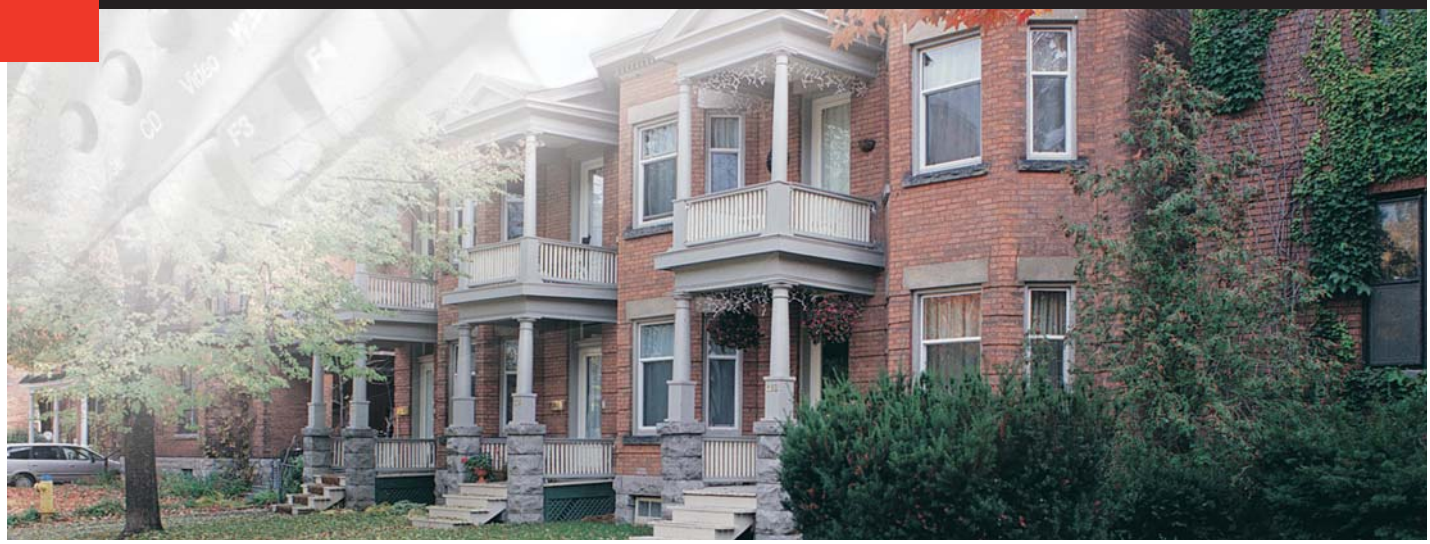
RESEARCH REPORT



Energy Efficiency and Alternative Energy for Northern Homes Report

Canada

CMHC SCHL
HOME TO CANADIANS

CMHC—HOME TO CANADIANS

Canada Mortgage and Housing Corporation (CMHC) has been Canada's national housing agency for more than 60 years.

Together with other housing stakeholders, we help ensure that Canada maintains one of the best housing systems in the world. We are committed to helping Canadians access a wide choice of quality, affordable homes, while making vibrant, healthy communities and cities a reality across the country.

For more information, visit our website at **www.cmhc.ca**

You can also reach us by phone at 1-800-668-2642 or by fax at 1-800-245-9274.

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April 9, 2002

Commentary on the use of RETScreen Data

To whom it may concern:

Please consider the following comments with regard to the use of RETScreen weather data in the CMHC Alternative Energy for Northern Homes Report.

I have some concern over the scientific validity of the results from the RETScreen weather data as it was used to calculate payback periods for the use of wind turbines in the RETScreen portions of Section 5 and Appendix C. The model used to calculate these numbers initially was based on the NASA satellite data which provided a percentage of the time that the wind speed in a given place on the planetary grid was within particular bounds. This number was depended upon heavily in the calculations to determine the amount of time that a wind generator could be running and producing electricity. If you look at these percentages, you will find that there is a strong correlation between a high percentage and a low payback period as long as the Average Wind Speed number is above a minimum threshold.

In the RETScreen program from Natural Resources Canada, there is no reliance on such a number. The wind distribution is assumed to match a Weibull distribution (a statistically normal distribution that does not allow values below zero). The average wind speed number is then used to determine the placement of that Weibull curve. The amount of time that the wind speed is high enough to produce electricity is then calculated based on this assumed curve. In the report calculations, we have used the RETScreen Average Wind Speed values, but continue to use the NASA satellite percentage values to calculate the payback time for a given system. This is a poor scientific use of differing values. If the RETScreen data is to be used for this report at all, I would strongly recommend having a statistician re-work the calculations (using the methodology of the RETScreen program) to remove the NASA percentages from the RETScreen calculations and calculate payback values using a Weibull distribution for this section of the report. This would affect the Wind payback calculations and the Hybrid payback calculations, and remove any requirement to use some NASA data along with the RETScreen weather data. This is highly desirable as there is often a discrepancy between the Average Wind Speed numbers from each source as is shown in the Raw Data Sections of Appendix C.

The methods used when calculating payback periods for wind systems with the NASA data is scientifically sound and I do not recommend any further changes to these numbers aside from updating them with more current NASA Satellite Weather data as it becomes available.

Sincerely,

Elaine Carr

Elaine Carr,
A.D. Williams Engineering Inc.

1. INTRODUCTION

1.1 STAKEHOLDERS

.1 Canada Mortgage and Housing Corporation (CMHC)
.2 Arctic Energy Alliance (AEA)
.3 Alaska Housing Finance Corporation (AHFC)

1.2 PURPOSE

The purpose of this study and report is to highlight the available energy efficiency and alternative energy technologies, products and systems for homes available on the market today with a proven track record for application in northern regions. Also covered are emerging technologies as well as some simple energy saving tools and behaviours. The motivation for this study is to decrease energy use and reliance on conventional non-renewable fuel sources. This would reduce energy costs and environmental impact from energy generation without negatively impacting the standard of living.

This report will be updated periodically as alternative technologies develop and more data becomes available on their use in northern communities.

1.3 TARGET AUDIENCE

The target audience for this report is anyone who owns a home, is planning to buy or build a home, or is responsible for housing in the northern regions of North America. The regions specifically covered are:

.1 Alaska
.2 Labrador
.3 Northwest Territories
.4 Nunavik
.5 Nunavut
.6 Yukon

Many of these systems and technologies have the most potential for benefit in remote communities because energy costs tend to be much higher than in larger centres due to transportation costs and lack of economies of scale. In these smaller centres, higher costs of living are often offset for homeowners by government subsidies for fuel, electricity, and transportation of goods. Unfortunately, these subsidies have the added effect of making alternative energy sources look less attractive to individual homeowners. In case of an abolition of these subsidies, information is included to help homeowners determine at what point these technologies would start to provide a substantial cost savings with or without subsidized energy costs.

The community specific information in this report is provided as a guideline for homeowners, but individuals and communities should assess the best combinations of conservation, passive systems, and mechanical systems that best suits their own unique needs and conditions.

2. COMMUNITY LISTING

REGION	COMMUNITY	POPULATION	LAT.	LONG.
ALASKA				
	Adak Station	106	51°45'N	176°45'W
	Akiachak	560	60°54'N	161°25'W
	Alakanuk	677	62°41'N	164°37'W
	Ambler	298	67°05'N	157°52'W
	Anaktuvuk Pass	312	68°08'N	151°45'W
	Anchorage	261,446	61° 13' N	149° 53' W
	Aniak	594	61°34'N	159°31'W
	Barrow	4,541	71° 17' N	156° 47' W
	Beaver	126	66°21'N	147°23'W
	Bethel	5,449	60°47'N	161°45'W
	Chevak	769	61°31'N	165°35'W
	Craig	2,124	55°'28N	133°09'W
	Dillingham	2,400	59°02'N	158°27'W
	Eagle City	171	64°47'N	141°12'W
	Elim	316	64°37'N	162°15'W
	Fairbanks/Fairbanks North Star	115,237	64°50'N	147°43'W
	Fort Yukon	565	66°34'N	145°16'W
	Galena	592	64°44'N	156°56'W
	Gambell	653	63°47'N	171°45'W
	Glenallen	494	62°07'N	145°33'W
	Homer	4,205	59°38'N	151°33'W
	Huslia	283	65°41'N	156°24'W
	Juneau	31,262	58°18'N	134°24'W
	Kaktovik	254	70°08'N	143°38'W
	Kaltag	251	64°20'N	158°43'W
	Ketchikan	8,295	55°20'N	131°38'W
	King Salmon	499	58°41'N	156°39'W
	Kipnuk	573	59°56'N	164°03'W
	Kodiak	20,864	57°47'N	152°24'W
	Kotzebue	3,000	66°54'N	162°35'W
	McGrath	408	62°57'N	155°35'W
	Metlakatla	1,499	55°07'N	131°34'W
	Mountain Village	757	62°05'N	163°43'W
	Napaskiak	395	60°42'N	161°54'W
	Nome	3,620	64°32'N	165°25'W
	Noorvik	634	66°50'N	161°03'W
	Prudhoe Bay (Deadhorse)	49	70°22'N	148°22'W
	Saint Mary's	482	62°03'N	163°10'W
	Saint Paul	585	57°07'N	170°16'W

Community Listing Cont'd:

REGION	COMMUNITY	POPULATION	LAT.	LONG.
	Sand Point	871	55°20'N	160°30'W
	Selawik	792	66°36'N	160°00'W
	Seward	3,085	66°07'N	149°26'W
	Shishmaref	547	66°15'N	166°04'W
	Sitka	8,788	57°03'N	135°20'W
	Skagway	880	59°27'N	135°18'W
	Tanana	300	65°10'N	152°04'W
	Togiak	824	59°04'N	160°24'W
	Tok	1,235	63°20'N	142°59'W
	Unalakleet	757	65°52'N	160°47'W
	Unalaska	4,283	53°52'N	166°32'W
	Valdez	4,271	61°07'N	146°16'W
	Wainwright	545	70°38'N	160°01'W
	Whittier	289	60°46'N	148°41'W
	Wragnell	2,569	56°28'N	132°22'W
LABRADOR				
	Davis Inlet (Utshimassits)	550	55° 53' N	60° 54' W
	Happy Valley - Goose Bay	8,655	53° 19' N	60° 20' W
	Hopedale	620	55° 28' N	60° 13' W
	Makkovik	367	55°05'N	59°11W
	Nain	995	56° 32' N	61° 41' W
	North West River	567	53° 32' N	60° 08' W
	Postville	225	54° 54' N	59° 47' W
	Rigolet	225	54° 11' N	58° 26' W
	Sheshatshiu	1,108	53° 31' N	60° 09' W
NORTHWEST TERRITORIES				
	Aklavik	727	68°13'N	135'00'W
	Colville Lake	90	67'02'N	126'07'W
	Deline	616	65°10'N	123°25'W
	Dettah	195	62°25N	114'18W
	Enterprise	94	60°33'N	116'08'W
	Fort Good Hope	644	66°15'N	128'38'W
	Fort Liard	512	60°15'N	123'28'W
	Fort McPherson	878	67°26'N	134'53'W
	Fort Providence	748	61°21'N	117'39'W
	Fort Resolution	536	61'11'N	113'41'W
	Fort Simpson	1,257	61'51'N	121'22'W
	Fort Smith	2,441	60° 1'N	111°57'W
	Hay River & (Hay River Reserve)	3,611 (253)	60'51'N	115'44'W
	Holman	423	70'43'N	117'45'W

Community Listing Cont'd:

REGION	COMMUNITY	POPULATION	LAT.	LONG.
	Inuvik	3,296	68'21'N	133'43'W
	Jean Marie River	53	61'32'N	120'38'W
	Kakisa	36	60'56'N	117'25'W
	Lutselk'e	304	62'24'N	110'44'W
	Nahanni Butte	75	61'02'N	123'23'W
	Norman Wells	798	65'17'N	126'50'W
	Paulatuk	277	69'21'N	124'04'W
	Rae Lakes (Gameti)	256	64'09'N	117'20'W
	Rae-Edzo (Rae)	1,662	62'50'N	116'4'W
	Sachs Harbour	135	71'59N	125'14'W
	Trout Lake	68	60'266'N	121'156'W
	Tsiigehtchic	162	67'27'N	133'44'W
	Tuktoyaktuk	943	69'27'N	133'02'W
	Tulita	450	64'54'N	125'34'W
	Wekweti (Snare Lake)	135	64'116'N	114'116'W
	Wha Ti	418	63'08'N	117'06'W
	Wrigley	167	63'14'N	123'28'W
	Yellowknife	17,275	62'276'N	114'226'W
NUNAVIK				
	Akulivik	411	60° 48' N	78° 12' W
	Aupaluk	159	59° 18' N	69° 36' W
	Inukjuak	1,184	58° 27' N	78° 06' W
	Ivujivik	274	62° 25' N	77° 55' W
	Kangiqsualujjuaq	648	58° 41' N	65° 57' W
	Kangiqsujuaq	479	61° 35' N	71° 57' W
	Kangirsuk	394	60° 01' N	70° 01' W
	Kuujjuaq	2,055	58° 06' N	68° 24' W
	Kuujjuarapik	1,210	55° 17' N	77° 45' W
	Puvirnituq	1,169	60° 02' N	77° 17' W
	Quaqtaq	257	61° 02' N	69° 37' W
	Salluit	1,143	62° 13' N	75° 39' W
	Tasiujaq	191	58° 42' N	69° 56' W
	Umiujaq	315	56° 33' N	76° 33' W
NUNAVUT				
	Arctic Bay	639	73°02N	85°10W
	Arviat	1,559	61°07'N	94°04'W
	Baker Lake	1,385	64°18'N	96° 5'W
	Bathurst Inlet	18	66°50'N	108°2'W
	Cambridge Bay	1,351	69° 07'N	105°3'W
	Cape Dorset	1,118	64°14'N	76°32'W

Community Listing Cont'd:

REGION	COMMUNITY	POPULATION	LAT.	LONG.
	Chesterfield Inlet	337	63°20'N	90°43'W
	Clyde River	708	70°28'N	68°36'W
	Coral Harbour	669	64°12'N	83°22'W
	Gjoa Haven	879	68°38'N	95°52'W
	Grise Fiord	148	76°25'N	82°54'W
	Hall Beach	534	68°47'N	81°15'W
	Igloolik	1,174	69°23'N	81°48'W
	Iqaluit	4,220	63°45'N	68°32'W
	Kimmirut	397	62°51'N	69°53W
	Kugluktuk	1,201	67°50'N	115°06'W
	Nanisivik	287	73°02N	84°33'W
	Pangnirtung	1,243	66°09'N	65°43'W
	Pelly Bay (Kugaaruk)	496	68°26'N	89°43'W
	Pond Inlet	1,154	72°42'N	77°59'W
	Qikiqtarjuaq (Broughton Island)	488	67°33'N	63°47'W
	Rankin Inlet	2,058	62°49'N	92°05'W
	Repulse Bay	559	66°32N	86°15'W
	Resolute	198	74°43'N	94°59'W
	Sanikiluaq	631	56°32N	79°14'W
	Taloyoak	648	69°32'N	93°31'W
	Umingmaktok	51	67°42'	107°57'
	Whale Cove	301	62°10'N	92°36'W
YUKON				
	Beaver Creek	109	62° 23' N	140° 52' W
	Burwash Landing	81	61° 21' N	138° 59'W
	Carcross	423	60° 10' N	134° 42' W
	Carmacks	461	62° 05' N	136° 17' W
	Dawson	2,057	64°04'N	139°25'W
	Destruction Bay	34	61° 15' N	138° 48' W
	Faro	350	62°12'N	133°22'W
	Haines Junction	800	60° 45' N	137° 30' W
	Mayo	484	63° 35' N	135° 53' W
	Old Crow	300	67° 34' N	139° 50' W
	Pelly Crossing	287	62° 49' N	136° 34' W
	Ross River	397	61° 59' N	132° 26' W
	Tagish	158	60° 18' N	134° 16' W
	Teslin	454	60° 10' N	132° 43' W
	Watson Lake	1,690	60° 03' N	128° 42' W
	Whitehorse	19,157	60° 43' N	135° 03' W

APPENDIX A

DETAILED COMMUNITY DATA

APPENDIX B

DETAILED TECHNICAL INFORMATION
Photovoltaics

PV TECHNOLOGIES

PV comes in many flavors, though the bulk of the material in use today is silicon-based. In general, PV materials are catagorized as either thick crystalline (sliced from boules or castings, or grown ribbons) or thin film (deposited in thin layers on a substrate) polycrystalline or amorphous. The following is information on the materials and technologies with application to photovoltaics.

Thick Crystalline Materials

Crystalline Silicon
Single-crystal silicon--Sliced from single-crystal boules of grown silicon, these wafers/cells are now cut as thin as 200 microns. Research cells have reached nearly 24-percent efficiency, with commercial modules of single-crystal cells exceeding 15-percent.

Multicrystalline silicon--Sliced from blocks of cast silicon, these wafers/cells are both less expensive to manufacture and less efficient than single-crystal silicon cells. Research cells approach 18-percent efficiency, and commercial modules approach 14-percent efficiency.

Edge-defined film-fed growth ribbons--Nearly single-crystal silicon ribbons grown from a crucible of molten silicon, drawn by capillary action between the faces of a graphite die.

Dendritic web--A film of single-crystal silicon pulled from a crucible of molten silicon, like a soap bubble, between two crystal dendrites.

Gallium Arsenide (GaAs)
A III-V semiconductor material from which high-efficiency photovoltaic cells are made, often used in concentrator systems and space power systems. Research cell efficiencies greater than 25 percent under 1-sun conditions, and nearly 28 percent under concentrated sunlight. Multijunction cells based on GaAs and related III-V alloys have exceeded 30-percent efficiency.

Thin-Film Materials

Amorphous Silicon (a-Si) A non-crystalline form of silcon, first used in photovoltaic materials in 1974. In 1996, amorphous silicon constituted more than 15 percent of the worldwide PV production. Small experimental a-Si modules have exceeded 10-percent efficiency, with commercial modules in the 5-7-percent range. Used mostly in consumer products, a-Si technology holds great promise in building-integrated systems, replacing tinted glass with semi-transparent modules.

Cadmium Telluride (CdTe)
A thin-film polycrystalline material, deposited by electrodeposition, spraying, and high-rate evaporation, holds the promise of low-cost production. Small laboratory devices approach 16-percent efficiency, with commercial-sized modules (7200-cm^2) measured at 8.34-percent (NREL-measured total-area) efficiency and production modules at approximately 7 percent.

Copper Indium Diselenide ($CuInSe_2$, or CIS)
A thin-film polycrystalline material, which has reached a research efficiency of 17.7 percent, in 1996, with a prototype power module reaching 10.2 percent. The difficulty in taking this technology to a production level lies in the difficulty in avoiding the formation of defects during deposition that prevent the formation of uniform layers.

Concentrators

Concentrator systems use lenses or reflectors to focus sunlight onto the solar cells or modules. Lenses, with concentration ratios of 10x to 500x, typically Fresnel linear-focus or point-focus lenses, are most often made of an inexpensive plastic material engineered with refracting features that direct the sunlight onto a small or narrow area of cells. The cells are usually silicon. GaAs cells and other materials would have higher conversion efficiencies, and could operate at higher temperatures, but they are often substantially more expensive. Module efficiency can range upwards from 17%, and concentrator cells have been designed with conversion efficiencies in excess of 30%.

Reflectors can be used to augment power output, increasing the intensity of light on modules, or to extend the time that sufficient light falls on the modules.

Concentrator system lenses are unable to focus scattered light, limiting their use to areas, like desert areas, with a substantial number of cloudless days on an annual basis.

What's New	History	Technology	Industry	Applications
Jobs	Calendar	Resources	FAQ	PV Home Page

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Planning and Sizing a Solar Electric System

In sizing a PV system the first two factors we work from are the sunlight levels or insolation values from your area and the daily power consumption of your electrical loads.

Insolation

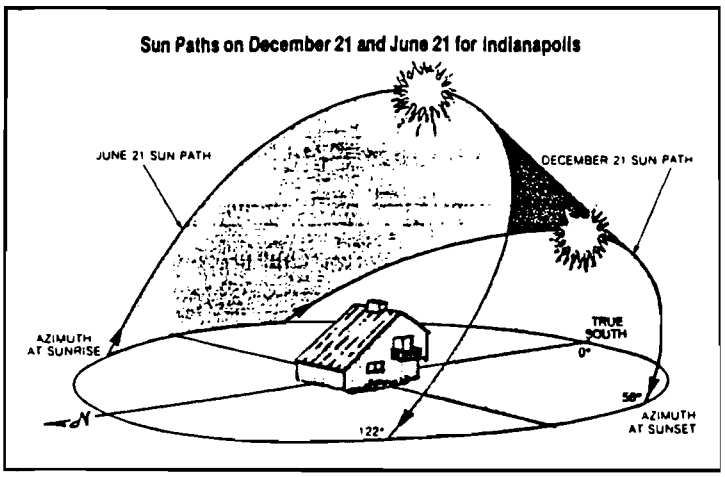
Insolation or sunlight intensity is measured in **equivalent full sun hours**. One hour of maximum, or 100% sunshine, received by a module equals one equivalent full sun hour. Even though the sun may be above the horizon, for example, 14 hours a day, this site may only receive six hours of equivalent full sun. Why? For two main reasons. One is reflection due to a high angle of the sun in relationship to your array. The second is also due to the high angle and the amount of the earth's atmosphere the light is passing through. When the sun is straight overhead the light is passing through the least amount of atmosphere. Early or late in the day the sunlight is passing through much more of the atmosphere due to its position in the sky.

Our sun trackers can help reduce reflectance but cannot help with the increased atmosphere in the sun's path.

Because of these factors our most productive hours of sunlight are from 9:00 a.m. to 3:00 p.m. around solar noon. Before and after these times we are making power but at much lower levels.

When we size solar modules, we take these equivalent full sun hour figures per day and average them over a given period. See the charts below.

We like to work with two figures here: average annual equivalent full sun hours and average winter equivalent full sun hours. In most locations in the United States winter yields the least sunlight because of shorter days and increased cloud cover, as well as the sun's lower position in the sky.



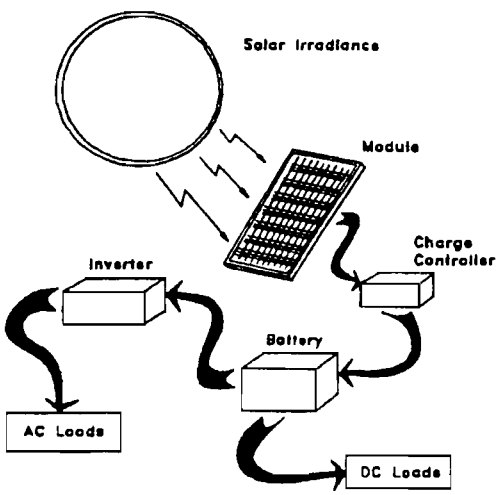
This diagram illustrates the path of the sun over varying seasons. Remember when selecting a site for your solar modules to pick a spot that is clear of shade from a minimum of 10 A.M. to 2 P.M. on December 21st. Even a limb from a deciduous tree will substantially reduce power output. These are averages, contact us for your exact insolation data.

Many solar sites are quite uncomplicated in terms of shading and aspect. You may already have a good idea of where the sun appears in the morning and disappears in the evening, as well as how low it swings in the winter sky. If your site is partially shaded, it may be necessary to determine exactly where the best placement of modules will be. We do have site analysis tools. If you need a more sophisticated site analysis, please contact us. We also have world-wide insolation data.

The Basic Idea Is Simple

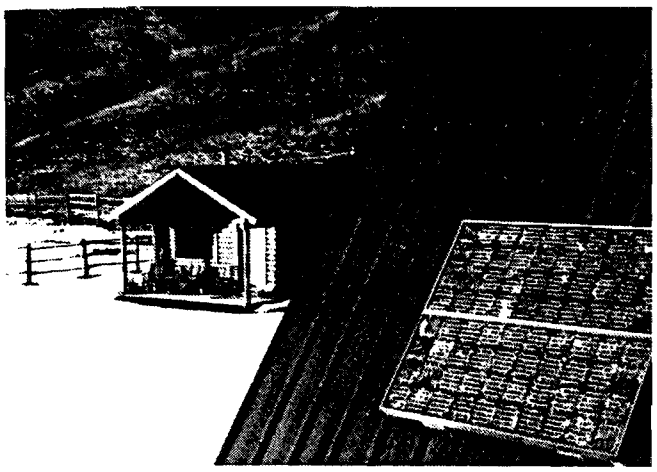
Photovoltaic modules (solar panels) convert sunlight into electricity. Wire conducts the electricity to batteries where it is stored until needed. On the way to the batteries, the electrical current passes through a controller (regulator) which will shut off the flow when the batteries become full.

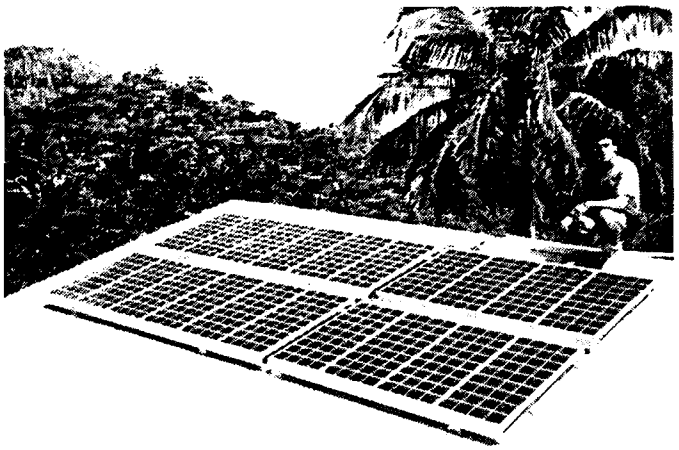
For some appliances, electricity can be used directly from the batteries. This is "direct current" and it powers "DC" appliances such as car headlights, flashlights, portable radios, etc. To run most appliances found in the home, however, we need to use "alternating current" or "AC", the type which is found in wall sockets. This we can produce utilizing an inverter which transforms DC electricity from the batteries into AC. The inverter's AC output powers the circuit breaker box and the common outlets in your home.



System Components

Systems vary greatly due to variation in size and run times of differing loads. They can use as little as a single 5 watt module or hundreds of large modules. There really is no such thing as an "average" system, even within a single kind of use. However, the basic PV system can be divided into several major components. The following section lists these components and their functions.





Components of a Solar Electric System

Component	Function
Modules	Generates electricity from sunlight
Controller	Regulates power to and from batteries
Fusing/Breakers and Disconnects	Overcurrent protection
Combiner Box	Enclosure for paralleling module output
Batteries	Stores electricity
Monitors and meters	Reports system status and power flows both instantaneously and cumulatively.

Component	Function
Inverter	Changes low voltage DC power to high voltage AC power
Generator	Provides backup AC power
Battery charger	Converts AC (generator power) to DC
Fixed Mount or Tracking Mount	Supports and aims modules toward sun
Powercenter	Combines: controllers, overcurrent protection and monitors in one enclosure

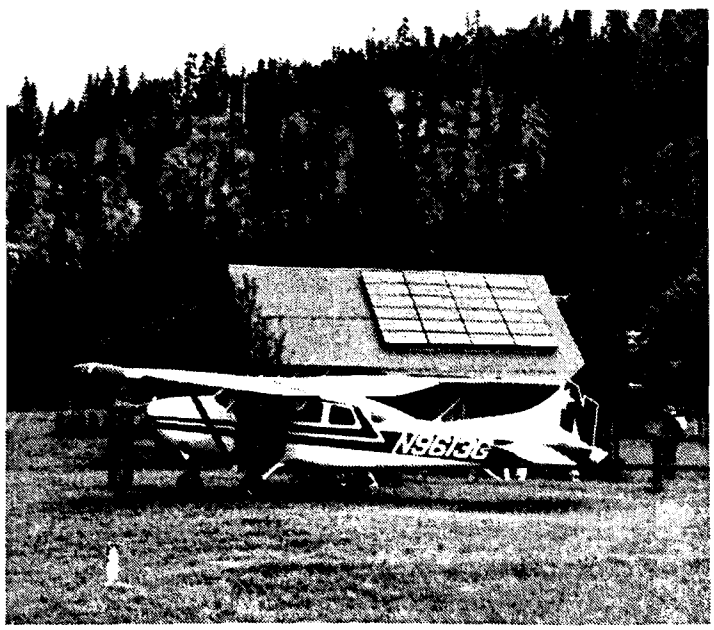
System Voltage Selection 12, 24 or 48 volts?

The nominal voltage of your system is usually determined by the system size. Small to medium systems, where most loads are DC, or a few loads are AC through an inverter, lend themselves to 12 volts nicely. Many lights and small appliances can be found at this voltage and efficiencies are high.

On the down side, 12 volt suffers from high line loss problems. The solar modules and loads cannot be far from the battery bank. (Review the wire loss tables in the Appendix.)

24 volt systems are suggested for medium to large systems. With 24 volts we have less wire loss problems and larger inverters are available. 24 volt DC appliances are more rare than 12 volt units. For this reason we lean heavily toward AC loads from these larger inverters. This simplifies wiring of the home to conventional AC wiring which exists in most homes and which any electrician can wire economically.

With the increased efficiency of AC lighting and the unlimited variety of low cost AC appliances, 24 volt systems, as well as 48 for large systems, have many advantages.



Solar Modules

Power Characteristics

The current and power output of photovoltaic modules are approximately proportional to sunlight intensity. At a given intensity, a module's output current and operating voltage are determined by the characteristics of the load. If that load is a battery, the battery's internal resistance will dictate the module's operating voltage.

A module which is rated at 17 volts will put out less than its rated power when used in a battery system. This is because the working voltage will be between 12 and 15 volts. As wattage (power) is the product of volts times amps, the module output will be reduced.

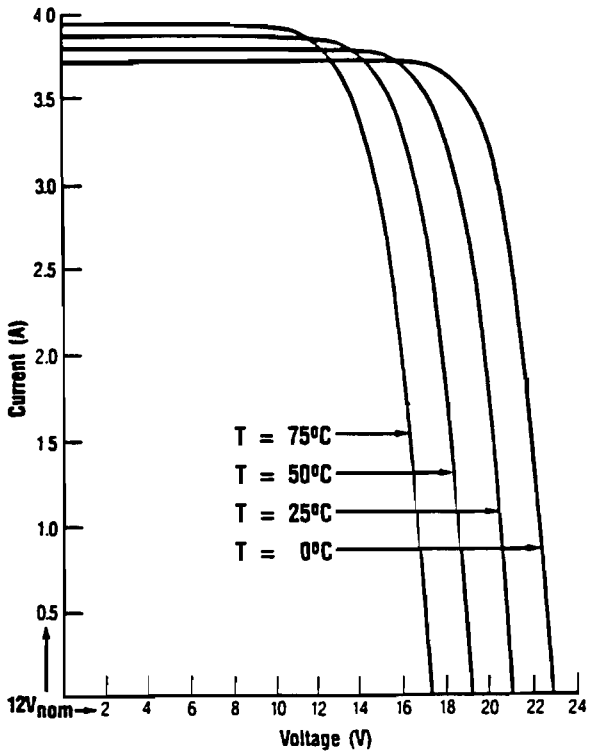
For example: a 50 watt module working at 13.0 volts will produce 39.0 watts (13.0 volts x 3.0 amps = 39.0 watts).

This is important to remember when sizing a PV system.

An I-V curve as illustrated to the right is simply all of a module's possible operating points (voltage/current combinations) at a given cell temperature and light intensity. Increases in cell temperature increase current but decrease voltage.

Maximum power is derived at the knee of the curve. Check the amperage generated at your batteries operating voltages to better illustrate the actual power developed at your voltages and temperatures.

Typical 12 Volt Module I-V Characteristics for Full Sun at 1000 Watts/m²



Mixing Sizes and Brands of Modules

In most cases mixing dissimilar modules in the same array is not a problem. When paralleling units of different amperage ratings, the output of the array will simply be the sum of the combined amperages. When paralleling units of different voltages, the lower voltage units will simply begin to taper off sooner as high battery voltage is reached. If used for array direct power, the array voltage will be the approximate average module voltage.

When series connecting strings of dissimilar modules, however, the amperage will be approximately that of the weakest module in the string. It pays then, to pay attention to matching the modules connected in series.

Shading

PV modules are very sensitive to shading. Unlike a solar thermal panel which can tolerate some shading, many brands of PV modules cannot even be shaded by the branch of a leafless tree.

Once a solar cell or a portion of a cell is shaded it becomes a load and draws power instead of producing it Watch the amp meter of your system when a hand is passed over a module and you will see a substantial drop in output

Some solar modules offer protection from partial shading The advanced design of these modules include a diode between every cell, reducing partial shading problems.

Ask your solar professionals for more information if shade protection is needed.

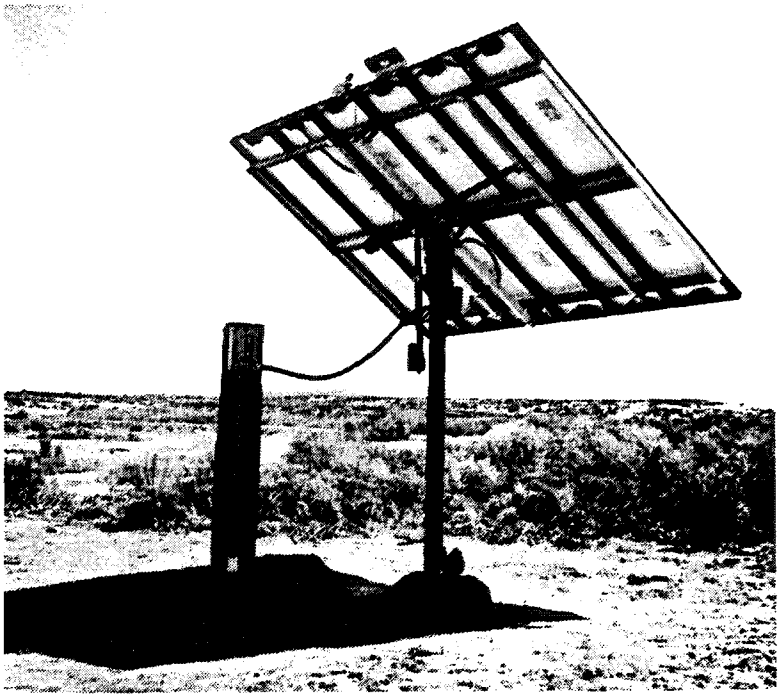
Another rule of thumb - make sure no shading occurs between 9:00 a.m. and 3:00 p.m. around solar noon. Shading early or late is not much of a problem because these are low power producing hours anyway

Reverse current protection

PV modules will leak power back from your batteries during no sun periods if not protected. This leakage is very small but over long, no-sun periods, this loss can accumulate To prevent this we install a diode or protecting circuitry in the controller

All controllers that we sell have reverse leakage protection. The circuit opens over periods of no sun, allowing the charging circuit to stop any reverse flow A diode can also be used. This unit acts as a one way check valve–letting power flow in one direction to the batteries but not back to the PV module.

Module Mounting



Solar modules perform best when perpendicular to the sun's rays. Because tracking the sun is not always possible, we typically mount the modules facing due south.

A common question is the effectiveness of facing one module to the southeast, one due south and another southwest. While this may sound like a good idea, it is not. All modules facing due south will net the largest amount of power of any other arrangement second only to a sun tracker. Remember that the true south and magnetic south vary upon your site's declination. Call your local airport or us if you do not have this figure.

Tilt angle

Because the sun's position in the sky varies through the year (higher in summer and lower in winter), it's a good idea to provide for seasonal adjustment. The rule of thumb goes: latitude plus 15 degrees angle in winter and latitude minus 15 degrees in summer. Your latitude can be found on any good map of your area.

If you wish to permanently mount the modules and not seasonally adjust the structure, fix your mount at a winter (minimal sun period) angle. This is when sunlight is limited, days are shorter and you want the system maximizing the available power. We offer a wide variety of mounts both fixed and tracking.

To Track the Sun ... or Not To Track...

Trackers are used to increase the daily output of PV modules by keeping them faced as directly as possible toward the sun. The sun sees a wider surface, and the increased reflectivity that occurs at low angles of incidence is avoided. During the long days of summer when the sun is rising north of east and setting north of west, a tracker can increase the daily output of modules by 25 to 40 percent (we can help determine what you can expect). During the winter when the sun takes a low, short arc above the horizon, the tracker will contribute much less, perhaps 10 to 15 percent. The output of a tracker remains much more constant throughout the year in tropical climates.

We generally recommend trackers for spring, summer and fall applications, such as water pumping for livestock summer pasture or small scale irrigation. For home power systems, we often do not recommend them because a household's power requirements are generally greatest in the winter just when the efficiency of the tracker is least. It often is a better choice to use a less expensive static mount and put the money into extra modules. In tropical and subtropical regions with less seasonal variation of sun and loads a tracker can make sense for a home system.

When calculating aiming error, rule of thumb is that a 10 degree aiming error will result in a loss of 2% of the solar module output, 20 degree-6%, 30 degree-14%, 40 degree-22%, 50 degree-35%, 60 degree-50%.

This table below compares insolation for fixed and tracking surfaces at three U.S. cities of varying latitudes. We have data for many locations broken down by the month, call if you would like the figures for your area.

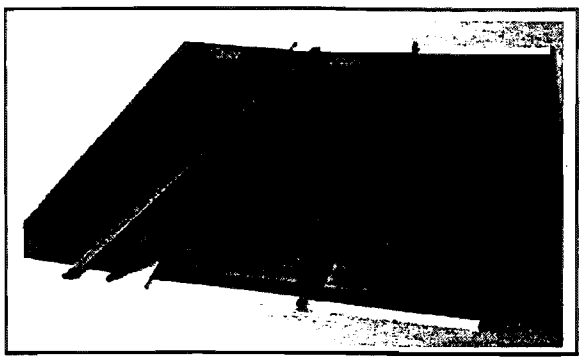
	Fixed Array Summer position latitude -15 deg.	Fixed Array Winter position latitude +15 deg.	One Axis Tracking Summer latitude -15 deg.	One Axis Tracking Winter latitude +15 deg	Two Axis Tracking E&W, N&S
Albuquerque, NM					
January	4.49	5.74	5.87	6.84	6.92
July	7.78	6.38	10.45	9.48	10.60
Pittsburgh, PA					
January	2.02	2.38	2.36	2.67	2.69
July	5.59	4.69	7.04	6.42	7.14
Great Falls, MT					
January	2.51	3.07	2.96	3.43	3.46
July	7.62	6.24	11.25	10.37	11.44

Values are equivalent full sun hours per day.

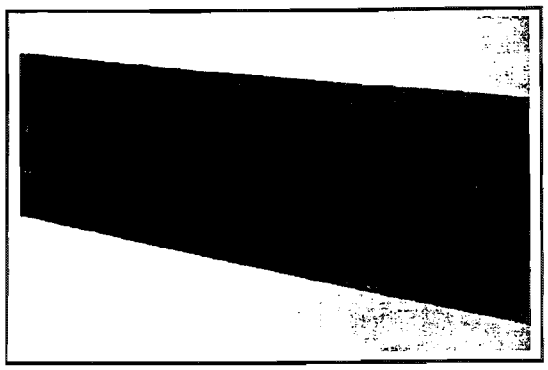
UNI-SOLAR®

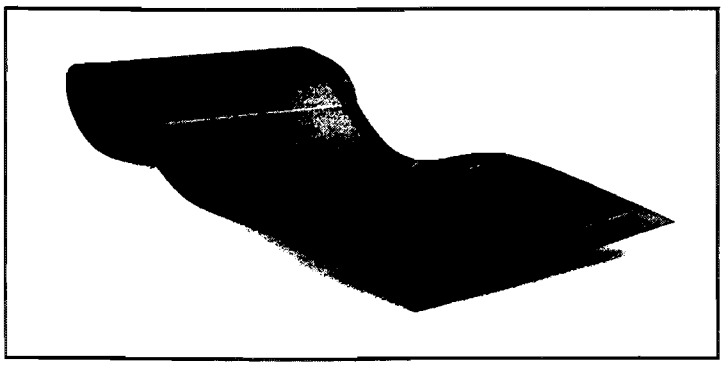
The Power To Change The World

Metal Roofing



Shingles





Field Applied Roofing Laminate

SOLAR METAL ROOFING	Rated Watts	Voltage (Vop)	Current (Iop)	Voltage (Voc)	Current (Isc)	Length	Width	Weight
Architectural Standing Seam Panels	64	16.5	3.9	23.8	4.8	9' 7 1/8"	16"	2 lbs. (per ft.
Structural Standing Seam Panels	128	33	3.9	47.6	4.8	18'3"	16"	2 lbs. (per ft
SOLAR SHINGLES								
SHR-17	17	8.6	2	12	2.5	86.4"	12"	1.4 lbs. (per f
FIELD APPLIED ROOFING LAMINATES								
PVL-64	64	16.5	3.88	23.8	4.8	9' 4.13'	15.5"	9 lbs.
PVL-128	128	33	3.88	47.6	4.8	18'	15.5"	17 lbs.

Manufactured By:

Offered By:

Bekaert ECD Solar Systems LLC
1100 West Maple Rd.
Troy, MI 48084
(800) 843-3892
www.uni-solar.com

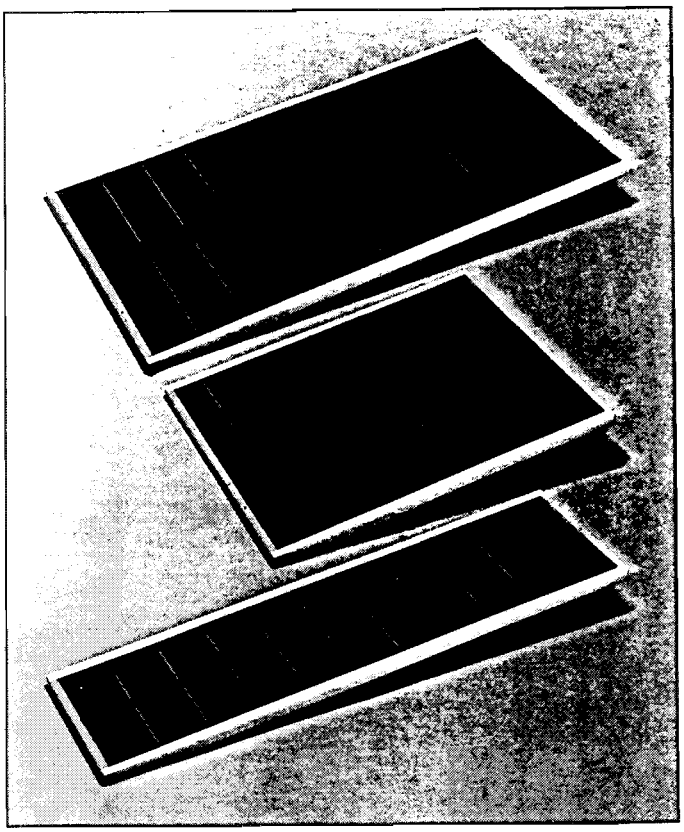
UNI-SOLAR®
United Solar Systems Corp.

UNI-POWER™ Solar Electric Modules

Specification Sheet

Models: US-64
US-42
US-32

- **Modules Rating: 64, 42, 32 Watts**
- **Triple Junction Silicon Solar Cells**
- **Unbreakable Construction**
- **Polymer Encapsulation - No Glass**
- **Anodized Aluminum Frame**
- **Bypass Diodes For Shadow Tolerance**
- **Weather Resistant Junction Box**
- **Twenty Year Limited Warranty**
- NEW **UL Listed**



Each *UNI-POWER* solar electric module utilizes United Solar's proprietary Triple Junction silicon solar cells. These cells are made in a roll-to-roll deposition process on a continuous roll of stainless steel sheet metal. The result is a unique, flexible, lightweight cell.

The modules are exceptionally durable. They are encapsulated in UV stabilized polymers and framed with anodized aluminum. A coated Galvalume steel backing plate provides stiffness. The polymer encapsulation includes EVA and fluoropolymer Tefzel®, a DuPont film.

Bypass diodes are connected across each cell, allowing the modules to produce power even when partially shaded. Each module has a weather resistant junction box designed to accept 1/2" conduit. These modules are appropriate for all applications from simple single module requirements to high voltage grid-connected installations.

Triple Junction Technology

The heart of the new *UNI-POWER* modules is the Triple Junction silicon solar cell unique to United Solar. Each cell is composed of three semiconductor junctions stacked on top of each other. The bottom cell absorbs the red light; the middle cell absorbs the green light and the top cell absorbs the blue light. This spectrum splitting capability is the key to higher efficiency.

