industry. Thus in this report, for the first time in this series, the data capture rate is assumed to be 100% across all sectors. That is, the values reported in the report are directly from the survey responses, without adjustment.

² Note that this data does not include data from residential solar thermal systems, for which there is a separate ecoENERGY program. Most sales in the residential program would be of liquid evacuated and liquid glazed collectors.

3 SURVEY RESULTS

3.1 Industry Characterization

The following three figures provide an idea of the type of companies responding to the survey. Figure 1 shows that this year one third of respondents (11 of 32) manufacture solar collectors, and that two of these respondents started manufacturing collectors in 2008. Nine companies reported importing solar collectors. Since three companies reported both manufacturing and importing collectors, a total of 17 companies – just over half the respondents to the survey – are at this initial step in the distribution chain. Vertical integration within the Canadian solar thermal industry remains the norm, with the average survey respondent indicating that they are active in 2.6 of the areas shown in Figure 1, and fully two thirds of all respondents reporting at least some activity in retail sales.

Figure 1: Sector involvement within the solar thermal industry

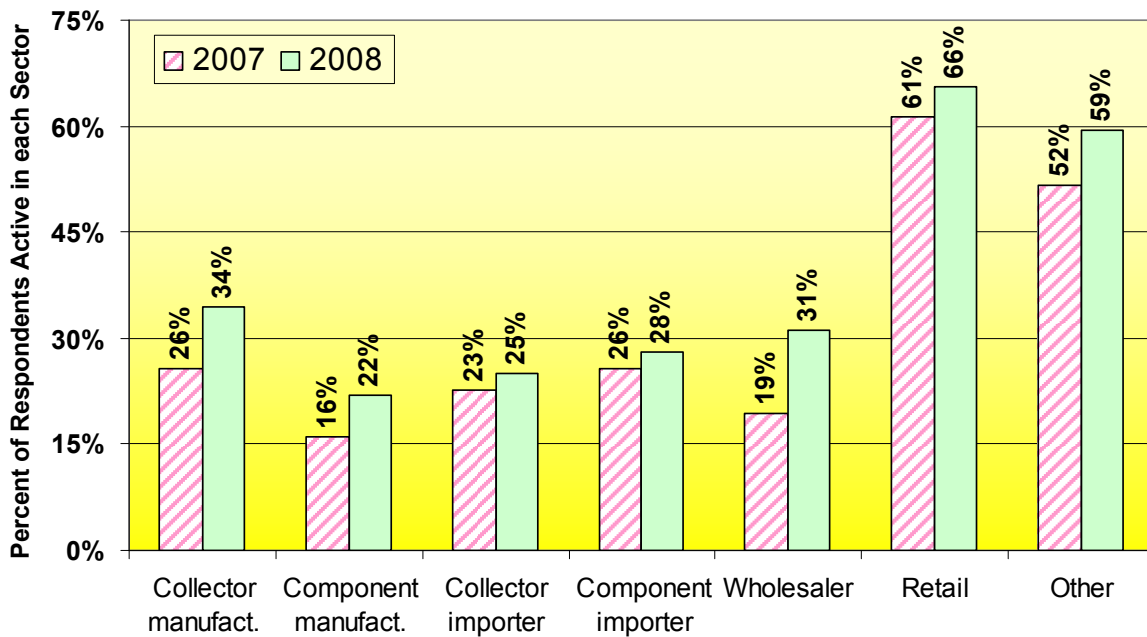


Figure 2 reveals that half of the survey respondents are specialized companies operating almost wholly within the solar thermal sector, deriving over 80% of their corporate revenue from solar. In 2008, fully 77% of respondents derived at least 20% of their total corporate revenue from solar thermal activities.

Similarly, Figure 3 reveals that 40% of all respondents have more than four full-time employees, up from 33% in 2007. The total number of person-years of employment in the solar thermal industry, as reported by respondents was 168, or an average of more than 5 employees per respondent, and more than double the 78 employees reported in 2007 (although some of this increase is likely due to the better response rate this year). Peak employment was reported as 195 employees. (Note that total employment in the Canadian

solar thermal industry is likely much higher than this, because this survey was not designed to capture all those working at the retail sales and installer level.)

Figure 2: Solar thermal revenue as a percent of total corporate revenue

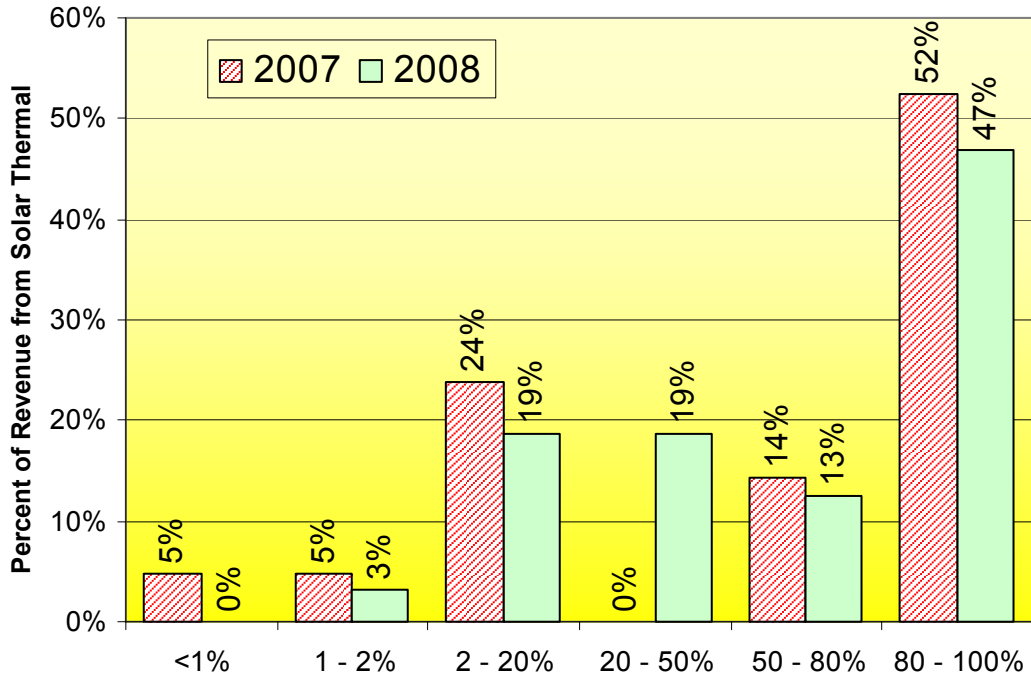
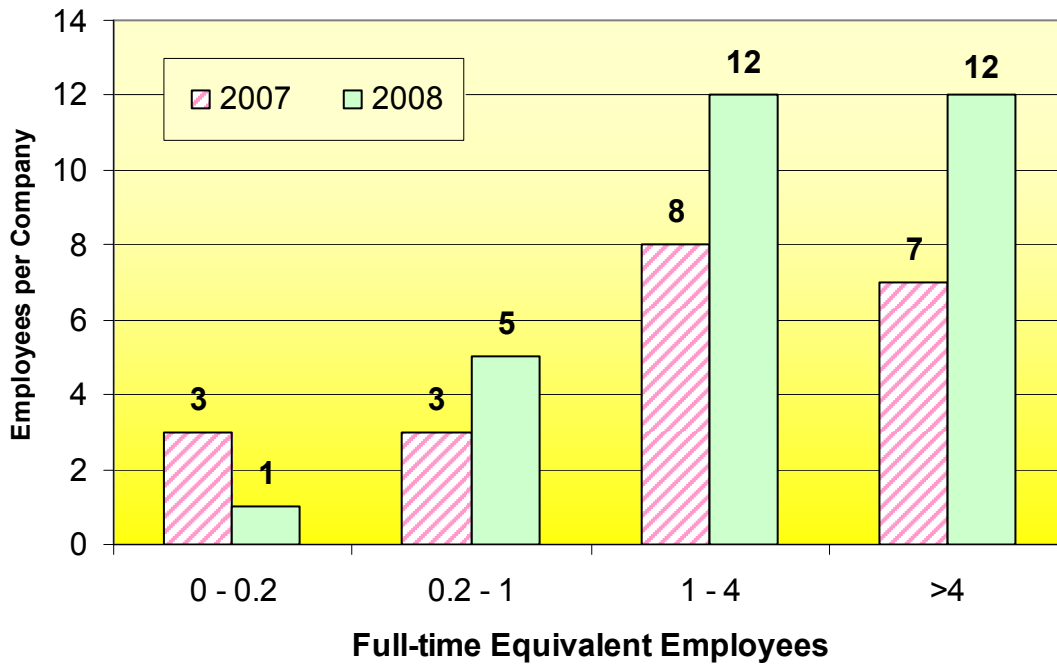