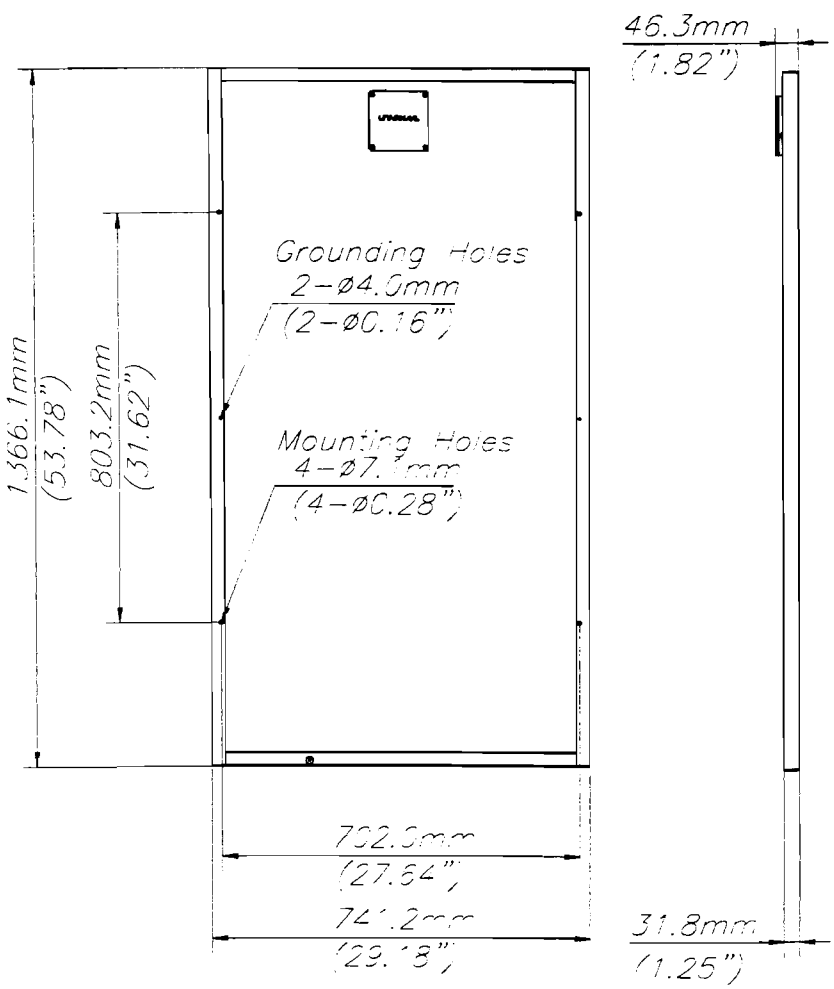
United Solar Systems Corp.

United Solar Systems Corp., a world leader in photovoltaics, is a joint venture of two of the world's most respected high technology companies, Energy Conversion Devices, Inc. (ECD) and Canon Inc. United Solar is devoted to the research, development, manufacturing and marketing of photovoltaic products.

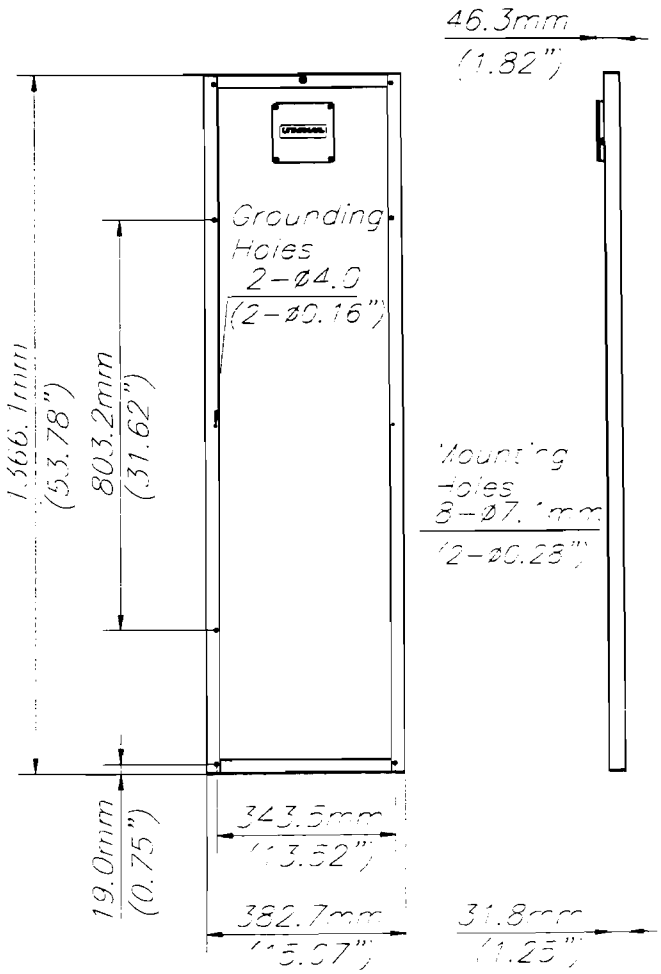
Village power
Water pumping
Telecommunications
Recreational vehicles
Traffic control signals
Remote homes
Security lighting
Parks & recreation
Grid-connected systems

Dimensions

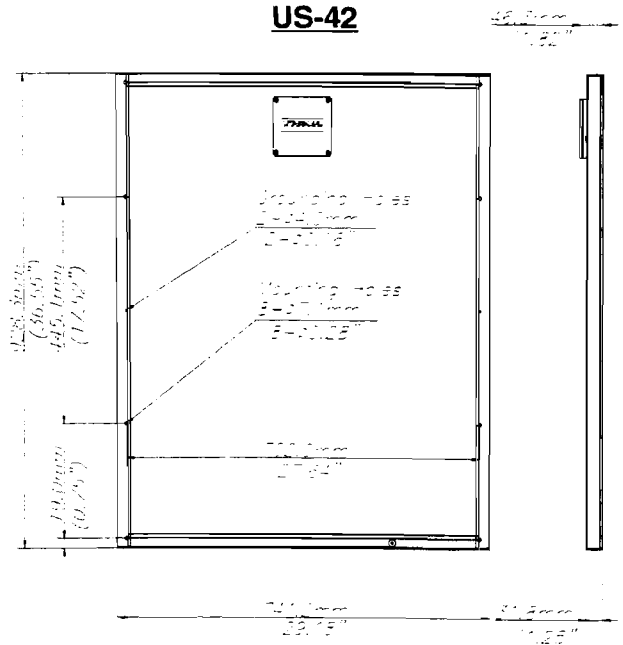
US-64

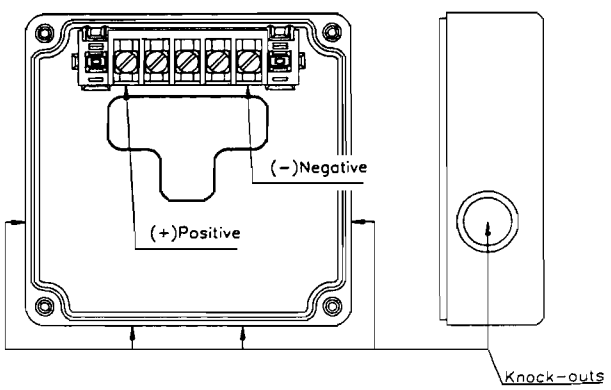


US-32



US-42





Specifications

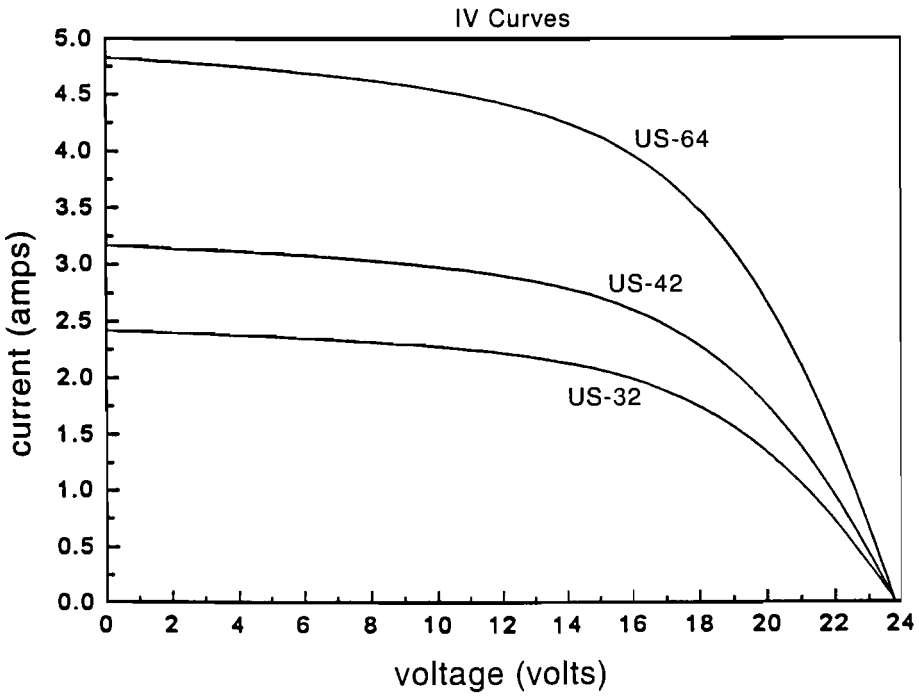
	US-64	US-42	US-32
Rated Power (Watts)	64	42	32
Operating Voltage (Volts)	16.5	16.5	16.5
Operating Current (Amps)	3.88	2.54	1.94
Open Circuit Voltage (Volts)	23.8	23.8	23.8
Open Circuit Voltage (Volts) at -10°C and 1250 W/m²	27.1	27.1	27.1
Short Circuit Current (Amps)	4.80	3.17	2.40
Short Circuit Current (Amps)* at 75°C and 1250 W/m²	6.30	4.20	3.10
Series fuse rating (Amps)	8.0	6.0	4.0
Minimum blocking diode (Amps)	8.0	6.0	4.0
Weight (lbs./kgs.)	20.2/9.17	13.8/6.27	10.6/4.8

During initial 8-10 weeks of operation, the module has higher electrical output than rated output. The output power may be higher by 15%, the operating voltage may be higher by 11% and operating current may be higher by 4%.

Electrical specifications (±10%) are based on measurements performed at standard test conditions of 1000 W/m² irradiance, Air Mass 1.5, and Cell Temperature of 25° C after long-term stabilization. Performance may vary up to 10% from rated power due to low temperature operation, spectral and related effects.

Maximum system open circuit voltage 600 VDC.

* Refer to section 690-8 of the National Electric Code for an additional factor of 125% which may be applicable.



Electrical Characteristics of US-64, US-42 and US-32 Modules at Standard Test Conditions of 1000 W/m² of AM 1.5 Irradiance and Cell Temperature of 25°C.

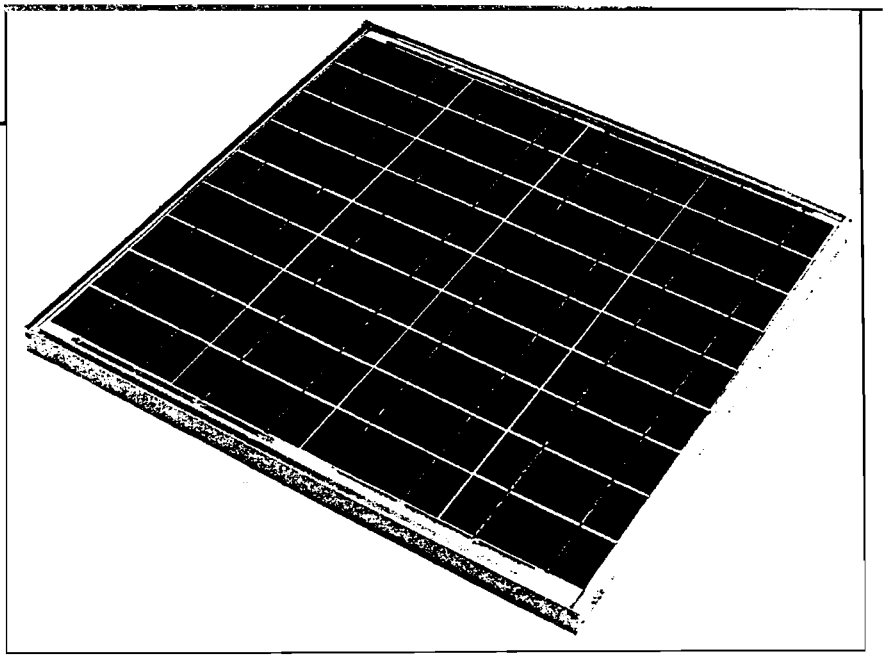
Specifications subject to change without notice.

KYOCERA

KC50

HIGH EFFICIENCY MULTICRYSTAL PHOTOVOLTAIC MODULE

TYPICAL OUTPUT 50 Wp



HIGHLIGHTS OF KYOCERA PHOTOVOLTAIC MODULES

Kyocera's advanced cell processing technology and automated production facilities have produced a highly efficient multicrystal photovoltaic modules.
The conversion efficiency of the Kyocera solar cell is over 14%.
These cells are encapsulated between a tempered glass cover and an EVA pottant with PVF back sheet to provide maximum protection from the severest environmental conditions.
The entire laminate is installed in an anodized aluminum frame to provide structural strength and ease of installation.

APPLICATIONS

- Microwave/Radio repeater stations
- Electrification of villages in remote areas
- Medical facilities in rural areas
- Power source for summer vacation homes
- Emergency communication systems
- Water quality and environmental data monitoring systems
- Navigation lighthouses, and ocean buoys
- Pumping systems for irrigation, rural water supplies and livestock watering
- Aviation obstruction lights
- Cathodic protection systems
- Desalination systems
- Recreational vehicles
- Railroad signals
- Sailboat charging systems

SPECIFICATIONS

■ Electrical Specifications

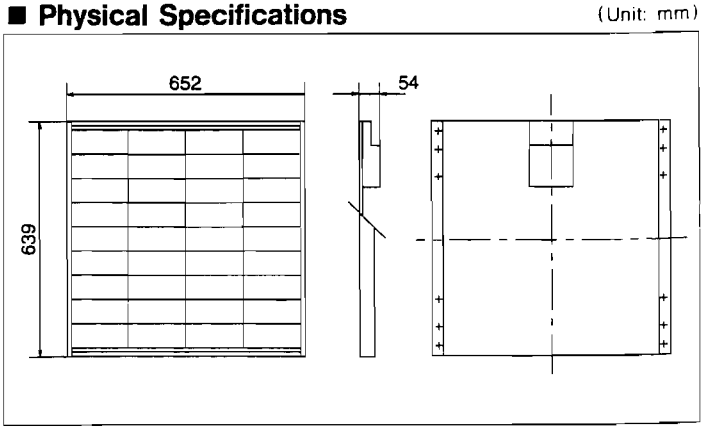
MODEL	KC50
Maximum Power	50 Watts
Maximum Power Voltage	16.7 Volts
Maximum Power Current	3.00 Amps
Open Circuit Voltage	21.5 Volts
Short-Circuit Current	3.10 Amps
Length	639mm (25.2in.)
Width	652mm (25.7in.)
Depth	54mm (2.1in.)
Weight	5.0kg (11.0lbs.)

Note: The electrical specifications are under test conditions of Irradiance of 1kW/m², Spectrum of 1.5 air mass and cell temperature of 25°C

Kyocera reserves the right to modify these specifications without notice.

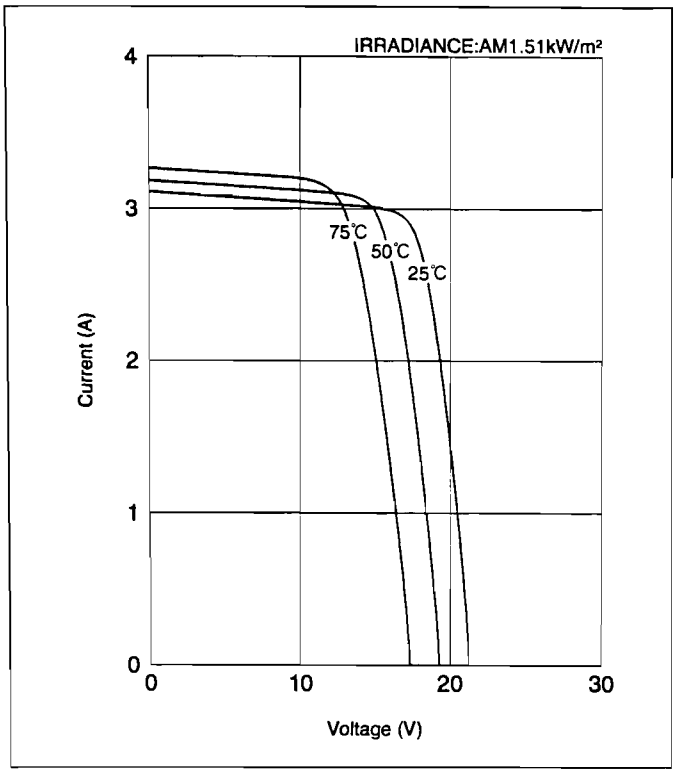
■ Physical Specifications

(Unit: mm)

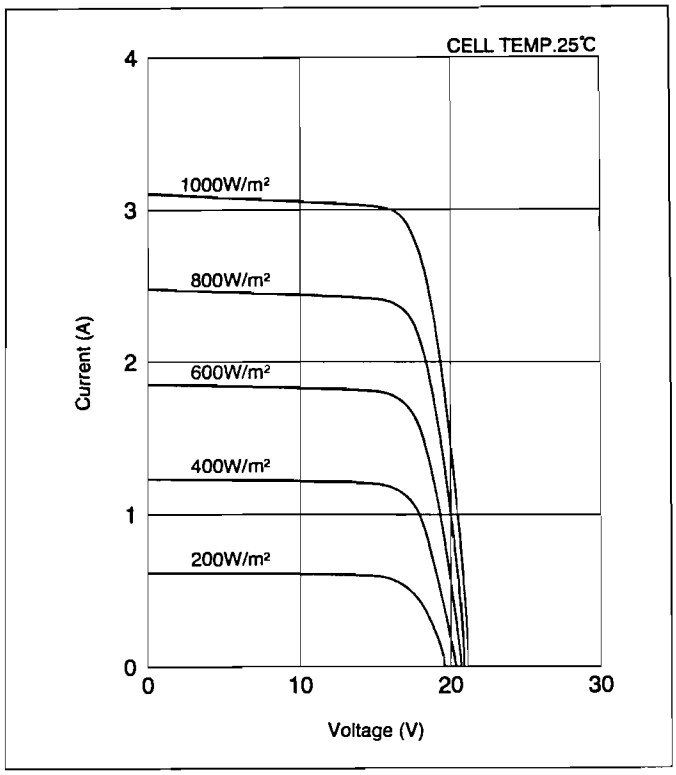


ELECTRICAL CHARACTERISTICS

Current-Voitare characteristics of Photovoltaic Module KC50 at various cell temperatures



Current-Voitare characteristics of Photovoltaic Module KC50 at various irradiance levels



QUALITY ASSURANCE

Kyocera multicrystal photovoltaic modules exceed government specifications for the following tests.

- Thermal cycling test
- Thermal shock test
- Thermal/Freezing and high humidity cycling test
- Electrical isolation test
- Hail impact test
- Mechanical, wind and twist loading test
- Salt mist test
- Light and water-exposure test
- Field exposure test

Please contact our office to obtain details without hesitation.

KYOCERA

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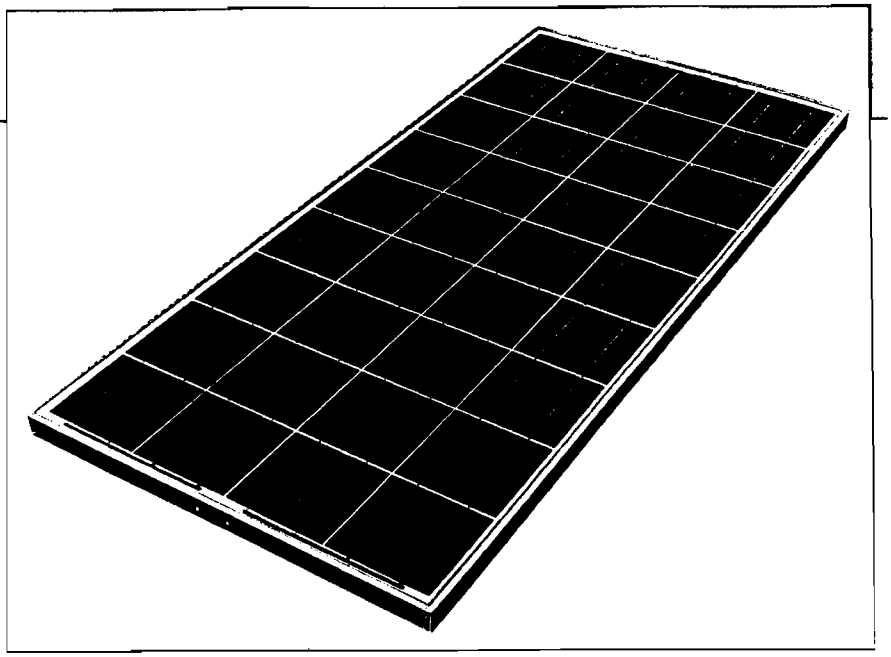
KYOCERA

KC120-1

HIGH EFFICIENCY MULTICRYSTAL PHOTOVOLTAIC MODULE

TYPICAL OUTPUT 120 Wp



HIGHLIGHTS OF KYOCERA PHOTOVOLTAIC MODULES

Kyocera's advanced cell processing technology and automated production facilities have produced a highly efficient multicrystal photovoltaic modules.
The conversion efficiency of the Kyocera solar cell is over 14%.
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The entire laminate is installed in an anodized aluminum frame to provide structural strength and ease of installation

APPLICATIONS

- Microwave/Radio repeater stations
- Electrification of villages in remote areas
- Medical facilities in rural areas
- Power source for summer vacation homes
- Emergency communication systems
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- Navigation lighthouses, and ocean buoys
- Pumping systems for irrigation, rural water supplies and livestock watering
- Aviation obstruction lights
- Cathodic protection systems
- Desalination systems
- Recreational vehicles
- Railroad signals
- Sailboat charging systems

SPECIFICATIONS

■ Electrical Specifications

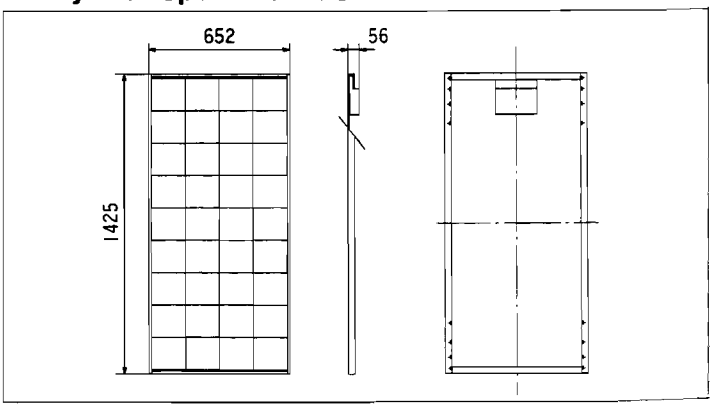
MODEL	KC120-1
Maximum Power	120 Watts
Maximum Power Voltage	16.9 Volts
Maximum Power Current	7.10 Amps
Open Circuit Voltage	21 5 Volts
Short-Circuit Current	7 45 Amps
Length	1425mm (56.1in)
Width	652mm (25 7in)
Depth	52mm (2.0in.)
Weight	11.9kg (26 3lbs.)

Note: The electrical specifications are under test conditions of Irradiance of 1kW/m², Spectrum of 1 5 air mass and cell temperature of 25°C

Kyocera reserves the right to modify these specifications without notice

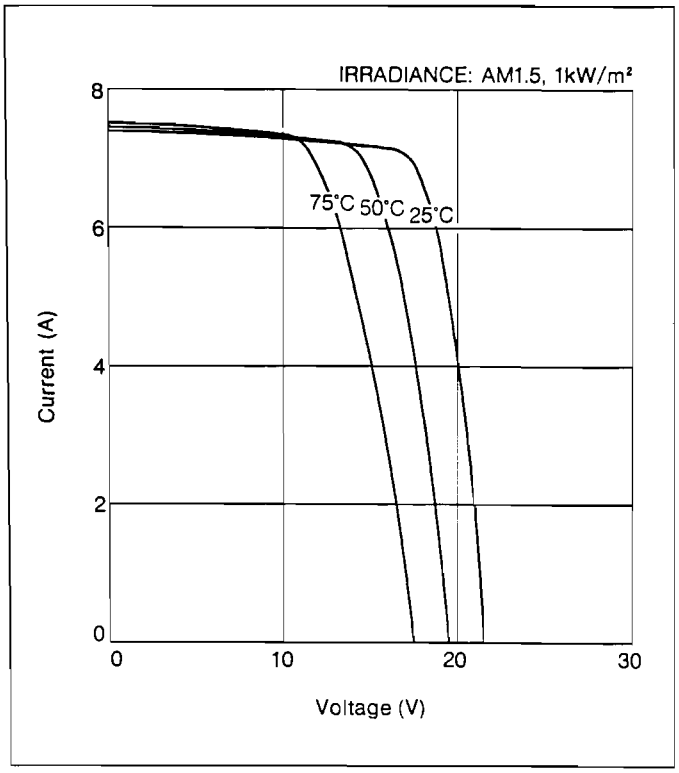
■ Physical Specifications

(Unit: mm)

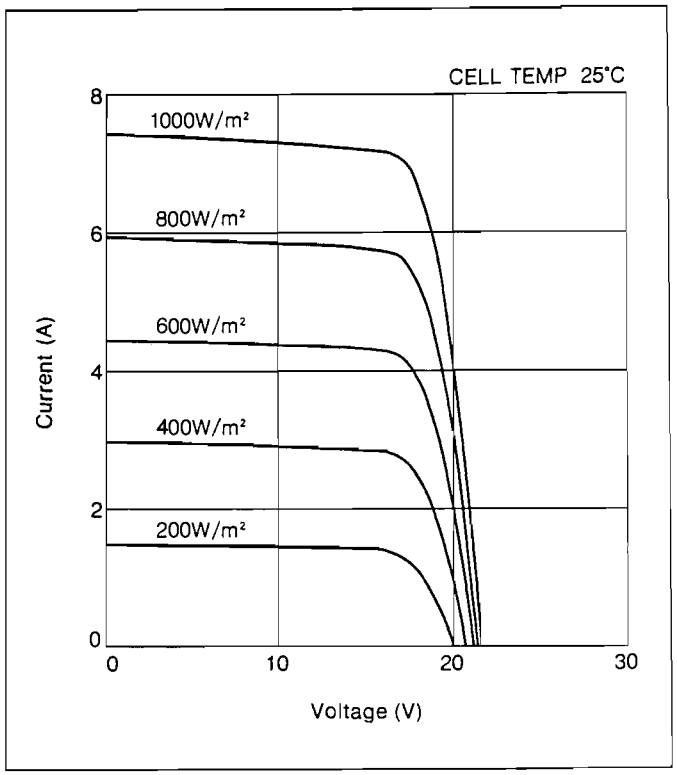


ELECTRICAL CHARACTERISTICS

Current-Voltage characteristics of Photovoltaic Module KC120-1 at various cell temperatures



Current-Voltage characteristics of Photovoltaic Module KC120-1 at various irradiance levels



QUALITY ASSURANCE

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- Electrical isolation test
- Hail impact test
- Mechanical, wind and twist loading test
- Salt mist test
- Light and water-exposure test
- Field exposure test

Please contact our office to obtain details without hesitation.

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100 Beach Road, # 22.01/03
Shaw Towers, Singapore 0718
Phone: 2917900 Telex: 20133 Telefax: 2918468

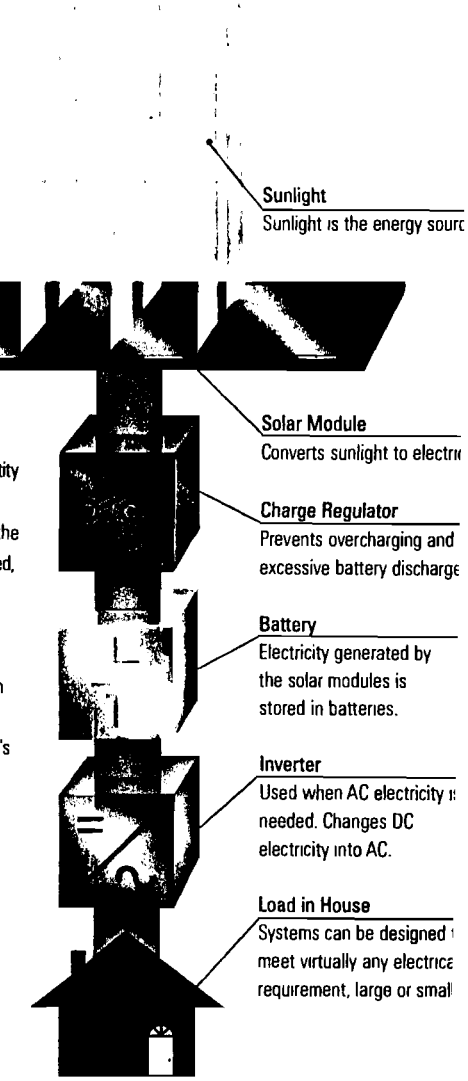
Solar Modules

Siemens Solar modules are designed to give 25 years of trouble-free use. They have proven themselves for years in some of the world's harshest climates. They power communications equipment in freezing mountain locations and water pumps in burning deserts. Solar power is a primary power source for thousands of home owners throughout the world. Utility-scale installations provide millions of kilowatt hours daily to power entire communities. Solar electricity works. Think of what it can do for you.

Discover the comfort, convenience and sense of security Siemens Solar modules can provide. Discover "Power Anywhere."

Application Examples - 4 to 6 Hours of usage	Siemens Solar Module	Quantity Required
Small Cabin - a few lightbulbs	SM55, SR50 or SM50H	One to Two
Home with Microwave, Refrigerator, Toaster, Stereo	SR100 or SP75	Two to Four
Off-Grid Home - all lights, appliances	SR100	Four to Six

See your dealer to select the appropriate modules



The type, size and quantity of these elements will vary depending upon the amount of power required, system location, and other considerations. Your Siemens Solar PowerPro™ Dealer can help configure and install the system that's right for you.

4650 Adohr Lane
Camarillo, CA 93011
800-947-6527
www.siemenssolar.com

Siemens Earthsafe Residential Kits

Earth Safe Residential Photovoltaic Kit

Siemens Solar offers a pre-engineered solar kit that enables homeowners to harness the power of the sun in a simplified, cost-effective way. The Earthsafe line of products provide utility-quality power and allow consumers to take advantage of net metering savings on their utility bills (where those programs are offered.)

In the past, solar electric systems were often designed for specific installations, which naturally increased installation costs. The systems each include solar panels and mounting hardware configured for 300, 600, 900, 1500 or 2400 Watts.

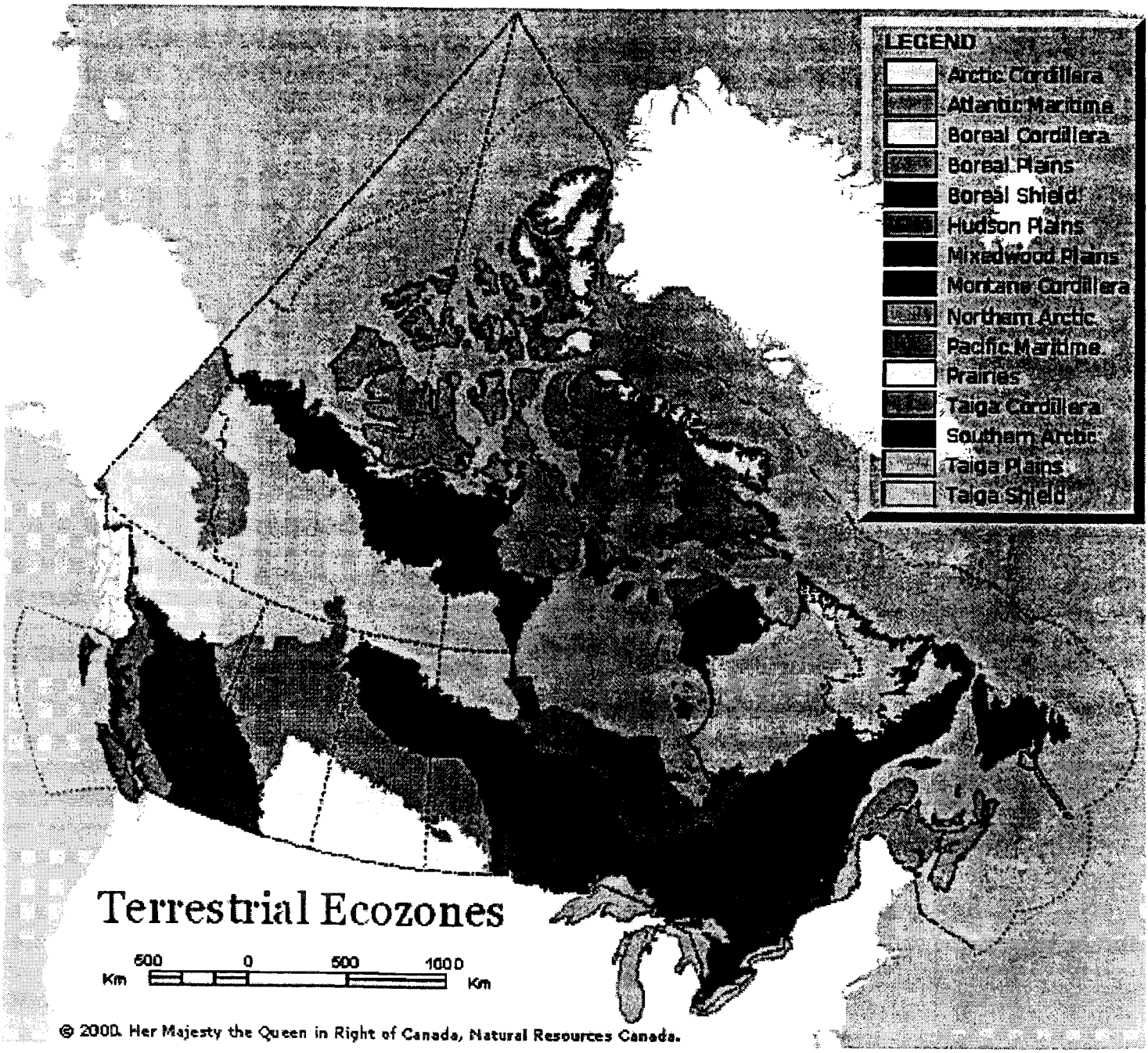
Suggested pricing starts at $1,790.00 for the minimum (300 Watt) configuration, making Earthsafe kits among the lowest cost in the industry. Earthsafe systems are the only UL listed solar residential kits available on the market.

Earth Safe Kit #	Description	# of Inverters	List Price	SC Solar Price
10-3-1	1 roof mount + 4 SP75's	1	$1,790.00	$1,667.80
10-6-2	2 roof mounts + 8 SP75's	1	$3,580.00	$3,361.75
10-9-3	3 roof mounts + 12 SP75's	1	$5,370.00	$5,055.70
10-12-4	4 roof mounts + 16 SP75's	1	$7,160.00	$6,749.65
10-18-6	6 roof mounts + 24 SP75's	2	$10,740.00	$10,137.55
10-21-7	7 roof mounts + 28 SP75's	2	$12,530.00	$11,831.50
10-24-8	8 roof mounts + 32 SP75's	2	$14,320.00	$13,525.45
20-6-2	2 roof mounts + 8 SP75's	1	$3,580.00	$3,361.75
20-9-3	3 roof mounts + 12 SP75's	1	$5,370.00	$5,055.70
20-15-4	5 roof mounts + 20 SP75's	1	$8,950.00	$8,443.60
20-24-8	8 roof mounts + 32 SP75's	1	$14,320.00	$13,525.45

APPENDIX B

DETAILED TECHNICAL INFORMATION
Biomass

802647AI (R02112) 6-99


LEGEND
Arctic Cordillera
Atlantic Maritime
Boreal Cordillera
Boreal Plains
Boreal Shield
Hudson Plains
Mixedwood Plains
Montane Cordillera
Northern Arctic
Pacific Maritime
Prairies
Taiga Cordillera
Southern Arctic
Taiga Plains
Taiga Shield
Terrestrial Ecozones
500
0
500
1000
Km
Km
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Consumer Energy Information: EREC Reference Briefs

EREC Brief: Comparing Heating Fuels

Selecting the fuel and heating system best suited for your needs depends on many factors: the cost and availability of the fuel and heating appliance, the heating appliance's and heat delivery system's efficiency, the heat content of the fuel, maintenance costs, comfort, and combustion emissions. Fuels are measured in physical units, such as gallons of oil, tons of coal, and cubic feet of natural gas. They are also measured by heat content: Btu (British thermal units), Therms (about 100,000 Btu), or Calories. One Btu is the amount of energy needed to raise the temperature of one pound of water 1°F. One Btu equals 252 Calories. One calorie is the amount of energy needed to raise the temperature of one gram of water by 1°C. Electricity is commonly measured in kilowatt-hours (kilo means one thousand); one kilowatt-hour (kWh) equals to 3,413 Btu (860,076 calories).

Btu Content of Fuels

Since the actual heat content of different types of fuels varies, the approximate average values are often used. The table below provides a list of the average heat content of different fuels. The figures below are general references for residential heating applications only. Commercial and industrial users should obtain more precise values from their fuel vendors.

Table 1: Average Heat Content of Fuels

Fuel Type	No. of Btu/Unit (Kilocalories/Unit)
Kerosene (No. 1 Fuel Oil)	135,000/gallon (8,988/liter)
No. 2 Fuel Oil	140,000/gallon (9,320/liter)
Electricity	3,412/kWh (859/kWh)
Natural Gas	1,028,000/thousand cubic feet (7,336/cubic meter)
Propane	91,333/gallon (6,081/liter)
Bituminous Coal	23,000,000/ton (6,400,000/tonne)
Anthracite Coal	24,800,000/ton (5,670,000/tonne)
Hardwood (20% moisture)*	24,000,000/cord (1,687,500/cubic meter)
Pine (20% moisture)*	18,000,000/cord (1,265,625/cubic meter)
Pellets (for pellet stoves; premium)	16,500,000/ton (4,584,200/tonne)

* Note: The moisture content of wood can greatly affect its heating value

These standards of measurement make comparisons of fuel types possible. For example:

The heat content of 2,000 pounds (907.18 kilograms) of bituminous coal roughly equals that of 22,337 cubic feet (626 cubic meters) of natural gas.

The heat content of 1,000 cubic feet (28 cubic meters) of natural gas equals about 90 pounds (41 kilograms) of bituminous coal.

One million Btu (252,000 kilocalories) is the heat equivalent of approximately 80 pounds (36 kilograms) of anthracite coal, 250 pounds (113.4 kilograms) of air-dried hardwood, 11 gallons (41.6 liters) of propane, 293 kilowatt hours of electricity, or seven gallons (26.5 liters) of No. 2 heating oil.

The efficiency of the heating appliance is an important factor when determining the production cost of a given amount of heat. In general, the efficiency is determined by measuring how well an appliance turns fuel into useful heat. (The condition of the distribution or delivery system also affects the overall system efficiency.) Many heating appliances must meet U.S. Department of Energy standards; and manufacturers are required by Federal law to place energy efficiency labels on the appliances. Table 2 provides average efficiencies for common heating appliances.

Table 2: Estimated Average Fuel Combustion Efficiency of Common Heating Appliances

Fuel Type - Heating Equipment	Efficiency (%)
Coal (bituminous)	
Central heating, hand-fired	45.0
Central heating, stoker-fired	60.0
Water heating, pot stove (50 gal.[227.3 liter])	14.5
Oil	
High efficiency central heating	89.0
Typical central heating	78.0
Water heater (50 gal.[2227.3 liter])	59.5
Gas	
High efficiency central heating	92.0
Typical central heating	82.0
Room heater, unvented	91.0
Room heater, vented	78.0
Water heater (50 gal.[227.3 liter])	62.0
Electricity	
Central heating, resistance	97.0
Central heating, heat pump	200+
Ground source heat pump	300+
Water heaters (50 gal.[227.3 liter])	97.0
Wood & Pellets	
Franklin stoves	30.0 - 40.0
Stoves with circulating fans	40.0 - 70.0
Catalytic stoves	65.0 - 75.0
Pellet stoves	85.0 - 95.0

Comparing Fuel Costs

You can use the following method to estimate the costs of producing one million Btu (252,000 kilocalories) of heat using different heating appliances and fuels. To do this, you need to know the efficiency of the appliance and the unit price of the fuel. Contact your utility or fuel supplier for the unit price of the fuel in question. Remember, the fuel price should not be the sole measure for selecting a heating appliance.

American Energy Systems

Click Here for More Information about Country Side

Retail Info

- Product Overview
- Support
- Newsletter
- Specifications
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- Press Releases
- Dealer Locator

Home Page

Products

Multi Fuel
- Country Side

Wood Burning
- Magnum ZC
- Magnum Masonry

Furnaces
- Magnum

Gas Burning
- Fireplace Heaters
- Space Savers
- Celebrity
- Viking

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- Reseller Sales

AES Resellers Info

- Log in

You must have a username and password to view this area. Please call AES for registration. 1-800-495-3196

Downloads

Don't forget to check out the product **specifications** in Adobe PDF format. If you don't have Adobe Acrobat Reader 4.0, you can **download** this free software from Adobe:

Get Acrobat Reader

Multi-Fuel Stove

Relative Cost of Heat
Corn / Wood Pellet Appliances

All heat output is measured in terms of BTU's. One BTU is the amount of heat needed to raise on pound of water one degree. Column 4 gives you a measure of the approximate cost of heat available from each alternative source of fuel. However, column 5 is the key column, as it incorporates the efficiency of a particular unit, to ensure the effective cost of that energy for heating your home.

It is important to realize that, even within a state, average energy or fuel prices can vary widely. So, to determine the specific cost comparisons in a particular region or Country, just change the price structure in Column 3 to determine the resulting costs on Column 4 and 5. Similarly, different efficiency levels can be substituted in Column 5 to allow flexibility here to test various heating units.

* Prices may vary according to location	1 BTU Value per unit	2 Units Required to Produce 1,000,000 BTU'S	3 Fuel Price / Unit (approximate)	4 Total Cost to Produce 1,000,000 BTU'S	5 Effective Cost to Produce 1,000,000 BTU'S
Dry Shelled Corn	9,000/pound	106.4/ pound = 1.9 bushels	$1.75/ bushel	$3.46	@85% efficiency = $4.07
Electricity	3,413/KWH	293/KWH	7.5 cents/ KWH	$21.98	@100% efficiency = $21.98
Natural Gas	100,020/cubic feet	1,030/cubic feet	$1.30/100 cubic feet	$13.39	@85% efficiency = $15.75
Fuel Oil	139,000/ gallon	7.1 gallons	$1.00/gallon	$7.19	@80% efficiency = $8.98
LP Gas	91,690/gallon	11 gallons	$1.69/gallon	$18.59	@80% efficiency = $23.23
Wood	16,464,000/ CORD	.0607 cords	$150.00/cord	$9.11	@60% efficiency = $15.18
Wood Pellets	8,000/ pound	125 pounds .06 tons	$175/ton	$10.50	@87% efficiency = $12.06

Corn Comparison

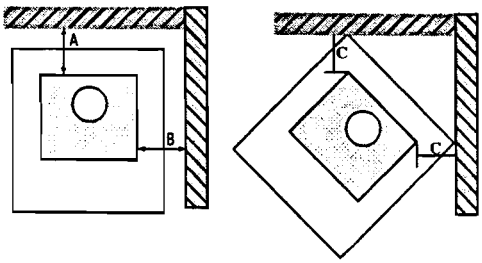
Now let's compare corn to other fuel sources. An average home will burn 150 to 200 bushels of corn a season, depending on the temperature.

1 BUSHEL OF SHELLED CORN = 5.5 GALLONS OF LP GAS
1 BUSHEL OF SHELLED CORN = 3.6 GALLONS OF FUEL OIL
1 BUSHEL OF SHELLED CORN = 148 KILOWATT HOURS OF ELECTRICITY
1 BUSHEL OF SHELLED CORN = 5.04 C.C.F. OF NATURAL GAS

- About Country Side Multi-Fuel Stoves

WOOD-BURNING STOVES & INSERTS

Clearances



Before installation, we recommend you consult your local building official. If you use an approved protected wall system, some U.S. building codes allow for reduced wall clearances.

Note that Canadian clearances are based on testing to Canadian standards. See instruction manual for Canadian requirements.

MODEL	WALL CLEARANCES (inches)			
	A	B	C	D
	BACK WALL TO STOVE	SIDE WALL TO STOVE	BACK WALL TO STOVE	STOVE BACK TO CENTER OF FLUE
	Single Wall / L-vent	Single Wall / L-vent	Single Wall / L-vent	
1900HT-M	13-3/4 / 6	15 / 15	7-3/4 / 5	9
1500HT	13 / 8	8-1/2 / 9-1/2	5 / 5	5-3/4
1003C	16 / 9**	16 / 16	15 / 8**	9
1400HT	13 / 8	8-1/2 / 9-1/2	5 / 5	–

**May be reduced to 5.5" with pipe shield

MODEL	Insert to Combustibles or Trim (inches)				
	STOVE TOP TO MANTLE	STOVE TOP TO TRIM	STOVE SIDE TO TRIM	STOVE SIDE TO SIDE WALL	STOVE BACK TO CENTER OF FLUE
BV400C	31	9	1	9	6
BV4000C	32	24	9	17	5-1/2
2800HT	27	16	6	6	6

Appliance Specifications

MODEL	FEATURES						PERFORMANCE						SPECIFICATIONS								
	Catalytic	Non-Catalytic	Ash Drawer	Blower Fan	Gold Door	Mobile Home Compatible	EPA BTU Range	Maximum Burn Rate	Emission Rate (Grm/Hr)	EPA Efficiency %	Approx Heating Capacity	Burn Time (hours)	Shipping Weight (lbs)	Width (inches)	Depth (inches)	Height (inches)	Height with Flue (inches)	Flue Size (inches)	Fire Box Size (cubic ft)	Max Log Length (inches)	Fan Capacity (cubic ft/min)
							LOW / HIGH				Square Feet										
1400HT		■		*		■	11,700 / 37,000	58,730	6.6	63	1,500	6-8	285	27	21-1/2	26	28	6	1 85	20	160 *
1900HT-M		■	■	*	■	■	11,500 / 39,000	61,900	2.5	63	2,000	6-8	380	27-3/4	27-1/2	33-1/2	32-3/4	6	2.0	18	160 *
1500HT		■	■	*	*	■	11,700 / 37,000	58,700	6.6	63	1,500	6-8	345	27-1/2	24	29-3/4	30-3/4	6	1 85	20	160 *
1003C	■		■	*	■	■	11,700 / 36,800	51,100	3.7	72	2,000	8-12	370	25-1/4	27	32-1/2	34-1/2	6	3.0	18	160 *
BV400C	■		*	Dual ■	■		11,000 / 48,100	66,800	3.0	72	2,400	8-12	455	29-1/2 F / 21-1/2 R / 48	15-3/8 / 26-1/4	20 ‡	32	8	3.7	24	500
BV4000C	■		■	■	*		6,500 / 40,900	56,800	1 9	72	2,000	8-10	390	22-1/2 / 42	16 / 25	21	32	6	2.4	18	250
2800HT		■		Dual ■	■		11,500 / 46,700	74,100	4 5	63	1,800	8-10	435	24F / 23 R / 42	15-1/2 / 28-1/4	20	32	6	2.9	18	500

Note that heating capacities are only approximations because so many factors influence the heatability of a home.

Specifications and clearances are subject to change without notice. ■ Standard feature * Optional ‡ Add 3 5" with optional Ash Drawer!

F = Front
R = Rear
Width of Surround

Lennox Hearth Products
www lennoxhearthproducts com

EARTH STOVE™ BY LENNOX HEARTH PRODUCTS

Model	Width	Height	Depth	Heating Capacity, sq. ft.	Hopper Capacity	Burn Rate lbs./hr.	BTUs Per Hour	Ash Drawer	Ignitor
Afton Bay	**26"**	**31"**	**23"**	**800-1800**	**60 lbs.**	**1.2-4.7**	**10,200-40,000**	**Full Pedestal**	**Yes**
Prescott EX	24 3/4"	34"	26"	800-1800	65 lbs.	1.2-4.7	10,000-40,000	Full Pedestal	Yes
Prescott EXL	24 3/4"	31 3/4"	26"	800-1800	65 lbs.	1.2-4.7	10,000-40,000	Large Belly Pan	Yes

Safety Test Statement:
Tested per: ASTM/E1509
UL1482, CAN/ULC 5627
B 366.2M/APFI/ASTM/E1509

Oregon Administrative Rules:
814-23-900 thru 814-23-909

Power Requirements
120 Volts A.C.
(200-250 watts)

Harman P61 Specifications

Built To A Standard, Not A Price

Harman Stoves Work!

- **BTU RANGE 8,000 to 61,000**
- **HEATING CAPACITY 2,000 sq. ft.**
- **HOPPER CAPACITY 72 lbs.**
- ***with optional hopper extension 132 lbs***
- **FUEL Bio-Mass Pellets**
- **BLOWER SIZE 135 CFM**
- **FLUE SIZE 3 in.**
- **OUTSIDE AIR SIZE 2-3/8 in.**
- **FUZE RATING 3 amp**
- **WEIGHT 249 lbs**
- **HEIGHT 34-1/2 in.**
- **WIDTH 23-1/2 in.**
- **DEPTH 29-1/2 in.**
- ***CLEARANCE TO COMBUSTABLES***
- ***REAR 2 in.***
- ***SIDE 18 in.***
- ***with rear side shields 10 in.***
- ***FRONT 16 in.***
- ***FLOOR TO CENTER OF FLUE 9 in.***

 Gas Stoves  Gas Fireplaces  Pellet  Coal  Wood  Central Heat  Boilers

 Return To Main Page

- **To Find A Dealer By Zip Code Click Here...**
- **Please Fill Out The Information Request Form? For Additional Dealer Listing or other Info.**
- **Are You Interested In Becoming A Harman Stove Dealer?**
- **You Can Send Us Email here.**

Please Note: There are no factory direct sales . You must go through a certified Harman Stove Company servicing dealership for purchasing stoves or parts.

Harman Stove Company

352 Mountain House Road

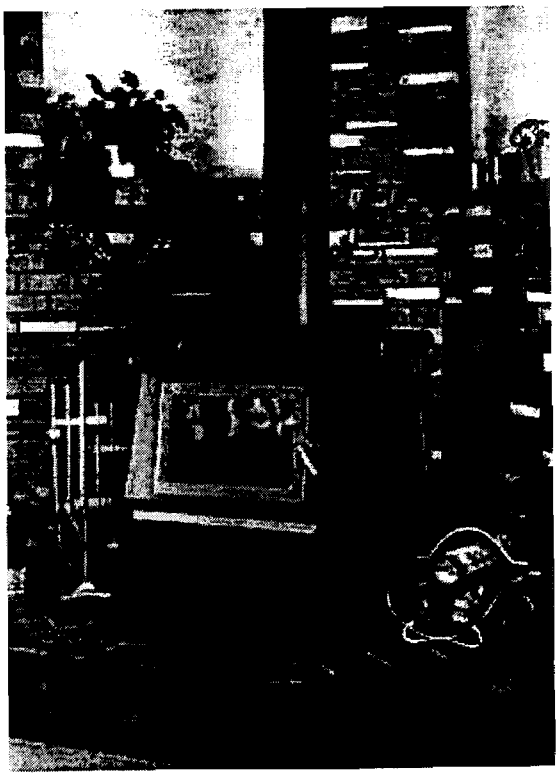
Blaze King Wood Products

KING & PRINCESS WOOD STOVES

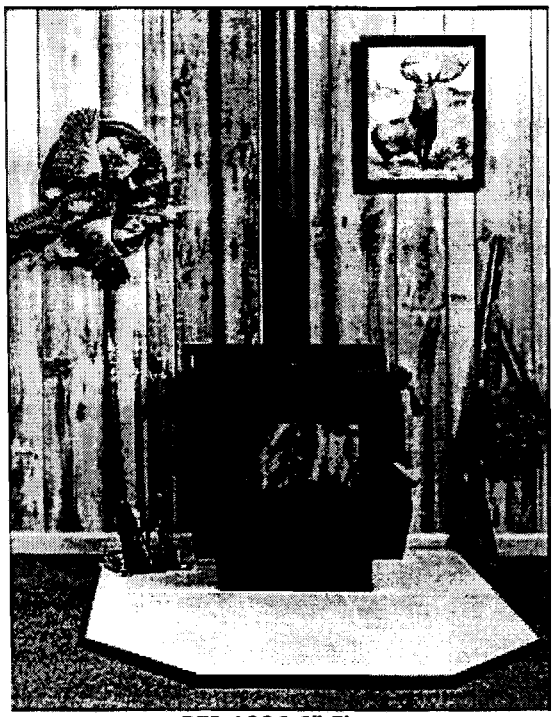
Specifications	KEJ-1102	PEJ-1006
MIN HEAT OUTPUT	8,400 BTU/HR	6,400 BTU/HR
MAX HEAT OUTPUT	43,600 BTU/HR	40,000 BTU/HR
WOOD CAPACITY / OAK	90 lbs.	60 lbs.
WOOD CAPACITY / FIR	60 lbs.	40 lbs.
LOW BURN TIME	40 hours	20 hours
HIGH BURN TIME	8 hours	6 hours
BLOWER W/RHEOSTAT	130 CFM	

Blaze King Classic Models Feature Dual Blowers

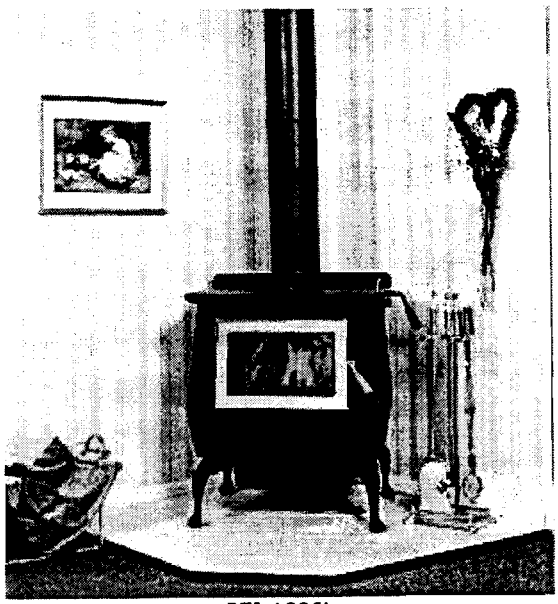
Return to Wood Products | Home



KEJ-1102 8"



PEJ-1006 6" Flue

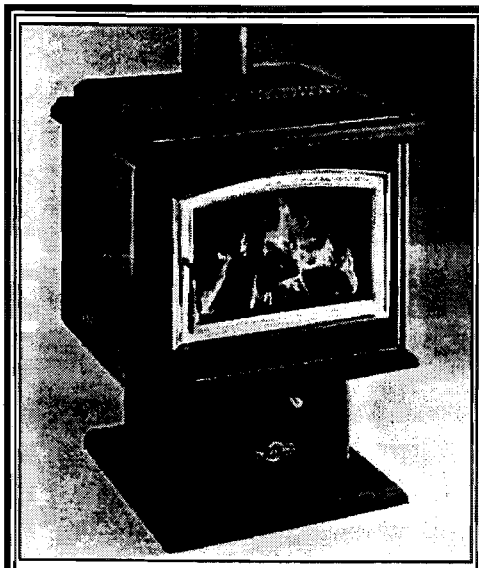


PEJ-1006L
6" Flue & Optional Ash Drawer

Blaze King Classic Wood Stoves

The Earth Stove®

Our Freestanding Woodstoves



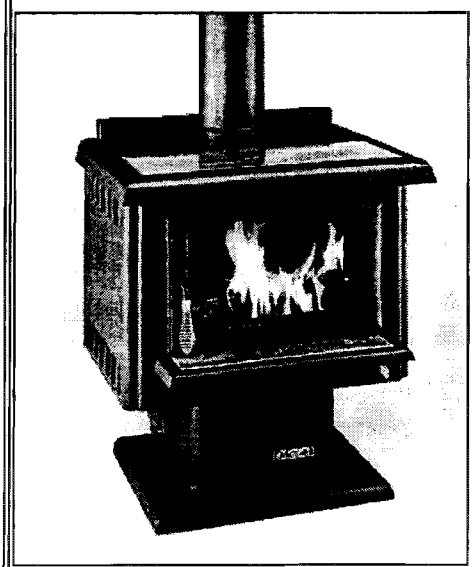
1900HT-M

Combining superb craftsmanship and stylish detailing, the new 1900HT-M is one of the most functional *and* aesthetically appealing woodstoves you can buy. From its elegant arched gold door (which you never need to polish) to its handsome marble accents, this freestanding non-catalytic woodstove will add both warmth and beauty to your home.

With a large, 2 cubic foot firebox, and highly advanced combustion system, the 1900HT-M provides up to 8 hours of burn time and a maximum BTU rate of 62,000. A large ash drawer and single-rod control add to its easy care and simple operation. Add the optional 160 CFM blower for additional heat circulation.

It's no wonder the 1500HT is one of our most popular woodstoves. With its medium size and rich marble accents, the freestanding 1500HT is the perfect choice for many different rooms.

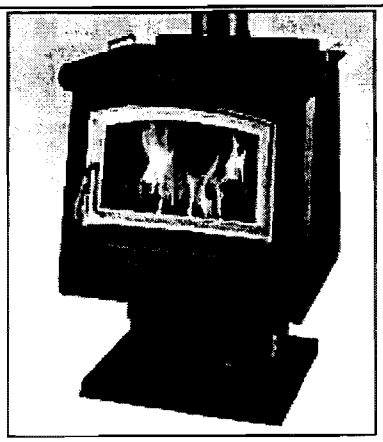
Plus, its advanced burn system is designed to keep you warm and cozy no matter what the weather is. And the HT technology that powers this non-catalytic woodstove produces a lively fire that not only warms your home efficiently, but adds to the pleasure of fire-gazing as well!



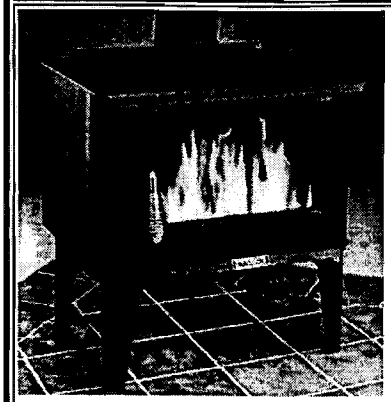
1500HT

If you're a serious woodburner, you'll love the **1003C**. The shape of its high capacity, easy-load firebox is a direct descendant of our original woodstove design, but is built to meet the demands of today's discriminating woodburner. Our efficient catalytic technology is honed to perfection in this ultra-efficient home warmer.

The steady output of the **1003C**, from 11,700 to 36,800 BTU's, will keep your family toasty. A large ash drawer allows for easy maintenance of the stove.



1003C



1400HT

If you're looking for a real value, look no further than our new 1400HT. This handsome, non-catalytic woodstove is designed to provide both durability and lasting heat. From its heavy plate steel construction to its 1500 square foot heating capacity, the 1400HT is one hardworking woodstove. It features a large, easy load door and an extra wide firebox that can accept up to 20 inch logs. For increased heat circulation, add the optional 160 CFM blower.

Fireplace Inserts

APPENDIX B

DETAILED TECHNICAL INFORMATION
Solar Air Heating

Conserval

www.solarwall.com

SOLARWALL®

Solar Residential Construction Manual

Six panel residential SOLARWALL® heater installed on the south west wall of home and connected to furnace return air.

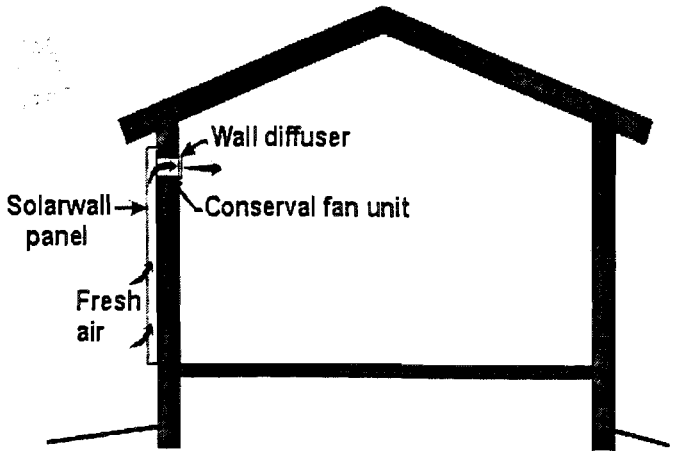
On a sunny day, this 110 sq.ft. SOLARWALL® heater, located in the gable, will raise the temperature of 150cfm of ventilation air about 50°F over ambiant.

Features

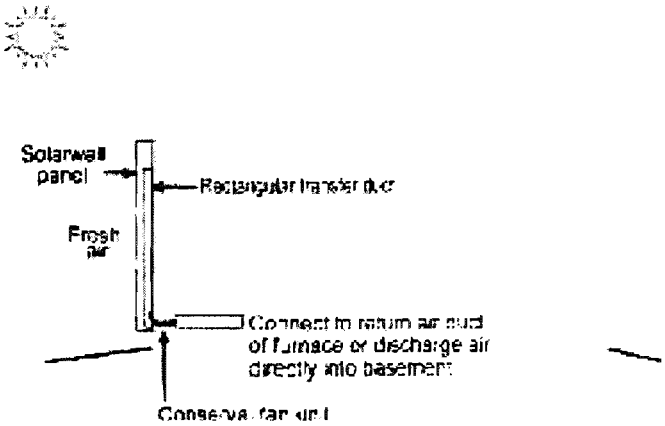
- **metal construction**
- **install onto walls or roofs**
- **attractive appearance**
- **low cost**
- **ideal for home or cottage**

Benefits

- **improves air quality**
- **provides ventilation air**
- **reduces heat loss from wall**
- **free heating of outside air**
- **lower heating bills**



Direct Room Discharge Solar heated air is discharged directly into the room. requires a variable speed or two speed control.



Forced Air Furnace Connection Fan discharge is connected directly to the return air plenum of a forced air furnace. Wire fan directly to the furnace fan.

Conserval Systems Inc., 4254 Ridge Lea Rd.,
Buffalo, N.Y., 14226
Ph. (716) 835-4903 Fax. (716) 835-4904

Conserval Engineering Inc., 200 Wildcat Rd.
Toronto, Ont., M3J 2N5
Ph. (416) 661-7057 Fax (416) 661-7146

Solarwall Technology

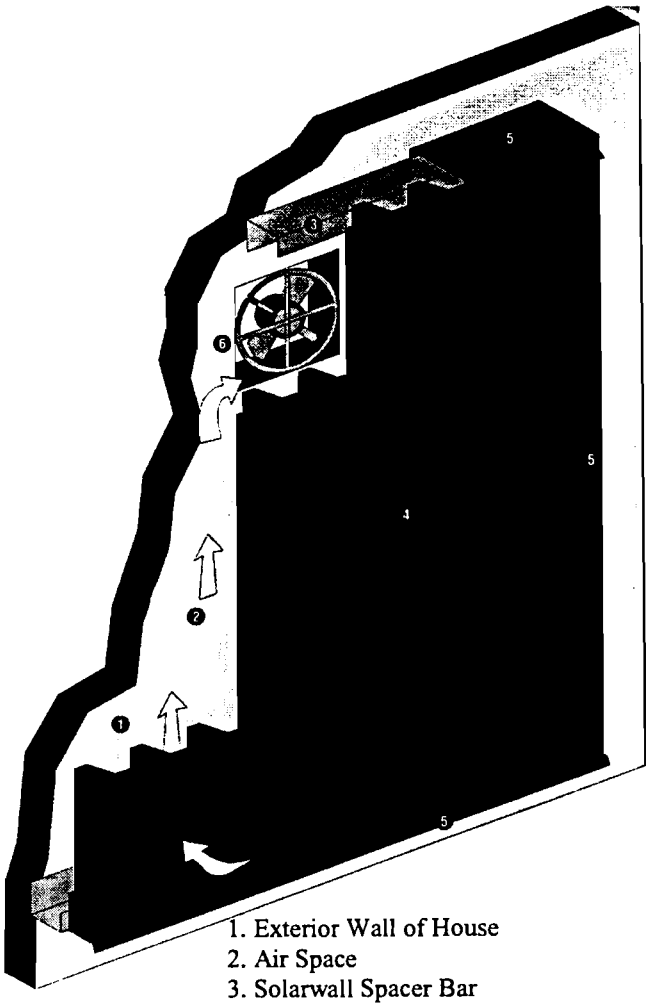
Most commercial and industrial buildings replace their air once or twice every hour to provide fresh air and to get rid of contaminated air. Now your home can utilize the same Solarwall® technology that has solved indoor air quality problems in numerous industrial applications.

The patented Solarwall® fresh air heater is so efficient and cost effective that the U.S. Department of Energy's Inventions Program rated the Solarwall® heater in the top two percent of energy saving inventions.

The federally funded National Renewable Energy Laboratory in Colorado has called the Solarwall® system the most advanced solar thermal collector ever developed.

The Solarwall® heater has received the prestigious R&D 100 award, the Popular Science "Best of What's New Award" and numerous other international awards.

The Solarwall panels are available from Conserval. The panels can easily be installed onto a south wall as a do-it-yourself project. The solar heated air can be ducted from the panel directly into a room, heat recovery ventilator (HRV), or into a warm air furnace. On a sunny, winter day, the panel can produce a temperature rise of over 50°F (30°C) over the ambient air temperature.



1. Exterior Wall of House
2. Air Space
3. Solarwall Spacer Bar
4. Perforated Solarwall Panel
5. Flashing
6. Fan or Ducting Into House

Solar Heated Air

The SOLARWALL panels heat outside air and the amount of heat is based on volume of air passing through the solar panels and the degree of sunshine. The Air Temperature Rise curves (figure 2) can be used to calculate the temperature increase of the heated air. A sunny day has solar radiation between 250 to 300 Btu/hr/square foot of solar panel and a cloudy day may be as low as 50 Btu/hr/ft². Curves A to E show the amount of heat that will be generated for different volumes of air. Curve A shows one cubic foot per minute of air per square foot of SOLARWALL panel whereas curve E heats seven cfm/ft² or seven times more air but at a lower temperature increase. The temperature increase is from ambient air temperature since outside air is being drawn through the panels. The SOLARWALL panels can also be used for space heating needs in warmer months or whenever the temperature of the solar heated fresh air is above room temperature (70° F).

The first step is to determine the amount of outside air that is needed in the house or building. Carpets, press board, animals, smokers all contribute to gases and particles being released inside a house. Indoor air quality is important and the best way to solve the sick building syndrome is to bring in more fresh air. This is where SOLARWALL® can help. Most homes need half an air change per hour which translates into 100 cfm for a 1500 sq. ft. house. Half an air change is approximately equal to the air infiltration in many houses so adding solar heated fresh air will help to reduce or eliminate infiltration and drafts sometimes found in older leaky houses. In new air tight houses, it is important to plan for heated fresh air to maintain good air quality.

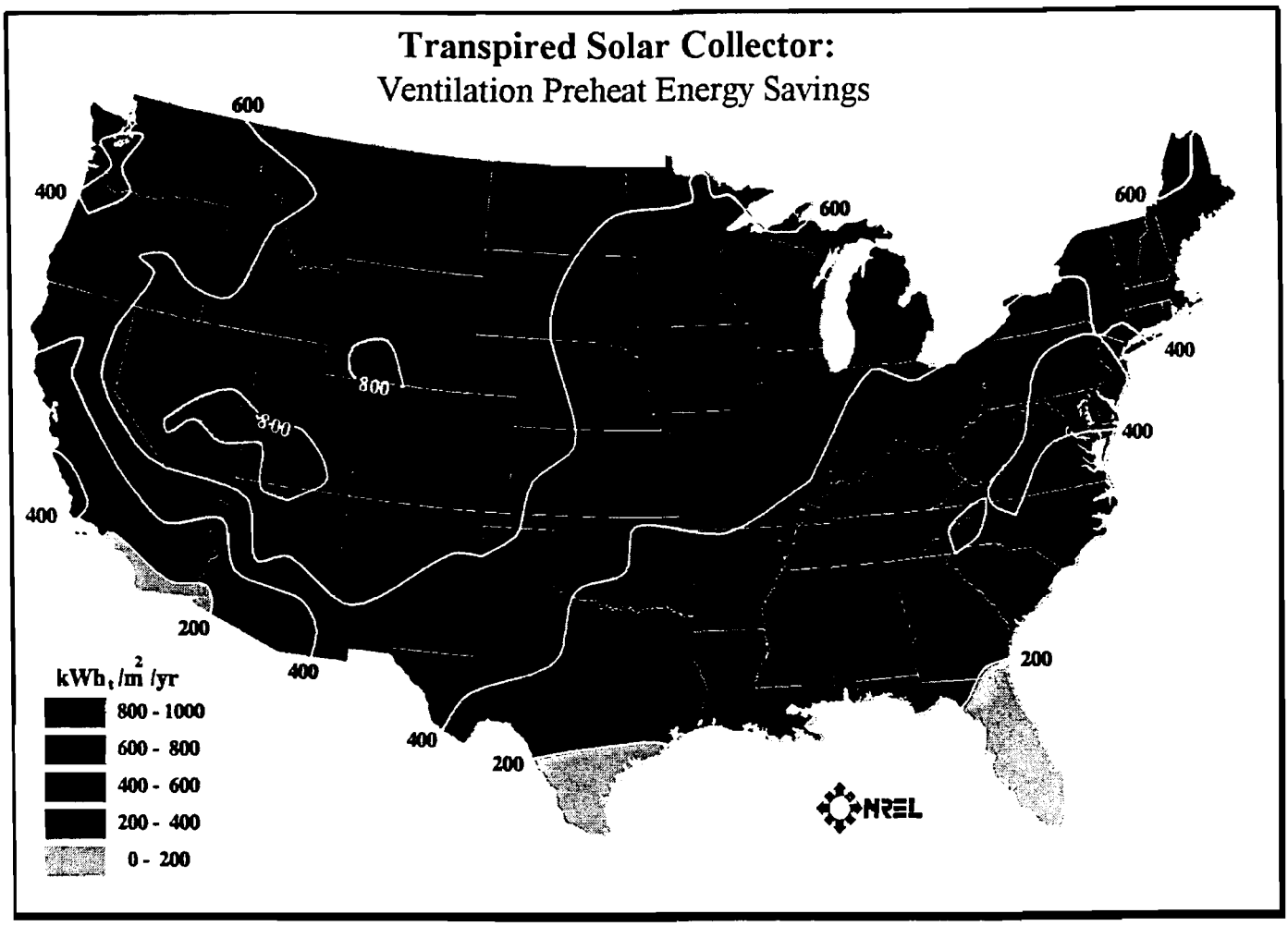


Fig. 5

The next step is to determine the cost of energy used to heat the building. Electric heat is expressed in kWh units and one can merely take the cost per kWh from the electric bill and multiply it by the total annual energy savings. If the furnace uses gas, oil or propane, it will be necessary to convert the energy units. In order to compare costs of different fuels, use the following conversion factors. These numbers assume a 100% burner efficiency. Actual burner efficiency will range from 60% to 90% depending on fuel source and burner type.

Electric - normally 100%
Gas and Propane - normally 70% for most older burners to 90% for condensing furnaces
Oil - normally 60% to 80%

Useful Conversion Factors

1 kWh per square meter = 317 BTU per square foot
1 kWh = 3,413 BTU
1 MCF (1,000 cubic feet) natural gas contains 1,000,000 BTU of heat = 293 kWh
1 cubic meter of natural gas contains 35,300 BTU of heat = 10.3 kWh
1 gallon of fuel oil contains 138,000 BTU of heat = 40 kWh
1 cubic foot of propane contains 2,500 BTU of heat = 0.73 kWh
1 pound of propane contains 21,500 BTU of heat = 6.3 kWh

Example

A house in Milwaukee is installing 100 ft^2 (9.3 m^2) of SOLARWALL panels to heat up to 150 cfm of air. From the NREL graph, the solar panels will save approximately 500 kWh /m^2 each year.

If the house is electrically heated and electricity costs $0.10/kWh, the total savings are:

9.3 m^2 x 500 kWh/m^2 x $0.10/kWh = $465 each year

If gas furnace with burner efficiency of 70% and gas costs $6.00/MCF, total savings are:

9.3 m^2 x 500 kWh/m^2 x $6.00/MCF / 293 kWh/MCF / 0.7 = $136 each year

Heat Storage

The purpose of a heat storage bin is to store excess solar heat during the day for use at night. Experience has shown that a typical house with less than 200 ft^2 (20 m^2) of solar collectors will not have enough solar heat collected to require a separate storage facility.

Systems with larger collector areas relative to the normal heat demand will require heat storage for the collected heat to be fully utilized. Retrofit systems which may encounter difficulty installing a rock storage bin could consider an external rock bin outside the house, or reducing the collector area and eliminating the storage, or else storing the excess heat in a domestic hot water preheating system.

In new construction there is more flexibility. Multi-day heat storage is possible but the size and cost of such a large rock bed makes them impractical. Most designs are based on accumulating the total solar heat collected during one sunny winter day. The size is thus based on the maximum daily solar radiation and the collector area used.

During the winter months when the heating requirements are high, a properly sized solar heating system with rock storage will provide only a few hours of stored solar heat each sunny day. In a typical cold season, often with cloudy conditions, stored heat will usually not be
sufficient for the night, and auxiliary heat will be needed. Rocks throughout the rockbed will then be at room temperature the next morning before solar heat collection begins. A storage system is advantageous during the spring and fall months when more sunshine is available and the heating requirements are lower. Unused stored heat can carry over to the next morning providing for the withdrawal of solar heat the day after it has been collected.

Recommendation

In order to achieve an economical solar heating installation, it is recommended that heat storage not be included at this time for SOLARWALL® projects with less than 200 square feet (20 square meters) of collectors. Since most homes will be in this group, heat storage is not included in this manual.

PRODUCT INFORMATION

SOLARWALL Panels

The SOLARWALL panels are made from aluminum or galvanized steel and have a baked on, heat absorbing coating. Both steel and aluminum perform the same but aluminum is lighter and easier to cut. Black coated panels will absorb 95% of the radiation falling on its surface, grey 86%, dark brown 90%. Other colors may also be available in small quantities depending on material in stock.

The residential panels have been designed for shipment by UPS which tend to have lower shipping costs. This restricts the maximum size to approximately four feet by three feet. Panels longer than four feet can be made and shipped by other carriers. Shipments are generally made from Buffalo NY or Toronto Canada. If ordering panels for immediate shipment, please check with Conserval for availability. If planning for a new building with two or more months lead time, you may be able to obtain additional colors, profiles, and or custom length panels depending on work in progress.

Design Criteria

Collector Angle

The sun's position in the sky will vary depending on the latitude and the month of the year. In winter the sun will have a low angle relative to the horizon and it will reach a maximum angle in June. Solar heating is most efficient when the sun's rays are perpendicular to the solar collector. If the collector is to be used for space heating then the panel should be closer to vertical to maximize the winter sun angle. Solar designers have traditionally recommended that collectors used for space heating applications be sloped at the degree of latitude, plus 10° to 15°. By having the collectors at this slope, the incident radiation is maximized during the months in which there is a space heating requirement however, there are other factors to consider. Unless the collectors can be supported on a sloped roof near this angle, a collector support rack must be built. In areas where snow is common and may accumulate, the collector slope should be at least 45 degrees to allow the snow to slide off the panels.

A vertical collector will perform close to that of a 60 degree sloped collector without any ground reflectance. When ground reflectance is considered, a wall mounted panel actually performs better with as much as 15% to 30% higher gain depending on the amount of snow. A vertical wall mounting will generally be more cost effective for solar space heating than a sloped surface in northern latitudes.

Collector Orientation

The available solar gain for vertical solar heaters facing south, and between east and west is illustrated in Figure 4. The solar panels absorb most sunlight when facing south plus or minus 20°. If the south wall is not suitable, consider either or both east and west walls. If a large volume of air is to be heated, all three walls can be utilized. Remember, only the solar contribution is affected by collector orientation, the wall insulation benefit remains the same for all walls.

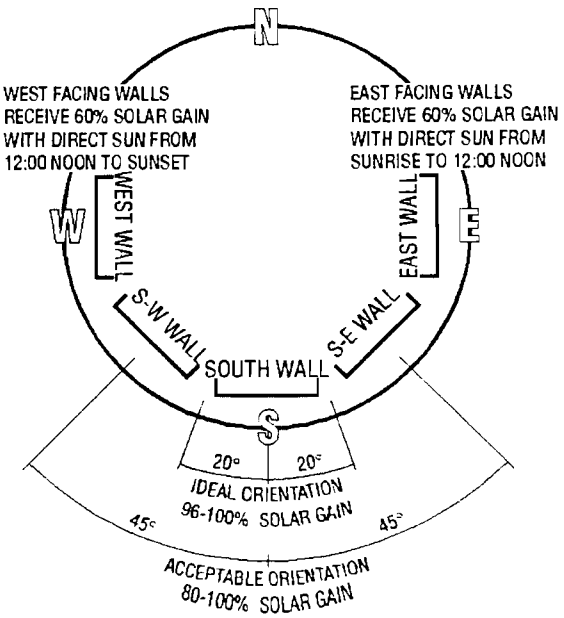


Fig. 4 Solar heating potential for vertical solar collector at different orientations.

Solar Heating Efficiency

The efficiency of a solar collector is highest when the temperature of the air entering the solar panel equals ambient temperature. This occurs with the SOLARWALL heater since outside air always enters the system.

In space heating designs, building return air enters a solar panel to be heated above room temperature. On cold, overcast days, there may be insufficient solar energy to achieve this, whereas, the perforated panel heat gain, whether it be a raise of two or twenty degrees, is useful energy. The perforated panel heats outside air, not recirculated air, for maximum efficiency.

Performance Example

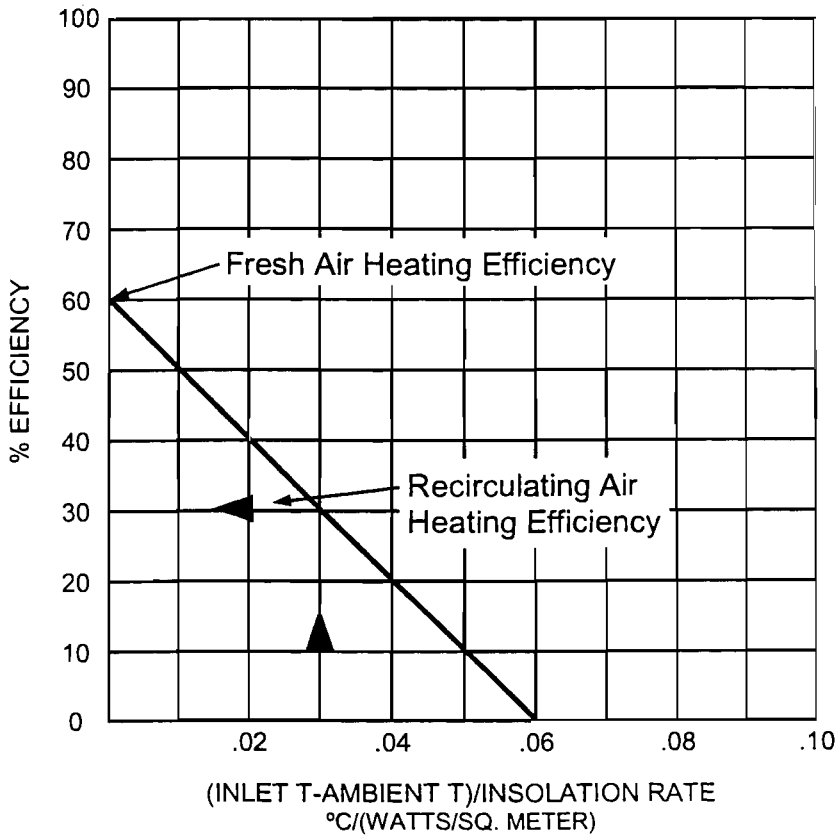
Using the solar efficiency curve in Figure 5, the solar performance of the perforated panel can be compared to conventional solar heating systems.

Assume:
Room Air Temperature: 20°C
Outside Temperature: -10°C
Solar Radiation: 1000 W/m^2

(a) Recirculating room air through solar panels:
X-axis intercept (20-(-10)) 1000=0.03;
therefore, efficiency is 30% from graph.

(b) Drawing ventilation (outside) air through solar panels:
X-axis intercept (-10-(-10)) /1000=0;
therefore, efficiency is 60% from graph.

Figure 5 *Solar Efficiency Curve*



Performance of the SOLARWALL system can be double that of recirculating solar heating designs.

Pick the Wall or Roof First

The SOLARWALL cladding absorbs most sunlight when facing south plus or minus 20°. If the south wall is not suitable, consider either or both east and west walls. If a large volume of air is to be heated, all three walls can be utilized. Only the solar contribution is affected by collector orientations. The wall insulation benefit remains the same.

Pick the Wall or Roof First

The SOLARWALL cladding absorbs most sunlight when facing south plus or minus 20°. If the south wall is not suitable, consider either or both east and west walls. If a large volume of air is to be heated, all three walls can be utilized. Only the solar contribution is affected by collector orientation, the wall insulation benefit remains the same.

By mounting the solar panels onto a south wall, there is an insulating effect on that wall. Heat losses from a building through the wall are picked up by the air stream and returned to the building when the fans are running. The wall acts as a huge heat exchanger recovering any heat loss. It provides an equivalent insulation value of RSI 10 or K value of 0.1.

If no wall is suitable or available, consider using a south facing roof. The slope of the roof should be at least 30° and preferably more. If snowfall occurs often at the proposed site, the minimum slope should be 45° to allow the snow to slide off the roof.

In new construction, the capital cost of a SOLARWALL cladding system is either similar to or slightly higher than conventional walls. In retrofit situations, the perforated solar cladding can be applied over most existing walls of block, metal, glazing, or precast concrete. A few obstructions on a wall should not present a problem.

Air Flow

Air in a solar wall system will normally travel in two directions. Once air enters the panels through the perforations it will travel vertically to the plenum or canopy at the top, then horizontally to nearest fan intake. It is important to balance air flows to ensure that air enters through the entire panel surface, otherwise, some of the solar heat may be lost.

Roofs

SOLARWALL panels can be roof-mounted provided snow can slide off and the main roof is waterproof. The solar sheets directly over the air intake opening must not be perforated to prevent water from entering air intake.

Designing SOLARWALL Heaters - Reference Guide

1. Decide on solar panel size and location. Is south wall suitable, if not, consider east or west walls. Note that a south wall may actually be south west, and the east wall would then be south east. In this case, both walls could be utilized effectively.

2. Determine volume of outside air required in building. Heat as much fresh air as possible. This will improve indoor air quality without increased fuel costs.

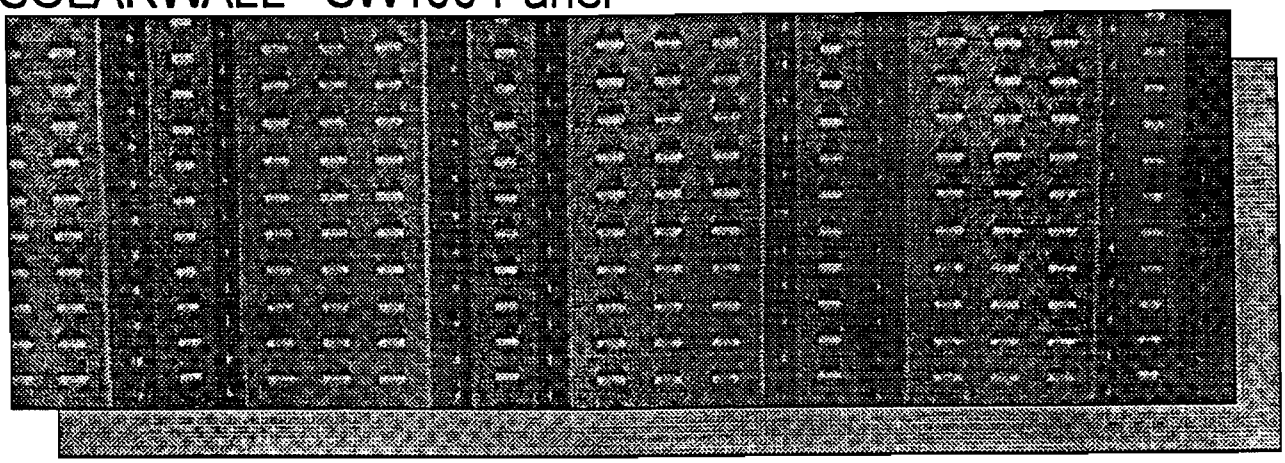
3. Calculate volume of air per area of solar heater, then refer to temperature chart to determine expected temperature rise.

4. Select colour, profile and type of canopy plenum.

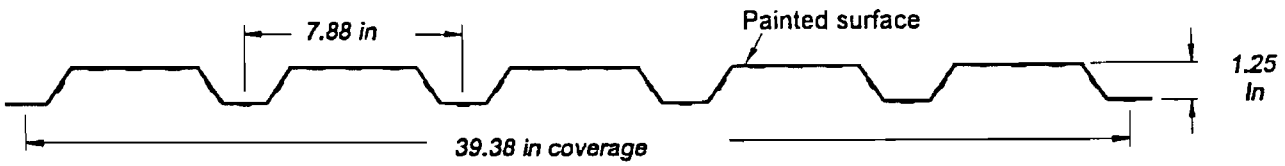
SOLARWALL® Panels

The SOLARWALL panels must be fastened securely to a south facing wall or steep roof creating an air gap of three to four inches (thickness of a 2 x 4 or brick). Conserval offers a kit which combined with locally sourced lumber will close off the sides and ends of the panels and also support the SOLARWALL panels off the wall.

SOLARWALL® SW100 Panel



SOLARWALL® Profile: SW100 Panel



Fan

A fan is needed to draw air through the solar panels. If the panels are connected to the return air on the house furnace fan and there is enough suction, a separate solar fan may not be required. Amount of air should be between 2 to 4 cfm per square foot of SOLARWALL panel. If a booster fan is needed, simply wire the solar fan to the furnace fan motor so they both operate at the same time. The solar fan can also have a manually operated on off switch.

If the fan discharges solar heated air directly into the house, then a fan and some type of control are necessary. Conserval offers a fan which will deliver up to 170 cfm of air. The volume of air will depend on resistence to airflow caused by length of ducts, bends in ducts and air tightness of house. The fan manufactured by Comair Rotron, uses 24 V power and 25 watts, suitable for either ac or dc power sources. If dc, a 24 V photovoltaic panel (or 2-12 volt panels in series) may be used which will also act as solar controller turning on when solar energy is available and varying the speed as required. If ac power, Conserval supplies an ac/dc rectifier and a 24 volt transformer which allows installer to connect to 110 volt power supply.

Solar controllers, which turn the fan on and off depending on the amount of heat, are also available.

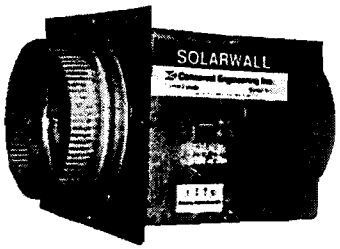
Diffuser

The airflow recommended in the system sizing table is the minimum recommended. You may prefer to have more rather than less. To control the airflow from the fan a manual diffuser can be used. Heating register diffusers are available from most building supply stores.

Fan and Controls

Conserval Model 200 Series Fan Unit

MODEL 201 - 6" Metal Duct Collar



Model 201

The fan unit comes complete with a low noise, long life brushless axial fan mounted in a sturdy steel housing. It features a backdraft damper to reduce air leakage when the system is not operating. The unit neatly fits into a 7" by 6" wall opening. The fan can supply up to 200 cfm and can operate on 24 volts DC, or 24 volts AC supplied by the Model T1 transformer below. Model 201 comes with a 6" metal duct collar on the intake and discharge. Specifications:Supply Voltage: 24 VAC; Power Consumption: 24wattsDimensions: 7" wide x 6" high x 8" deep; Weight: 4.5 lbs.

MODEL T1 Power Supply Transformer

This CSA certified transformer steps down 120 volts AC to 24 volts AC @ 40 VA output to power the 200 series fan unit. It comes with stripped wire input leads and screw terminal output. It has a nipple locknut mount for flat surface installation and bracket for panel installation.

SOLARWALL® Control Options and Accessories

Different control options are available depending on how the system is to be used. If the system is connected to the return air duct of a forced air furnace, no control is required. Simply wire the supply transformer to the furnace fan motor so they both operate at the same time. The fan unit can be manually operated by switching power to the fan off and on. Automatic temperature control can be provided by using the model A350AA-1C control below. Automatic fan control can also be provided by using the solar electric panel below.