Figure 3: Number of employees per company engaged in solar thermal activities



3.2 Industry Size and Growth

Table 2 contains industry sales figures for 2008. This table reveals very significant growth from 2007.

- Total industry revenue has increased from \$11.3 to 18.8 million (66%).
- Total area of collectors sold increased from 91,467 to 184,329 m² (102%).
- Revenue from domestic sales increased from \$7.3 to 13.1 million (79%).
- Revenue from export sales increased from \$4.0 to 5.7 million (43%)

A more detailed review of the data reveals that for respondents that completed the survey for each of the past three years (approximately half of the 32 respondents, reporting approximately half of the revenue); the revenue growth rate in 2008 was a healthy 37%.

Figure 4 shows the rate of growth of the domestic market, by collector area, for each of the five types of solar thermal collectors. Because of the relatively small sample size for, especially for “air glazed” and “liquid evacuated” collectors, the precise year-over-year growth rates should be taken with caution, although it does seem clear that the industry growth is based on most collector types.

Table 2: Solar collector sales by type, 2008

Domestic Sales

Collector Type	Thermal Capacity (MW)	Collector Area (m ²)	Revenue (\$1,000's)
Air glazed	0.8	1,191	715
Air unglazed	23.9	34,135	3,767
Liquid evacuated	0.8	1,083	514
Liquid glazed	9.2	13,173	3,923
Liquid unglazed	62.7	89,577	4,141
Total	97.4	139,159	13,060

Export Sales

Collector Type	Thermal Capacity (MW)	Collector Area (m ²)	Revenue (\$1,000's)
Air glazed	1.2	1,747	1,148
Air unglazed	5.1	7,224	797
Liquid evacuated	0.4	551	721
Liquid glazed	7.4	10,506	1,796
Liquid unglazed	17.6	25,142	1,263
Total	31.6	45,170	5,725

Total Sales

Collector Type	Thermal Capacity (MW)	Collector Area (m ²)	Revenue (\$1,000's)
Air glazed	2.1	2,938	1,863
Air unglazed	29.0	41,359	4,564
Liquid evacuated	1.1	1,634	1,235
Liquid glazed	16.6	23,679	5,719
Liquid unglazed	80.3	114,719	5,404
Total	129.0	184,329	18,785

Figure 4: Annual domestic sales growth by collector type (m²)

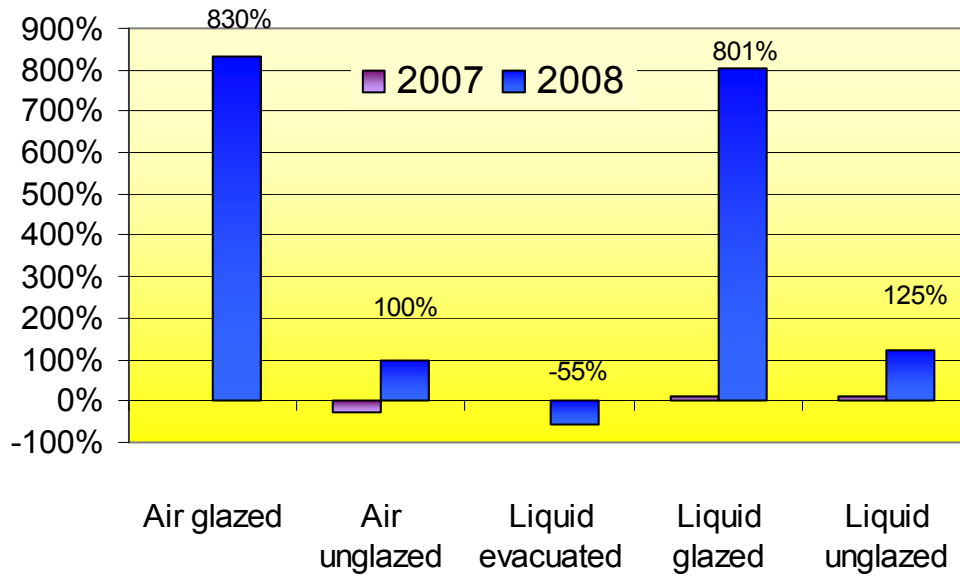


Figure 5 and Figure 6 provide a history of domestic solar collector sales in Canada over the past 10 years, and a history of revenue growth for the seven years since the inception of this survey series. Both show consistent, strong growth over the years, with particularly strong growth in 2008.