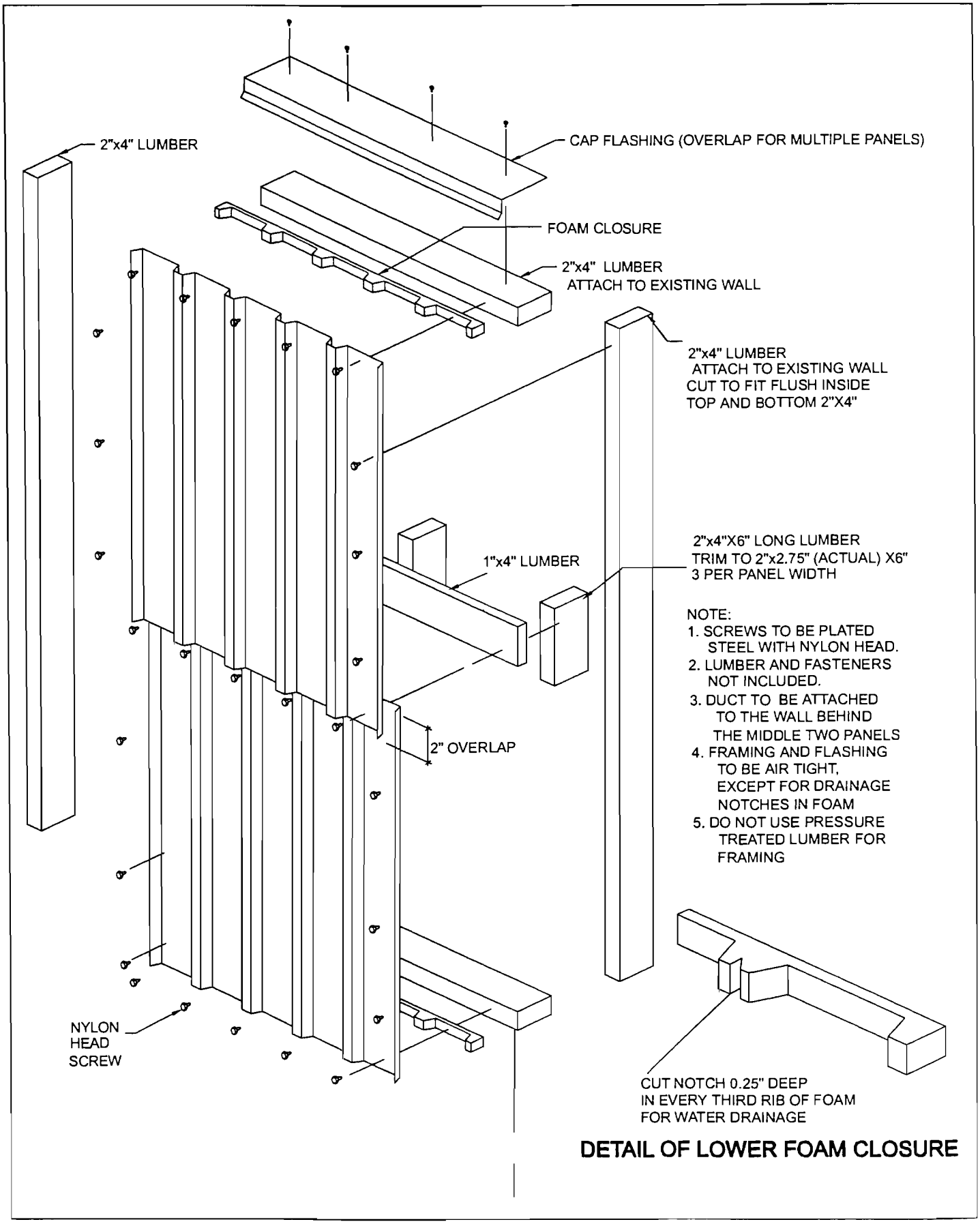
MODEL A350AA-1C Temperature Control - Fan Control Option

The temperature control is recommended if ducting the SOLARWALL® directly into a room. This advanced electronic control is designed to provide reliable, efficient operation of your SOLARWALL® air heating system. It will turn the Model 200 fan unit on when the temperature inside the SOLARWALL® panel is higher than the setpoint. It features fast and easy operation, 1 year limited warranty. It comes with an electronic temperature sensor.
Manufacturer- Johnson Controls
Specifications:Supply Voltage: 24 VAC
Setpoint: -30 to 130°F
Differential: 1-30°F

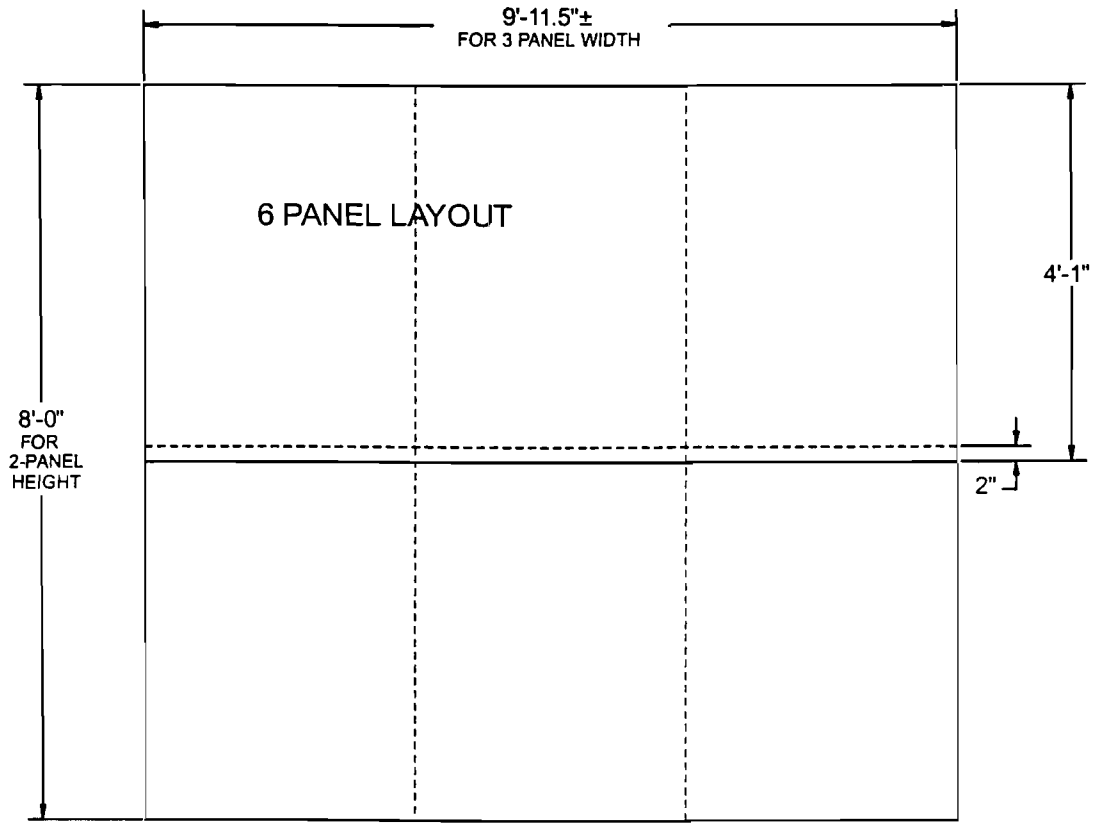
Solar Electric Panel (Photo-voltaic Module) - Fan Power and Control Option

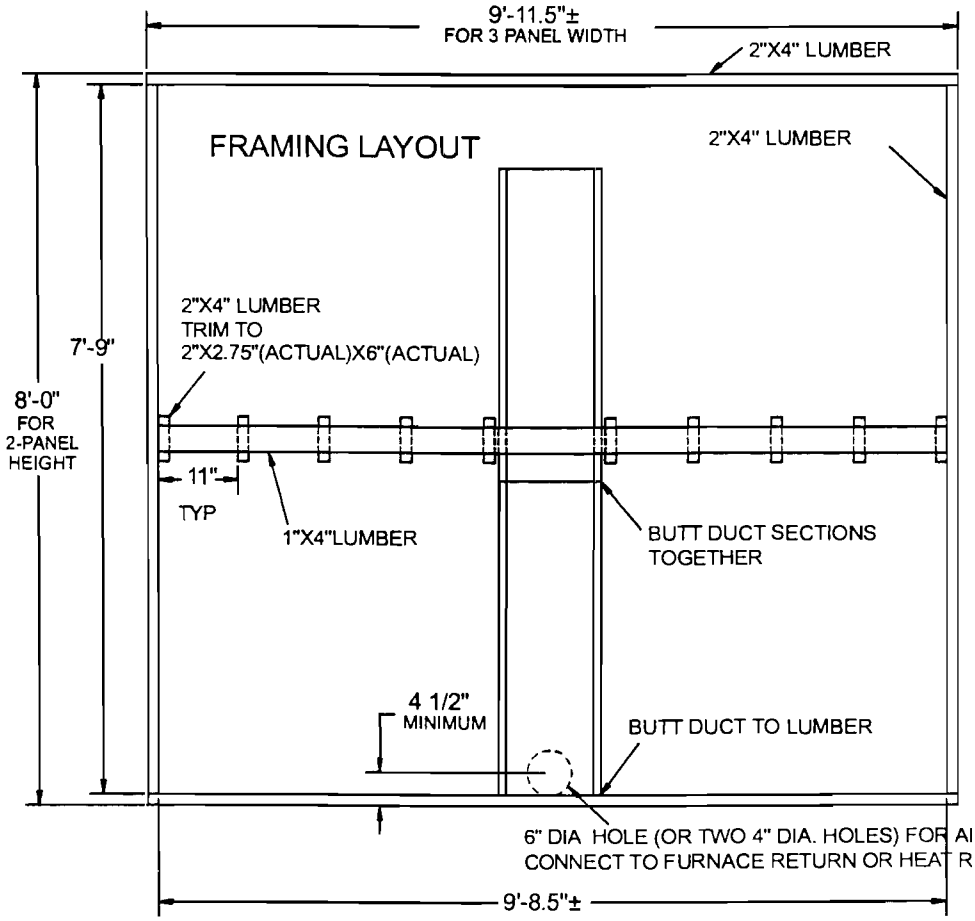
This solar electric panel will provide both the power and control for the SOLARWALL® fan. When the sun shines the panel produces electricity and powers the fan, drawing heated air from the SOLARWALL® panels. At night the solar electric panel produces no electricity and the fan is automatically shut off. No connection into any home wiring is required, as this is a stand alone system. 56 watt, 24 volt DC nominal solar electric panel with tempered glass and anodized aluminum frame, complete with mounting hardware (to power Model 201 fan).
Manufacturer- Evergreen

SOLARWALL® panel assembly - using wood framing



SOLARWALL® panel and wood framing layout - basement inlet





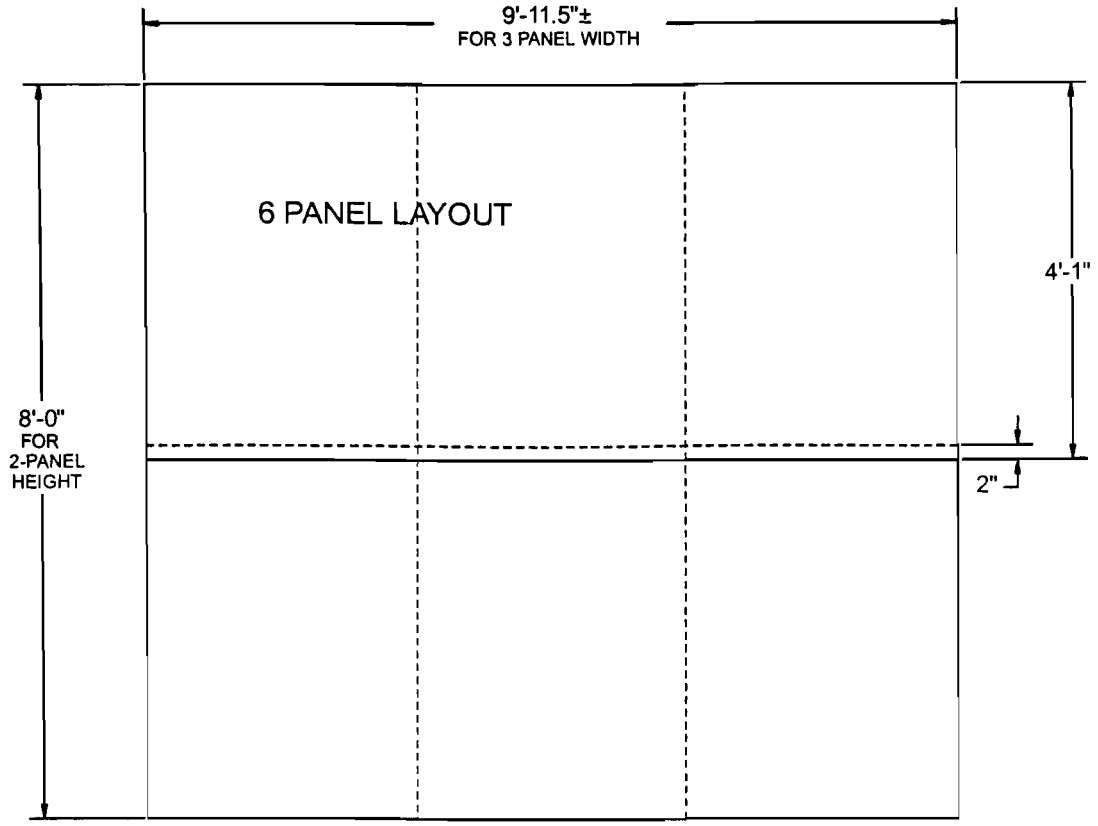
NOTES:
SUGGESTED METHOD FOR FASTENING FRAMING TO WALL.

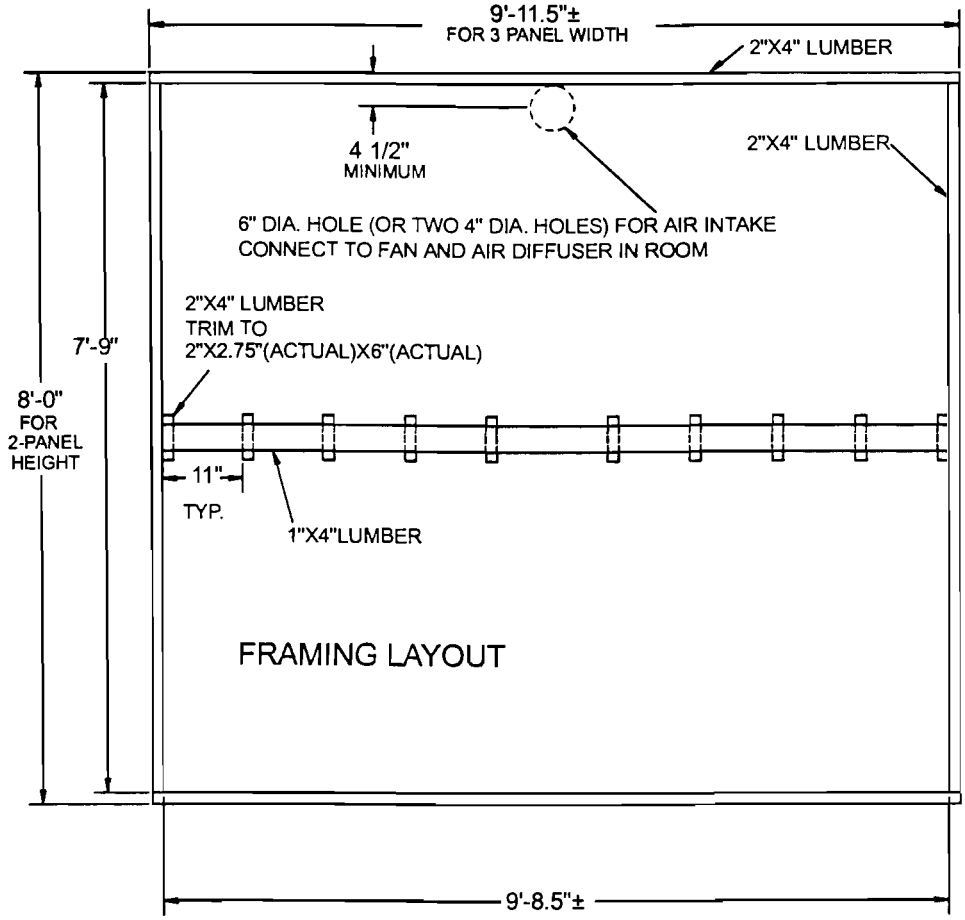
WOOD FRAME WALL.
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH #12X3" WOOD SCREWS
SCREW DUCT TO WALL
WITH #12X1.5" WOOD SCREWS

BRICK WALL:
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH 1/4"X2.5" MASONRY SCREWS (TAPCONS)
SCREW DUCT TO WALL
WITH 1/4"X1.25" MASONRY SCREWS

RECOMMENDED SCREW SPACING = 18" FOR FRAMING LUMBER AND DUCT

SOLARWALL® panel and wood framing layout - direct room inlet





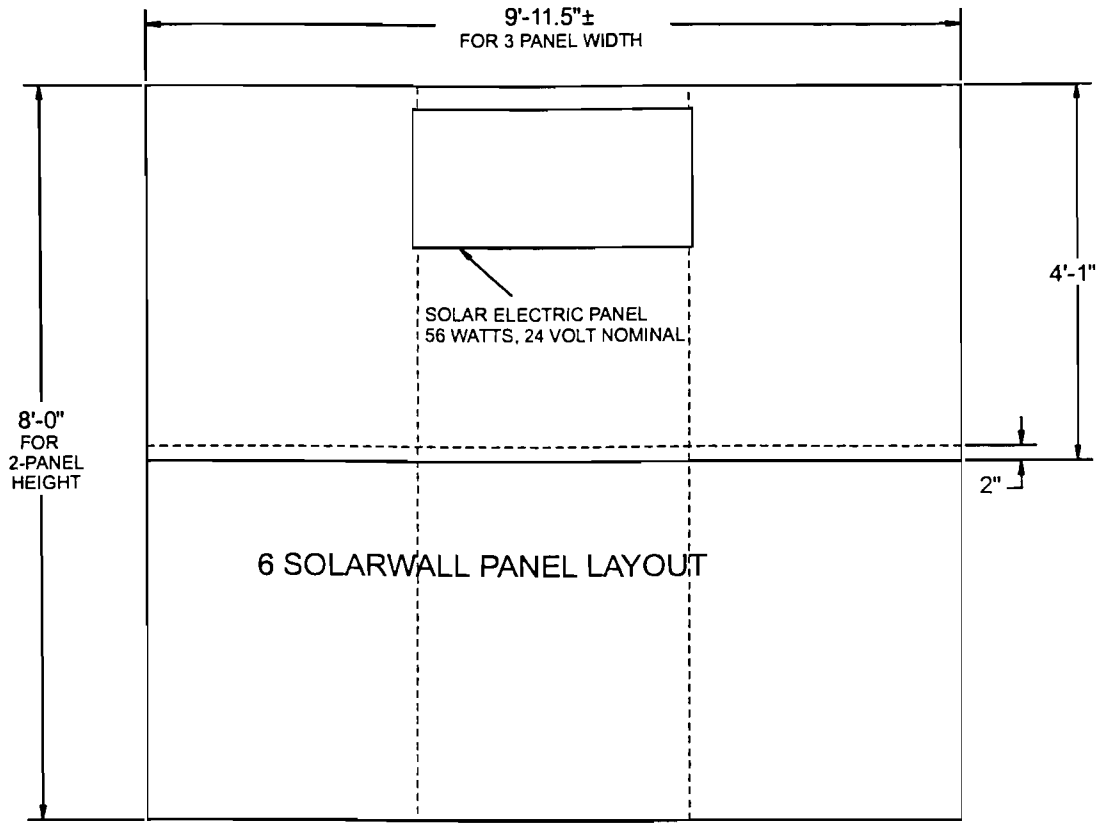
NOTES:
SUGGESTED METHOD FOR FASTENING FRAMING TO WALL:

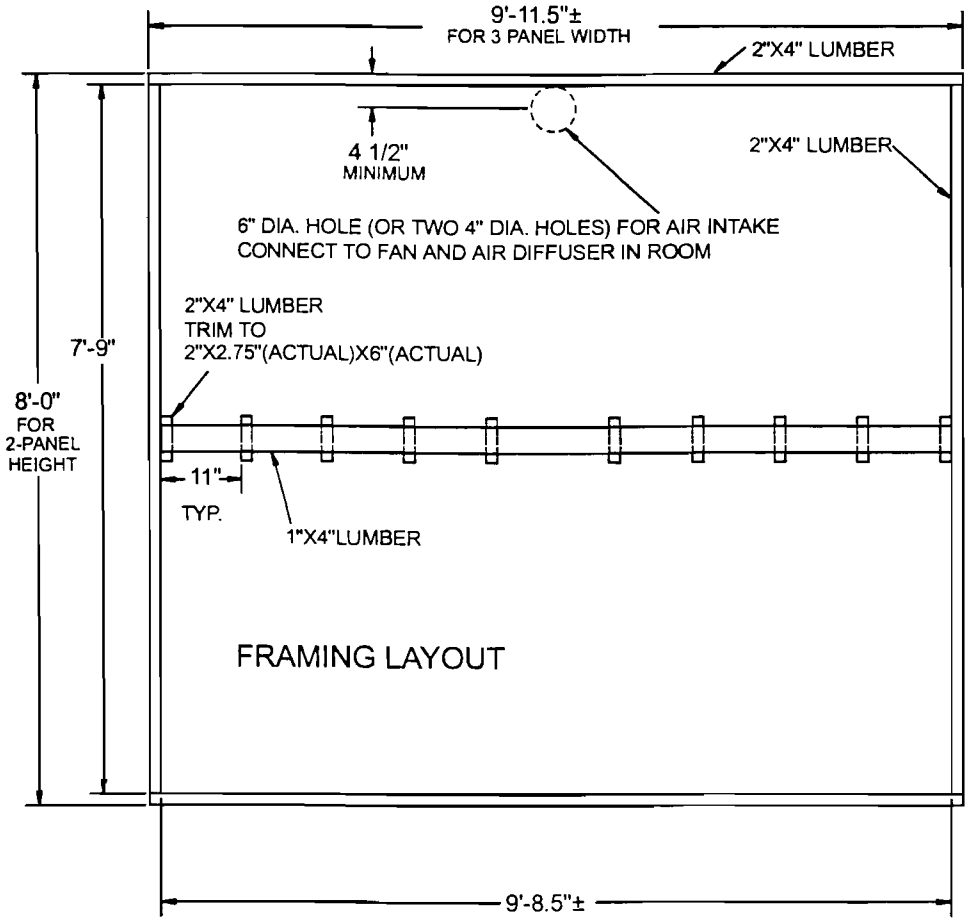
WOOD FRAME WALL:
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH #12X3" WOOD SCREWS

BRICK WALL:
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH 1/4"X2.5" MASONRY SCREWS (TAPCONS)

RECOMMENDED SCREW SPACING = 18" FOR FRAMING LUMBER

SOLARWALL® + solar electric panels and wood framing layout
Direct room inlet





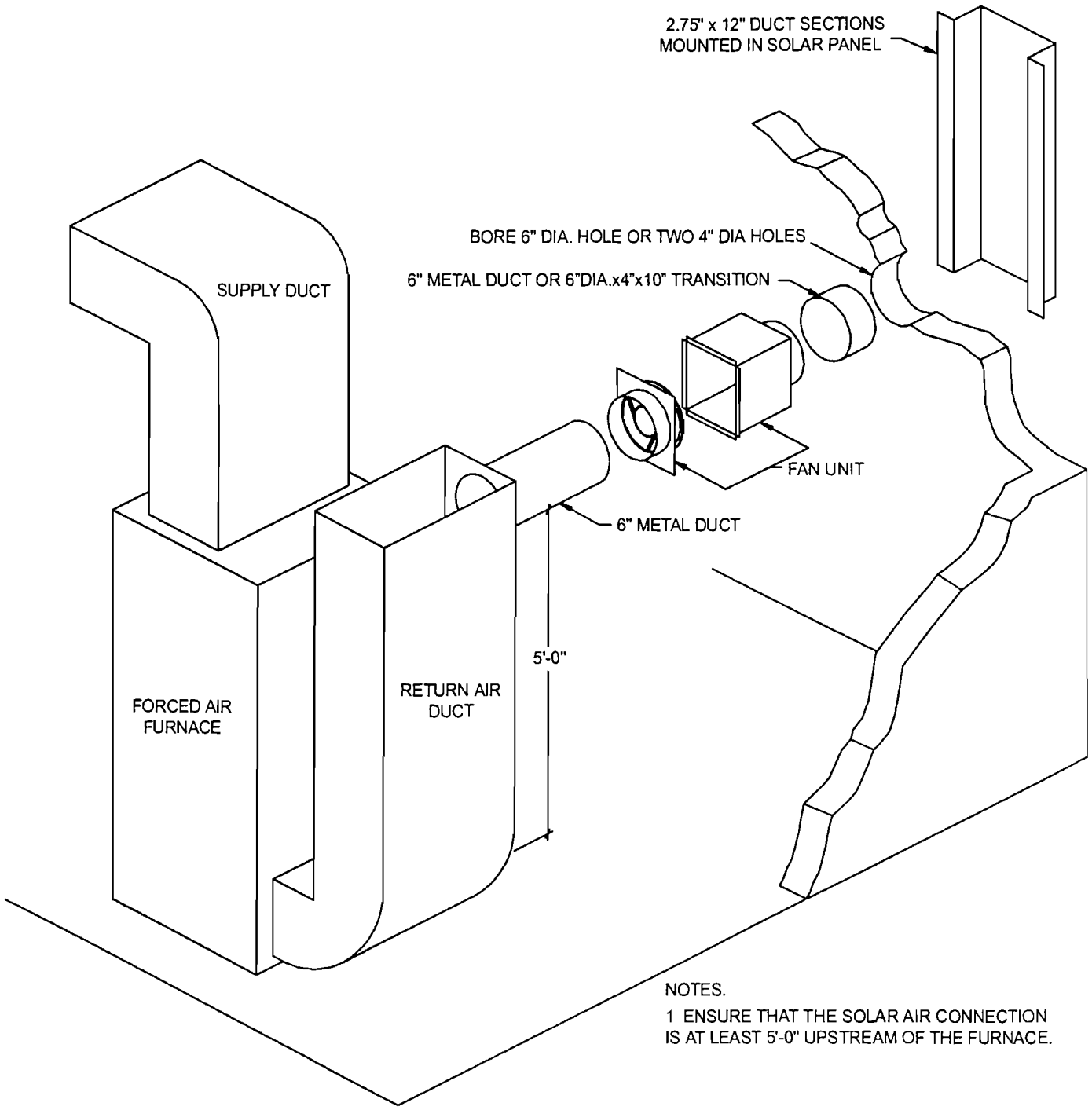
NOTES.
SUGGESTED METHOD FOR FASTENING FRAMING TO WALL.

WOOD FRAME WALL.
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH #12X3" WOOD SCREWS

BRICK WALL.
COUNTERSINK 2"X4"LUMBER 2"DEEP
AND SCREW WITH 1/4"X2.5" MASONRY SCREWS (TAPCONS)

RECOMMENDED SCREW SPACING = 18" FOR FRAMING LUMBER

Fan to furnace assembly



NOTES.

1 ENSURE THAT THE SOLAR AIR CONNECTION IS AT LEAST 5'-0" UPSTREAM OF THE FURNACE.

SOLARWALL System Sizing and Option Chart

Do you have an unshaded wall facing south, southeast or southwest? — NO ⇨ Sorry, perhaps your next house will have good exposure.

YES ⇩

What size is your house?
Based on the table below, choose either a 4, 6, 8 or 10 panel kit which includes Solarwall panels, foam gasket (closure), plated steel nylon head screws (color matched) and cap flashings (color matched). This kit is for two rows of panels, one above the other. Call for assistance on other configurations.
Solarwall panel is fabricated from 26 gauge galvanized steel, black or brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" long x 39.4" wide.

HOUSE AREA (m^2)	HOUSE AREA (ft^2)	AIR FLOW cfm	AIR FLOW (m^3/h)	PANEL AREA (each panel is12 ft^2)	HEAT OUTPUT (maximum)
93	1,000	70	120	4 panels	5,300 btu/hr
140	1,500	100	170	6 panels	8,000 btu/hr
186	2,000	135	230	8 panels	10,600 btu/hr
232	2,500	170	290	10 panels	13,300 btu/hr

An average house requires 0 5 air changes per hour
For homes with heavy smokes, double the panel area and fan size
*Smaller panel area for ventilation pre-heat, larger panel area for ventilation and space heating

☐ 4 Solarwall Panel Kit - Model SW-100-4
☐ 6 Solarwall Panel Kit - Model SW-100-6
☐ 8 Solarwall Panel Kit - Model SW-100-8
☐ 10 Solarwall Panel Kit - Model SW-100-10

⇨ Do you have a forced air furnace?

NO ⇩ — YES ⇩

YES ⇩ Is the furnace in the basement?

NO ⇦ For houses without a basement forced air furnace or difficult furnace connection, choose one of the following two options:

YES ⇩ Is part of the basement above ground level, meaning: is the upper part of the basement wall exposed so that a hole can be made in the wall directly to the basement?

NO ⇦ (back to options)

YES ⇩ ☐ Two internal ducts needed for basement inlet.

⇩ **Recommended Option**
☐ Model 201 Fan Unit - supplies up to 170 cfm, runs directly on 24VDC solar panel.

☐ Solar Electric Panel (PV module) - Fan Power and Control Option Conserval E-56, Nominal 24VDC, 56watts, polycrystaline solar cells, tempered glass face with anodized aluminum frame. This Solar Electric Panel is recommended if ducting directly into a room, in place of the temperature control. No connection to house wiring needed.

⇩ ☐ Model 201 Fan Unit – Supplies up to 170 cfm. Complete with 24vac transformer.

☐ A350AA-1C Temperature Control - Fan Control Option This control is recomended if ducting directly into a room.

SOLARWALL PANEL ORDER FORM (US)	QTY.	PRICE	TOTAL
4 Solarwall Panel Kit- Model SW-100-4 ☐ black ☐ dark brown (check one) The kit includes the following, four Solarwall panels, foam closure, plated steel nylon head screws (color matched), two cap flashings (color matched), this kit is for two rows of two panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **60 lbs**		X 199.00	
6 Solarwall Panel Kit- Model SW-100-6 ☐ black ☐ dark brown (check one) The kit includes the following, six Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of three panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **85 lbs**		X 298.00	
8 Solarwall Panel Kit- Model SW-100-8 ☐ black ☐ dark brown (check one) The kit includes the following,eight Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of four panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **120 lbs**		X 397.00	
10 Solarwall Panel Kit- Model SW-100-10 ☐ black ☐ dark brown (check one) The kit includes the following, ten Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of five panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **145 lbs**		X 495.00	
Internal duct - Basement Furnace Option Two 40" long ducts required for each of the above kits if ducting to basement furnace. **19 lbs**		X 29.00	
A350AA-1C Temperature Control - Fan Control Option This control is recommended if ducting directly into a room. (requires fan model 201) **2 lbs**		X 99.00	
Solar Electric Panel (PV module) - Fan Power and Control Option Conserval E-56, Nominal 24VDC, 56watts, polycrystalline solar cells, tempered glass face with anodized aluminum frame. This Solar Electric Panel is recommended if ducting directly into a room, in place of the temperature control. No connection to house wire needed. (Requires fan model 201) **32 lbs**		X 399.00	
Extra Solarwall Panel Model SW-100 ☐ black ☐ dark brown (check one) Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **17 lbs**		X 49 00	
Extra Screws ☐ black ☐ dark brown (check one) Order extra plated steel, nylon head screws with each extra panel (20 screws per panel). **2 lbs**	**Lot of 20 only**	X 4.00	
Extra Foam Closure Order extra foam closure to seal edges of panel if installing in one horizontal row. Each piece is 36" long. **1 lb**		X 4.00	
Extra Top flashing ☐ black ☐ dark brown (check one) Order extra top flashing if installing panels in one horizontal row. **3 lbs**		X 25.00	
Conserval Model 201 Fan Unit The fan can supply up to 150 cfm and operates on 24 volts AC or DC. For 110 volt AC connections add transformer. **7 lbs**		X 99 00	
24 VAC transformer **3 lbs**		X 22.00	

Total From First Page	
Shipping and Handling Add the total weight in lbs. and multiply by $1.30 for shipping and handling cost.	
Subtotal	
N. Y. Tax	
Total	

NAME:		
ADDRESS:		
CITY:	**STATE:**	**ZIP:**
PHONE:	**FAX#:**	

Mail your order to Conserval Systems Inc. 4254 Ridge Lea Rd., Buffalo, NY 14226.
Payment can be made by personal check, certified check, MasterCard or Visa.
All orders will be shipped freight prepaid.
There is a $12.00 freight charge for difficult delivery locations.
There is a 30% restocking fee on all returned orders.
We cannot ship to PO Boxes.
Delivery takes approximately two-three weeks.

CONSERVAL SYSTEMS INC.

4254 Ridge Lea Rd., Buffalo, NY 14226
Phone (716) 835-4903 Fax (716) 835-4904

Visit our web site at http://www.solarwall.com

Solarwall systems are protected by patents 1,196,825, 1,283,333, 1,326,619,4,774,932, 4,899,728 and 4,934,338.
Solarwall is a registered trademark of Conserval Engineering Inc.

SOLARWALL PANEL ORDER FORM (CAN)	QTY.	PRICE	TOTAL
4 Solarwall Panel Kit- Model SW-100-4 ☐ black ☐ dark brown (check one) The kit includes the following, four Solarwall panels, foam closure, plated steel nylon head screws (color matched), two cap flashings (color matched), this kit is for two rows of two panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **60 lbs**		X 298.00	
6 Solarwall Panel Kit- Model SW-100-6 ☐ black ☐ dark brown (check one) The kit includes the following, six Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of three panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **85 lbs**		X 447.00	
8 Solarwall Panel Kit- Model SW-100-8 ☐ black ☐ dark brown (check one) The kit includes the following,eight Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of four panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **120 lbs**		X 595.00	
10 Solarwall Panel Kit- Model SW-100-10 ☐ black ☐ dark brown (check one) The kit includes the following, ten Solarwall panels, foam closure, plated steel nylon head screws (color matched), three cap flashings (color matched), this kit is for two rows of five panels one above the other (call for assistance on other configurations). Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **145 lbs**		X 742.00	
Internal duct - Basement Furnace Option Two 40" long ducts required for each of the above kits if ducting to basement furnace. **19 lbs**		X 39.00	
A350AA-1C Temperature Control - Fan Control Option This control is recommended if ducting directly into a room. (requires fan model 201) **2 lbs**		X 149.00	
Solar Electric Panel (PV module) - Fan Power and Control Option Conserval E-56, Nominal 24VDC, 56watts, polycrystalline solar cells, tempered glass face with anodized aluminum frame. This Solar Electric Panel is recommended if ducting directly into a room, in place of the temperature control. No connection to house wire needed. (Requires fan model 201) **32 lbs**		X 549.00	
Extra Solarwall Panel Model SW-100 ☐ black ☐ dark brown (check one) Solarwall panel is fabricated from 26 gauge galvanized steel black or dark brown coated. The panel has a ribbed profile and is approximately 49" long and 41.5" wide for coverage of 48" x 39.4". **17 lbs**		X 75.00	
Extra Screws ☐ black ☐ dark brown (check one) Order extra plated steel, nylon head screws with each extra panel (20 screws per panel). **2 lbs**	**Lot of 20 only**	X 6.00	
Extra Foam Closure Order extra foam closure to seal edges of panel if installing in one horizontal row. Each piece is 36" long. **1 lb**		X 6.00	
Extra Top flashing ☐ black ☐ dark brown (check one) Order extra top flashing if installing panels in one horizontal row. **3 lbs**		X 35.00	
Conserval Model 201 Fan Unit The fan can supply up to 150 cfm and operates on 24 volts AC or DC. For 110 volt AC connections add transformer. **7 lbs**		X 149.00	
24 VAC transformer **3 lbs**		X 29.00	

Total From First Page	
Shipping and Handling Varies upon destination. Approximately $70 for the 6 Solarwall Panel Kit (SW-100-6).	
Subtotal	
GST and PST (if applicable)	
Total	

NAME:		
ADDRESS:		
CITY:	**PROVINCE:**	**POSTAL CODE:**
PHONE:	**FAX#:**	

Mail your order to Conserval Engineering, 200 Wildcat Rd., Toronto, Ontario, M3J2N5.
Payment can be made by certified cheque.
We cannot ship to PO Boxes.
Delivery takes approximately two-three weeks.

CONSERVAL Engineering

200 Wildcat Rd., Toronto, Ontario, M3J2N5
Phone (416) 661-7057 Fax (416)661-7146

Visit our web site at http://www.solarwall.com

APPENDIX B

DETAILED TECHNICAL INFORMATION
Solar Water Heating

ISO 9001
ISO 9002

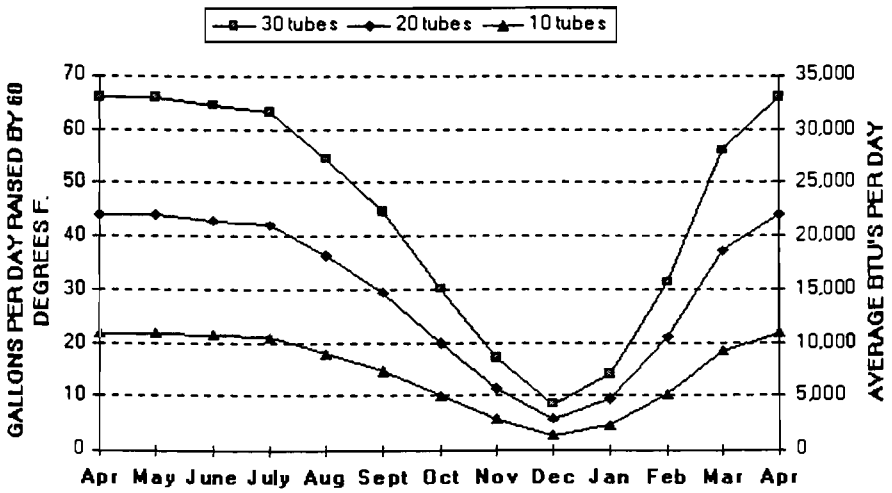
THERMOMAX TECHNOLOGIES

5560 Sterrett Place, Suite 115, Columbia, MD 21044 Voice USA (410)
997-0778

Anchorage, AK
Annual Average Daily Solar Radiation

Latitude: *61.17 N Degrees*
Longitude: *85.73 W Degrees*
Elevation: *149 Meters*
System Tilt: *Latitude*
Annual Total BTU's per square meter (10 tubes): *2,619,482*

Please read the Collector Tube Efficiency and System Sizing sections before using this chart.



This page provides solar radiation values for Thermomax Solar Collectors and expected gallons of water raised by 60 degrees F. Radiation figures are from the Solar Radiation Data Manual, WBAN NO. 26451. Thermomax collector (average) efficiency of 70% (based on Florida Solar Energy Center, Solar Collector Test Report No. 97005) is used for this chart.

E-Mail:
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ISO 9001
ISO 9002

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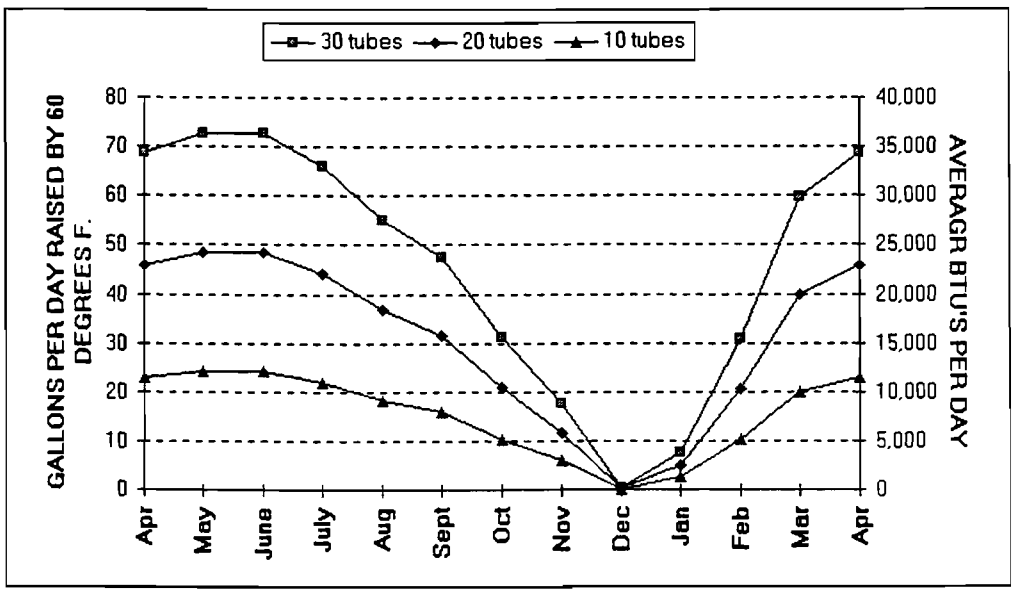
5560 Sterrett Place, Suite 115, Columbia, MD 21044 Voice USA (410)
997-0778

Fairbanks, AK
Annual Average Daily Solar Radiation

Latitude: *64.82 N Degrees*
Longitude: *147.87 W Degrees*
Elevation: *138 Meters*
System Tilt: *50 Degrees*
Annual Total BTU's per square meter (10 tubes): *2,690,074*

Please read the Collector Tube Efficiency and System Sizing sections before using this chart.



This page provides solar radiation values for Thermomax Solar Collectors and expected gallons of water raised by 60 degrees F. The average daily radiation data are from University of Wisconsin EES Report No. 44 - 2 (F - Chart Data). Thermomax collector (average) efficiency of 70% is used for this chart.

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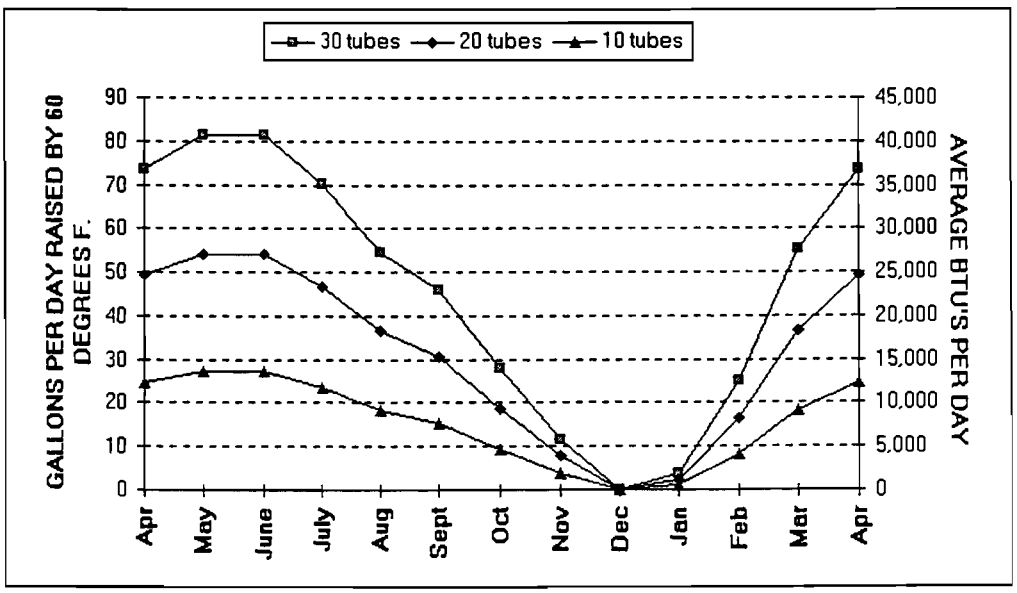
5560 Sterrett Place, Suite 115, Columbia, MD 21044 Voice USA (410)
997-0778

Bettles, AK

Annual Average Daily Solar Radiation

Latitude: *66.92 N Degrees*
Longitude: *151.52 W Degrees*
Elevation: *205 Meters*
System Tilt: *40 Degrees*
Annual Total BTU's per square meter (10 tubes): *2,694,294*

Please read the Collector Tube Efficiency and System Sizing sections before using this chart.



This page provides solar radiation values for Thermomax Solar Collectors and expected gallons of water raised by 60 degrees F. The average daily radiation data are from University of Wisconsin EES Report No. 44 - 2 (F - Chart Data). Thermomax collector (average) efficiency of 70% is used for this chart.

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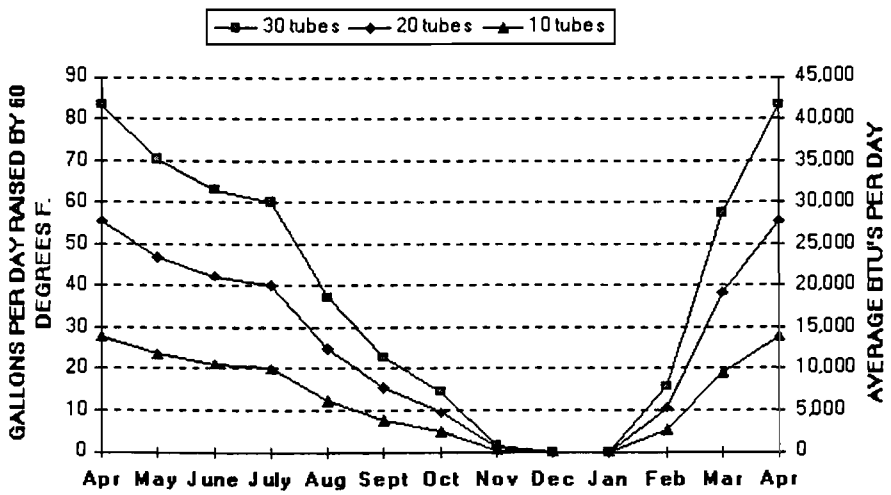
5560 Sterrett Place, Suite 115, Columbia, MD 21044 Voice USA (410)
997-0778

Barrow, AK

Annual Average Daily Solar Radiation

Latitude: *71.30 N Degrees*
Longitude: 156.78
Elevation: 4 *Meters*
System Tilt: *Latitude*
Annual Total BTU's per square meter (10 tubes): *2,164,180*

Please read the Collector Tube Efficiency and System Sizing sections before using this chart.



This page provides solar radiation values for Thermomax Solar Collectors and expected gallons of water raised by 60 degrees F. Radiation figures are from the Solar Radiation Data Manual, WBAN NO. 27502. Thermomax collector (average) efficiency of 70% (based on Florida Solar Energy Center, Solar Collector Test Report No. 97005) is used for this chart.

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ISO 9002

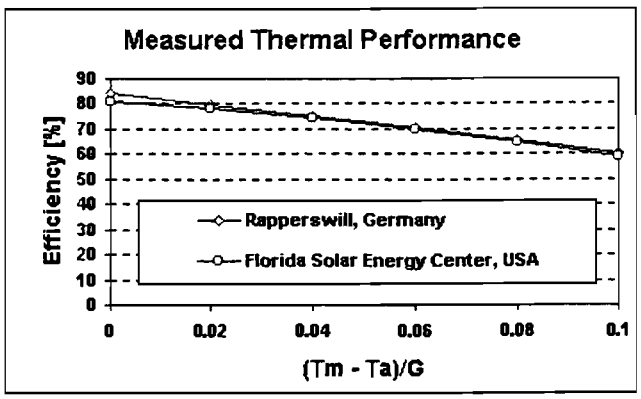
THERMOMAX TECHNOLOGIES

Collector Tube Efficiency

SOLAR COLLECTOR EFFICIENCY

Thermomax collectors are tested by European and North American authorities. The test results of **Institute SPF at the Hochschul Rapperswil** of Switzerland leads to following thermal performance equations (Test Report No. 264, August 1997):

Efficiency of Collector = 0.84 - 2.02 (Tm-Ta)/G - 0.0046G[(Tm-Ta)/G]2**



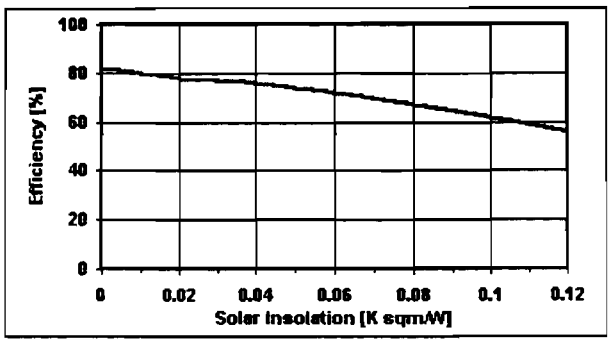
Tests conducted by **Florida Solar Energy Center** of USA (FSEC Solar Collector Test Report No. 97005, May 1998) is in very good agreement with the performance test reported by SPF Institute:

Efficiency of Collector = 0.82 - 2.19 (Tm-Ta)/G
Efficiency of Collector = 0.81 - 1.23 (Tm-Ta)/G - 0.0122G[(Tm-Ta)/G]2**

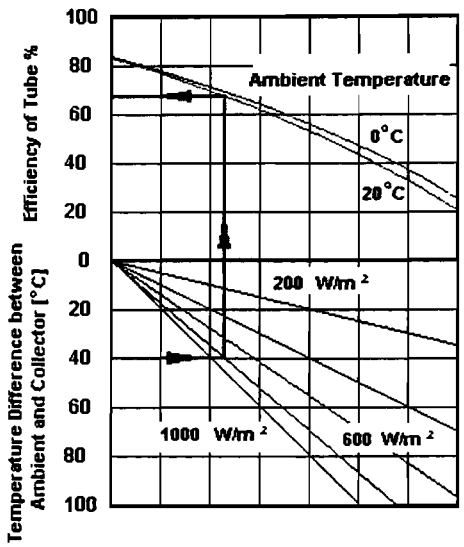
where:
Tm = mean collector temperature, (Toutlet+Tinlet)/2 [C]
Ta = ambient air temperature [C]
G = Solar irradiance [W/sq m]

These test results are shown in the following graph:
(G= 800 W/sq m)

Thermomax offers following measured efficiency curve of the Thermomax and Mazdon collector system:



Thermomax evacuated solar collectors are specifically designed for all-year-round operation in regions with cold winters and also locations with high humidity such as the tropics. The following chart shows a practical approach to find collector tube efficiency for various insolation levels.



5560 Sterrett Place,
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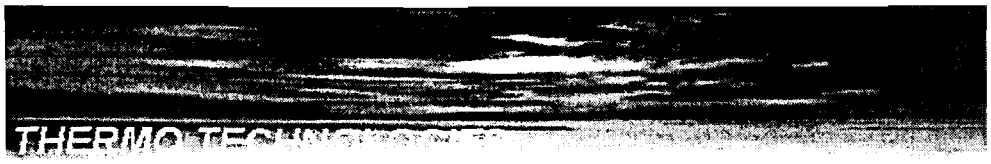
Columbia, MD 21044
USA
Phone
(410) 997-0778
Fax
(410) 997-0779
info@thermomax.com

Collector Temperature of 60 degrees C (140 F) with an ambient temperature of 20 degrees C (68 F) and insolation of 800 W/m gives a collector efficiency of 69%.

E-Mail:
Thermomax Technologies

Collector Dimensions | System Sizing | Installation Photos | Application | Design Considerations
Solar Energy Products | Electronic Products



General Information The most common application of Thermomax Solar Collector is domestic water heating, because hot water is needed year-round. When designing a solar water heating system, decide first how much hot water will be used per average day. Other information you will need is:
Insolation, Hours of Sunshine per Year
Orientation, Deviation from North/South line
Inclination, Difference between local Latitude and Roof Angle
International units of measurement are used for scientific communities..

Step 1 Size the system based on number of People using hot water..

Step 2 Using local data, find hot water consumption per day, per person. ASHRAE recommends 20 gallons per day, per person.

Step 3 Select the Solar Water Heater tank size.

Step 4 Find Solar Insolation and hours of Sunshine per year.

Step 5 Select the Solar Collector Installation location.

Step 6 Calculate deviation from true North/South line.

Step 7 Find local Latitude

Step 8 Find Roof Angle or installation Tilt Angle.

Step 9 Calculate the difference between local Latitude and Roof Angle.

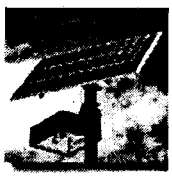
Step 10 Estimate Thermomax Tubes required.

Step 11 Contact your local dealer for Delivery and Pricing information

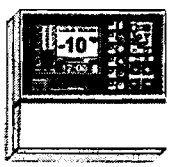
Example In the following four pages we are going to size a solar water heating system for a family of five. They have a hot water requirement of 50 liters per day, per person, with a local Annual Insolation of 1400 hours. Orientation of the roof is 30° West of South. The local Latitude is 45° and the roof angle 35° (inclination difference 10°). If your property is located in the US, go directly to US Insolation Charts.

- Hot Water Consumption and Storage Capacity
- Solar Insolation
- Orientation
- Inclination

Solar Heating Systems

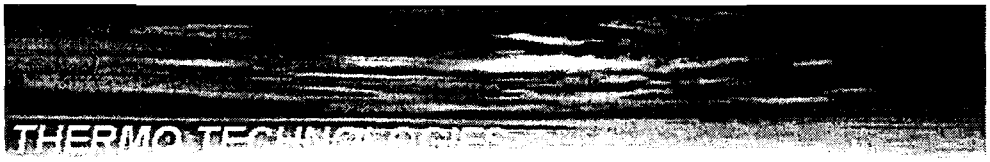


Solar Electric Systems

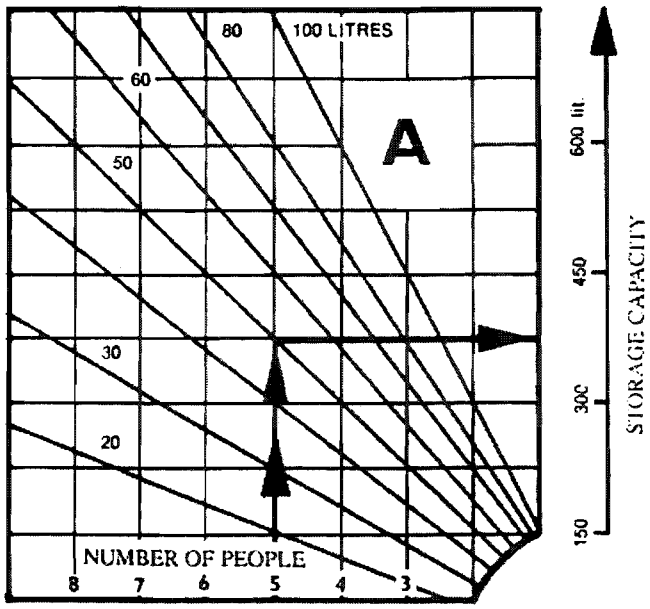


Electronics Surface Mount Technologies

Consulting, Project Management Services



Hot Water Consumption and Storage Capacity



Recommended solar water storage tank for a family of five is 400 liters.

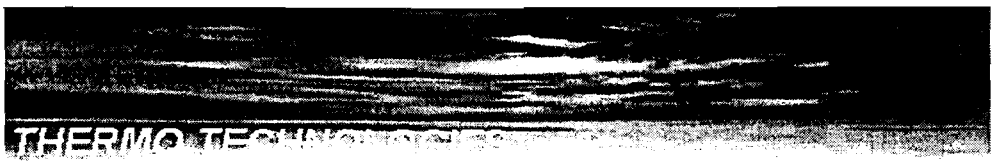
General Information When designing a Thermomax domestic solar water heating system for a family of five, determine first how much hot water the family will be using per average day. ASHRAE recommends 20 gallons per day per person.

The solar water heater storage tank for a family of five with a hot water consumption of 50 liters per day, per person is 375 liters as shown. In the United States, with higher hot water consumption, a 120-gallon tank is used.
The home may have a dishwasher, washing machine, several children taking daily showers or baths during the day, and all of this water usage must be figured into the total water needs.

Go To Next Step

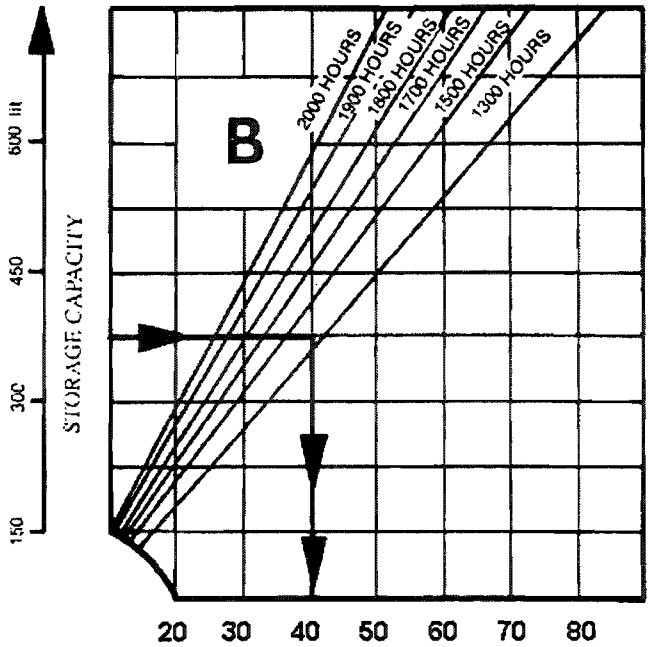
Example In the following four pages we are going to size a solar water heating system for a family of five. They have a hot water requirement of 50 liters per day, per person, with a local Annual Insolation of 1400 hours. Orientation of the roof is 30° West of South. The local Latitude is 45° and the roof angle 35° (inclination difference 10°). If your property is located in the US, go directly to US Insolation Charts.

- Hot Water Consumption and Storage Capacity
- Solar Insolation
- Orientation
- Inclination



Solar Insolation

To heat 375 liters of water at a job site with a local Annual Insolation of 1400 hours, you need 40 Thermomax tubes.



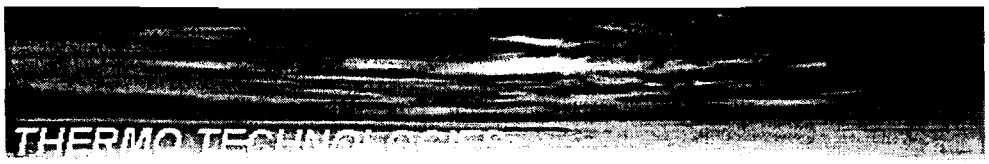
General Information When designing a Thermomax domestic solar water heating system for a family of five, determine first how much hot water the family will be using per average day. ASHRAE recommends 20 gallons per day per person.
Next find latitude, the amount of solar insolation, and number of hours of available sunshine at the job site location.
THERMOMAX can provide you with the expected solar energy figures for any month of the year.

Once the amount of hot water that must be supplied by solar heating system is known, use the above chart to find how many Thermomax tubes you need. The chart suggests 40 Tubes.

Go To Next Step

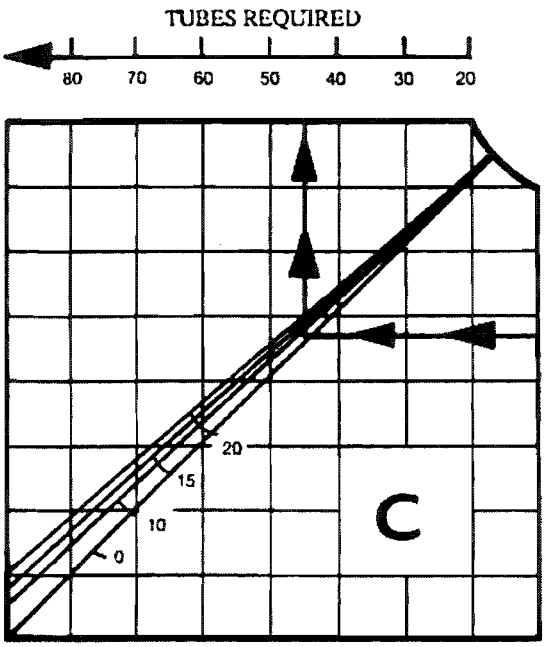
Example In the following four pages we are going to size a solar water heating system for a family of five. They have a hot water requirement of 50 liters per day, per person, with a local Annual Insolation of 1400 hours. Orientation of the roof is 30° West of South. The local Latitude is 45° and the roof angle 35° (inclination difference 10°). If your property is located in the US, go directly to US Insolation Charts.

- Hot Water Consumption and Storage Capacity
- Solar Insolation
- Orientation
- Inclination



Solar Collector Inclination

Angle of Inclination
Difference between Local Latitude and Roof Angle



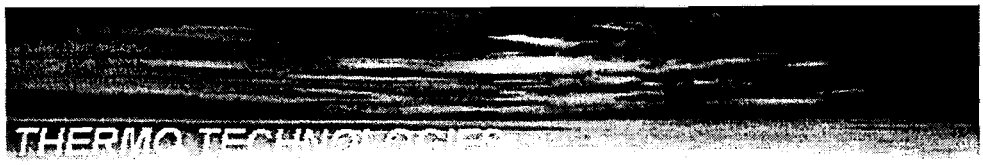
To heat 375 liters of water at a job site with a local Annual Insolation of 1400 hours, roof orientation of 30 ° West of South, and an inclination difference of 10 °, you need 45 Thermomax tubes.

General Information The most desired angle of Inclination to mount the solar collector is the local Latitude. Positive difference between Latitude and Roof angle results better system performance in winter. Lower Solar Collector mounting angle than the local Latitude will result in greater system performance in summer.
Variations of Solar Collector tilt angle for architectural reasons can be compensated with additional Thermomax tubes.

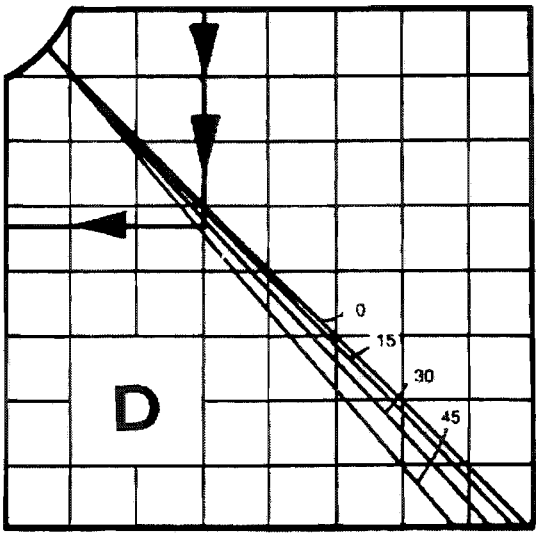
45 Thermomax tubes will supply hot water requirement of the above example by following Thermomax suggestions. For best result a 375 liters solar hot water storage tank should be used.

Example In the following four pages we are going to size a solar water heating system for a family of five. They have a hot water requirement of 50 liters per day, per person, with a local Annual Insolation of 1400 hours. Orientation of the roof is 30° West of South. The local Latitude is 45° and the roof angle 35° (inclination difference 10°). If your property is located in the US, go directly to US Insolation Charts.

- Hot Water Consumption and Storage Capacity
- Solar Insolation
- Orientation
- Inclination



Orientation



To heat 375 liters of water at a job site with a local Annual Insolation of 1400 hours, roof orientation of 30 degrees West of South, you need 43 Thermomax tubes.

General Information The Solar Insolation charts are based on a Solar Collector facing true South/North line. When Solar Collectors are mounted east or west of true south/north, there is some loss of insolation. But it is not measurable at 5 degrees east or west. By angling the Solar Collector to face westward in the Northern Hemisphere, a greater amount of solar insolation can be absorbed in the late afternoon. However, there is some loss of solar insolation during the course of the day, when the Solar Collectors are mounted east of true south. A good deal of morning solar insolation is lost at the same time.
The following above chart suggests a correction parameter for deviation from North/South line.

When designing a Thermomax domestic solar water heating system, determine first how much hot water the family will be using per average day. Next find latitude, the amount of solar insolation, and number of hours of available sunshine at the job site location. Use the above chart to correct the effect of orientation of the roof (east/west orientation deviation).

Go To Next Step

Example In the following four pages we are going to size a solar water heating system for a family of five. They have a hot water requirement of 50 liters per day, per person, with a local Annual Insolation of 1400 hours. Orientation of the roof is 30° West of South. The local Latitude is 45° and the roof angle 35° (inclination difference 10°). If your property is located in the US, go directly to US Insolation Charts.

- Hot Water Consumption and Storage Capacity
- Solar Insolation
- Orientation

A clean, renewable source of energy

The *Solar Boiler™* uses **renewable energy** – is good for our environment – does not pollute – even the pump used to circulate fluid from the solar collectors to the *Solar Boiler™* heat exchanger is powered by the sun.

The *Solar Boiler™* is used as a pre-heater in conjunction with your conventional domestic water heater. Cold water enters the *Solar Boiler™* where it is heated by free, clean solar energy. The heated water is then delivered to a conventional water heater – electric, oil, gas or propane-fired – for final heating, if required.

The operation of the *Solar Boiler™* is fully automatic throughout the entire year. A solar-powered photovoltaic (PV) module controls the operation of the *Solar Boiler™*. The solar loop circulator, connected to the PV module, turns only when there is solar energy to heat the water in the storage tank.

Solar energy is a sound investment in everyone's future...*today.*

Call now for more information and a *free* site inspection, with NO obligations.

Installation is easy

Installation of the *Solar Boiler™* is quick and easy:

- All hardware necessary to integrate the *Solar Boiler™* with your conventional domestic water heater is included.
- Micro-Flo® solar collectors have a unique bolt track design. This allows the mounting brackets to be fixed anywhere around the perimeter of the collector to ensure proper alignment with roof trusses.
- Small diameter tubing, Life-Line®-C, between the solar collectors and the *Solar Boiler™* module makes it easy to install in both new construction and existing homes.

THERMO DYNAMICS LTD.

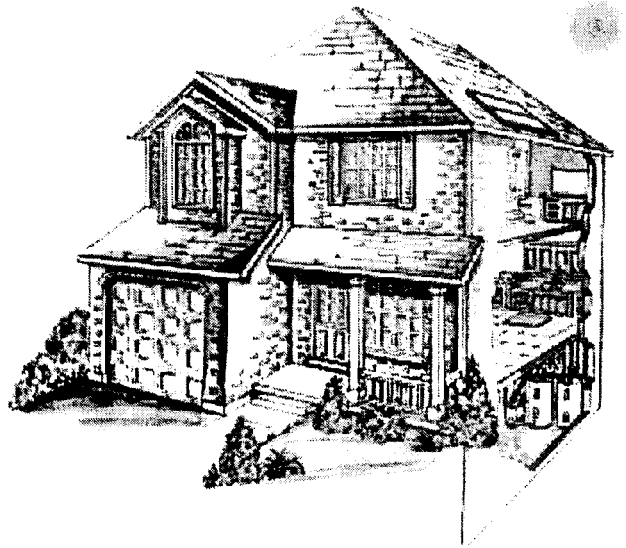
Thermo Dynamics Ltd.
44 Borden Avenue
Dartmouth, Nova Scotia
Canada B3B 1C8

Tel: (902) 468-1001
Fax: (902) 468-1002
email: solarinfo@thermo-dynamics.com
Web: http://www.thermo-dynamics.com

Sensible • Ecological • Economical • Reliable • Affordable

SOLAR ELECTRIC HOT WATER

Thermo Dynamics Ltd., the largest manufacturer of solar water heaters in Canada, has developed the most efficient and reliable solar water heater in the world. This is the Thermo Dynamics *Solar Boiler™*, with fifteen years of experience in Canadian conditions!



The *Solar Boiler™* uses photovoltaic (PV) solar power, the sun's energy converted into electricity, and solar thermal collectors, to produce the cleanest, least expensive energy for hot water.

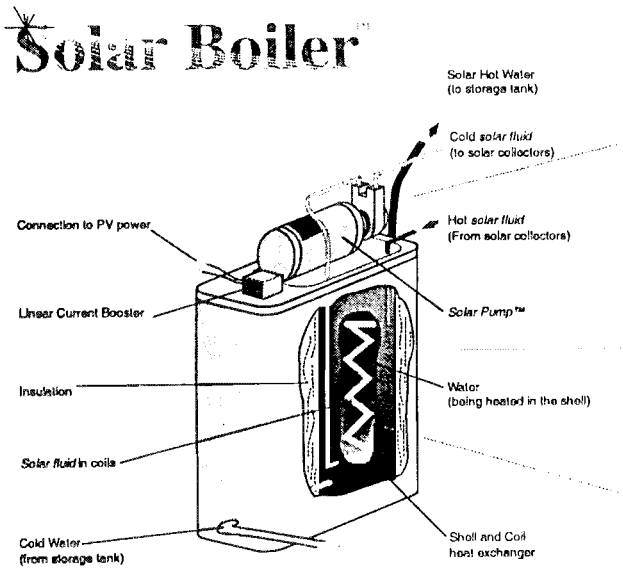
The *Solar Boiler™* comes complete with a 10 year warranty from Thermo Dynamics Ltd.

Now is your opportunity to save money and reduce pollution by cutting your electricity and oil consumption. Now is the time for you to ***GO SOLAR!!***

Solar Saves!!

Domestic hot water can be the highest energy cost in the typical home. With the *Solar Boiler™* by Thermo Dynamics, your domestic hot water energy cost can be reduced by as much as 75%.

The *Solar Boiler™* is the state-of-the-art solar water heating appliance. It is environmentally friendly and *very* affordable.



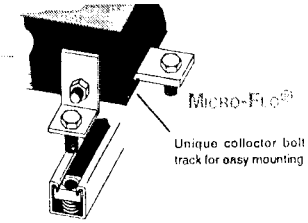
How the *Solar Boiler™* works

1 Solar collectors absorb sunlight and convert it to heat.

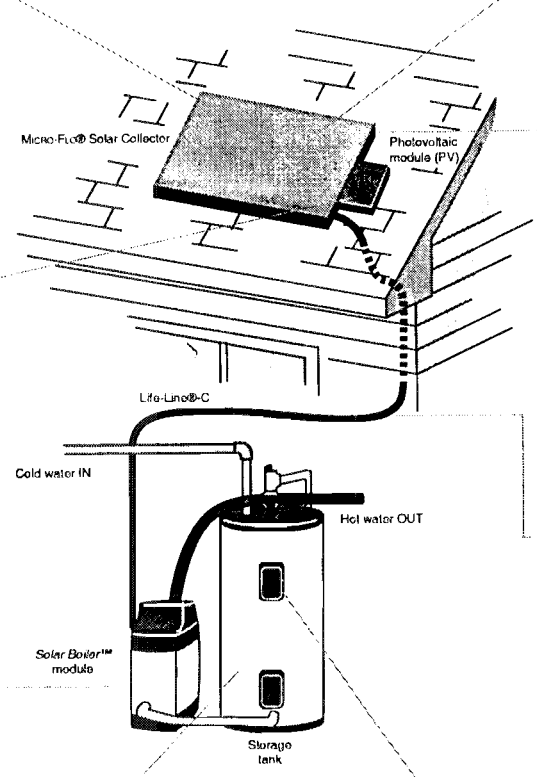
2 When there is sufficient sunlight, the photovoltaic module produces electricity and turns the pump.

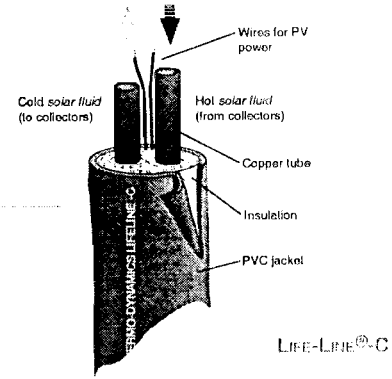
3 The pump circulates *solar fluid* through the solar collectors.

4 Heat is transferred to the *solar fluid* in the solar collector.



5 The *solar fluid* is returned to the heat exchanger in the *Solar Boiler™* module.





6 The heat is transferred to the water which circulates naturally to the top of the storage tank.

7 Solar heated water is stored in the storage tank until water is drawn.

8 The auxiliary heater increases the temperature of the solar heated water, if necessary.

9 The energy required to heat water is significantly less when water is preheated by the *Solar Boiler™*.

THERMO

Solar Pump™

Sensible, Ecological, Economical, Reliable

The BEST Little Pump in the World !!

System Description

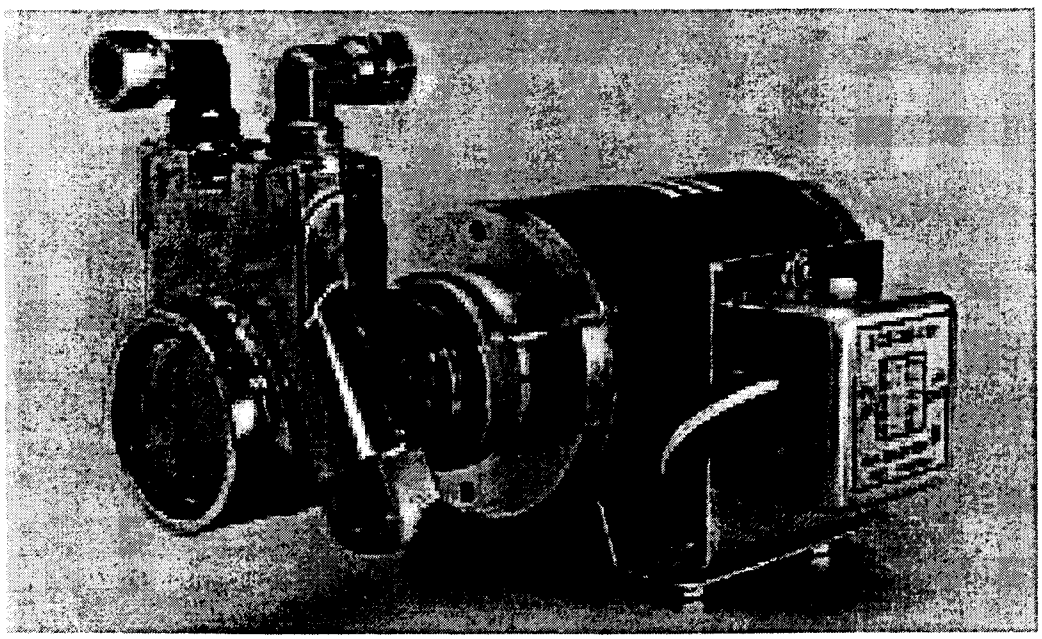
The sun powers the Solar Pump™. No batteries, no gasoline or diesel generator are required- only low-voltage, solar-generated electricity, eternally available and pollution free. The Solar Pump™ system utilises a positive-displacement vane pump driven by a DC motor. A photovoltaic (PV) module drives the DC motor using a current booster that provides high performance at all levels of solar irradiance.

System Applications

The Solar Pump™ is the perfect pump for a solar water heater. There are no electronic controller and temperature sensors to install, with none of the associated high-voltage wiring. For single-family home solar water heaters a 10 - 20 watt PV module is usually adequate. The PV module powers the Solar Pump™ that circulates the solar collector fluid at the optimal flow rate to maximise the delivery of heat from the solar collectors. Installers love the Solar Pump™ - it is so much easier to install than the conventional controller-based systems. Homeowners appreciate the fact that **ALL** the energy used to produce their solar-heated water comes from the sun, and none from the electrical grid. The Solar Pump™ is also suitable for low-flow irrigation and general water pumping.

System Advantages

The Solar Pump™ will run 2000 hours per year in mid-latitude countries. Assuming your application requires a 35-watt PV module you can save 200 kilowatt-hours of purchased electricity each year if using the Solar Pump™, or 2000 kilowatt-hours over the 10-year warranty period of the pump. These savings will more than cover the additional costs of the Solar Pump™ relative to a standard "plug-in" pump. Not only is it economical to use the Solar Pump™, but by using solar energy you reduce pollution. In fact, the Solar Pump™ will eliminate up to two tonnes of CO_2 emissions per year!!



44 Borden Ave • Dartmouth, Nova Scotia • Canada • B3B-1C8 • Tel: (902) 468-1001 • Fax: (902) 468-1002 • thermody@atcon.com

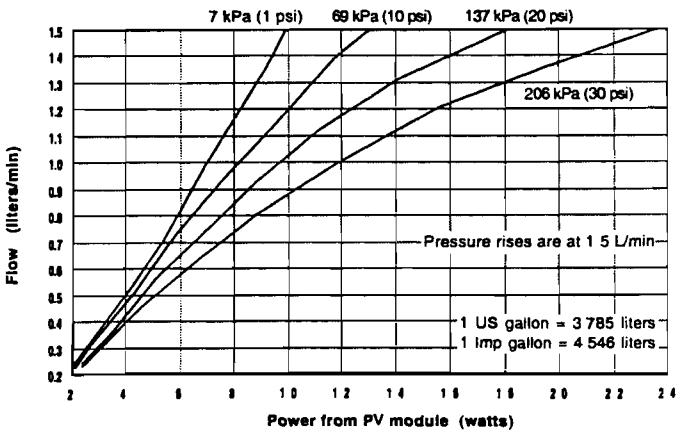
Solar Pump™

Technical Specifications

Consider all the advantages:

- quiet, maintenance-free operation
- self-priming, positive displacement
- life expectancy of more than 20 years
- 10-year warranty
- easy and inexpensive to install
- provides for a healthier environment
- less exposure to electromagnetic fields (EMF)

Performance Curves for Model P15035



System Configuration:

- sliding-vane brass pump with integral strainer
- DC motor complete with mounting feet
- pump-motor V-band coupling
- 3-ampere linear current booster
- PV module, sized for your application

Pump

The pump is a brass body, vane pump, with special clearances and seals for high temperature protection to 90°C. Maximum pressure rise is 400 kPa, (60 psi). At the inlet and outlet ports the pump has standard compression fittings for 3/8" OD tube (9.53 mm OD); 1/2" OD (12.7 mm OD) with models P34100 and P45125.

With the Solar Pump™ flow rates range from 0.3 L/min (0.1 USGPM) with model P15035 at zero pressure rise and low solar irradiance to 4.5 L/min (1.2 USGPM) with model P45125 at 400 kPa (60 psi) pressure rise and full sun. The Solar Pump™ operates in low sunlight - even at one-fifth of a full sun (200 W/m^2).

The Solar Pump™ is engineered for long life and super efficient operation to enable you to use the lowest possible power PV module. The Solar Pump™ is equipped with a built-in strainer (100 mesh/125 micron). No parts are subject to corrosion - all wetted parts are stainless steel, brass and carbon. Each Solar Pump™ is backed by a 10-year warranty.

The Solar Pump™ is a positive displacement pump, which means no time or equipment is required to purge air from the circulation loop. It is also self-priming, with a maximum suction lift of 2 meters (6 feet).

DC Motor

The Solar Pump™ motor, because of its efficient design, is larger than motors designed to operate at 110 to 240 volts AC. Unlike standard motors that use electrical coils and electric current to create the magnetic field, which wastes precious electricity, we use efficient permanent magnets. To produce the torque required to boost the pressure of the pumped liquid we use a heavy-duty, large-diameter armature with thick copper windings to reduce parasitic power consumption. The result is amazing - even in very weak sun the motor produces enough power to start the pump, power that is produced in the "greenest" of all possible methods.

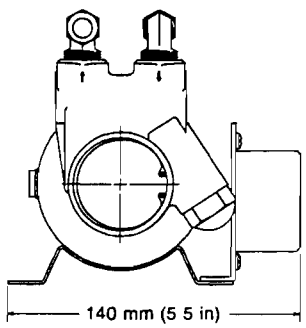
With durability and reliability in mind, the motor brushes and commutator are designed such that they will never require replacement when the motor is driven by a PV module under 50 watts peak power.

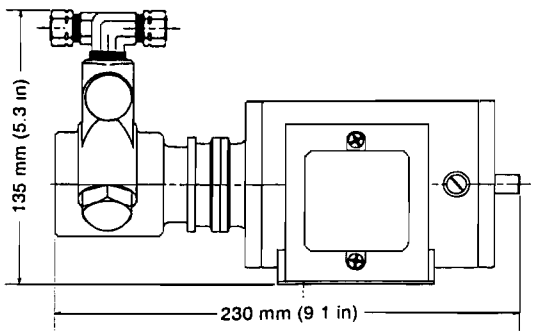
PV Module

Depending on the flow and pressure requirements of your application a 10 to 50 watt PV module powers the Solar Pump™. A PV module with V_{mp} of 16-17 volts is required, which is typical of PV modules with 36 crystalline cells or 13 amorphous cells. Tell us your flow and pressure requirements and we will specify the correct pump model and PV module.

Linear Current Booster

The linear current booster (LCB) maximises the power delivery of the PV module to the DC motor. At full sun the PV module drives the motor at full speed. At lower sunlight levels the LCB converts PV power into high motor current to start the motor and keep it running at low RPM. This control strategy provides a flow rate proportional to the intensity of the solar radiation. The LCB is rated for up to 3 amperes of current from the PV module.





Maximum Flow Rates

Model #	Liters/min	USGPH
P15035	1 5	24
P19050	1.9	30
P24070	2.4	38
P34100	3.4	54
P45125	4 5	71

Weight = 3.9 kg (8 5 lbs)

Information

Solar Energy

Solar Radiation

Solar Economics
Economic Benefits of a typical Solcan Residential SDHW

Solcan SDHW system cost - $3,400 plus taxes
2 - 4 ft x 6.5 ft panel (4.8 sq m)
1 - storage tank @ 225 L (60 gal)
1 - pump
1 - controller
Installation cost - $500 including labour and materials

Typical output: 2.2 GJ/yr. sq m = 2.2 GJ/yr. sq m x 4.8 sq m = 10.6 GJ/yr
= 10.6 x 278 kWh/ GJ = 2,946 kWh

Monitoring the results for 15 comparable solar DHW systems in the Halifax area from May 1990 to September 1991 (TDL Field Trials Demonstration report to EMR, November 1991) showed :
* area of solar collectors was 2 @ 2.6 sq m. = 5.2 sq m.
* mean annual solar energy delivered was 3,235 kWh/ year or 11.6 GJ/year
--> 11.6 GJ/year / 5.2 sq m. = 2.23 GJ/ year. sq m
* average hot water consumption was 278 litres per day
* average solar fraction was 48%. i.e. 48% of hot water needs came from solar.

Cost: $3,400 + $500 = $3,900
$3,900 / 10.6 GJ/year = $368/ annual GJ
or $3,900 x 2000 ÷ 10.6 GJ/ year x 278 kWh/ GJ = $2,645/kW

The Economic Activity Associated with Solar HW Heating
Ontario uses approximately 5,540 GWh of electricity for residential hot water heaters (which represents 40% of HW heating) whereas Quebec uses 5340 GWh.

Assume a 10% penetration by SDHW in Ontario which would displace 554,000,000 kWh. This would represent a total of 554,000,000 kWh @ 3,000 kWh per SDHW system = 184,700 solar water heaters. The resulting economic activity could be 184,700 x $2,900 = $553,600,000 in total or $55 million a year for 10 years.

Assume 6 man-days to sell, manufacture and install a SDHW system, including overhead. There would also be maintenance and service jobs created. In one year of 200 man-days there will be over 550 man-years of work to sell, manufacture and install 18,470 solar DHW systems.

Environmental Benefits

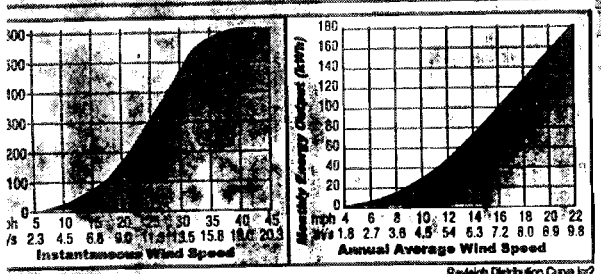
The environmental costs of SO2, CO2 and other gases are estimated to be 6¢/kWh (Active Solar Heating in Canada to the Year 2010, EMR 1992). One residential solar system displacing 3000 kWh @ 6¢/kWh would reduce environmental damage by $180 in one year or $900 over 5 years. The SDHW system would reduce demand by 3,000 kWh ÷ 2,000hrs = 1.5kW

The marginal cost of electricity is $2,000 to $4,000/kW for Ontario Hydro and the peak load power cost for Quebec Hydro is about 60¢/kWh. The potential savings are 3,000kWh x $2000/kW ÷ 2,000 hrs = $3,000 in avoided cost, plus 3,000 kWh x 60¢/kWh x peak factor (use 30%) = $540 if solar displacement occurs at summer peak. In 1990 Hydro had to buy 10% of its power requirements (13.2 TWh) of which 11 TWh came from US at price of 3.2¢/kWh. Acid rain was consequently produced in the USA and not in Canada.

APPENDIX B

DETAILED TECHNICAL INFORMATION
Wind

erformance Curves



pecifications

otor Diameter:	46" (1.15 meters)
'eight:	13 lbs. (5.85 kg)
ount:	1.5" (1.9" OD, 48 mm) SCHED 40 pipe
tart up wind speed:	7 mph (2.7 m/s)
oltage:	12, 24, 48 VDC
ated Output:	400 watts @ 28 mph (12.5 m/s)

eatur

- Variable aerodynamic carbon fiber blades
- Maintenance free - only two moving parts
- Best watt value in any wind turbine

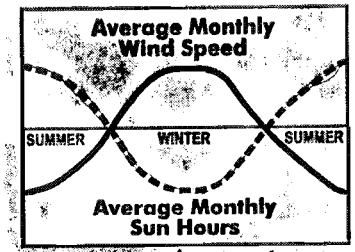
Considering Wind?

The ***AIR*** is a low cost solution to ensure your batteries stay charged on those cloudy-windy days.

The combination of solar and wind make the ***AIR*** beneficial even in low wind sites.

Ideal for those windy winter periods when the sun is at its lowest.

Seasonal Energy Resources



Benefits of Wind/PV Hybrid

- More consistent power supply
- Lower total system cost
- Smooths out seasonal weather fluctuations
- Reduced "deep-cycling" of batteries
- Extended battery life
- Avoid noisy gas generator

"The main use of our Air Wind Module is to supplement my solar panels during the winter when there is lots of wind and no sun."
- Cohasset, California, USA

"It was more cost effective to add a wind generator than add more panels."
- Prescott, Arizona, USA

"Amazing performance for such a small machine."
- Napier, New Zealand

AIR POWER

New

AIR 403

An all new design that once again redefines how the world looks at wind...

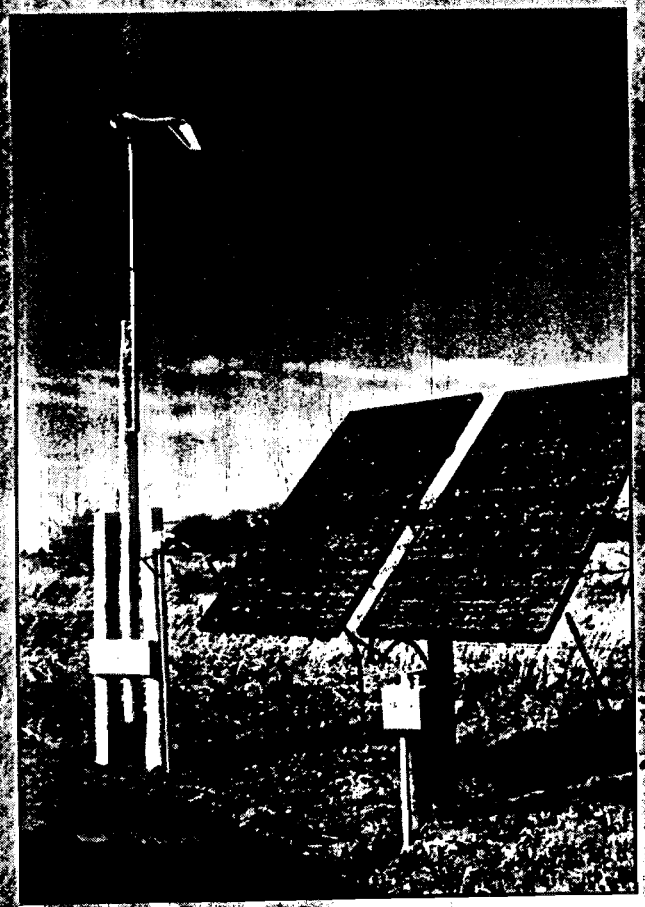
A revolution in wind!

Just a few years ago, we introduced a new concept in battery charging wind turbines. In only four years, over 18,000 ***AIR***s have been installed in 150 countries.

When it comes to conventional thinking of wind turbine design and installation, the ***AIR*** breaks all the rules. With an ***AIR***, you don't have to spend a fortune on lengthy wind data collection, heavy-duty towers, costly installation and scheduled maintenance.

Simple to use:

- Automatic regulation and operation
- As convenient as a solar panel
- Can be installed in a few hours
- Only two moving parts
- Requires no maintenance
- Only 13 lbs!



*An ***AIR*** 403 pairs with a PV system to supply a consistent supply of power for battery charging.*

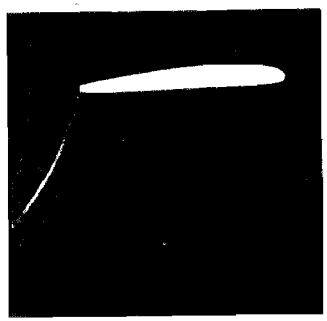
All new AIR 403

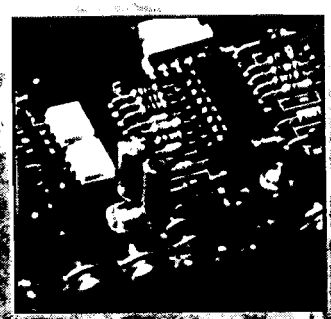
Now, the ***AIR 403*** has more power, greater efficiency, high reliability and quieter operation all in the same size turbine.

PERFORMANCE –

An airfoil so advanced it approaches the theoretical limits of efficiency.

Combined with the new airfoil, the ***403***'s alternator uses new arced magnets and windings that increase rated power by 30% and 50% in low winds.



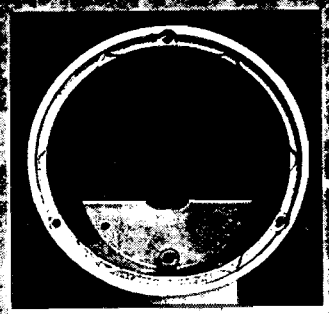


CONTROL –

Unlike any other wind turbine design, the exclusive Autobrake™ regulator automatically slows the blades to a silent spin when the batteries are charged.