Figure 5: Ten-year history of domestic collector sales (m²)

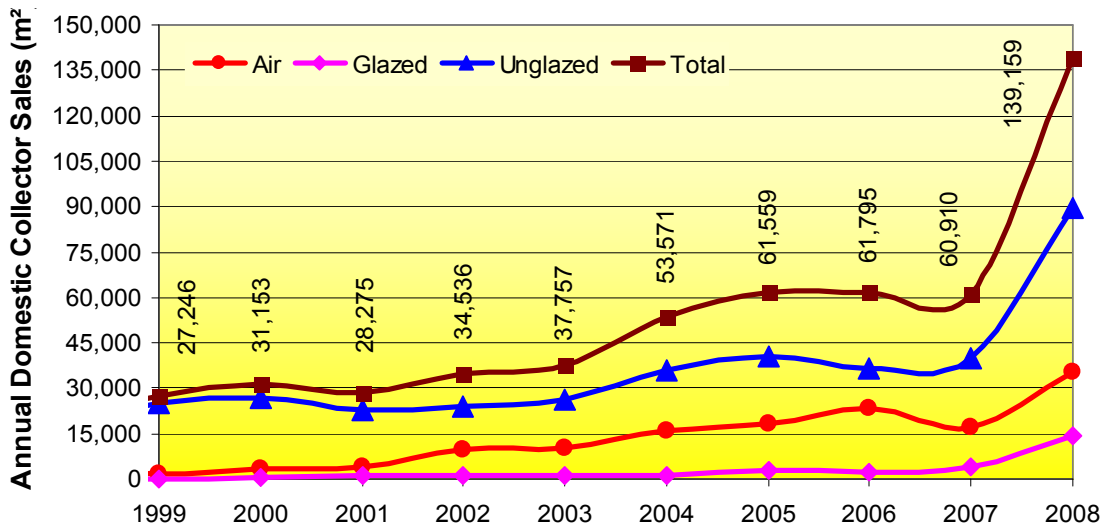
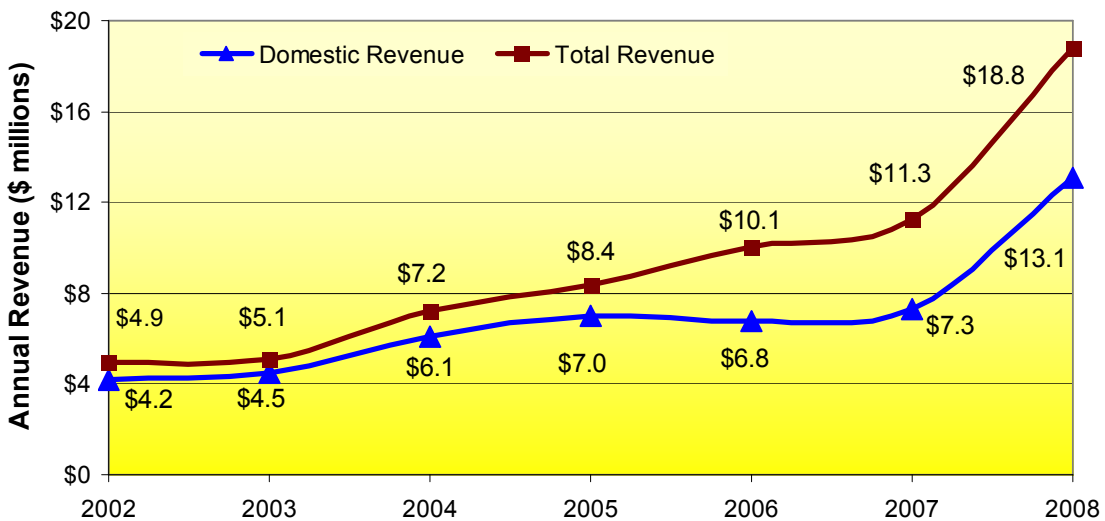


Figure 6: Canadian solar thermal industry revenue growth



3.3 Applications of Solar Thermal Technology

Table 3 provides a summary of end-use application by collector type. There are only moderate changes in these applications from 2007, with unglazed liquid collectors used almost exclusively for residential swimming pool heating, and air-based collectors used almost exclusively for space heating. There is a strong divergence between glazed and unglazed air collectors, where the unglazed are sold into the ICI market, and the glazed air collectors are used in residential applications.

As in previous years, the glazed liquid and evacuated tube collectors have the broadest range of applications. In 2008 both of these were employed roughly equally in the residential and I/C/I sectors, continuing the move into the I/C/I sector which was 17% in 2006, 30% in 2007 and 46% this past year. Within the I/C/I sector, these collector types have increased their penetration into domestic water heating applications, and for the first time are being reported for use in “space heating” and “combined/other”.

Table 3: Solar heating applications (by revenue), by sector and collector type

Revenue by Sector	Liquid			Air	
	Unglazed	Glazed	Evacuated	Unglazed	Glazed
Residential	98%	53%	58%	1%	99%
Industrial/Commercial/Institutional (ICI)	2%	47%	42%	99%	1%

Revenue by Solar Heating Application	Liquid			Air	
	Unglazed	Glazed	Evacuated	Unglazed	Glazed
Residential pool heating	98%				
Residential domestic water heating		48%	44%		
Residential space heating		1%	7%	1%	99%
Residential combined space and water heating		4%	7%		
ICI pool heating	2%	1%	11%		
ICI domestic water heating		38%	17%		
ICI space heating			7%	99%	1%
ICI combined/other		8%	7%		

3.4 Geographic Distribution

3.4.1 Domestic Sales

In 2008, solar thermal collectors were installed in all areas of Canada, including the North (although data from sales in the Yukon, NWT and Nunavut is withheld, to protect the confidentiality of the small number of respondents reporting sales in that area). It is noteworthy that sales of all five collector types are reported in every region of Canada, except the North, where only two of the collector types are represented in the survey responses.

As in the previous survey, Ontario holds onto first place in terms of total sales, with nearly half of all sales. Quebec, the Prairies, BC and the Atlantic provinces follow in order, as in 2007.

On a *per capita* basis, Canada-wide industry revenue has increased 73%, from \$0.22 per person in 2007 to \$0.38 in 2008. All regions reported increases in sales, except the Atlantic Provinces, which reported a decline of 24%, dropping from the area with the highest *per capita* revenue in 2007, to below the Canadian average in 2008. (Albeit the number of survey respondents in the Atlantic region was small in both 2007 and 2008.) Interestingly, although total sales in the North were limited, this region actually reported the highest *per capita* sales of solar thermal systems, more than doubling the Canadian average. One of the more notable results is that the Prairie region had the lowest *per capita* spending in 2007, but in 2008 trails only Ontario.

Figure 8 shows shifts in regional distribution of sales during the past three years. Generally, the regional distribution has remained fairly stable during this period, although Ontario does seem to be growing more rapidly than other markets.