REFINEMENT –

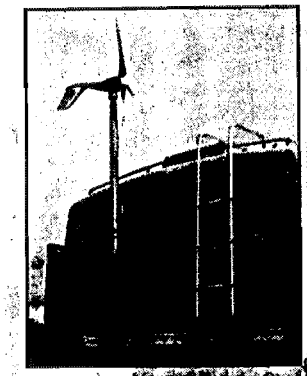
The new body houses an incorporates a large heat sink that efficiently flows heat into the wind for cool operation and increased output. A new casting process refines the fit and finish. The improved design doubles tip-to-tower clearance for greater reliability in high winds.

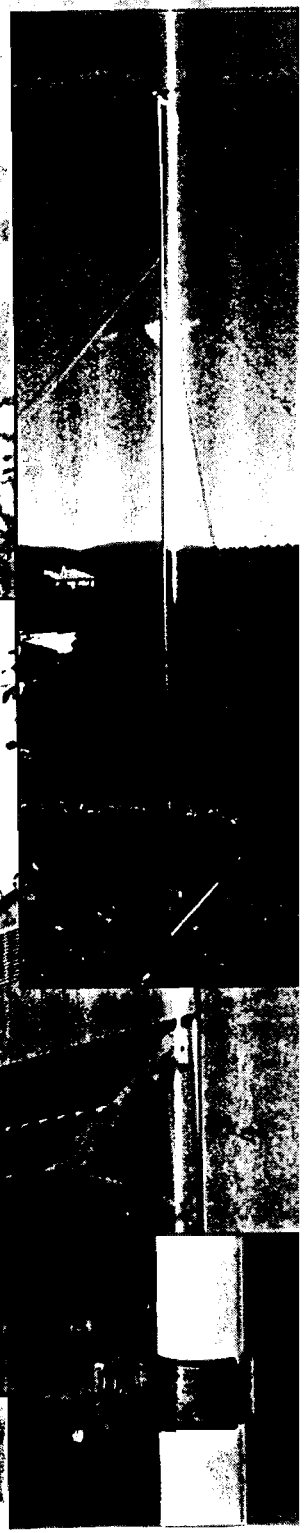


AIR 403

Tower Kits

The flexible design of the ***AIR*** allows it to be installed just about anywhere. These new low cost tower kits add a new meaning to simple installation.



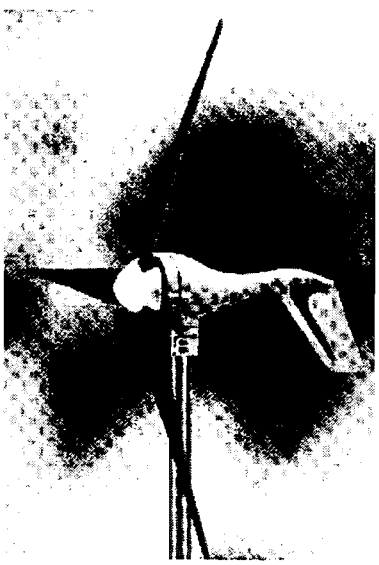


Call your dealer or Southwest Windpower for complete information on towers and accessories.

Oasis Montana Inc.

Alternative Energy Supply and Design
Toll Free: 1 877-OASISMT (877-627-4768)
e-mail: info@oasismontana.com
Home Page: www.oasismontana.com

Air 403 Wind Turbine Generators



The folks at Southwest Windpower have improved this wind turbine, with a design that changes the way the world looks at wind power! With a three year warranty, this wind generator is an excellent addition for battery charging in cloudy weather or the lower light conditions of winter. The units are light-weight and easy to install, suited for adding to your solar power system or for marine or mountaintop installation. Please look over our information on these popular, low-cost units, and do not hesitate to e-mail us if you need anything or have questions our site doesn't answer.

Air 403, 12 or 24V: $499

Air 403 Marine, 12 or 24V: $795

Air Industrial, 12 or 24V: $995

Three year warranty on all Air 403 units

For more accessories and pricing see below!

ROOF MOUNT KITS

Because of the small size and simplicity of mounting the Air 403 turbine, there are a variety of mounting options. If you know of a welder or metal fabricator, you may wish to come up with your own custom design for your installation.

There are simple roof tower mounts that offer low cost and easy installations for single or multiple Air 403 turbines. The kits are designed with effective built-in vibration isolation mounts, and can be installed alongside a truss, going through the roof, or on the side of a building. An optional roof seal is available.

Guyed tower kits are also available, available is 25 or 47 ft. heights; they are the standard for simple and durable tower installations. These towers tilt-up for easy erection. All parts are threaded--no welding is required. Screw-type anchors are available as an option. All parts are included except the schedule 40 2" pipe. The Air 403 requires a 1 1/2" pipe for the last four feet.

Roof Mount Kit $85
Roof Mount Kit with Seal $105
Roof Seal Only $30
Air Marine Tower Hardware Kit $169
(for aluminum powder coated masts)
Air Marine Aluminum Pole Set $179
(9 ft - 3m - pole and stays only)
25 ft (7.6m) Guyed Tower Kit $199
47 ft (14.3m) Guyed Tower Kit $249

36" Augers $59
48" Augers $69
Stop Switch (50A Toggle Switch) $19
Amp Meter, 30A $25
Amp Meter and Shunt $49
(for 12V units)
Air 403 Land Unit $499 Air 403 Marine Unit $795
Air 403 Industrial Unit $995

Windseeker 502 and 503 - 500 watt units, maintenance-free; silent operation. Uses 2" pipe that is easy to erect and inexpensive (not included). Comes with a "smart" voltage regulator. Available in 12, 24 or 48 VDC. Two year warranty.

Windseeker 502, 12VDC $895 Windseeker 502, 24VDV $895

Windseeker 503, 12VDC $1075 Windseeker 503, 24VDC $1075.

403 Exploded view	AIR 403 Home pg	403 wiring diagram	Multi 403 wiring	Air 403 FAQ
Used/Surplus	LP Appliances	Oasis Home page	Contact us	Newsletter

Oasis Montana Inc.

Alternative Energy Supply and Design

436 Red Fox Lane
Stevensville, MT 59870

E-mail us for free information on system sizing; or order our Design Guide & Product Catalog for $10.00 ($18.00 for international customers)

mailto:
info@oasismontana.com
Home Page
www.oasismontana.com

141619

Go To Our
Quick Link Site Map

Toll Free :
1(877-OASISMT) 1(877-627-4768) or
1(877-OASISPV) 1(877-627-4778)
Fax: 406-777-2632

Revised 02/28/01

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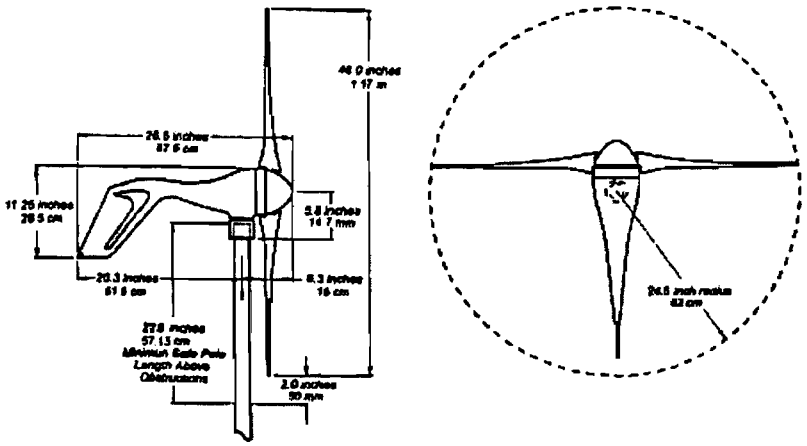
e-mail: info@oasismontana.com
Home Page: www.oasismontana.com

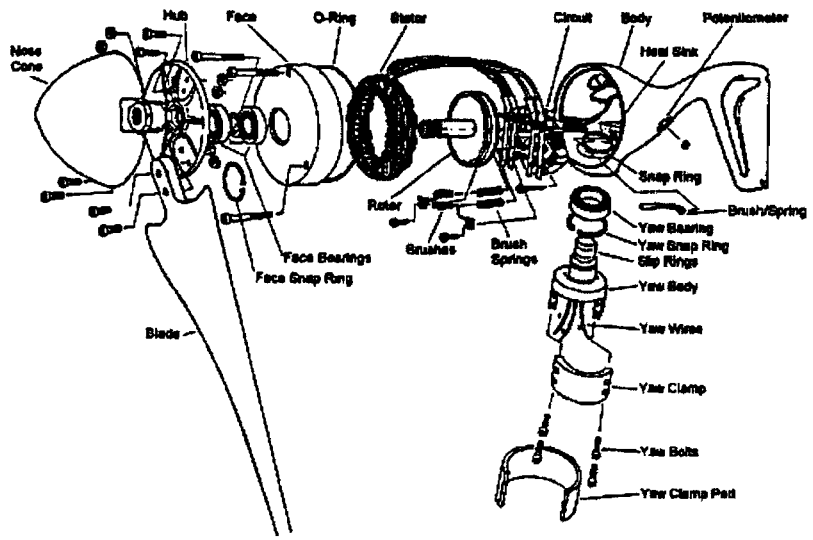
Air 403 Wind Turbine Generators

Exploded view of the Air 403 Units:

7.2 Sphere of Operation



7.3 Exploded View of AIR



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Home Page: www.oasismontana.com

Air 403 Wind Turbine Generators

Basic Wiring Information about the Air 403 Units :

Choose the appropriate wiring diagram below for proper wiring information.

A. Single AIR 403 Wiring

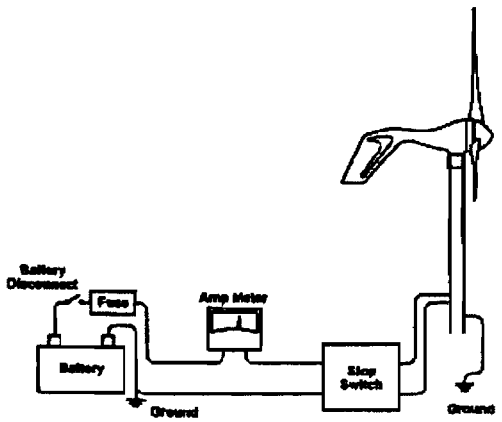

Figure 3

B. AIR 403 In A System With Solar Panels (Hybrid System)

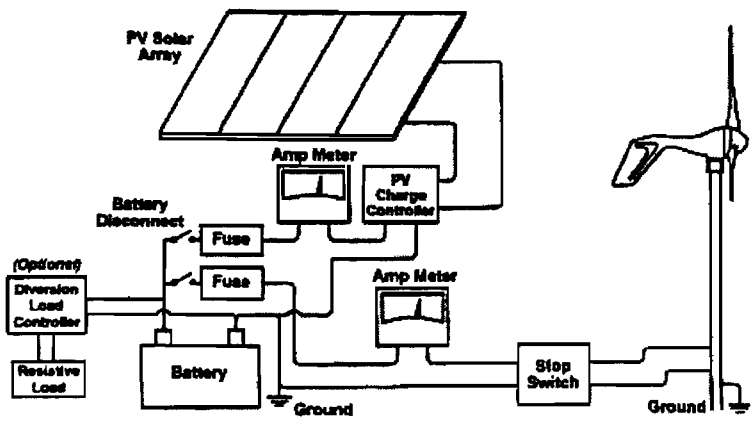

Figure 4

NOTE: In this drawing the ***AIR 403's*** internal regulator is used. A diversion type external regulator can also be used.

Oasis Montana Inc.

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Home Page: www.oasismontana.com

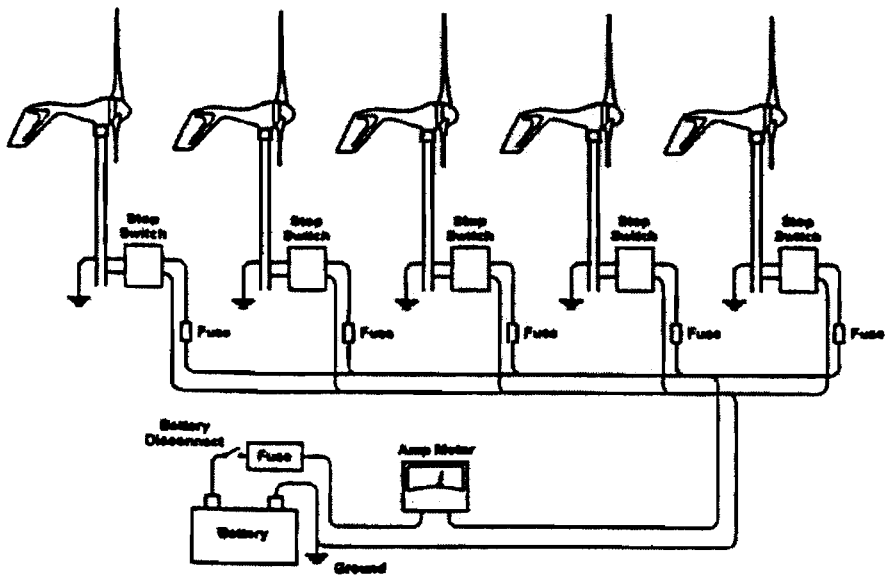
Multi Air 403 Wiring Diagram

MULTIPLE AIR 403 INSTALLATION
There are two methods to wire multiple Air 403s.

1) Each turbine directly wired to the battery
Each turbine operates as an independent system separate from other solar panels, gas generators or any other battery charging sources.. If the turbine has its own fuse, stop switch, and wires, the turbine is able to individually communicate and charge the battery or battery bank.

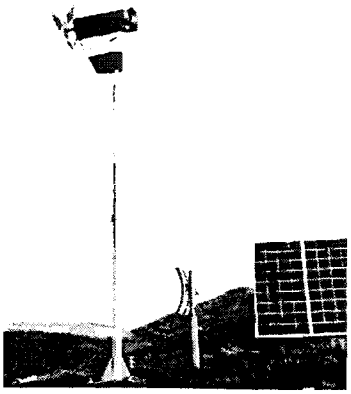
2) Each turbine wired to a bus bar
If you plan to wire two or more turbines to a "bus" and then run one set of wires from the bus bar to the battery, you can use each turbine's internal regulator or install an external regulator. If you use an external regulator, use a diversion style ("dump load") regulator that turns excess power into heat for heating air or water. When wiring multiple turbines, it's possible to reduce your wiring costs by using a bus bar system.

Mounting to Tower
The Air 403 is designed to be mounted on a 1 1/2" schedule 40 steel or aluminum pipe (do not use plastic!). The outside diameter of the pipe should be 1.875" (48 mm). There's a soft coupling inside the yaw shaft mount that is designed to provide a good, tight fit and to dampen some of the noise that is transmitted down the tower. The clamp and soft coupling design will accommodate small variations in diameter; however, if you use something other that a 1.5" SCH 40 (48mm) pipe, be certain the unit has a secure fit prior to installation .



Proven Wind Turbines

There are three Proven Wind Turbines to choose from with the following common features :-



Proven WT600 at British Telecom Microwave Station

- downwind configuration - stable, does not need a separate tail
- award winning blade technology - Proven WTs can run off-load without over-speeding!
- high build quality using stainless steel, galvanised steel or plastic throughout - marine site ready
- low rpm permanent magnet generator for good output in wide range of wind speeds
- low rpm and shaped blade tips contribute to very low noise output
- no gearbox - so no maintenance and no annoying gear box "whine"
- mechanical disc brake (WT2500 and WT6000) - operated from base of tower

Proven WT600 at British Telecom Microwave Station

Model	WT600	WT2500	WT6000
Rated Power (Watts)	600 Watts	2500 Watts	6000 Watts
Rotor Diameter (metres)	2.55	3.5	5.5
Cut-in windspeed (m/s)	2.5	2.5	2.5
Rated windspeed (m/s)	10	12	10
Cut-out windspeed	none!	none!	none!
Maximum windspeed (m/s)	>70	>70	>70
Head Weight	70	190	450
Warranty	2 years	2 years	2 years
Rated RPM	500	300	200

Click here to see pictures of our WT6000 6kW wind turbine.

Click here to a typical layout for energy storage and control equipment.

PROVEN WORLD FRIENDLY ENERGY RETAIL PRICE LIST - October 2000

Proven Engineering Products Ltd, Moorfield Ind. Est., Kilmarnock, KA2 0BA, Scotland UK Tel 01563 543020 Fax 01563 539119

Product Code			*Description*	*List Price*
			600W WIND TURBINES & TOWERS	
WT600/	012		600 Watt wind generator (12V output)	£1,700
WT600/	024		600 Watt wind generator (24V output)	£1,700
WT600/	048		600 Watt wind generator (48V output)	£1,700
GM600/	650		6.5 m mast with 4 guyed anchors. Includes base plate, anchor hairpins, gin pole, guy ropes	£535
GM600/	1300		13m mast (2 sections) with 4 guyed anchors. Includes base plate, anchor hairpins, gin pole,	£1,020
TM600/	550		Tilt-up self supporting wind turbine mast (5.5m) including foundation kit, plans & gin pole	£990
TM110/	600		Tower mount for WT600 for use with own mast. Supplied ungalvanised on request	£95
			2.5kW WIND TURBINES & TOWERS	
WT2500/	024		2.5kW wind turbine/generator (24V output)	£3,385
WT2500/	120		2.5kW wind turbine/generator (120V output)	£3,385
WT2500/	048		2.5kW wind turbine/generator (48V output)	£3,385
TM650/	2500		Tilt-up self supporting wind turbine mast (6.5m) including foundation kit, plans & gin pole	£1,580
TM150/	2500		Wind turbine mount for use with own mast. (Ungalvanised on request)	£140
TM1100/	2500		Tilt-up self supporting wind turbine mast (11m) including foundation kit, plans & gin pole	£2,950
TWT508			Tirfor winch with 20 metres wire rope + strop (suitable for WT600/WT2500)	£360
			6kW WIND TURBINES & TOWERS	
WT6000/	048		6kW wind turbine/generator (48V output)	£7,175
WT6000/	120		6kW wind turbine/generator (120V output)	£7,175
WT6000/	240		6kW wind turbine/generator (240V output)	£7,175
TM900/	6000		Tilt-up self supporting wind turbine mast (9m) including foundation kit and plans & gin pole	£2,850
TM160/	6000		Wind turbine mount for use with own mast (ungalvanised on request)	£195
TWT532			Tirfor winch with 20 metres wire rope + strop (suitable for WT6000)	£720
			SOLAR PHOTOVOLTAIC PANELS	
BP245			BP Solar 45 Watt peak 12V	£186
BP275			BP Solar 75 Watt peak 12V	£295
BP585			BP Solar 85 Watt peak 12V	£352
SIE110			Siemens mono crystalline 110 Watt peak 12V or 24V output available	£509
KYO110			Kyocera polycrystalline 110Watt peak 12V	£440
			600W WIND TURBINE CONTROLLERS FOR BATTERY CHARGING	
ECM600/	012		12V WT600 charge controller with high voltage control. Includes MCB Isolator (No Meters) 500mmHx300mmWx200mmD.	£370
ECM600/	024	048	24V or 48V WT600 controller with high voltage charge control. Includes MCB Isolator (No Meters). 500mmHx300mmWx200mmD.	£320
MET600/			Analogue Volt and Ammeters for use with ECM600 Controllers	£160
ECM601/	024	048	WT600 controller suitable for telecoms applications. Supplied in IP65 box. Includes Voltmeter, Ammeter, Adjustable LV relay and system status LEDs.	£475
			2.5kW WIND TURBINE CONTROLLERS FOR BATTERY CHARGING AND DIRECT HEATING	
ECM2501/	024	048	2.5kW 24V DC battery charging controller. Includes 2 DC and 3 AC divert load connections, Volt/Ammeters plus 8 system status indicators. 600mmHx300Wx200D Suitable for use with a DC system or DC/AC using an inverter.	£970
ECM2502/	024	048	2.5kW 24V DC battery charging controller... Includes 3 AC divert load connections, Volt/Ammeters plus 8 system status indicators. 600mmHx300Wx200D Suitable for an AC	£855
ECM2503/	120		2.5kW 120V heating controller. Volt and Ammeters 400mmHx250Wx200D (Additional connections for PV input to battery charging controllers on request)	£610

		6kW WIND TURBINE CONTROLLERS FOR BATTERY CHARGING AND DIRECT	
ECM6001/	048	6kW 48V DC battery charging controller. Includes 2 DC and 3 AC divert load connections, Volt/Ammeters plus 8 system status indicators. 600mmHx400Wx200D Suitable for use with a DC system or DC/AC using an inverter.	£1,150
ECM6002/	048	6kW 48V DC battery charging controller... Includes 3 AC divert load connections, Volt/Ammeters plus 8 system status indicators. 600mmHx300Wx200D Suitable for an AC	£1,045
ECM6003/	120	6kW 120V heating controller. Volt and Ammeters 400mmHx250Wx200D	£795
ECM6003/	240	6kW 240V heating controller. Volt and Ammeters 400mmHx250Wx200D	£740
		(Additional connections for PV input to battery charging controllers on request)	

		INVERTERS & BATTERIES	
INV602/	024	250 Watt sine wave Piccolo Inverter (24V input)	£177
INV603/	024	600Watt sinewave Domino Inverter (24V input)	£446
INV2503/	012 / 024	1.5kW 230Vac TRACE semi-sine inverter (12V or 24V input) with 3 stage charger (70 Amp or	£696
INV2504/	024	2.4kW 230Vac TRACE semi-sine inverter (24V input) with 70 Amp 3 stage charger	£942
INV2510/	024	2.5kW 230Vac TRACE sinewave inverter (24V input) with 65 Amp 3 stage charger	£1,463
INV2509/	012	2.6kW 230Vac TRACE sinewave inverter (12V input) with 150 Amp 3 stage charger	£1,955
INV2507/	024 / 048	3.3kW 230Vac TRACE sinewave inverter (24V or 48V input) with 3 stage charger (100 Amp or	£2,361
INV2508/	048	4.5kW 230Vac TRACE sinewave inverter (48V input) with 60 Amp 3 stage charger	£2,697
LNK2508		Linking unit to allow two TRACE sinewave inverters to be stacked in parallel	£235
		Large range of other inverters & batteries available - Prices on application	
BAT2423		24Volt 230 Amp. hour, low maintenance battery. Supplied as 2 12V blocks each 580mmLx280Wx300H and 66kg	£595

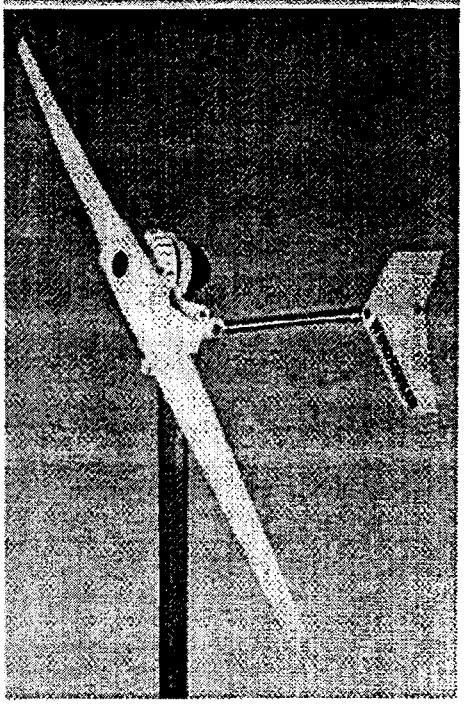
		ACCESSORIES	
PWL01		Proven Windlogger containing anemometer and LCD display. Records instantaneous and ave	£93.62
CAB024		3-core amoured cable for WT2500/024/048, terminated at controller end (per metre)	£7.60
CAB120		3-core amoured cable for WT2500/120, terminated at controller end (per metre)	£2.25
JB2501/ 6001		Cable Kit for WT2500/WT6000 (useful when using large cable diameters) IP66 3-phase junction box with stud mounts. Supplied with glands for WT2500/WT6000 flexible armoured	£70
RES1000/	024	1kW 24V Resistive heating element for use with ECM2501 & ECM6001	£82
RES1000/	048	1kW 48V Resistive heating element for use with ECM2501 & ECM6001	£82
HBX2500/	024 048	Custom stainless steel heater box containg 2 RES1000 24V or 48V heating elements. Ideal for use as DC divert load with ECM2501 or ECM6001	£295
IM120/	2500	2.5kW 120Vac immersion heater with thermostat fitted for the WT2500/120	£72
IMM504/	230	4 off 500Watt Immersion elements plus a thermostat all in a standard 21/4" BSP fitting	£108
FUS/	100	DC removable fuse and fuse holder rated at 100 Amps	£52
FUS/	200	DC removable fuse and fuse holder rated at 200 Amps	£123
DIS200		DC Double Pole Disconnect (Includes 200 Amp DC Fuse)	£230
FAC30		32 Amp 230Vac Double Pole Isolator/MCB suitable for inverter output	£95
LINK10/	024 048	DC Amp Hour Meter to record battery performance. Digital Volt & Ammeter. Shows Amp-Hour in Battery, kWh meter. Shows overall charge/discharge efficiency of battery & time remaining. Price includes shunt & fuses required.	£234

		EXPORT PACKING CASES	
BOX601		Sturdy export packing case for 1 WT600 wind turbine 1.4m x 1.4 x 0.5 110kg	£155
BOX2501		Sturdy export packing case for 1 WT2500 wind turbine 1.8m x 1.9m x 0.6m 300kg	£225
BOX6001		Sturdy export packing cases for 1 WT6000 wind turbine 2.4m x 2.2m x 1.2m 550kg	£325

OVER 12 YEARS OF PROVEN RELIABILITY

WINDSEEKER™

WINDSEEKER 502



- 2 Blade Design
- Lighter Weight
- Economical

Specifications

- Rotor Diameter: 60" (1.52 meters)
- Weight: 502: 19.5 lbs (8.8 kg)
  503: 22.5 lbs (10.2 kg)
- Start up windspeed: 7 mph (3 m/s)
- Output: 500 Watts
- Alternator: PM 3 phase brushless
- Output Voltage: 12V: Preset 14.8
  24V: Preset 29.5
- Voltages available: 12, 24, 36, 48

Easy to install, low cost tower designs available.

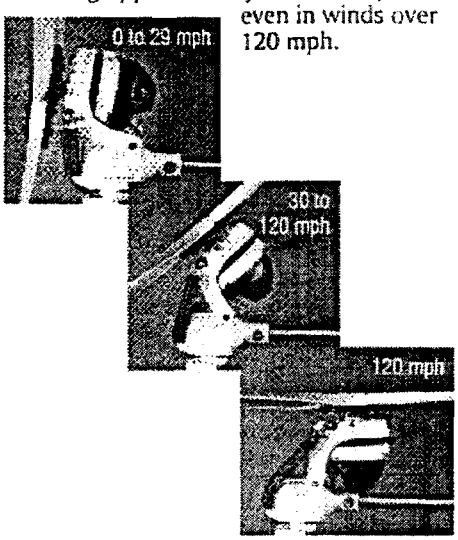
For over a decade, the Windseeker has set the standard for affordable, reliable wind power. With its unique patented upward-furling design, the Windseeker produces power dependably, in low wind to the extremes of stormy mountain tops. Thousands of Windseekers can be found in use around the world.

Standard Features

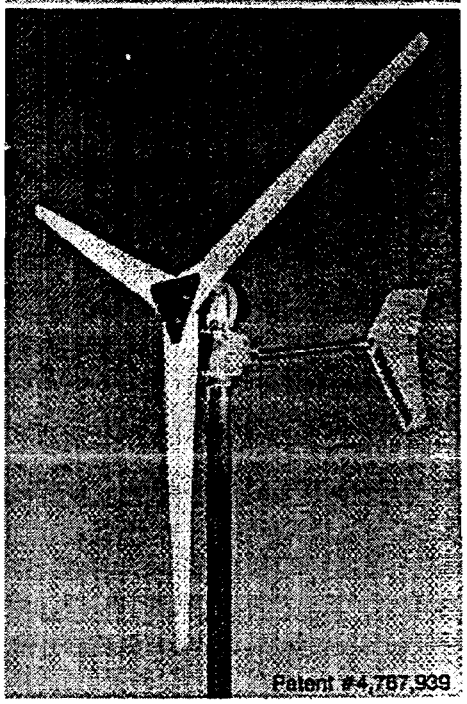
- Double ball bearing yaw shaft
- Corrosion Resistant, durable powder coated finish
- Cast aluminum and stainless steel construction
- Brushless neodymium permanent magnet alternator
- Precision aircraft quality rotor
- Built-in voltage regulator
- Marine and Industrial versions available

2 YEAR WARRANTY

Exclusive to Windseeker: Other turbines cut output by as much as 90% once the wind governor is activated. The Windseeker's output drops only 15%, retaining approximately 85% of full power, even in winds over 120 mph.

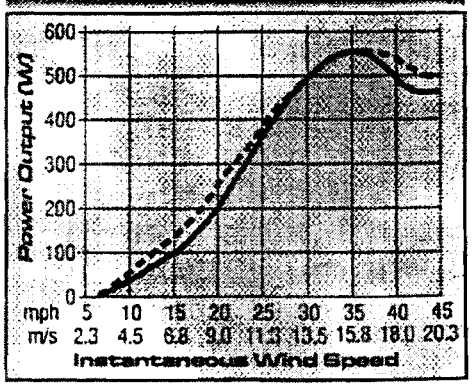


WINDSEEKER 503



- 3 Blade Design
- Smoother and Quieter Operation
- High Wind Stability

Performance Curve



——— Windseeker 502
- - - - - - - Windseeker 503

Performance calculated at sea level

Southwest Windpower

Renewable Energy Made Simple

2131 N. First Street • Flagstaff, Arizona 86004 USA • Tel 520-779-9463 Ext 398 • Fax 520-779-1485
www.windenergy.com • E-mail info@windenergy.com

Wind Generator Comparisons

Wind Generator Comparisons			
Model	**Watts**	**Cost**	**Special Features**
Aerogen 3	48	**$775**	very strong
Rutland 500	60	**$500**	only 8.5 lbs.
Windstream	96	**$497**	regulator +$89
Helius	150	**$497**	kit form (difficult)
Rutland 910	180	**$650**	starts 4 mph wind
Aerogen 5	192	**$1950**	very strong
Air 403	475	**$595**	Improved on Air303; Industrial model avail.
Windseeker 502	550	**$850**	90% @120 mph
Whisper 600	600	**$990**	regulator +$260
Windseeker 602	650	**$950**	90% @120 mph
Windseeker 503	550	**$950**	"super quiet"
Outback 5'2"	780	**$1769**	AC 3-phase
Outback 6'2"	900	**$1769**	AC 3-phase
Whisper 1000	1000	**$2590**	regulator +$260
Bergey	1500	**$4795**	super durable
NorthWind 3	3000	**$13k**	harsh environ.
Bergey	10 kw	**$16k**	super durable
NorthWind 12	12 kw	**$46k**	harsh environ.
Monopteros	30 kw	**$69k**	Big
Atlantic Orient	50kw	**$60k**	Used at NREL

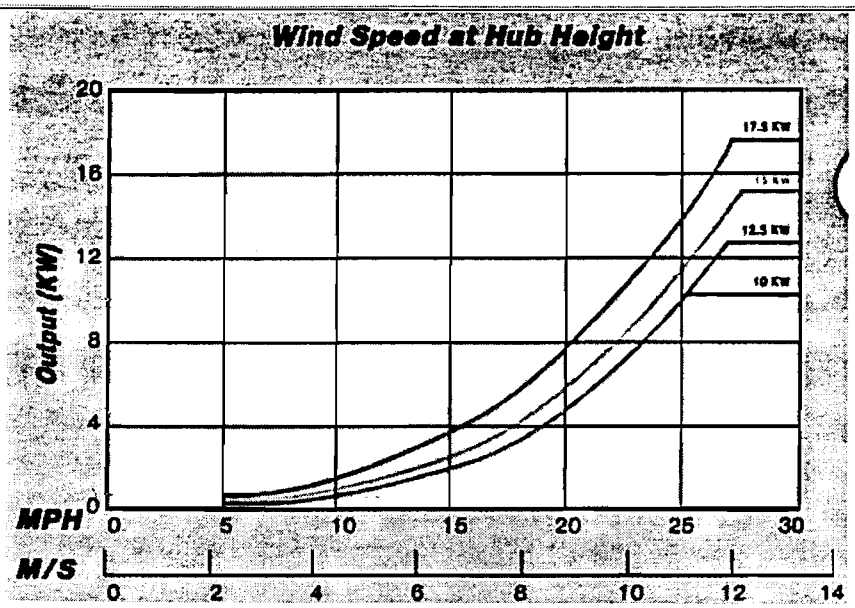
For larger models and more detailed specifications, order our $12 Wind Generator booklet.

We now have more on .pdf format! See our detailed product specs page or contact us for an email .pdf!

Please email comments or questions to info@jademountain.com

10-17 Kw Power Curve

Content
This Section:



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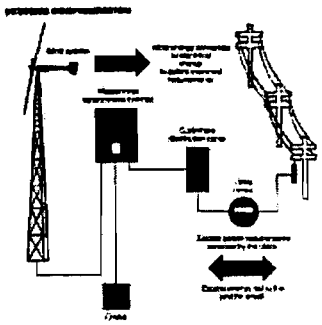
Grid Intertie System

Basics, Specifications & Pricing

Basics

The *Jacobs*® Grid Intertie System takes the power that the wind plant produces and converts it to useable energy and transfers it to the utility grid (power company) through the customers circuit breaker panel. When the customers usage exceeds the wind systems output, the additional power required is drawn from the utility grid. If the electrical needs are satisfied by the wind system, no power is used from the utility. During periods of sustained high winds the system may produce more power than is consumed, a financial return can be realized by selling the excess power to the utility company and through net energy savings. The Grid Intertie System is not a backup power system, if the utility power goes out, the control shuts down until the utility power comes back on.



Basic configuration of a Grid Intertie System.

(Click to enlarge picture)

Basic system consists of the following:

- Wind Turbine
- Grid Intertie Controls
- Tower & Hinges

Specification

Back to Top

Inverter:

Type	Synchronous - Current Source, Line Commutated
Dimensions - Inverter	37" x 28" x 14"
- Choke	22" x 19" x 14"
Weight - Inverter	135 lbs.
- Choke	175 lbs.

Peak Power Rating:	10 - 20kw
Operating Voltage:	
Input	0 - 180 vac, 3 phase, 0 - 40 hz
DC Buss	0 - 210 vdc, power transfer @ 40 vdc
Output	208 - 250 vac, 50 or 60 hz, single phase
Back-Feed Protection:	
Over/Under Voltage	+/- 10%
Off Frequency	+/- 1%
Power Factor:	0.95 @ full load
Voltage Harmonic Distortion:	< 5% @ full load
Efficiency:	95%
Operating Temperature:	35 - 110 deg. F.
Operating Humidity:	0 - 90 % relative humidity without condensation

Performance

Content This Section:

Up
Grid Intertie System
Hybrid Power Plant
Features
10-17 Kw Power Curve
20 Kw Power Curve
General Prices
Performance
Turbine/Tower Spec.
Dealers (USA)
Reps. (INTL.)
Warranty
Site Factors
Brochures & Misc. Data

Model No.	23-10	23-12.5	26-15	26-17.5	29-20
Max. Output (Kw)	10	12.5	15	17.5	20
Rotor Diameter (Ft.)	23	23	26	26	29
Rated Wind Speed (mph)	25	27	26	27	26

Wind Speed (MPH)	Estimated Annual Output (KWH)				
10	10486	10521	11363	14729	19727
11	13618	13800	14966	19320	25704
12	17044	17486	19065	24479	32297
13	20648	21472	23558	30060	39289
14	24321	25643	28317	35900	46468
15	27969	29887	33217	41841	53646
16	31515	34103	38135	47744	60665
17	34899	38205	42963	53486	67398
18	38073	42119	47609	58966	73743

All outputs are based on Rayleigh Distribution, outputs will vary depending on tower height.

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APPENDIX B

DETAILED TECHNICAL INFORMATION
Batteries

SYSTEM DESIGN

CANADA'S SUSTAINABLE LIVING STORE

VISIT OUR CATALOGUE

NEWS & EVENTS
FORUMS
SYSTEM DESIGN
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FAX
(250) 544-0478
ADDRESS
#8-6782
VEYANESS RD
VICTORIA BC
CANADA - V8M 2G2
CONTACT SALES

Batteries

PREVIOUS | 1 OF 3 | NEXT

Storage batteries are the heart of an independent power system. They store electricity for use at a later time when a charging source (sun, wind, water or generator) is not available. They also provide a reserve of available energy to run loads that require more power than that provided by the charging source.

Batteries wear out and must eventually be replaced. Regular monitoring and maintenance will extend the life span of your battery bank and save you money. The deeper they are discharged, the shorter their life span will be. Batteries contain toxic materials and should be disposed of properly.

Choosing a Battery

There are many types of batteries available. Many are unsuitable for an independent power system. Choosing the right type of battery is the first step in designing a reliable renewable energy system.

Car Batteries

Car batteries are designed to provide a brief, high current for engine starting, not for deep discharge applications. The ÏCold Cranking AmpsÓ rating does not indicate the batteryÌs storage capacity. The thin plates in these batteries are good for a quick release of energy, but deep discharging will cause rapid deterioration. These are a poor choice for alternative energy systems.

Motive Power Batteries

Motive batteries are deep-cycle batteries used to provide energy for electric vehicles such as golf carts and forklifts. They have thick plates that will withstand many deep discharge cycles. These are used for most independent power systems as they are durable, have good storage capacity and are cost effective. These are usually in a 2, 6 or 12V casing. Typically, the golf cart batteries will last four to seven years, while the Global-Yuasa forklift batteries will last 10 to 20 years.

Stationary Batteries

These cells, common known as utility backup cells are used by telephone companies for back-up power supply systems. They are often designed with calcium alloy plates which are not for deep cycling, so they are poor batteries for a most renewable energy systems. However, they may be suitable for use in systems where there is no requirement for autonomy such as a micro hydro installation. When batteries are used this way, also referred to as Ïfloat serviceÓ, they are storing reserve energy for peak load demands. Stationary 2V cells frequently come in a clear casing.

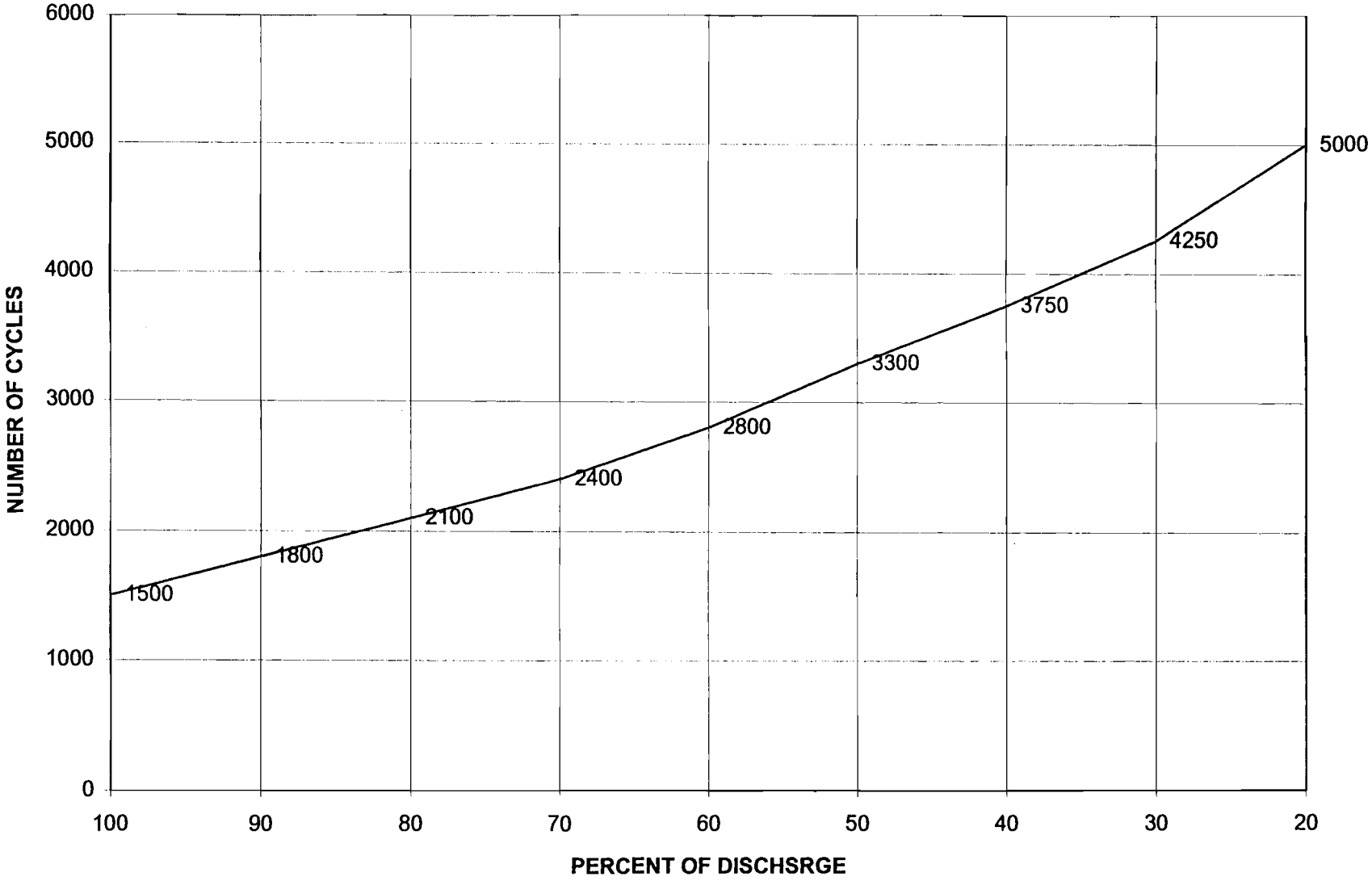
Gel (sealed) Batteries

Gel cells are filled with an electrolyte that is in the form of a gel or sponge. It is not possible to service this type of battery or replace the electrolyte. They have a much shorter life and cost considerably more than liquid filled batteries. These batteries require no maintenance, tolerate low temperatures, do not spill and do not produce corrosive gases. They are good at remote sites where maintenance is not possible and cold weather prevails. Precise charge control is critical.

RV and Marine Batteries

These Batteries are a compromise between engine starting batteries and deep cycle batteries. The plates are similar to the engine starting batteries and will not withstand repeated deep discharging. They are adequate for small (under 200 amp / hours) systems and might last 2 to 4 years. These are not a true deep discharge battery despite the claims on the label to be a Ïdeep cycleÓ battery.