Figure 7: 2008 regional solar collector sales, by population

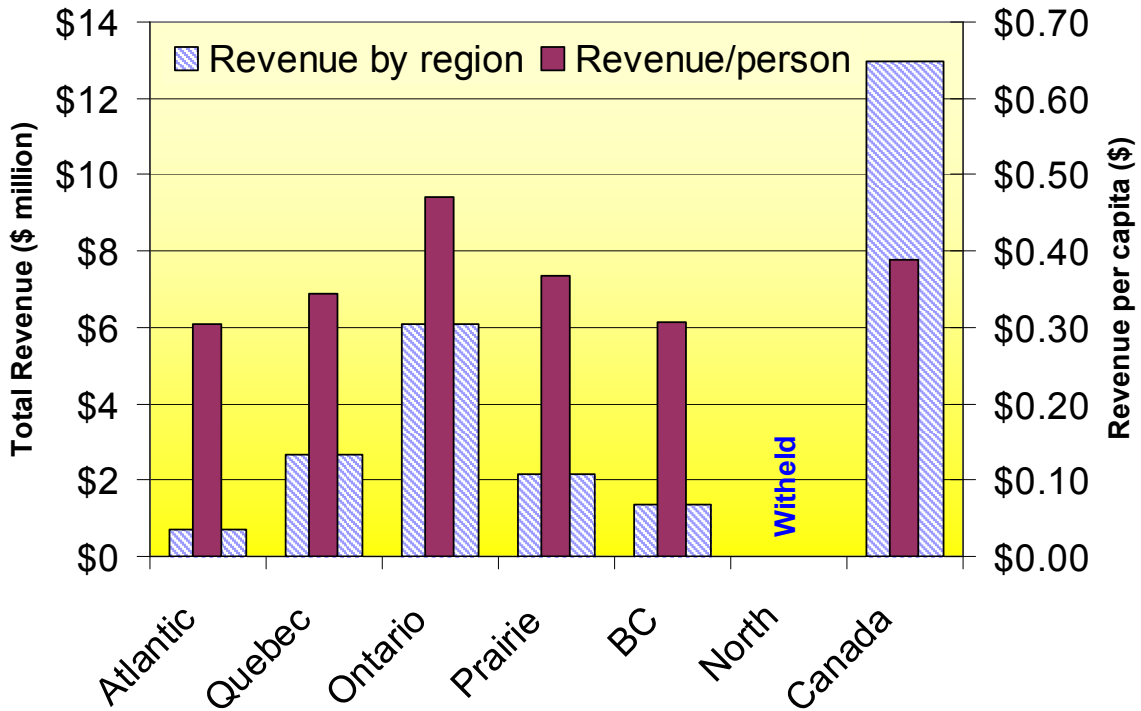
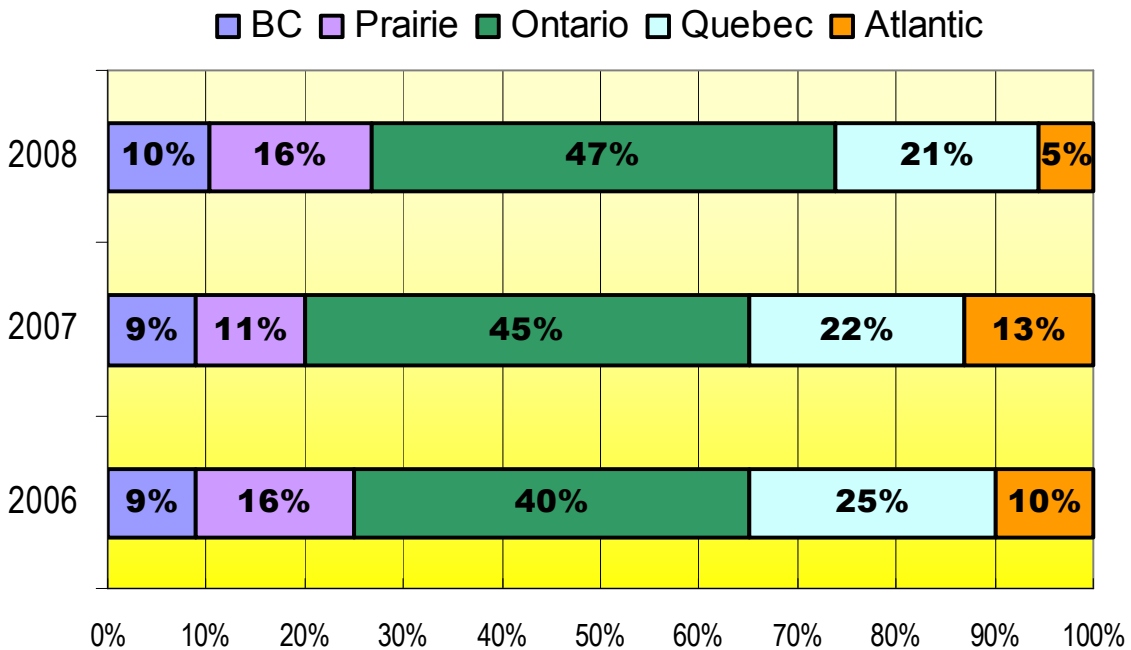


Figure 8: Regional distribution of domestic market (by revenue)



3.4.2 Exports

Canada continues to export solar thermal collectors in considerable quantities, exporting over 41,000 m² of collectors valued at \$5.7 million. This was the first year of this survey that clear evidence was provided that all five types of solar collectors were exported, with each of the five types having reported exports of at least \$700,000. A breakdown, along with comparable 2007 values, is provided in Table 4 and Table 5. As in past years, the majority of solar collector exports were to the United States (84% of revenue; 74% of exported collector area), although exports to Europe grew strongly in 2008.

Table 4: Regional distribution of solar exports (by revenue)

Distribution of Solar Exports	2007	2008
United States	91%	84%
Central and South America	5%	4%
Europe	3%	11%
Asia	1%	1%
Africa	--	--
Australia	<1%	--
Total	100%	100%

Table 5: Exports by collector type (by revenue)

Exports by Collector Type	2007	2008
Air, glazed	23%	20%
Air, unglazed	58%	14%
Liquid, evacuated tube	<1%	13%
Liquid, glazed	--	31%
Liquid, unglazed	19%	22%
Total	100%	100%