CYCLE LIFE VS. DEPTH OF DISCHARGE 500 / 5000 series batteries / cells



SOLAR

DEEP CYCLE-BY SURRETTE - NON BREAKABLE CONSTRUCTION

BATTERY TYPE		**6 CS 25P S**	
VOLTS		**6**	
DIMENSIONS			
LENGTH		559 MM	22 INCHES
WIDTH		286 MM	11.25 INCHES
HEIGHT		464 MM	18.25 INCHES
WEIGHT DRY		116 KG	256 LBS
WEIGHT WET		145 KG	318 LBS
CONTAINER CONSTRUCTION			
INNER CONTAINER		POLYPROPYLENE	
INNER COVER		POLYPROPYLENE-HEAT SEALED TO INNER CONTAINER	
OUTER CONTAINER		HIGH DENSITY POLYETHYLENE	
OUTER COVER		HIGH DENSITY POLYETHYLENE SNAP FIT TO OUTER CONTAINER	
PLATES PER CELL		25	
ELECTROLYTE RESERVE	ABOVE PLATES	92.08 MM	3.625 INCHES
POSITIVE PLATE DIMENSION			
HEIGHT		273.05 MM	10.75 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		6.73 MM	0.265 INCHES
NEGATIVE PLATE DIMENSION			
HEIGHT		273.05 MM	10.75 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		4.70 MM	0.185 INCHES
INSULATION		POSITIVE PLATE ENVELOPED VERTICAL SLYVER	
TERMINALS		FLAG WITH LEAD NUTS AND BOLTS	

		CAPACITY AMP. HRS.	AMPS PER HOUR
CAPACITY AT THE 100 HOUR RATE	1.265 SPECIFIC GRAVITY	1156	12
CAPACITY AT THE 72 HOUR RATE	1.265 SPECIFIC GRAVITY	1091	15
CAPACITY AT THE 20 HOUR RATE	1.265 SPECIFIC GRAVITY	820	41
CAPACITY AT THE 10 HOUR RATE	1.265 SPECIFIC GRAVITY	705	71
CAPACITY AT THE 8 HOUR RATE	1.265 SPECIFIC GRAVITY	672	84
CAPACITY AT THE 6 HOUR RATE	1.265 SPECIFIC GRAVITY	631	105
CAPACITY AT THE 5 HOUR RATE	1.265 SPECIFIC GRAVITY	599	120
CAPACITY AT THE 4 HOUR RATE	1.265 SPECIFIC GRAVITY	558	139
CAPACITY AT THE 2 HOUR RATE	1.265 SPECIFIC GRAVITY	443	221
CAPACITY AT THE 1 HOUR RATE	1.265 SPECIFIC GRAVITY	336	336
CAPACITY AT THE 1/2 HOUR RATE	1.265 SPECIFIC GRAVITY	180	361

SOLAR

DEEP CYCLE-NON BREAKABLE CONSTRUCTION

BATTERY TYPE		**4-KS-21PS**	
VOLTS		**4**	
DIMENSIONS			
LENGTH		400 MM	15.75 INCHES
WIDTH		238 MM	9.38 INCHES
HEIGHT		629 MM	24.75 INCHES
WEIGHT DRY		85 KG	186 LBS.
WEIGHT WET		121 KG	267 LBS.
CONTAINER CONSTRUCTION			
INNER CONTAINER		POLYPROPYLENE	
INNER COVER		POLYPROPYLENE-HEAT SEALED TO INNER CONTAINER	
OUTER CONTAINER		HIGH DENSITY POLYETHYLENE	
OUTER COVER		HIGH DENSITY POLYETHYLENE SNAP FIT TO OUTER CONTAINER	
HANDLES		MOLDED	
PLATES PER CELL		21	
ELECTROLYTE RESERVE	ABOVE PLATES	92.08 MM	3.625 INCHES
POSITIVE PLATE DIMENSION			
HEIGHT		431.80 MM	17 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		6.99 MM	0.275 INCHES
NEGATIVE PLATE DIMENSION			
HEIGHT		431.80 MM	17 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		4.57 MM	0.18 INCHES
INSULATION		POSITIVE PLATE ENVELOPED PLUS HEAVY GLASS	
TERMINALS		FLAG WITH LEAD NUTS AND BOLTS	

		CAP.	AMPS
CAPACITY AT THE 100 HOUR RATE	1.265 SP. GR.	1557	16
CAPACITY AT THE 72 HOUR RATE	1.265 SP. GR.	1468	20
CAPACITY AT THE 50 HOUR RATE	1.265 SP. GR.	1358	27
CAPACITY AT THE 24 HOUR RATE	1.265 SP. GR.	1148	48
CAPACITY AT THE 20 HOUR RATE	1.265 SP. GR.	1104	55
CAPACITY AT THE 10 HOUR RATE	1.265 SP. GR.	949	95
CAPACITY AT THE 8 HOUR RATE	1.265 SP. GR.	905	113
CAPACITY AT THE 6 HOUR RATE	1.265 SP. GR.	850	142
CAPACITY AT THE 5 HOUR RATE	1.265 SP. GR.	806	161
CAPACITY AT THE 4 HOUR RATE	1.265 SP. GR.	751	188
CAPACITY AT THE 2 HOUR RATE	1.265 SP. GR.	596	298
CAPACITY AT THE 1 HOUR RATE	1.265 SP. GR.	453	453

SOLAR

DEEP CYCLE-NON BREAKABLE CONSTRUCTION

BATTERY TYPE		**4-KS-25PS**	
VOLTS		**4**	
DIMENSIONS			
LENGTH		400 MM	15.75 INCHES
WIDTH		273 MM	10.75 INCHES
HEIGHT		629 MM	24.75 INCHES
WEIGHT DRY		100 KG	220 LBS.
WEIGHT WET		143 KG	318 LBS.
CONTAINER CONSTRUCTION			
INNER CONTAINER		POLYPROPYLENE	
INNER COVER		POLYPROPYLENE-HEAT SEALED TO INNER CONTAINER	
OUTER CONTAINER		HIGH DENSITY POLYETHYLENE	
OUTER COVER		HIGH DENSITY POLYETHYLENE SNAP FIT TO OUTER CONTAINER	
HANDLES		MOLDED	
PLATES PER CELL		25	
ELECTROLYTE RESERVE	ABOVE PLATES	92.08 MM	3.625 INCHES
POSITIVE PLATE DIMENSION			
HEIGHT		431.80 MM	17 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		6.99 MM	0.275 INCHES
NEGATIVE PLATE DIMENSION			
HEIGHT		431.80 MM	17 INCHES
WIDTH		142.88 MM	5.625 INCHES
THICKNESS		4.57 MM	0.18 INCHES
INSULATION		POSITIVE PLATE ENVELOPED PLUS HEAVY GLASS	
TERMINALS		FLAG WITH LEAD NUTS AND BOLTS	

		CAP.	AMPS
CAPACITY AT THE 100 HOUR RATE	1.265 SP. GR.	1900	19
CAPACITY AT THE 72 HOUR RATE	1.265 SP. GR.	1800	25
CAPACITY AT THE 20 HOUR RATE	1.265 SP. GR.	1350	68
CAPACITY AT THE 10 HOUR RATE	1.265 SP. GR.	1161	116
CAPACITY AT THE 8 HOUR RATE	1.265 SP. GR.	1107	138
CAPACITY AT THE 6 HOUR RATE	1.265 SP. GR.	1020	170
CAPACITY AT THE 5 HOUR RATE	1.265 SP. GR.	986	197
CAPACITY AT THE 4 HOUR RATE	1.265 SP. GR.	918	230
CAPACITY AT THE 2 HOUR RATE	1.265 SP. GR.	729	365
CAPACITY AT THE 1 HOUR RATE	1.265 SP. GR.	554	554
CAPACITY AT THE 1/2 HOUR RATE	1.265 SP. GR.	378	756

Surrette Solar

Series 400

Longest Life

Less Maintenance

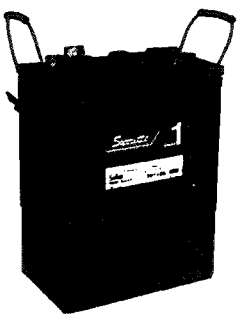
7 Year Warranty

Applications:

- Residential
- Communications
- Remote Monitoring
- Navigation Aids
- Water Pumping
- Utilities
- Refrigeration
- Uninterrupted power

Next-Generation Batteries for Renewable Energy Management

Surrette Battery, based in Springhill, Nova Scotia, has been manufacturing deep cycle batteries of the highest quality for more than 60 years. Our series 400 system of batteries, manufactured specifically for solar and other renewable energy applications, are designed to offer up to 12 years of life.



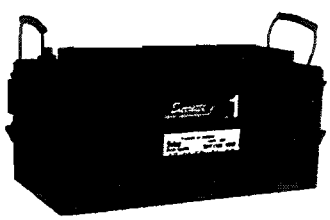
Specs-at-a-Glance:

Voltage: 6, 8 & 12
Plate Alloy: 4% Antimony
Post Type: Flag (Typical)
Charge Voltage (77F): Float 2.2 - 2.23 VPC, Bulk 2.37 - 2.4 VPC
Specific Gravity: 1.265
Electrolyte: Sulfuric Acid

Feature:
Use of thickest plate, highest density active material in plate construction

Benefit:
- Unsurpassed cycling service - 10 year average life

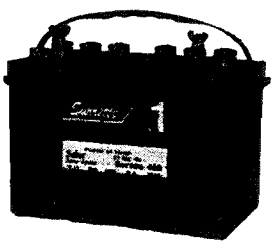
Feature:
Many of our batteries are constructed with structural foam containers



Benefits:
- Less weight
- Greater rigidity
- Greater durability

Feature:
Enveloped Separators

Benefits:
- Ability to remove sediment chamber, eliminating separator misalignment, treeing or shorting.
- Also allows for higher plates to be used in the same sized cell, which yields greater capacity.



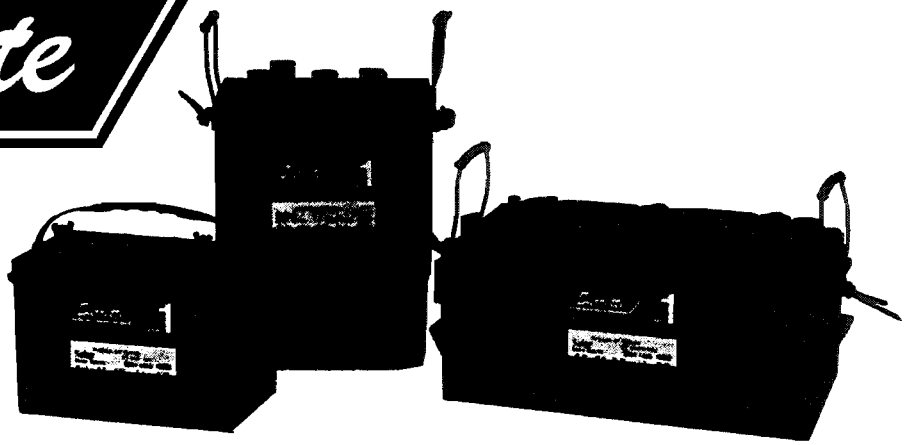
Feature:
Increased Liquid Reserve

Benefit:
- Less maintenance

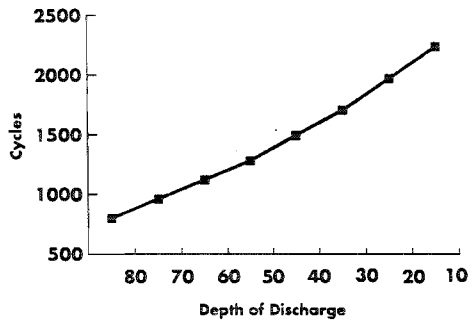
Surrette

Solar

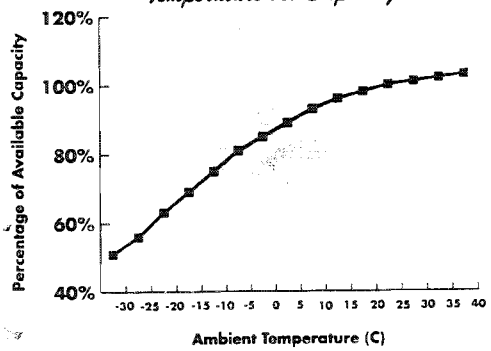
Series 400



Cycle Life - Series 400



Temperature vs. Capacity



Series 400

Model	CAP. 100 Hour 1.75 VPC	CAP. 20 Hour 1.75 VPC	Lt. Inches	Wd. Inches	Ht. Inches	Wt. Wet Lbs.	Wt. Dry Lbs.
6 Volt 3 Cell							
EIGH-225	281	225	10 1/2	7 1/8	11 5/8	74	59
EIGH-262	328	262	12 1/4	7 1/8	11 1/4	90	66
S-460	460	350	12 1/4	7 1/8	16 3/4	117	90
12 Volt 6 Cell							
24 HT 80	100	80	11	6 3/4	9 1/2	50	38
27 HT 90	113	90	12 3/4	6 3/4	9 1/2	62	46
T12 250	250	200	15 3/8	7	14 3/8	140	97
HT 8D	276	221	20 3/4	11	10	164	117
12 HHG 8D	344	275	20 3/4	11	10	180	135

Warranty Information:

The Surrette Warranty - Series 400
Failure within 24 months from date placed in service yields FREE replacement, not including freight charges from factory to destination. After the first 24 months of service, defective batteries will be adjusted for a period of up to 84 months from date first in service at prices in effect at time of adjustment. Certain Restrictions Apply - contact your local representative for more details.

Contact:

Surrette Battery Co. Ltd., 1 Station Rd., P.O. Box 2020, Springhill, NS, Canada, B0M 1X0. Tel: (902) 597-3767 Fax: (902) 597-8447
Or your nearest distributor:

Surrette Solar

Series 500

Up to 20 Year Life Span

Non-breakable

Environmentally Friendly

Applications

Residential

Communications

Remote Monitoring

Navigation Aids

Water Pumping

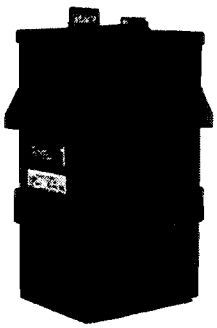
Utilities

Refrigeration

Uninterrupted power

Next-Generation Batteries for Renewable Energy Management

Surrette Battery, based in Springhill, Nova Scotia, has been manufacturing deep cycle batteries of the highest quality for more than 60 years. Our series 500 system of batteries, manufactured specifically for solar and other renewable energy applications, are designed to offer up to 20 years of life thanks in part to their "Non-Breakable" Dual Container (Modular) Construction.



Specs-at-a-Glance:

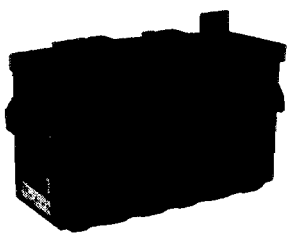
Voltage: various configurations
Plate Alloy: 4% Antimony
Post Type: Flag (Typical)
Charge Voltage (77F): Float 2.2 - 2.23 VPC, Bulk 2.37 - 2.4 VPC
Specific Gravity: 1.265
Electrolyte: Sulfuric Acid

Feature:
Dual Container Modular Construction

Benefits:
- Elimination of stray current
- Environmentally friendly
- No acid leakage
- Easy on-site assembly/disassembly, with no special tools or skills required
- Drastic reduction in connections, which eliminates many points of failure, increasing charging efficiency

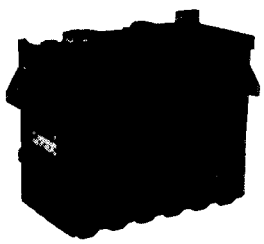
Feature:
Enveloped Separators

Benefits:
- Ability to remove sediment chamber, eliminating separator misalignment, treeing or shorting
- Also allows for higher plates to be used in the same sized cell, which yields greater capacity



Feature:
Coupling our thick plate design with the highest density active material

Benefit:
- Unsurpassed cycling service - 15 year average life



Feature:
Increased Liquid Reserve

Benefit:
- Less maintenance

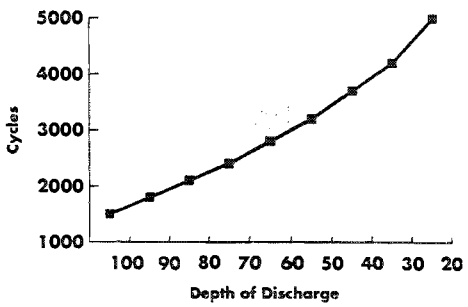
Surrette

Series 500 - Solar

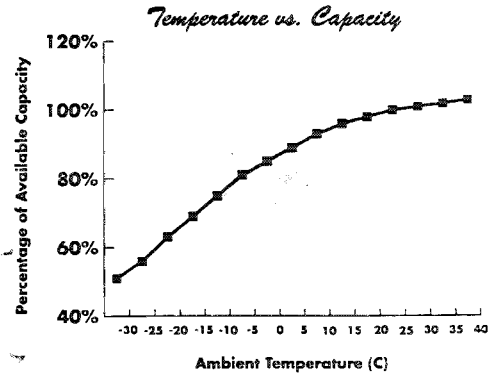
Dual Container Construction

Surrette Series 500 batteries are enhanced by their non-breakable dual container construction. Each cell is assembled in its own inner container - eliminating breakage due to rough handling and abuse, acid leakage, and short circuits due to the accumulation of moisture and dirt and other foreign objects. Cell replacement is clean and quick - allowing the battery to be assembled or repaired on location, without special skills or tools.

Cycle Life - Series 500



Temperature vs. Capacity



Series 500

Model	CAP. 100 Hour 1.75 VPC	CAP. 20 Hour 1.75 VPC	Lt. Inches	Wd. Inches	Ht. Inches	Wt. Wet Lbs.	Wt. Dry Lbs.
4 Volt 2 Cell							
4-CS-17P	770	546	14 3/8	8 1/4	18 1/4	128	98
4-KS-21P	1557	1104	15 3/4	9 3/8	24 3/4	267	186
4-KS-25P	1900	1350	15 3/4	10 5/8	24 3/4	315	220
6 Volt 3 Cell							
6-CS-17PS	770	546	22	8 1/4	18 1/4	221	178
6-CS-21PS	963	683	22	9 3/4	18 1/4	271	217
6-CS-25PS	1156	820	22	11 1/4	18 1/4	318	254
8 Volt 4 Cell							
8-CS-17PS	770	546	28 1/4	8 1/4	18 1/4	294	238
8-CS-25PS	1156	820	28 1/4	11 1/4	18 1/4	424	342
12 Volt 6 Cell							
12-CS-11PS	503	357	22	11 1/4	18 1/4	272	220

Warranty Information:

The Surrette Warranty - Series 500
Failure within 36 months from date placed in service yields FREE replacement, not including freight charges from factory to destination. After the first 36 months of service, defective batteries will be adjusted for a period of up to 120 months from date first in service at prices in effect at time of adjustment. Certain Restrictions Apply - contact your local representative for more details.

Contact:

Surrette Battery Co. Ltd., 1 Station Rd P.O Box 2020, Springhill, NS, Canada, B0M 1X0 Tel: (902) 597-3767 Fax: (902) 597-8447
Or your nearest distributor:

GNB

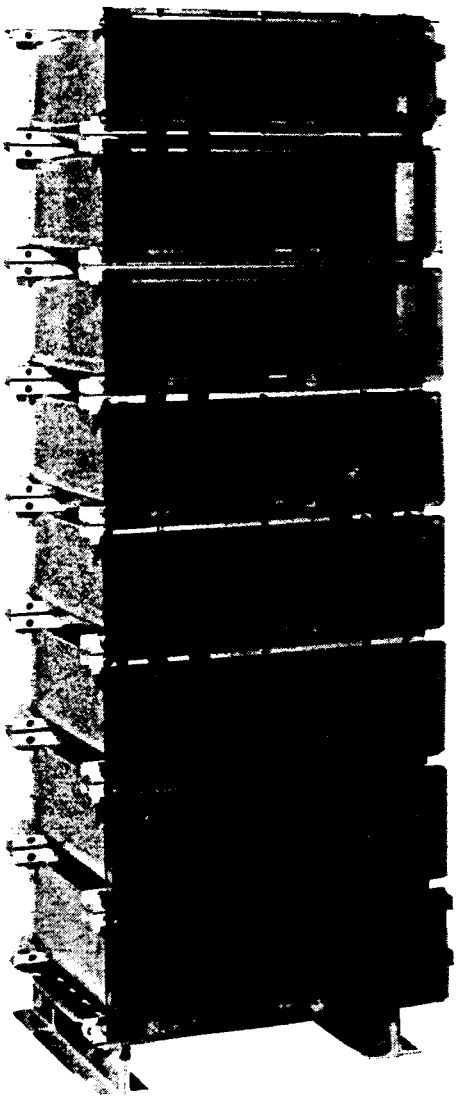
ABSOLYTE® IIP

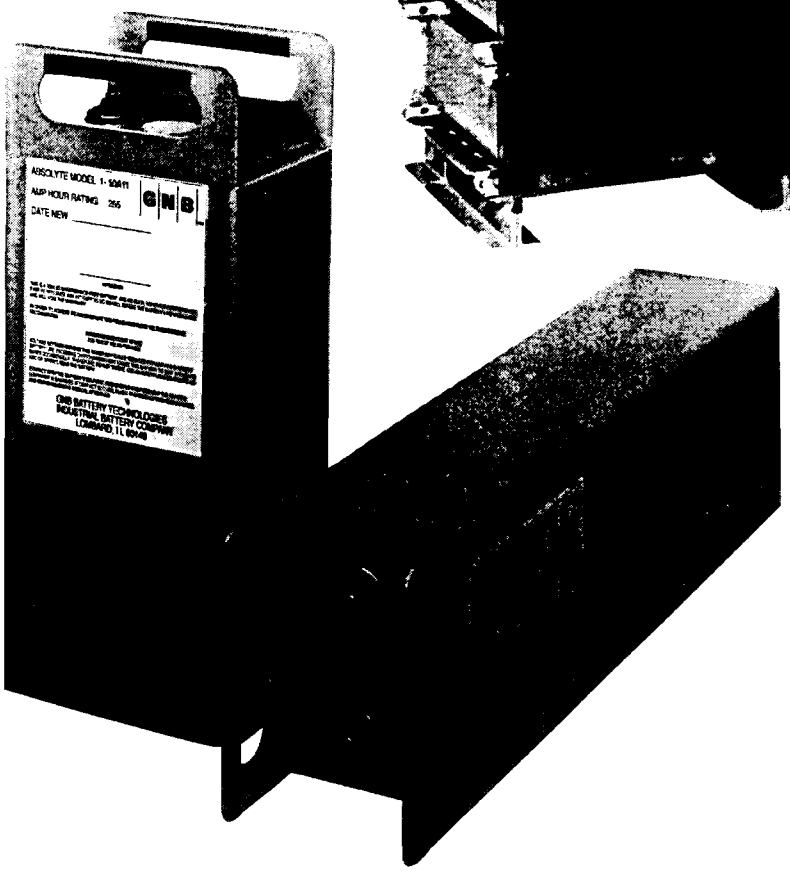
Photovoltaic and Alternative Energy Sealed VRLA Batteries

Section 62.61

SPECIFICATIONS

- 5000 cycles at 20% D.O.D. (1200 cycles at 80% D.O.D.)
- 145-6385AH @ 100 Hour Rate
- Single Cell and stackable modules
- Recyclable to world standards
- UL recognized component





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ABSOLYTE® IIP

Photovoltaic and Alternative Energy Batteries

Absolyte IIP Stackable Module Weights and Dimensions

MODULE TYPE	VOLTS	NOM AH CAP (100 HR)	STACKING DIMENSIONS						UNPACKED WEIGHT		DOMESTIC PACKED WEIGHT		EXPORT PACKED WEIGHT	
			LENGTH		WIDTH		DEPTH OR HEIGHT*							
			IN	MM	IN	MM	IN	MM	LBS	KGS	LBS	KGS	LBS	KGS
50A														
6-50A05	12	145	17.19	437	8.53	217	16.22	412	157	71	176	80	228	104
6-50A07	12	220	21.69	551	8.53	217	16.22	412	209	95	228	104	280	127
6-50A09	12	290	26.19	665	8.53	217	16.22	412	252	114	271	123	323	147
6-50A11	12	365	30.69	780	8.53	217	16.22	412	313	142	332	151	384	174
6-50A13	12	440	35.19	894	8.53	217	16.22	412	356	162	381	173	433	197
6-50A15	12	510	39.69	1008	8.59	218	16.22	412	417	189	442	201	494	224
90A														
6-90A05	12	245	17.19	437	8.53	217	23.56	599	235	107	254	115	322	146
6-90A07	12	365	21.69	551	8.53	217	23.56	599	316	143	335	152	413	187
6-90A09	12	490	26.19	665	8.53	217	23.56	599	396	180	415	188	493	224
6-90A11	12	610	30.69	780	8.53	217	23.56	599	477	216	502	228	581	264
6-90A13	12	730	35.19	894	8.53	217	23.56	599	557	253	582	264	661	300
6-90A15	12	855	39.69	1008	8.59	218	23.56	599	637	289	668	303	747	339
3-90A17	6	975	24.50	622	8.59	218	23.56	599	376	171	395	179	474	215
3-90A19	6	1100	26.75	679	8.59	218	23.56	599	416	189	435	197	514	233
3-90A21	6	1220	29.00	737	8.59	218	23.56	599	456	207	478	217	557	253
3-90A23	6	1340	31.25	794	8.59	218	23.56	599	497	226	522	237	601	273
3-90A25	6	1465	33.50	851	8.59	218	23.56	599	538	244	564	256	642	291
3-90A27	6	1585	35.75	908	8.59	218	23.56	599	578	262	606	275	685	311
100A														
3-100A13	6	800	19.93	506	8.53	217	26.38	670	328	149	356	162	436	198
3-100A15	6	930	22.18	563	8.59	218	26.38	670	374	170	408	185	489	222
3-100A17	6	1065	24.50	622	8.59	218	26.38	670	424	192	446	202	528	240
3-100A19	6	1200	26.75	679	8.59	218	26.38	670	470	213	491	223	574	260
3-100A21	6	1330	29.00	737	8.59	218	26.38	670	515	234	539	245	623	283
3-100A23	6	1460	31.25	794	8.59	218	26.38	670	561	255	589	267	674	306
3-100A25	6	1595	33.50	851	8.59	218	26.38	670	608	276	637	289	723	328
3-100A27	6	1730	35.75	908	8.59	218	26.38	670	653	296	684	310	772	350
3-100A29	6	1860	38.00	965	8.59	218	26.38	670	704	319	736	334	824	374
3-100A31	6	1995	40.25	1022	8.59	218	26.38	670	750	340	783	355	873	396
3-100A33	6	2130	42.50	1080	8.59	218	26.38	670	795	361	829	376	920	417
1-100A39	2	2400	19.93	506	8.53	217	26.38	670	328	149	356	162	436	198
1-100A45	2	2795	22.18	563	8.59	218	26.38	670	374	170	408	185	489	222
1-100A51	2	3190	24.50	622	8.59	218	26.38	670	424	192	446	202	528	240
1-100A57	2	3590	26.75	679	8.59	218	26.38	670	470	213	491	223	574	260
1-100A63	2	3990	29.00	737	8.59	218	26.38	670	515	234	539	245	623	283
1-100A69	2	4390	31.25	794	8.59	218	26.38	670	561	255	589	267	674	306
1-100A75	2	4790	33.50	851	8.59	218	26.38	670	608	276	637	289	723	328
1-100A81	2	5185	35.75	908	8.59	218	26.38	670	653	296	684	310	772	350
1-100A87	2	5585	38.00	965	8.59	218	26.38	670	704	319	736	334	824	374
1-100A93	2	5985	40.25	1022	8.59	218	26.38	670	750	340	783	355	873	396
1-100A99	2	6385	42.50	1080	8.59	218	26.38	670	795	361	829	376	920	417

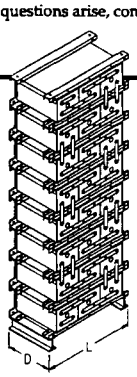
*Includes 77mm (3") additional for Module Cover Assembly

NOTE: Design and / or specification subject to change without notice. If questions arise, contact your local GNB sales representative for clarification

ASSEMBLY CONFIGURATIONS

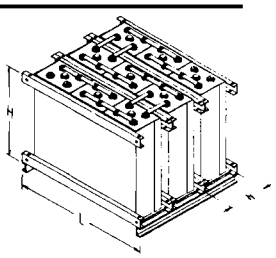
Horizontal Stack Assembly (Preferred)

Depth is overall, including module cover assembly. Add 102mm (4") for bottom I-beam supports to determine total height (width) of assembled horizontal stack.



Vertical Assembly, Side-by-side

Height is overall, including module cover assembly. Add 51mm (2") for bottom channel support to determine final height.



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ABSOLYTE® IIP

Photovoltaic and Alternative Energy Batteries

Absolyte IIP Performance Characteristics
Amperes to 1.75 Volts Per Cell @ 25°C (77°F)

CELL TYPE	HOURS									
	120	100	72	48	36	24	20	12	10	8
50A										
50A05	1.2	1.4	1.9	2.8	3.6	5.1	6.0	9.3	11	13
50A07	1.8	2.1	2.9	4.2	5.5	7.7	9.1	14	16	19
50A09	2.4	2.9	3.9	5.6	7.3	10	12	18	22	26
50A11	3.0	3.6	4.9	7.1	9.1	13	15	23	27	33
50A13	3.7	4.3	5.9	8.5	11	15	18	28	33	39
50A15	4.3	5.1	6.9	9.9	12	18	21	32	38	46
50A17	4.8	5.9	7.9	11	15	21	24	37	44	53
50A19	5.4	6.6	8.9	13	16	23	27	42	49	59
50A21	6.0	7.4	9.9	14	18	26	31	47	55	66
50A23	6.6	8.1	11	16	20	29	34	51	60	73
50A25	7.2	8.8	12	17	22	31	37	56	65	79
50A27	7.8	9.6	13	19	24	34	40	61	71	86
90A										
90A05	2.0	2.4	3.2	4.7	6.0	8.6	10	15	18	21
90A07	3.0	3.6	4.9	7.0	9.1	12	15	23	27	32
90A09	4.0	4.8	6.5	9.4	12	17	20	31	36	43
90A11	5.0	6.0	8.1	11	15	21	25	39	46	54
90A13	6.1	7.2	9.8	14	18	25	30	47	55	65
90A15	7.1	8.4	11	16	21	30	35	55	64	76
90A17	8.1	9.6	13	18	24	34	40	63	73	87
90A19	9.1	10	14	21	27	38	45	71	82	98
90A21	10	12	16	23	30	43	50	79	92	109
90A23	11	13	18	26	33	47	55	87	101	120
90A25	12	14	19	28	36	51	60	95	110	131
90A27	13	15	21	30	39	56	65	103	119	142
100A										
100A13	6.7	7.9	10	15	20	29	34	54	62	75
100A15	7.8	9.2	12	18	23	33	40	63	73	87
100A17	8.9	10	14	20	26	38	45	72	83	100
100A19	10	11	16	23	30	43	51	81	94	112
100A21	11	13	17	25	33	48	57	90	104	125
100A23	12	14	19	28	36	53	63	99	115	137
100A25	13	15	21	31	40	58	68	108	125	150
100A27	14	17	23	33	43	62	74	117	135	162
100A29	15	18	25	36	46	67	80	127	146	175
100A31	16	19	26	38	50	72	85	136	156	187
100A33	17	21	28	41	53	77	91	145	167	200
100A39	20	23	30	45	60	87	102	162	186	225
100A45	23	27	36	54	69	99	120	189	219	261
100A51	26	30	42	60	78	114	135	216	249	300
100A57	30	33	48	69	90	129	153	243	282	336
100A63	33	39	51	75	99	144	171	270	312	375
100A69	36	42	57	84	108	159	189	297	345	411
100A75	39	45	63	93	120	174	204	324	375	450
100A81	42	51	69	99	129	186	222	351	405	486
100A87	45	54	75	108	138	201	240	381	438	525
100A93	48	57	78	114	150	216	255	408	468	561
100A99	51	63	84	123	159	231	273	435	501	600

For Additional Ratings, refer to section 26.10B

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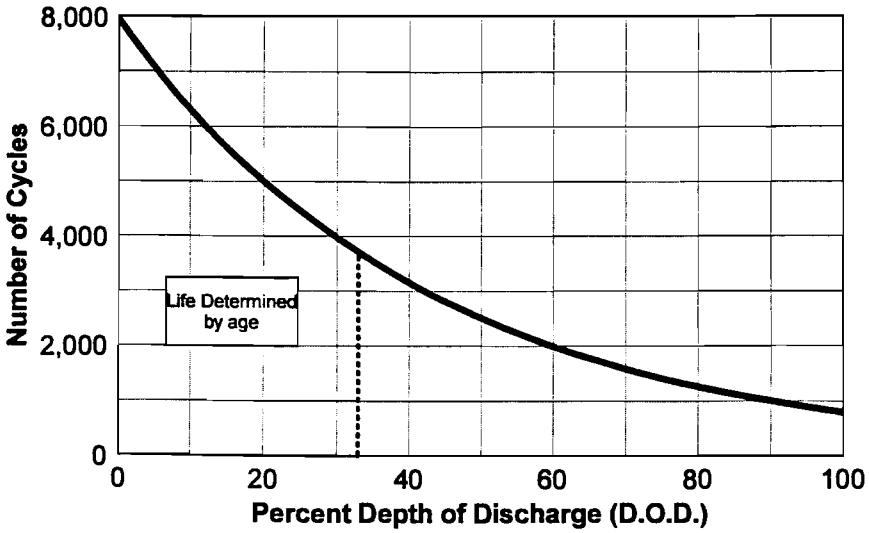
ABSOLYTE® IIP

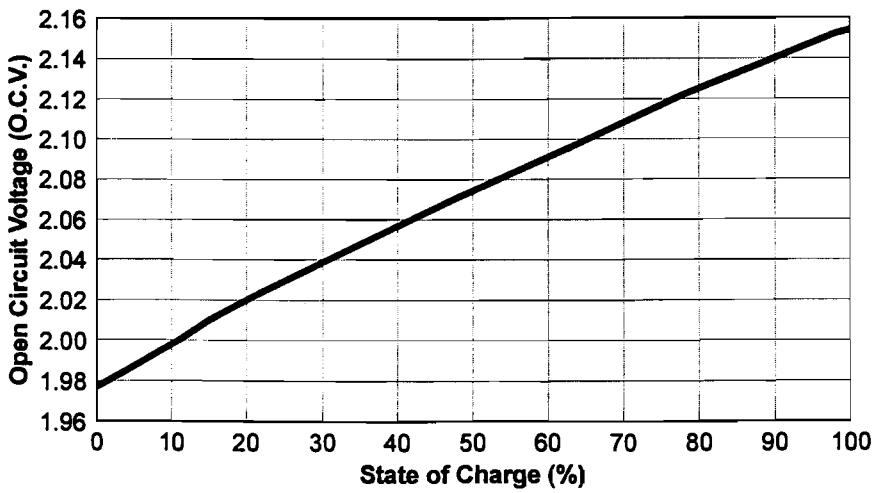
Photovoltaic and Alternative Energy Batteries

Absolyte IIP Performance Characteristics

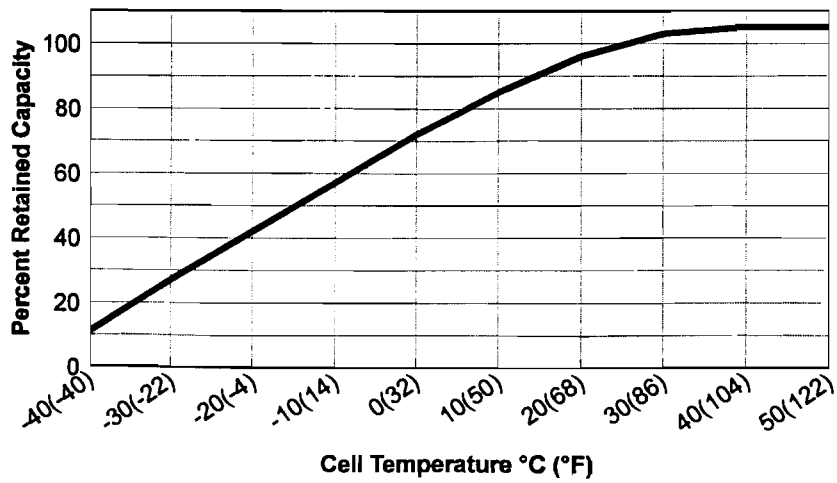
Cycle Life vs. Depth of Discharge [at 25°C (77°F)]



Open Circuit Voltage vs. State of Charge [at 25°C (77°F)]



Capacity Retention vs. Temperature



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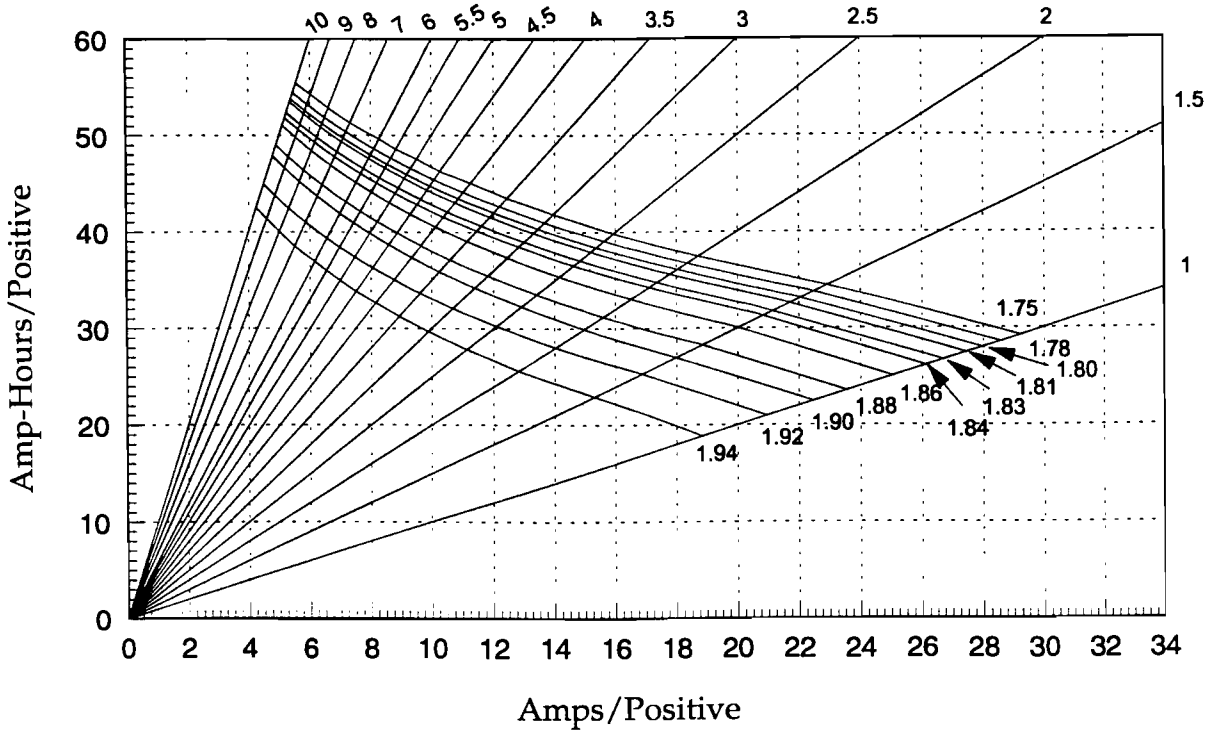
ABSOLYTE® IIP

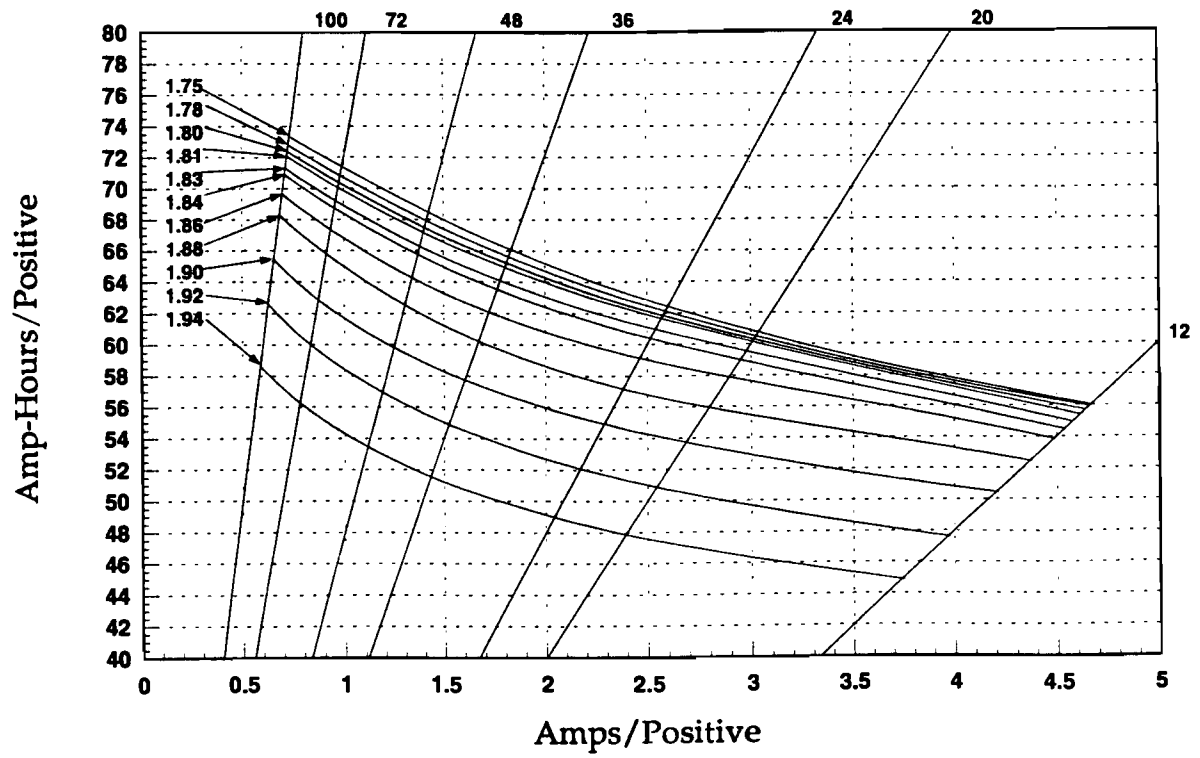
Photovoltaic and Alternative Energy Batteries

Absolyte IIP Performance Curves @ 25°C (77°F)

50A Series 1 to 10 Hours



50A Series 12 to 100 Hours



GNB

SUNLYTE

Photovoltaic and Alternative Energy VRLA Batteries

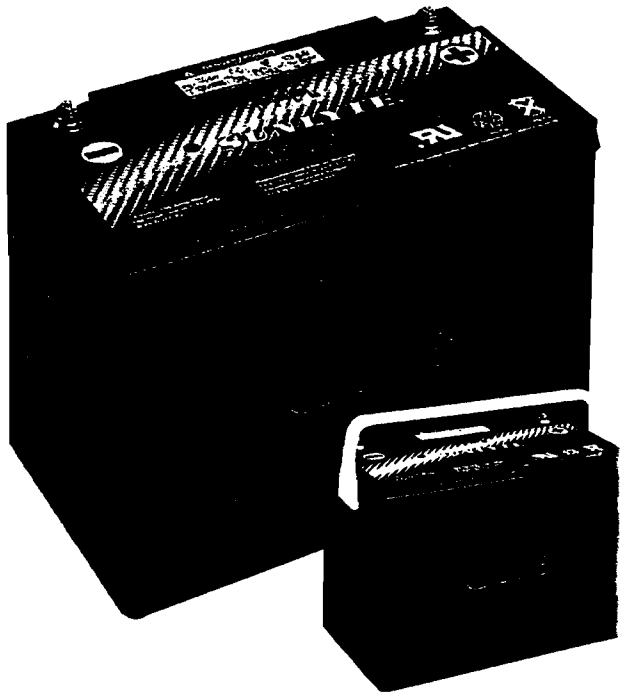
Section 62.26

SPECIFICATIONS

12-5000X

6 Cell, 12 Volt Valve-Regulated Lead-Acid Battery

100 Ah at 100 Hour Rate



INNOVATIVE FEATURES

Valve-Regulated Lead-Acid Design

- Never requires watering
- Spillproof and leak proof
- Explosion resistant
- Horizontal or vertical operation
- No gases escape under normal charging
- Operates at low internal pressure
- Increased operating safety

Immobilized Electrolyte

- Extended partial state of charge operation (at reduced capacities)
- Freezing tolerant
- Minimized need for equalization

Proprietary MFX Alloy

- Deep cycle capability
- Long life
- Low self-discharge rate

SPECIFICATIONS

Container and Cover - Reinforced polypropylene
Separators - Spun glass, microporous matrix
Safety Vent - 5 PSI nominal, self resealing
Self-Discharge - 0.5-1.0% per week
Terminals - Heavy duty copper alloy

Charge Voltage - 2.25-2.35 VPC @ 25°C (77
(30 amp max. current)
Positive Plate — Patented MFX alloy
Negative Plate — Lead calcium
Estimated Cycle Life —
{8 hour rate to 1.75 VPC @ 25°C (77°F
300 cycles @ 80% DOD
600 cycles @ 50% DOD
1,000 cycles @ 20% DOD

PHYSICAL CHARACTERISTICS

	Nominal Dimensions						Weight	
	Length		Width		Height		Net Each	
Type	In	mm	In	mm	In	mm	Lbs	Kgs
12-5000X	12.05	307	6.85	175	8.80	224	67	30.5

GNB SUNLYTE

Photovoltaic and Alternative Energy VRLA Batteries

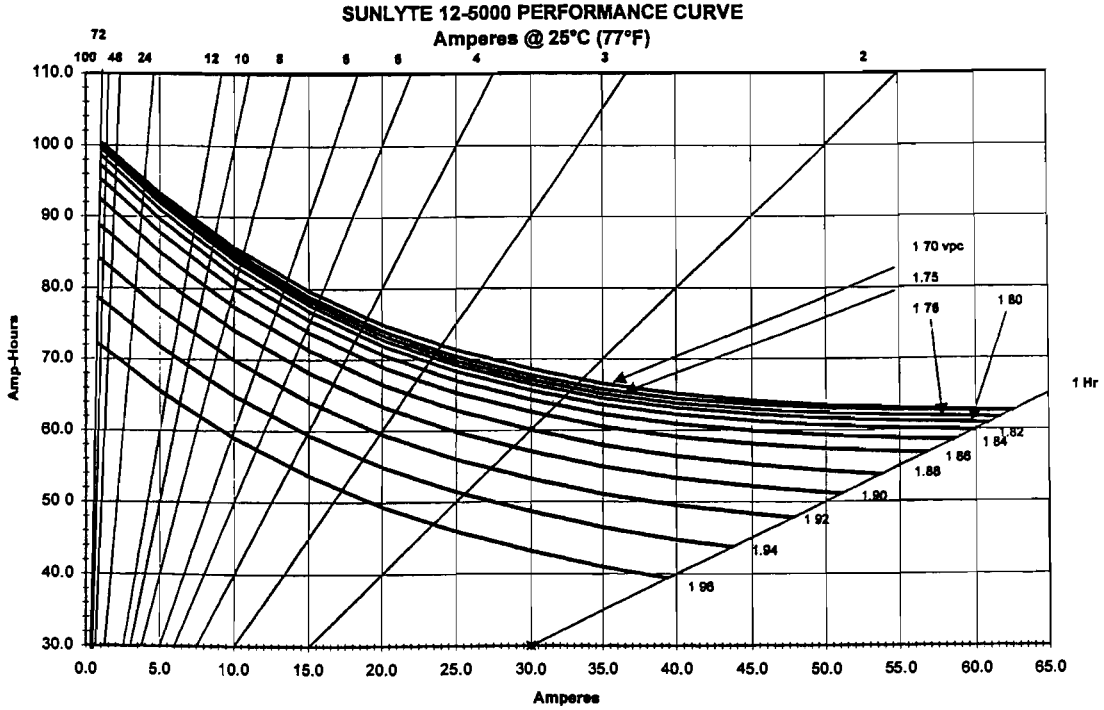
SUNlyte® 12-5000X Perfromance Specifications

Amperes @ 25°C (77°F)

End Voltage	Hours												
	100	72	48	24	12	10	8	6	5	4	3	2	1
1.70 Final Volts per Cell	1.0	1.4	2.1	4.0	7.5	8.7	10.6	13.6	15.8	19.0	24.0	33.6	62.6
1.75 Final Volts per Cell	1.0	1.4	2.0	4.0	7.4	8.7	10.5	13.5	15.7	18.8	23.8	33.2	62.5
1.78 Final Volts per Cell	1.0	1.4	2.0	4.0	7.4	8.7	10.5	13.4	15.6	18.7	23.6	33.0	61.6
1.80 Final Volts per Cell	1.0	1.4	2.0	4.0	7.3	8.6	10.4	13.3	15.5	18.6	23.4	32.7	60.8
1.82 Final Volts per Cell	1.0	1.4	2.0	3.9	7.3	8.5	10.3	13.2	15.3	18.4	23.2	32.3	59.9
1.84 Final Volts per Cell	1.0	1.3	2.0	3.9	7.2	8.4	10.2	13.0	15.1	18.1	22.9	31.8	58.5
1.86 Final Volts per Cell	1.0	1.3	1.9	3.8	7.1	8.3	10.0	12.8	14.8	17.8	22.4	31.1	56.7
1.88 Final Volts per Cell	0.9	1.3	1.9	3.7	6.9	8.0	9.7	12.4	14.4	17.3	21.8	30.0	53.7
1.90 Final Volts per Cell	0.9	1.2	1.8	3.6	6.6	7.7	9.4	12.0	13.9	16.7	20.9	28.8	51.0
1.92 Final Volts per Cell	0.8	1.2	1.7	3.4	6.3	7.4	8.9	11.4	13.2	15.9	19.9	27.3	47.7
1.94 Final Volts per Cell	0.8	1.1	1.6	3.2	5.9	6.9	8.4	10.7	12.4	14.9	18.7	25.6	43.6
1.96 Final Volts per Cell	0.7	1.0	1.5	2.9	5.4	6.4	7.7	9.9	11.5	13.8	17.3	23.5	39.4

SUNLYTE 12-5000 PERFORMANCE CURVE

Amperes @ 25°C (77°F)



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GNB TECHNOLOGIES

APPENDIX B

DETAILED TECHNICAL INFORMATION
Inverters
(Grid Tied)

Sun Tie (ST)

SOLAR ELECTRIC INVERTER

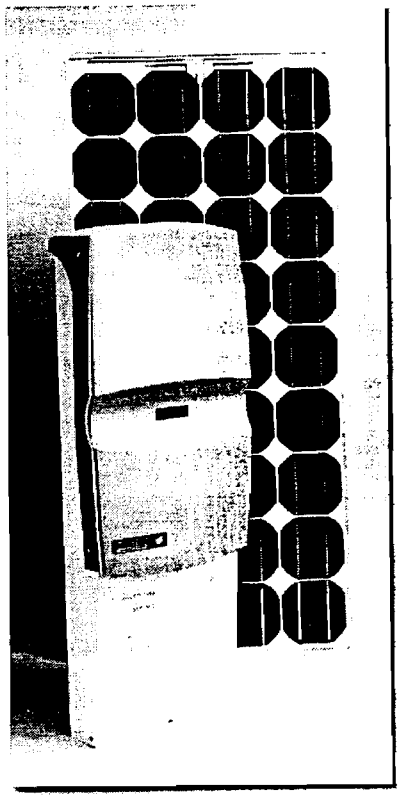
Connecting The Sun To Your Utility Meter

Trace Engineering's new Sun Tie (ST) solar electric inverters are designed, built and priced to make the benefits of site-generated PV power easy for anyone to attain. The Sun Tie operates interactively with the utility, without the use of batteries. Made specifically for new, small-scale, independent power producers, the ST is a perfect choice for anyone interested in participating in the emerging Green Power market. The ST is available in four models with output capacity of 1.0, 1.5, 2.0 and 2.5 kVA.