3.5 Anticipated Sales Growth

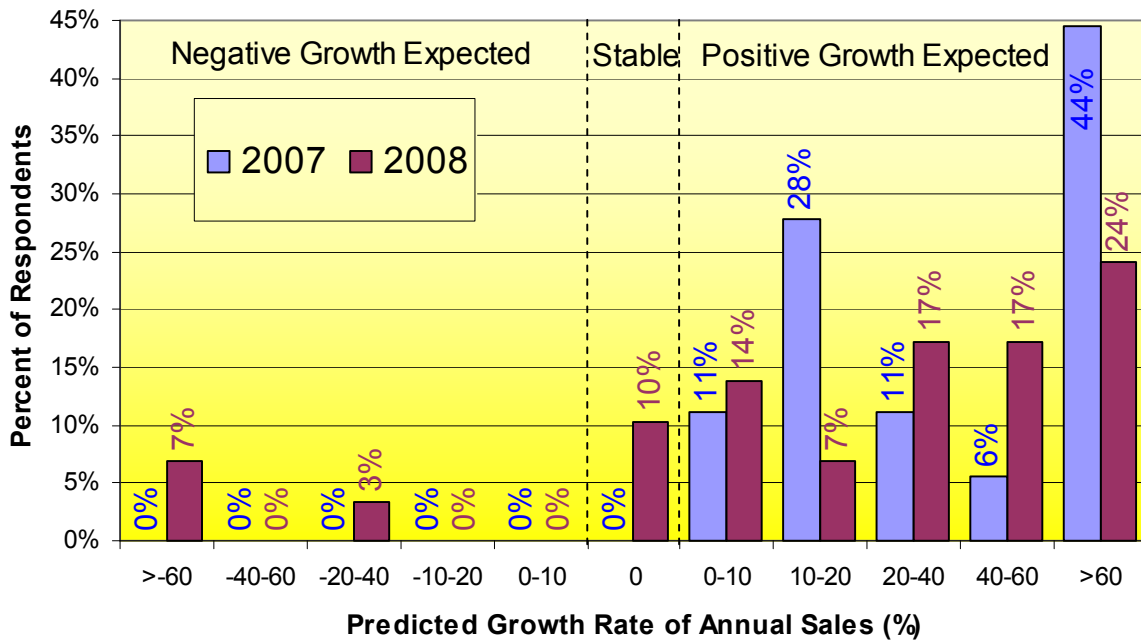
The recipients were asked to estimate how future sales revenue would relate to their 2008 solar revenue. Figure 9 shows the range of responses, both from this survey and the previous survey (2007). At first glance, this appears to indicate a substantial drop in optimism within the industry, as this year 20% of the respondents expect either no growth or a fall in sales, whereas in 2007 every respondent expected sales growth. This drop in optimism is also apparent among the most optimistic companies, where the number that expected growth to exceed 60% per year has dropped from 44% to 24%.

However, it would be wrong to conclude that the industry expects a slowing of its growth rate, for when the expectations of future sales are weighted according to current sales

figures, the projected industry growth rate for 2009 is 84%, whereas the respondents to the 2007 survey projected a weighted growth rate of only 38% for 2008. (Note that this survey indicates that 2008 revenue was actually 52% greater than in 2007, exceeding those expectations.) Based on this projected growth rate, weighted by current company revenue, it is clear that a number of companies with larger sales are anticipating very significant future growth.

When trying to compare the difference between growth rate expectations between the 2007 and 2008 surveys, it must be remembered that in 2007 only 19 respondents completed this question, whereas 29 respondents completed it in 2008. Thus there is a substantial difference in the companies sampled, making it difficult to directly compare the 2007 and 2008 results.

Figure 9: Estimate of future sales growth



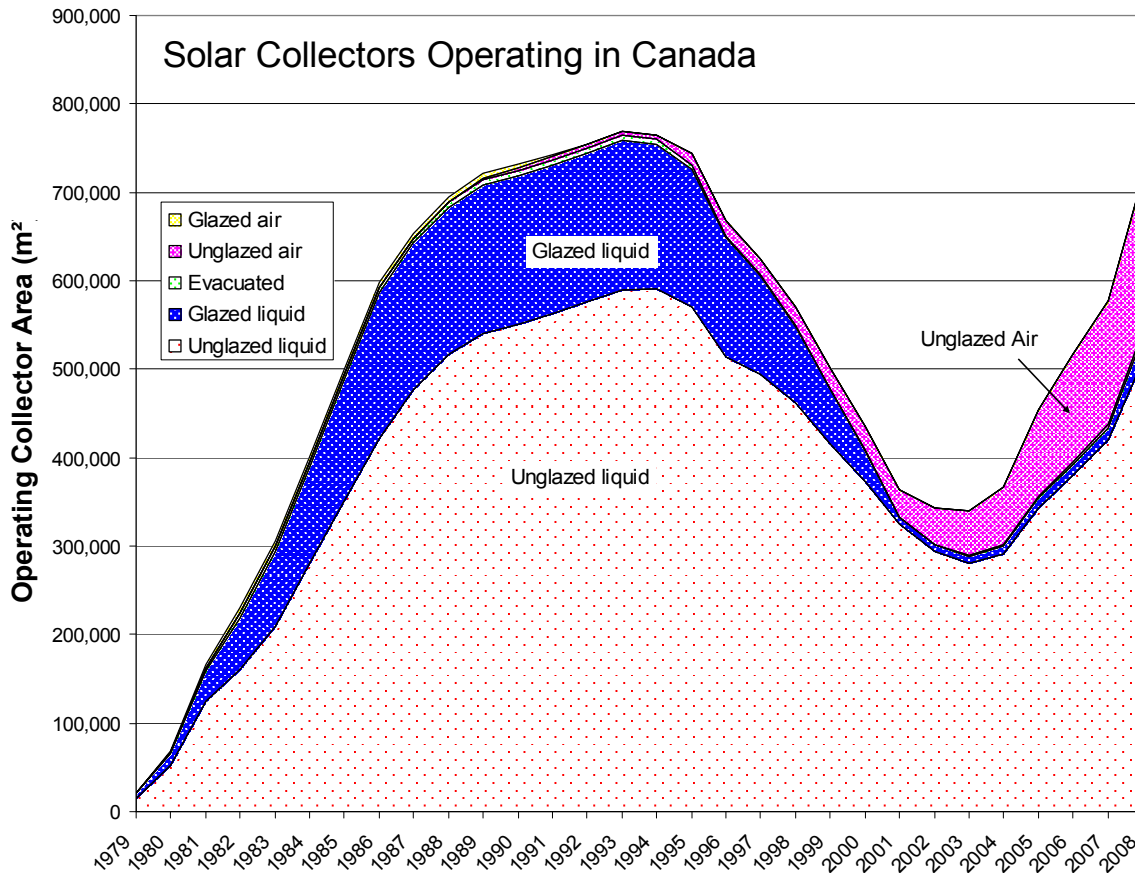
4 ESTIMATE OF AVOIDED GREENHOUSE GAS EMISSIONS

4.1 Background

Estimating GHG emissions avoided due to solar thermal installations in Canada is a complex issue that involves estimating the operational effectiveness of all solar heating systems in Canada, the fuel that they displace, and the location of the systems within Canada, among other variables. These variables cannot all be known with precision. With the support of the IEA, Weiss *et al* developed a methodology for estimated GHG avoidance, using a system of reference solar heating systems. This methodology was adopted, with some modifications, for use on earlier Canadian data, and is described in detail in a previous report (ref 1). A summary of the reference system definitions follows.

Figure 10 shows a historical record of installed, operational solar collectors. This data – showing 720,000 m² of solar collectors operating in Canada at the end of 2008 – was used in calculating the amount of GHG's avoided due to the use of active solar thermal energy in Canada.

Figure 10: History of Operating Solar Thermal Systems in Canada



4.2 Reference System Definitions

Weiss developed four reference systems in his work on estimating avoided GHG emissions, but only three of these four were applicable within Canada. We have chosen to use the same three systems, albeit with some adjustments to reflect the Canadian market, plus a fourth – commercial air.

Residential DHW – This system is identical to Weiss' solar domestic hot water systems for single family houses in Canada. It represents a typical solar DHW preheat system consisting of two 4' x 8' (6 m²) glazed solar collectors, 150 L/d hot water usage³, with a 300 L hot water storage tank. Commercial marketing material indicates that each system will produce about 50% of the energy required for hot water in a home, on an annual basis.

Commercial Water – This system is essentially a new name for Weiss' solar domestic hot water systems for multi-family houses and district heating, retaining many of its features. This incorporates all larger scale systems with glazed, liquid collectors, covering applications from institutional or multi-residential DHW, to municipal indoor pool heating, to process water at car washes, laundries or other facilities. As with Weiss, the reference system consists of 50 m² of collectors, 2,000 L/d hot water draw and a 2,500 L storage tank.

Residential Pool – This system is identical to Weiss, except that the collector area has been reduced from 200 m² to 25 m², to more closely reflect the Canadian market (5-6 nominal 4' x 12' collectors per system). This reduction in size has little impact on the GHG analysis, but it does affect the calculation of the number of systems. Note that this reference system covers all unglazed, liquid-type collectors, and thus does include seasonal municipal or resort pools, which may have collector areas of 50 – 300 m². However, these commercial pools constitute well below 5% of the Canadian market, and they do perform similarly to the more common residential pools.

Commercial Air – This is a new reference system, based on the successful use of unglazed air collectors for preheating ventilation and makeup air in industrial, commercial and agricultural (livestock barns) applications. Within Canada, this is a strong market sector, and cannot be ignored. System sizes vary widely from below 50 m² to 10,000 m². For a reference system we have selected 200 m², because it is within the size range for both agricultural and industrial/commercial/institutional sectors, and should provide a reasonable estimate of the mean size of all systems.

4.3 GHG Emission Avoidance Calculations

Table 6 shows the calculations used to estimate the GHG emissions avoided due to all solar thermal systems operating in Canada at the end of 2008. The value of 49,854 tonnes of CO₂e avoided in 2008 is 27% higher than the value reported in 2007, indicating that the healthy growth in the solar thermal industry is starting to significantly impact GHG emissions in Canada.

³ The 150 L/d hot water usage used by Weiss is probably low for Canadian practice, but we chose to keep this value for consistency with international reports. Using a larger hot water draw (~225 L/d is more typical of actual hot water usage in Canada) would have increased the estimate of GHG avoided, but since residential DHW heating systems are a small segment of the Canadian market, the overall effect would be small.

Table 6: Analysis of avoided GHG emissions, using four reference systems, 2008

Parameter	Residential DHW	Commercial Water	Residential Pool	Commercial Air
Collector type	glazed	glazed	unglazed	unglazed air
Collector area (m ²)	6	50	25	200
Annual yield per system (GJ/a)	9.9	82.1	19.4	422
Specific annual yield (GJ/a-m ²)	1.64	1.64	0.78	2.11
Displaced fuel mix (%)				
• Oil (73 kg of CO ₂ /GJ)	4%	15%	1%	5%
• Natural gas (50 kg of CO ₂ /GJ)	50%	75%	63%	50%
• Propane (60 kg of CO ₂ /GJ)	--	5%	--	40%
• Electricity (151 kg of CO ₂ /GJ)	46%	5%	12%	5%
• Heat pump (38 kg of CO ₂ /GJ)	--	--	24%	--
• No fuel	--	--	--	--
Blended CO ₂ avoided (kg of CO ₂ /GJ)	97	59	59	60
Annual CO ₂ avoided (t/a-system)	0.96	4.84	1.14	25.3
Annual specific CO ₂ avoided (kg/a-m ²)	160	97	46	127
Estimated system life (years)	15/20	15/20	15/20	30
Total operating collector area (m ²)	21,642	11,653	509,325	174,215
Calculated number of systems	3,607	233	20,373	871
Total annual CO ₂ avoided (t/a)	3,463	1,128	23,225	22,038
Total annual CO ₂ avoided, all types (t/a)	49,854			

The 49,854 tonnes of GHG emissions avoided due to solar thermal installations in Canada is equivalent to removing more than 10,000 mid-size cars from Canadian roads, or the total GHG emissions of 2,240 Canadians⁴.

4.4 Forecast GHG Emission Avoidance from Collectors sold in 2008

An alternative view of GHG emission avoidance - and one that is more representative of the current sales rate of solar thermal systems, rather than past sales - is to estimate the total GHG's that will be avoided over the operating life of systems installed in the current year. Applying the same calculations in the previous section to the 139,159 m² of collectors installed in Canada during 2008, leads to the conclusion that 252,000 tonnes of CO₂ equivalent will be saved over the lifetime of these systems (using a 20 year expected life for all water systems and a 30 year life for commercial air systems).

⁴ "Human Activity and the Environment: Annual Statistics – 2007 and 2008" Statistics Canada, March 2009. This report indicates that the per capita GHG emissions from a typical Canadian are 23 tonnes per annum, and that a typical mid-size car driven 25,000 km each year emits 5 tonnes of GHG's.

Since the solar industry earned just over thirteen million dollars in revenue from domestic sales in 2008, this means that one tonne of CO₂ is saved for every \$50 of revenue (neglecting any service and repair revenue that may be earned over the life of the systems).

Depending upon climatic conditions and displaced fuel data in the country of use, it is likely that the solar collectors exported from Canada during 2008 will be responsible for avoiding approximately 78,000 tonnes of CO₂ equivalent, during their operating life.

5 CONCLUSIONS

The Canadian solar thermal industry has shown sustained growth through the early years of the twenty-first century, with a particularly strong showing in 2008, with industry revenue growing by 67%. Figure 11 shows the 2008 market share, by collector type, against three different metrics. Note that while unglazed swimming pool collectors constitute more than 60% of the total collector area sold, they are responsible for a much lower fraction of industry revenue (29%) due to their low cost, and a lower proportion of GHG savings (31%), due to their short operating season.