Distributed generation, using the power of the sun, is a win - win choice for the environment, utility companies and consumers alike. With this form of electrical distribution, solar PV power is generated and inverted at the location where it's used. Solar electricity helps reduce the need for new large-scale—and often environmentally harmful—generating stations and distribution lines.

Consumers can have lower electricity bills because any PV power they generate is either used in their home or business or, when there is excess, sold to the utility company. "Net Metering" is one way electricity is exchanged between the power grid and solar generators. Net Metering programs are available from many utility companies, contact your local electricity provider for details.

Utilities benefit from increased solar generation by gaining the ability to resell the PV power they purchase to environmentally conscious customers at premium Green Power rates. Consumer generated, solar electricity can also help utility companies meet their growth requirements at lower capital costs.



ST Series Inverter*

Introducing the Sun Tie

All-in-One Design

All NEC (U.S. National Electrical Code) required DC input and AC output connections, disconnects and circuit breakers are housed within the Sun Tie's compact case. A built in LCD panel provides easy-to-read system status and daily cumulative power production information.

Works With Any Type of PV Technology

The ST is designed to optimize the output from all types of solar electric technologies. The open circuit voltage window of the Sun Tie ranges up to 125 VDC so both conventional Crystalline and newer Thin Film PV modules can be used.

Maximum Power Point Tracking

The Sun Tie uses sophisticated software to track and adjust the output of the PV array. Our Maximum Power Point Tracking (MPPT) software, which samples once a minute, ensures complete harvest of the sun's energy all day long.

Expandable

Multiple ST inverters can be connected to a utility grid so that additional generating capacity may be added in a fully modular manner.

High Efficiency, Long Life Design

The high frequency, solid state design of the ST inverter is extremely efficient. The inverter efficiency is over 90%, with peak efficiencies of 94%. Built and designed in the U.S.A. by Trace Engineering, makers of the worlds most reliable inverters, the Sun Tie is sure to provide many years of trouble free service and carries a two year warranty.

* The Sun Tie is shown with optional protective rain shield which is required for outdoor installation of the inverter.

Standard Features:

Sun Tie—Utility interactive inverter, 240 VAC 60 Hz output. Includes factory installed DC and AC input/output breakers, combination DC and AC lightning arrestor.

Options:

STRS—Protective rain shield, required for out door installation of ST Series inverters

Certifications:

UL Listed—The Sun Tie is UL Listed to UL 1741 and cUL Listed to CSA 22.2. The ST is designed to comply with IEEE 929.

Note:

ST1000 and **ST2000** models do not include PV ground fault interrupters and PV combiner boards. Trace offers a PV ground fault interrupter (**PVGFP**) which requires an enclosure (not included) and a UL Listed 10 circuit combiner box (**TCB10**). Both of these items can be ordered separately.

P/N 974-0100-01-01 Rev A 05/00

5916 195th N E Arlington, WA 98223 USA www.traceengineering.com Phone 360 435 8826 Fax 360 435 2229

Sun Tie

Utility Interactive Solar Electric Inverter

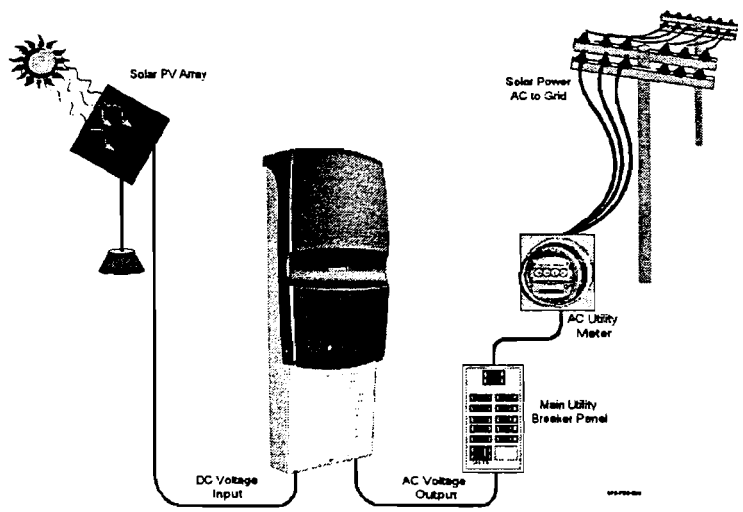
LISTED UL1741

Model	ST1000	ST1500	ST2000	ST2500
AC Voltage – Nominal	240 VAC			
DC Input Voltage Range– Nominal	52 - 85 VDC			
Minimum Perational DC Input	42 VDC			
Minimum Wake-up DC Input Voltage	70 VDC			
AC Voltage - Min/Max	211-254 VAC (North American models)			
Maximum Power Point Tracking	52 – 85 VDC (For full rated AC output power)			
Absolute Maximum PV Open Circuit Voltage	125 VDC			
AC Output Characteristics	Current source			
Frequency - Nominal	60 Hz			
Frequency Window - Min/Max	59.5 - 60.5 Hz Default			
Continuous AC Output @ 25 °C	1.0 kVA	1.5 kVA	2.0 kVA	2.5 kVA
Efficiency - Peak	92%		94%	
AC Output Waveform	Sine wave, high frequency PWM controlled			
Total Harmonic Distortion	Less than 5% at rated power per IEEE 929 and UL 1741			
AC Disconnect	Double pole 15 Amp 240 VAC rated circuit breaker			
DC Disconnect	Single pole 100 Amp DC rated circuit breaker			
Specified Temperature Range	32 °F – 113 °F (0 °C – 45 °C)			
Islanding Protection	Over/under AC Voltage and frequency detection plus active islanding detection – Meets IEEE 929 and UL 1741 requirements.			
User Display	Backlit alphanumeric LCD displays –AC RMS voltage, AC frequency, DC volts, output power (watts) and cumulative daily power production (watt/hours).			
Enclosure Type	Powder coated aluminum enclosure, fully screened			
Dimensions - Inverter Only	13.25" W x 33.25" H x 5.3" D (33.8 cm W x 83.1 cm H x 13.25 cm D)			
Weight – Inverter Only	35 lbs. (16 kg)			
Dimensions – Shipping	15.75" W x 37.75" H x 9.5" D (39.4 cm W x 94.4 cm x 23.8 cm D)			
Weight – Shipping	40 lbs. (18 kg)			
Mounting	Vertical wall mount only			
Certifications	UL Listed to UL 1741 and CSA 22.2 #107.1-95			

Specifications subject to change without notice

Standard Features and Options				
Model	**ST1000**	**ST1500**	**ST2000**	**ST2500**
PV Ground Fault Protection System	—	Standard	—	Standard
PV combiner board with 6 fused inputs 20 Amp max per input	—	Standard	—	Standard
Surge arrestor – Combined AC/DC protection	Standard	Standard	Standard	Standard
Rain Shield (**STRS**) – Protective rain shield Required for outdoor installation	Optional	Optional	Optional	Optional

Available From:



The Sun Tie connects all the elements of a utilit interactive solar electric system together.

Model MicroSine

UTILITY INTERACTIVE INVERTER

A Modular Way to Connect Solar Electric Panels to a Utility Grid

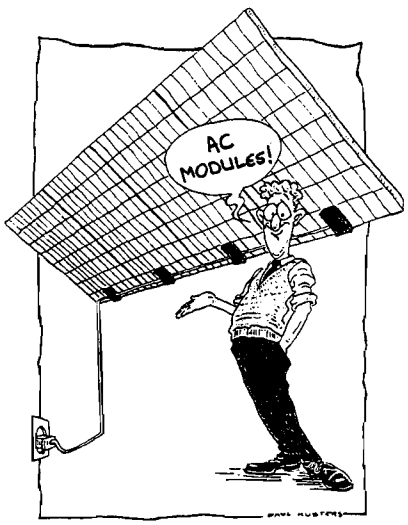
Trace Engineering is leading the way once again with our new miniature utility interactive inverter- the AC PV module. Designed to fit on the back of an individual 24 volt PV solar module (or 2 12 volt modules wired in series), this totally weather proof inverter produces utility grade power suitable for supply to a power distribution grid. With a single 24 volt solar PV module you can begin to reduce your electricity bill and dependence on the utility grid. As finances allow additional AC modules may be added, increasing the power output of your personal utility company.

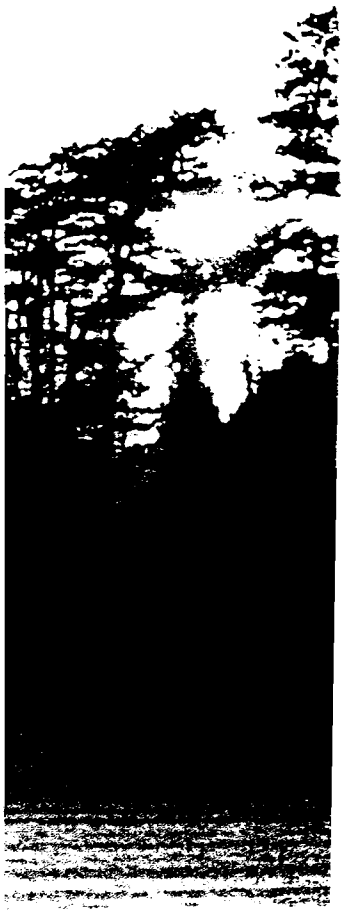
These units are designed to "sell back" power only. They will not operate as back up power supplies or with batteries.. Check with your Trace dealer and local utility before connecting to the grid.

An advanced original and revolutionary design: the smallest utility interactive inverter in the world!

Benefits of AC PV modules

- *each inverter works independently - if one fails, the other AC PV modules will keep on providing power into the utility grid*
- *high modularity allows easy system expansion, start with one module and easily add more to the system as money and time allow*
- *low minimum system size, one solar panel coupled with one AC PV module is all that is needed*
- *use of standard AC installation methods and components*
- *reduced losses in wiring, no DC wire runs*
- *maximises system performance since each PV module operates at its peak power point (peak power point tracking)*
- *no need for power robbing string or bypass diodes*
- *less potential for lightning damage because of reduced DC wiring*
- *weather proof, encapsulated construction protects electronics*
- *no special mounting enclosure required; compact dimensions - 5.4" x 4.2" x 1.2" (136 x 108 x 30mm), designed to attach to the back of a PV module*
- *compatible with most solar modules*
- *reduced electrical bills*





THE POWER COMPA

TRACE ENGINEERIN

Model MicroSine

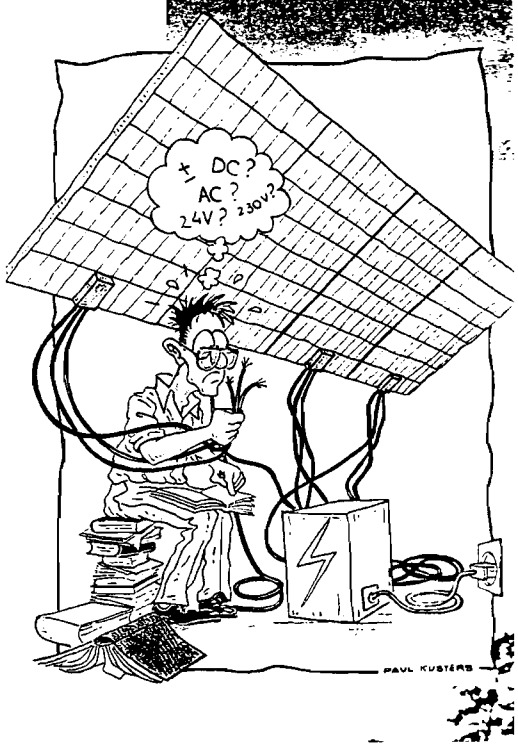
SPECIFICATIONS

Model	Voltage Range	Frequency Range
MS100	108 - 132 Vac	59 - 61 Hz
MS100U	216 - 262 Vac	59 - 61 Hz
MS100E	216 - 262 Vac	49 - 51 Hz
input power	0.4 Watts to 110 Watts	

Input voltage window	24 to 50 VDC
Maximum open circuit voltage	50 VDC
Minimum DC voltage for full rated output power	29 VDC
Starting power	0.4 Watts
Operating temperature	-4°F to 176°F (-20°C to +80 °C)
Efficiency	89% average, 92.5% maximum
*Frequency range	adjustable: 59 - 61 Hz
Distortion (THD)	less than 5% above 25 watts less than 3% at full power
Size (encapsulated)	5.4" x 4.2" x 1.2" (108 x 108 x 30 mm)

*UL/ETL, NEC and utility requirements are pending at this time.

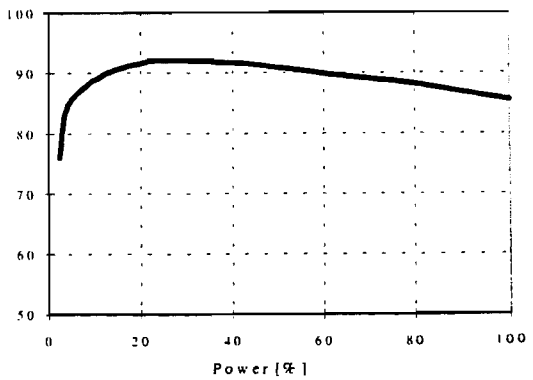
*The optional OKE485 interface and software is required to change the voltage and frequency window and access the built-in metering system PV Module not included. Specifications subject to change without notice



Features of the MicroSine AC PV module inverter

- high efficiency - comparable to traditional utility interactive inverters (89% average, 92.5% peak)
- very good power quality - meets European and IEEE standards
- good performance on electromagnetic compatibility, meeting the EMC standards VDE0871, both classes A and B
- very low stand-by power of 0.003 Watts
- built-in islanding protection - frequency and voltage are monitored continuously, as well as the waveform's zero crossing
- extremely low light operation - when connected to a 100 Watt PV module, power will be produced with as little as 15 Watts per square meter of solar irradiation
- built-in computer interface allows monitoring of each AC PV module system - total kilowatt-hours delivered, internal inverter temperature, AC output current, utility grid AC voltage and DC voltage of the PV module is available via an RS485 port
- field adjustable voltage and frequency limits (When using the optional OKE485 interface and software)
- engineered and tested for an expected operating life of over 20 years

Efficiency



Options:

- MSCA - Communications Adapter connects up to 127 MicroSine inverters to a PC type computer serial port. Includes RS485-232 adapter and DOS based software (twisted pair, two wire cable not included).

trace ENGINEERING

Available From:

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USA

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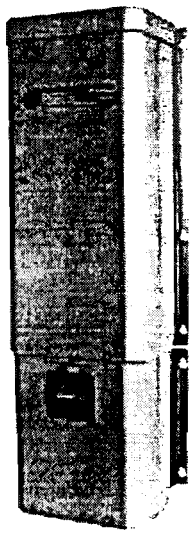
info@advancedenergy.com

Web:
www.advancedenergy.com

Advanced Energy is the recognized leader in the innovative design and manufacture of utility-interactive inverters.

Grid-Connected Photovoltaic Inverter
GC-1000 Model Series

Description



The GC-1000 is a 1KW DC-to-AC grid-tied inverter designed for residential and commercial on-site power generation systems. Manufactured for both indoor and outdoor use, this complete inverter package meets all code requirements and provides maximum efficiency, reliability, and ease of installation. The inverter can be purchased as a single unit or as part of a packaged system which includes a string combiner, GFI protection, and DC and AC disconnects. An optional interactive data monitor is also available.

Standard Features

- 1000 Watt, single-phase AC output at 25 °C
- 93% peak efficiency with DC input range of 52 to 92 Volts*
- Maximum Power Point Tracking over 55 to 70 VDC input range
- No-load power consumption of only 2.4 Watts
- Nighttime losses eliminated by using control power from PV array
- Meets UL 1741 and IEEE 929 requirements including anti-islanding and under/over frequency and voltage shift detection
- Automatically limits array current at high temperatures
- UL Listed, NEC Article 690-compliant
- Standard outdoor-rated enclosure
- Innovative thermal design requires no fans and maximizes efficiency
- Removable casing allows for easy installation
- Rugged, industrial-rated components with low inverter parts count
- Standard five-year warranty
- Certified by the California Energy Commission

Optional Code-Compliant Package System

String Combiner

- Detachable outdoor-rated combiner housing allows for wiring flexibility and alternate DC disconnect location
- Fused 10 Amp, six input combiner accepts up to #8 AWG wire from each string
- Six string combiner inputs allow for a wide range of PV module configurations/power

GFI, DC/AC Disconnects, and Surge Protection

- Tandem DC/GFI Disconnect disables the array under system ground fault conditions (meets requirements of NEC Article 690-5 for residential rooftop installations)
- Optional AC Disconnect provides means for local inverter output disconnect
- Weatherproof disconnect boot allows easy access for fault isolation and servicing
- AC silicon oxide surge protector required for warranty coverage

Specifications

DC Input

Input Range*	48 V/60 V MPP nominal; 100 V max.
Operating Input Range	52 to 92 VDC standard; 44 to 75 VDC low voltage version
Utility Feedback Current	15 A max.
Array Short-Circuit Current	25 A max. total

AC Output

Output Voltage†	120 V nominal; 106 to 127 VAC operating
Output Frequency†	60 Hz nominal; 59.5 to 60.5 Hz operating
Output Current	8.0 A max.; < 5% THD

Performance

Temp. Range	-40 to +60 °C
Efficiency	93% max.
Tare Losses	2.4 Watts

Mechanical

Weight	43 lbs. net, 45 lbs. ship
Dimensions	19"x8"x6.5" inverter alone
	28.5"x8"x6.5" with string combiner
Enclosure	Outdoor rated

*Low input voltage (36 V nominal) version available. †220/240 V, 50 Hz versions also available

TRACE Backup Electric System Packages

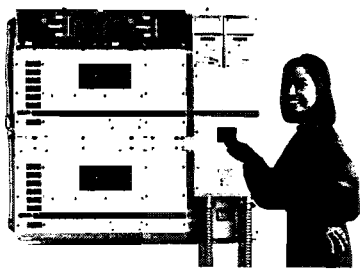
SW SERIES BACKUP ELECTRIC SYSTEMS

LOWER-COST BACKUP ELECTRIC SYSTEMS

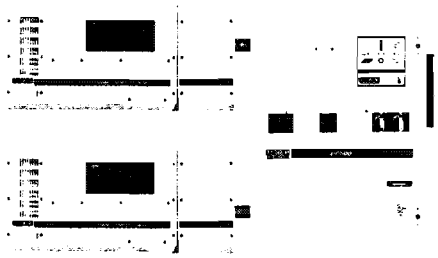
Backup Electric System	2,000SW	3,500SW	5,000SW	7,000SW	10,000SW	400TS	1,000DR	2,000DR	3,000DR
Trace Inverter Model	SW2512/S	SW4048/S	SW5548/S	SW4048/D	SW5548/D	TS512SB	DR1524	DR2424	DR3624
AC Output Voltage	120 VAC	120 VAC	120 VAC	120/240 VAC	120/240 VAC	120 VAC	120 VAC	120 VAC	120 VAC
System Rating	**2,000 watts**	**3,500 watts**	**5,000 watts**	**7,000 watts**	**10,000 watts**	**400 watts**	**1,000 watts**	**2,000 watts**	**3,000 watts**
Continuous Power	2,500 VA	4,000 VA	5,500 VA	8,000 VA	11,000 VA	500 VA	1,500 VA	2,500 VA	3,600 VA
Maximum Power	7,200 watts	9,400 watts	9,400 watts	18,700 watts	18,700 watts	1,900 watts	4,800 watts	8,600 watts	12,000 watts
Nominal Input Voltage	12 VDC	48 VDC	48 VDC	48 VDC	48 VDC	12 VDC	24 VDC	24 VDC	24 VDC
Max. Charging Current	150 amps	80 amps	75 amps	120 amps	150 amps	15 amps	35 amps	70 amps	70 amps
Max. Charging Power	1,800 watts	2,800 watts	3,600 watts	5,760 watts	7,200 watts	180 watts	840 watts	1,680 watts	1,680 watts
Number of AC Inputs			2			1		1	
Transfer Relay Rating			60 amps			15 amps		30 amps	
Transfer Time (typical)			16 ms			16 ms		16 ms	
Transfer Time (max.)			34 ms			34 ms		34 ms	
AC Output Waveform			sinewave			modified sw		modified sinewave	
Voltage Regulation			+/- 2%			+/- 10%		+/- 5%	
Frequency Regulation			+/- 0.04%			+/- 0.04%		+/- 0.04%	
Automatic Transfer	✔	✔	✔	✔	✔	✔	✔	✔	✔
3-Stage Battery Charger	✔	✔	✔	✔	✔	✔	✔	✔	✔
Generator Starting	✔	✔	✔	✔	✔				
Generator Support	✔	✔	✔	✔	✔				
Utility Sell Back	✔	✔	✔	✔	✔				
PLC Compatible*	✔	✔	✔						
Battery Bank Sizing									
Minimum Size †									
2 hours at 1/2 rated power	2 KWh	3.5 KWh	5 KWh	7 KWh	10 KWh	400 Wh	1 KWh	2 KWh	3 KWh
Standard Size †									
8 hours at 1/2 rated power	8 KWh	14 KWh	20 KWh	28 KWh	40 KWh	1.6 KWh	4 KWh	8 KWh	12 KWh
Generator Guidelines									
Minimum Size	4.0 KW	5.0 KW	6.0 KW	8.5 KW	11.0 KW	900 watts	4.0 KW	6.0 KW	6.0 KW
Recommended Size	8.5 KW	8.5 KW	8.5 KW	11.0 KW	17.0 KW	2.0 KW	8.5 KW	8.5 KW	11.0 KW

* Power line carrier control systems for home automation use
† Battery bank may be increased in size to meet longer run time requirements

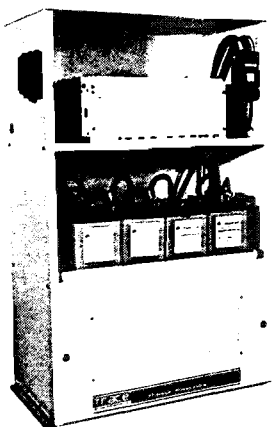
Note: Specifications may change without notice



SW Series Power Panel



Power Center with two SW Series inverters



Complete Power Module System with cover removed

Battery Needs

Trace backup electric systems use special high-quality electric storage batteries. Trace dealers can customize a system based on the amount of power you want in reserve. We normally recommend an eight-hour battery bank to allow operation without a generator, or to keep a generator off for long periods. An adjustable "quiet period" (typically set for nighttime hours) is a standard feature on systems in Trace's SW series.

Recharging the System

A Trace backup system automatically recharges when utility power is restored. Trace SW (sine wave) inverters can also automatically start and stop a generator as needed during a long outage. Trace systems may also be recharged from renewable energy sources such as solar panels and wind generators, as well as emerging technologies such as fuel cells.

Speed of Operation

In a power outage or brownout, Trace systems typically transfer to battery power in less than 16 milliseconds (less than 1/50th of a second). Even the worst-case transfer time, 34 milliseconds (less than 1/25th of a second), is so fast that computers and other appliances will continue operating without a glitch.

System Installation

A Trace backup system integrates with your home's electric system and must be installed by a qualified installer. Typically, a **Trace Power Panel**™ or **Power Center**™ is mounted on a wall near your main circuit breaker panel. But it may also be installed elsewhere if another location is more convenient, or even outdoors using a **Trace Power Module**™ enclosure. Ask your Trace dealer to help you select the installation system that best meets your needs.

Available from

POWERFUL SOLUTIONS

TRACE ENGINEERING®

www.traceengineering.com
5916 195th St. N.E.
Arlington, WA USA 98223

All Trace products are Y2K compliant.

Printed on recycled paper

rev - 99

List of Certified Inverters

California Energy Commission
Emerging Technologies Buydown Program

Updated: June 26, 2001

Mfr Name	Inverter Model No.	Description	Power Rating	Peak Efficiency	Certified
Bergey Windpower Co.	Gridtek 10	10kW, 240Vac split-phase, utility interactive inverter	10000	92.0	Yes
Trace Engineering	PS2512AE	2.5 kVA. 12Vdc, 120Vac, stand alone, sine wave inverter	2500	90.0	Yes
Trace Engineering	PS2524AE	2.5 kVA. 24Vdc, 120Vac, stand alone, sine wave inverter	2500	92.0	Yes
Trace Engineering	SW2512	2.5 kVA, 12Vdc, 120Vac, grid tie with battery backup, sine wave inverter	2500	90.0	Yes (1)
Trace Engineering	SW4048U	4.0 kVA, 48Vdc, 240Vac, grid tie with battery backup, sine wave inverter	4000	95.0	Yes (1)
Trace Engineering	SW5548U	5.5 kVA, 48Vdc, 240Vac, grid tie with battery backup, sine wave inverter	5500	96.0	Yes (1)
Trace Engineering	UX1112	1.1 kVA, 12Vdc, 120Vac, stand alone, modified sinewave inverter	1100	90.0	Yes
Trace Engineering	UX1112SB	1.1 kVA, 12Vdc, 120Vac, stand alone, mod. sinewave inverter w/stby batt. chgr.	1100	90.0	Yes
Trace Engineering	UX1412	1.4 kVA, 12Vdc, 120Vac, stand alone, modified sinewave inverter	1400	92.0	Yes
Trace Engineering	UX1412SB	1.4 kVA, 12Vdc, 120Vac, stand alone, mod. sinewave inverter w/stby batt. chgr.	1400	92.0	Yes
Trace Engineering	UX612	0.6 kVA, 12Vdc, 120Vac, stand alone, modified sinewave inverter	600	92.0	Yes
Trace Engineering	UX612SB	0.6 kVA, 12Vdc, 120Vac, stand alone, mod. sinewave inverter w/stby batt. chgr.	600	92.0	Yes
Xantrex Technology, Inc.	BWT10240	10kW, 240Vac split-phase, utility interactive inverter	10000	92.0	Yes

Xantrex Technology, Inc.	DR1512	1.5 kVA, 12Vdc, 120Vac, stand alone, modified sine wave inverter	1500	94.0	Yes
Xantrex Technology, Inc.	DR1524	1.5 kVA, 24Vdc, 120Vac, stand alone, modified sine wave inverter	1500	94.0	Yes
Xantrex Technology, Inc.	DR2412	2.4 kVA, 12Vdc, 120Vac, stand alone, modified sine wave inverter	2400	94.0	Yes
Xantrex Technology, Inc.	DR2424	2.4 kVA, 24Vdc, 120Vac, stand alone, modified sine wave inverter	2400	95.0	Yes
Xantrex Technology, Inc.	DR3624	3.6 kVA, 24Vdc, 120Vac, stand alone, modified sine wave inverter	3600	95.0	Yes
Xantrex Technology, Inc.	PV-10208	10kW 208Vac/3phase Utility Interactive Inverter	10000	95.0	Yes
Xantrex Technology, Inc.	PV-15208	15kW 208Vac/3phase Utility Interactive Inverter	15000	96.0	Yes
Xantrex Technology, Inc.	PV-20208	20kW 208Vac/3phase Utility Interactive Inverter	20000	96.0	Yes
Xantrex Technology, Inc.	PV-5208	5kW, 208Vac/3 phase, photovoltaic utility interactive inverter	5000	95.0	Yes
Xantrex Technology, Inc.	ST1000	1.0kVA, 42-85Vdc, 240Vac, grid tie, sine wave inverter	1000	92.0	Yes
Xantrex Technology, Inc.	ST1500	1.5kVA, 42-85Vdc, 240Vac, grid tie, sine wave inverter	1500	92.0	Yes
Xantrex Technology, Inc.	ST2000	2.0kVA, 42-85Vdc, 240Vac, grid tie, sine wave inverter	2000	94.0	Yes
Xantrex Technology, Inc.	ST2500	2.5kVA, 42-85Vdc, 240Vac, grid tie, sine wave inverter	2500	94.0	Yes
Xantrex Technology, Inc.	SW4024	4.0 kVA, 24Vdc, 120Vac, grid tie with battery backup, sine wave inverter	4000	94.0	Yes
Xantrex Technology, Inc.	SW4048	4.0 kVa, 48Vdc, 120Vac, grid tie with battery backup, sine wave inverter	4000	95.0	Yes
Xantrex Technology, Inc.	SW5548	5.5 kVA, 48Vdc, 120Vac, grid tie with battery backup, sine wave inverter	5500	96.0	Yes

APPENDIX C

DETAILED CALCULATIONS FOR ECONOMIC ANALYSIS

Appendix C Assumptions for Calculations

Heat Loss for average home:	24.5	MJ/HDD (15KW (51MBH) at -35C)
Average Home Electrical Consumption 1.4 Kw --> 1000 KWhr/month		
Conventional Fuel Conversion Efficiency	80%	
Ventilation Rate:	50	LPS
Domestic Hot Water Consumption (L/day)	200	
Diesel Fuel Energy Content (MJ/litre)	37	
Propane Fuel Energy Content (MJ/liq.litre)	25.5	
Kerosene Fuel Energy Content (MJ/litre)	35	

Assume Diesel fuel is used as home heating oil where multiple heating fuels are available
Assume Can/US Exchange Rate of $0.63US/$1CDN
Assume Alaska Shipping Costs Approx. $0.20US/lb from Seattle to Anchorage and $0.50US/lb from Anchorage to any other community via Postal Service. (Source: Lynden Transport Ltd.)
No discounting of future spending or savings for inflation
Decommissioning costs are divided yearly over expected life of system
Assume transportation cost from Seattle for central & southern Alaska communities
Assume transportation cost from Edmonton via Hay River for north shore Alaska communities
Assume transportation cost from Edmonton for NWT
Assume transportation cost from Churchill or Montreal for Nunavut
Assume transportation cost from Montreal for Nunavik
Assume transportation cost from Montreal for Northern Labrador

Note: See CMHC Northern Cost Comparison Database to confirm shipping costs to your community

Generator Electricity Conversion Efficiency is 25%
In communities where no electricity grid exists, electrical costs were calculated based on incremental cost of fuel to generate electricity with a diesel generator.

Appendix C - Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
ALASKA									
	Adak Station	$2,490	N/A	N/A	$18.69	$2,422	$131	18.5	$72.03
	Akiachak	$2,490	N/A	N/A	$15.60	$2,422	$197	12.3	$80.55
	Alakanuk	$2,490	N/A	N/A	$15.13	$2,422	$129	18.8	$83.98
	Ambler	$2,490	N/A	N/A	$14.64	$2,422	$242	10.0	$80.55
	Anaktuvuk Pass	$2,490	N/A	N/A	$14.46	$2,422	$70	34.7	$79.82
	Anchorage	$2,140	$681	3.1	$15.28	$2,335	$93	25.2	$83.77
	Aniak	$2,490	N/A	N/A	$15.27	$2,422	$171	14.2	$79.46
	Barrow	$2,051	N/A	N/A	$13.44	$2,313	$159	14.5	$85.06
	Beaver	$2,490	$2,479	1.0	$14.59	$2,422	$184	13.2	$72.92
	Bethel	$2,490	N/A	N/A	$15.60	$2,422	$103	23.5	$80.55
	Chevak	$2,490	N/A	N/A	$15.37	$2,422	$143	16.9	$85.61
	Craig	$2,490	$714	3.5	$17.28	$2,422	$120	20.1	$76.38
	Dillingham	$2,490	N/A	N/A	$15.88	$2,422	$102	23.9	$79.82
	Eagle City	$2,490	$1,141	2.2	$14.92	$2,422	$126	19.3	$73.23
	Elim	$2,490	N/A	N/A	$14.84	$2,422	$157	15.4	$80.92
	Fairbanks/Fairbanks North Star Borough	$2,490	$701	3.5	$14.82	$2,422	$99	24.5	$75.73
	Fort Yukon	$2,490	$2,492	1.0	$14.47	$2,422	$181	13.4	$72.92
	Galena	$2,490	$2,184	1.1	$14.90	$2,422	$171	14.1	$75.73
	Gambell	$2,490	N/A	N/A	$14.91	$2,422	$137	17.6	$87.73
	Glenallen	$2,490	$625	4.0	$15.28	$2,422	$91	26.5	$81.66
	Homer	$2,490	$437	5.7	$16.96	$2,422	$99	24.5	$75.73
	Huslia	$2,490	$2,824	0.9	$14.80	$2,422	$195	12.4	$77.38
	Juneau	$2,490	$855	2.9	$15.46	$2,422	$111	21.7	$76.71
	Kaktovik	$2,037	N/A	N/A	$13.51	$2,309	$84	27.5	$82.05
	Kaltag	$2,490	N/A	N/A	$14.78	$2,422	$175	13.9	$76.71
	Ketchikan	$2,490	$683	3.6	$16.56	$2,422	$120	20.3	$71.74
	King Salmon	$2,490	N/A	N/A	$16.06	$2,422	$95	25.4	$78.41
	Kipnuk	$2,490	N/A	N/A	$15.99	$2,422	$131	18.4	$80.92
	Kodiak	$2,490	$604	4.1	$17.61	$2,422	$124	19.6	$71.17
	Kotzebue	$2,490	N/A	N/A	$14.70	$2,422	$119	20.3	$83.59
	McGrath	$2,490	$2,053	1.2	$15.41	$2,422	$174	13.9	$77.05
	Metlakatla	$2,490	$809	3.1	$16.56	$2,422	$128	18.9	$71.74
	Mountain Village	$2,490	N/A	N/A	$15.09	$2,422	$149	16.2	$82.42
	Napaskiak	$2,490	N/A	N/A	$15.60	$2,422	$103	23.5	$80.55
	Nome	$2,490	N/A	N/A	$14.87	$2,422	$104	23.3	$85.61
	Noorvik	$2,490	N/A	N/A	$14.73	$2,422	$139	17.4	$82.42
	Prudhoe Bay (Deadhorse)	$2,037	N/A	N/A	$13.56	$2,309	$267	8.7	$81.66
	Saint Mary's	$2,490	N/A	N/A	$15.09	$2,422	$180	13.5	$82.42
	Saint Paul	$2,490	N/A	N/A	$16.99	$2,422	$96	25.2	$82.04
	Sand Point	$2,490	N/A	N/A	$18.18	$2,422	$100	24.3	$75.41
	Selawik	$2,490	N/A	N/A	$14.74	$2,422	$151	16.0	$81.29
	Seward	$2,490	$719	3.5	$14.72	$2,422	$101	24.0	$74.46
	Shishmaref	$2,490	N/A	N/A	$14.55	$2,422	$130	18.7	$88.16
	Sitka	$2,490	$458	5.4	$16.26	$2,422	$92	26.2	$78.76
	Skagway	$2,490	$513	4.9	$15.32	$2,422	$92	26.3	$76.71
	Tanana	$2,490	$453	5.5	$14.92	$2,422	$86	28.1	$77.05
	Togiak	$2,490	N/A	N/A	$15.99	$2,422	$169	14.3	$79.82
	Tok	$2,490	$159	15.7	$15.04	$2,422	$76	31.8	$73.84
	Unalakleet	$2,490	N/A	N/A	$14.79	$2,422	$139	17.5	$79.82
	Unalaska	$2,490	N/A	N/A	$18.77	$2,422	$170	14.2	$71.74

Appendix C - Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
ALASKA									
	Adak Station	$3,622	-$58	9999.0	$0.77	$24,623	-$73	9999.0	$2.53
	Akiachak	$3,622	$192	18.9	$0.87	$24,623	$415	59.4	$2.83
	Alakanuk	$3,622	$177	20.4	$0.90	$24,623	$387	63.7	$2.95
	Ambler	$3,622	$194	18.6	$0.87	$24,623	$420	58.6	$2.83
	Anaktuvuk Pass	$3,622	$82	44.0	$0.86	$24,623	$201	122.4	$2.80
	Anchorage	$3,535	$68	52.2	$0.91	$24,106	$173	139.7	$2.99
	Aniak	$3,622	$189	19.2	$0.85	$24,623	$410	60.1	$2.79
	Barrow	$3,513	$70	49.9	$0.93	$23,974	$178	134.9	$3.05
	Beaver	$3,622	$96	37.9	$0.78	$24,623	$227	108.4	$2.56
	Bethel	$3,622	$141	25.6	$0.87	$24,623	$316	77.8	$2.83
	Chevak	$3,622	$171	21.1	$0.92	$24,623	$375	65.6	$3.01
	Craig	$3,622	$104	34.9	$0.82	$24,623	$243	101.3	$2.68
	Dillingham	$3,622	$142	25.6	$0.86	$24,623	$317	77.6	$2.80
	Eagle City	$3,622	$101	35.8	$0.79	$24,623	$238	103.4	$2.57
	Elim	$3,622	$186	19.5	$0.87	$24,623	$404	60.9	$2.84
	Fairbanks/Fairbanks North Star Borough	$3,622	$114	31.7	$0.81	$24,623	$264	93.4	$2.66
	Fort Yukon	$3,622	$175	20.7	$0.78	$24,623	$382	64.5	$2.56
	Galena	$3,622	$250	14.5	$0.81	$24,623	$529	46.5	$2.66
	Gambell	$3,622	$168	21.5	$0.94	$24,623	$370	66.6	$3.08
	Glenallen	$3,622	$218	16.6	$0.88	$24,623	$466	52.8	$2.87
	Homer	$3,622	$78	46.6	$0.81	$24,623	$192	128.2	$2.66
	Huslia	$3,622	$197	18.4	$0.83	$24,623	$426	57.8	$2.72
	Juneau	$3,622	$96	37.9	$0.82	$24,623	$227	108.5	$2.69
	Kaktovik	$3,509	$72	48.6	$0.90	$23,954	$181	132.1	$2.94
	Kaltag	$3,622	$195	18.6	$0.82	$24,623	$421	58.4	$2.69
	Ketchikan	$3,622	$103	35.2	$0.77	$24,623	$241	102.0	$2.52
	King Salmon	$3,622	$57	63.7	$0.84	$24,623	$151	162.7	$2.75
	Kipnuk	$3,622	$145	25.0	$0.87	$24,623	$323	76.2	$2.84
	Kodiak	$3,622	$205	17.7	$0.77	$24,623	$441	55.9	$2.50
	Kotzebue	$3,622	$127	28.5	$0.90	$24,623	$289	85.3	$2.94
	McGrath	$3,622	$140	25.9	$0.83	$24,623	$314	78.5	$2.71
	Metlakatla	$3,622	$90	40.2	$0.77	$24,623	$216	113.8	$2.52
	Mountain Village	$3,622	$183	19.8	$0.89	$24,623	$398	61.9	$2.89
	Napaskiak	$3,622	$276	13.1	$0.87	$24,623	$580	42.5	$2.83
	Nome	$3,622	$139	26.1	$0.92	$24,623	$312	78.9	$3.01
	Noorvik	$3,622	$186	19.5	$0.89	$24,623	$403	61.0	$2.89
	Prudhoe Bay (Deadhorse)	$3,509	-$58	9999.0	$0.89	$23,954	-$73	9999.0	$2.93
	Saint Mary's	$3,622	$180	20.1	$0.89	$24,623	$393	62.7	$2.89
	Saint Paul	$3,622	$301	12.0	$0.88	$24,623	$629	39.2	$2.88
	Sand Point	$3,622	$129	28.1	$0.81	$24,623	$292	84.3	$2.65
	Selawik	$3,622	$189	19.1	$0.87	$24,623	$410	60.0	$2.86
	Seward	$3,622	$85	42.8	$0.80	$24,623	$206	119.7	$2.62
	Shishmaref	$3,622	$167	21.6	$0.95	$24,623	$367	67.0	$3.10
	Sitka	$3,622	$87	41.5	$0.85	$24,623	$211	116.9	$2.77
	Skagway	$3,622	$130	27.8	$0.82	$24,623	$295	83.5	$2.69
	Tanana	$3,622	$323	11.2	$0.83	$24,623	$671	36.7	$2.71
	Togiak	$3,622	$189	19.1	$0.86	$24,623	$411	60.0	$2.80
	Tok	$3,622	$139	26.0	$0.79	$24,623	$312	78.9	$2.59
	Unalakleet	$3,622	$137	26.4	$0.86	$24,623	$309	79.8	$2.80
	