Figure 11: 2008 market share by Area, Revenue and GHG Savings

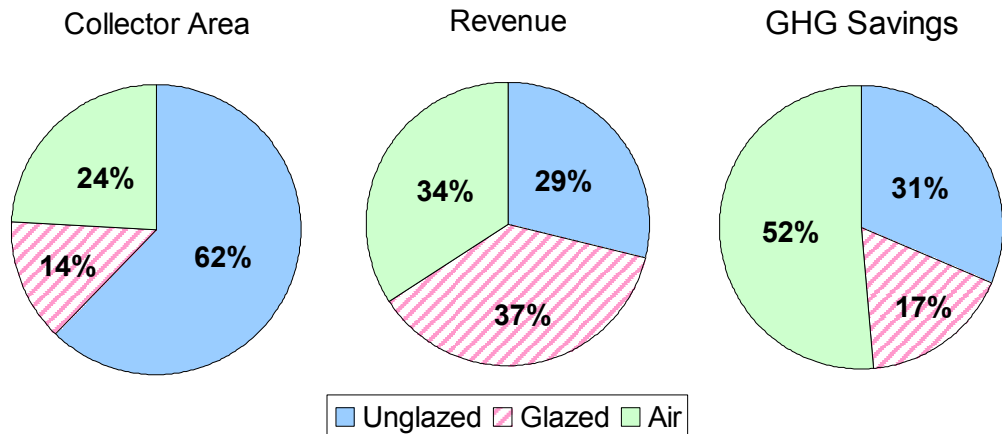
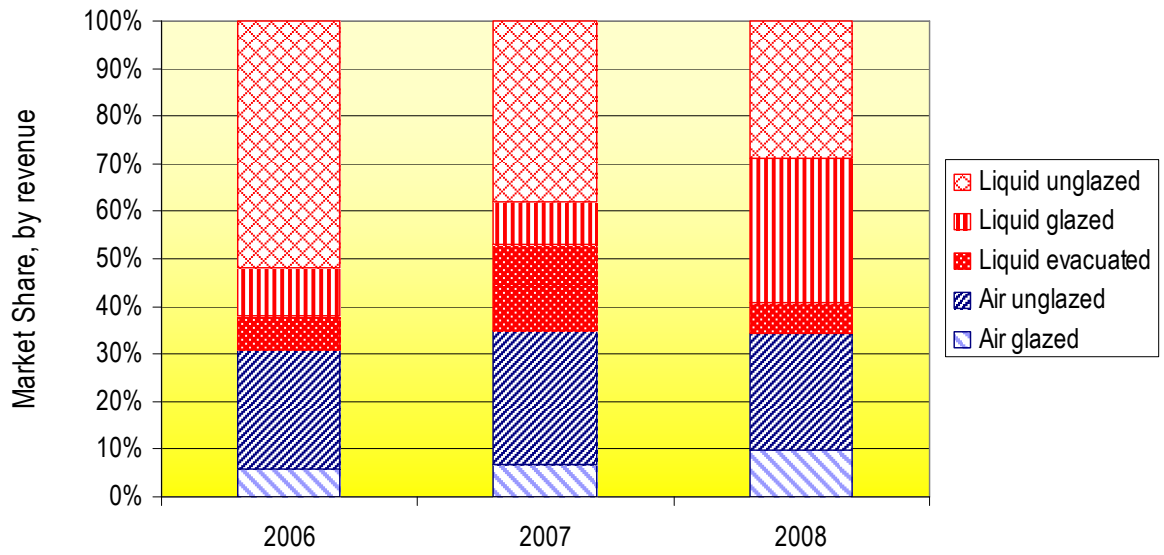


Figure 12 summarizes recent changes in the market of the five collector types, by revenue. Note that while the overall division between air and liquid collectors has remained nearly constant, with 1/3 from air collectors and 2/3 from liquid collectors, there have been noticeable shifts in market share. There has been a gradual increase in the market share of glazed air collectors over the past three years, to just below 10% in 2008. In liquid collectors, there rapid growth in sales of glazed and evacuated tube collectors has resulted in a steady decline, proportionally, of unglazed collectors from more than 50% of the total market in 2006 to less than 30% in 2008. (However, recall from Figure 5 that sales of unglazed collectors have continued to grow during this period, in absolute terms.) Another observation from Figure 12 is that the ratio of liquid glazed to liquid evacuated collectors has been highly variable in the past three years. Since both of these collector types generally address the same market (production of water in the 60 – 90C range), it would appear that while both are being sold successfully, the market has not yet settled on which type is most effective in the various types of systems and applications that they address.

Figure 12: Recent changes in market share of five collector types (domestic plus export sales, by revenue)



6 REFERENCES

- 1) ***Final Report Survey of Active Solar Thermal Collectors, Industry and Markets in Canada (2002 – 2004)***, August 2005, SAIC Canada report no. CM001743.
- 2) ***Final Report Survey of Active Solar Thermal Collectors, Industry and Markets in Canada (2005)***, October 2006, SAIC Canada report no. CM002056.
- 3) ***Final Report Survey of Active Solar Thermal Collectors, Industry and Markets in Canada (2006 & 2007)***, March 2008, SAIC Canada report no. CM002208.
- 4) Mayes, Fred *et al*, July 2006. ***Renewable Energy Trends 2005: With Preliminary Data for 2005***. Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Department of Energy.
- 5) Mayes, Fred *et al*, July 2007. ***Renewable Energy Trends 2006: With Preliminary Data for 2006***. Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Department of Energy.
- 6) Omboli, Eugène and McClenahan, Doug, 2002, ***NRCan In-house Survey of Solar Collectors for 1995 – 2001***, Natural Resources Canada.
- 7) Weiss, Werner; Bergmann, Irene and Faninger, Gerhard, February 2004. ***Solar Heating Worldwide: Markets and Contribution to the Energy Supply 2001***. IEA Solar Heating & Cooling Program.
- 8) Hubbard, Richard, 2005, ***Canadian Swimming Pool Industry: 2005 Market Report***, Pool & Spa Marketing, spring 2006.
- 9) Hubbard, Richard, 2006, ***Canadian Swimming Pool Industry: 2006 Market Report***, Pool & Spa Marketing, spring 2007.
- 10) Energy, Mines and Resources Canada, ***Energy in Canada 1986 Handbook***
- 11) Watson, Heather Louise, 2009, a summary of recent ecoENERGY-supported solar thermal installations in Canada, private communication

APPENDIX A – Survey Questionnaire

The following pages contain a copy of the 11 questions asked of survey recipients. The appendix contains the questions in English, although the questionnaire was distributed in both French and English.

ID No.

To be assigned during processing

Questionnaire

Solar Thermal Collector Survey

Calendar Year 2008

Please note that, for the purpose of this survey, active Solar Thermal (ST) includes activity pertaining to solar collector-based systems only. Any solar technology that does not incorporate manufactured solar collectors – such as most passive solar applications – is beyond the scope of this survey.

Please enter company contact information:

COMPANY

ADDRESS

NAME

TITLE

TELEPHONE

FAX

E-MAIL

DEADLINE FOR COMPLETION IS MARCH 16, 2009

Completed surveys should be returned to:

Sandi Mish
SAIC Canada
Suite 1516, 60 Queen Street
Ottawa, Ontario
K1P 5Y7

Tel: (613) 563-7242

Fax:(613) 563-3399

toll-free number: 1-888-SAIC-CAN

e-mail: mishs@saiccanada.com

ID No.

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To be assigned during processing

1. Please provide some profile information pertaining to your Solar Thermal business. Which of the following business segments were/are applicable to your organization for the calendar years 2007 and 2008?

Business Segments	2007	2008
a. ST Collector Manufacturer	<input type="checkbox"/>	<input type="checkbox"/>
b. ST System Component Manufacturer	<input type="checkbox"/>	<input type="checkbox"/>
c. ST Collector Importer	<input type="checkbox"/>	<input type="checkbox"/>
d. ST System Components Importer	<input type="checkbox"/>	<input type="checkbox"/>
e. Wholesale Distributor	<input type="checkbox"/>	<input type="checkbox"/>
f. Retailer/installer	<input type="checkbox"/>	<input type="checkbox"/>
g. Other: Design/consulting services: Please describe:	<input type="checkbox"/>	<input type="checkbox"/>

2. a) Please estimate the time spent on ST activities of all employees (full and part-time), and contractors, to provide the number of full-time employee equivalents.

Person-years in 2008

2. b) Including full-time, part-time and seasonal staff, but excluding contractors, what was the peak number of persons employed at any single time during 2008? _____

3. In 2008, what proportion of your organization's total revenue was from active solar thermal business?

_____%

ID No.

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To be assigned during processing

4. In addition to solar thermal, please indicate if your business was involved in any of the following business segments in 2008. Check all that apply in the left column; in the right column, check only one, and only if you would describe one of these as your primary area of business.

Business Segments	Some Involvement	Primary Business
Other renewable energy (e.g. PV, wind, wood stoves, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Swimming pool sales and installation	<input type="checkbox"/>	<input type="checkbox"/>
Plumbing contractor	<input type="checkbox"/>	<input type="checkbox"/>
HVAC contractor	<input type="checkbox"/>	<input type="checkbox"/>
HVAC equipment manufacturer or distributor	<input type="checkbox"/>	<input type="checkbox"/>
Building contractor	<input type="checkbox"/>	<input type="checkbox"/>
Other building trades	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

5. Please report your total revenue earned from solar thermal activities, and then provide the percentage of this revenue that was earned from various types of sales. For this table, please include all types of revenue related to ST activities (e.g. product sales, service contracts, installation fees, consulting revenues).

Total Sales Revenue from Solar Thermal Activities	\$	
--	----	--

Revenue from All Export Sales	Revenue from Sales to Domestic Re-sellers	Revenue from Sales Direct to Domestic End Users	Revenue from Other Sales
%	%	%	%

6. Compared to this year, does your organization expect more, less or about the same revenues in the ST collector and components sales and services area over the next 2 years?

- Remain the same
- Increase by _____% average per year
- Decrease by _____% average per year

ID No.

To be assigned during processing

7. Please report collector sales in two units, square metres and dollars. If your business involved the sale of complete systems, or related services or components along with solar collectors, please report the total revenue earned for the sale, in the most appropriate column.

Sales	Collector Type				
	<i>Air</i>		<i>Liquid</i>		
	Glazed	Unglazed	Evacuated	Glazed	Unglazed
Collector area (m ²)					
Revenue (\$)					

ID No.

To be assigned during processing

8. Please provide a percentage distribution, by collector type, of dollar sales by application. If you were wholesaling the product to re-sellers, and are unaware of the final application, please report these shipments in the “unknown” category.

Sector	Application	Collector Type				
		<i>Air</i>		<i>Liquid</i>		
		Glazed	Unglazed	Evacuated	Glazed	Unglazed
Residential	Pool	%	%	%	%	%
	DHW	%	%	%	%	%
	Space	%	%	%	%	%
	Combined/other (includes hot tubs)	%	%	%	%	%
Industrial/ Commercial/ Institutional	Pool	%	%	%	%	%
	DHW	%	%	%	%	%
	Process heat	%	%	%	%	%
	Space heat	%	%	%	%	%
	Combined/other	%	%	%	%	%
Unknown/Wholesale		%	%	%	%	%
Total		100%	100%	100%	100%	100%

ID No.

To be assigned during processing

9. Please provide details on the geographic area to which the ST Collectors were shipped/sold. Within each region, please report the distribution of collector types, by percentage. **Example:** If you sold \$40,000 of liquid unglazed collectors plus \$10,000 of liquid glazed collectors into the Atlantic region, report regional sales as \$50,000, and then write 80% beside “liq-UNGL” and 20% beside “liq-GLAZ”.

Domestic Sales			Export Sales		
Region	Revenue (\$)	Type (%)	Region	Revenue (\$)	Type (%)
Atlantic Provinces		air-GLAZ	United States		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL
Ontario		air-GLAZ	Central & South America, Mexico, Caribbean		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL
Quebec		air-GLAZ	Europe		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL
Prairie Provinces		air-GLAZ	Asia, Middle East		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL
British Columbia		air-GLAZ	Africa		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL
Northern		air-GLAZ	Australia, New Zealand, Oceania		air-GLAZ
		air-UNGL			air-UNGL
		liq-EVAC			liq-EVAC
		liq-GLAZ			liq-GLAZ
		liq-UNGL			liq-UNGL

ID No.

To be assigned during processing

10. Please list your sources of ST collectors, including in-house manufacturing. For calculation purposes, use dollar value of ST collectors from all sources for the year as 100%. Use an additional sheet, if needed.

Collector Source	Collector Type(s) [†]	Supplier Name	Supplier Location*	% of total supply
Manufactured In-house		n/a	n/a	
Purchased Within Canada				
Purchased Outside Canada				
Total				100%

[†] Please use the five collector types used in questions 7, 8 and 9.

* Please use a Canadian or global region from the table in question 9 (e.g. Atlantic provinces).

11. Have there been any changes in your business during 2008 (e.g. merger, acquisition, etc.) that have had a significant impact on solar thermal sales from previous years? If so, please describe the change briefly.
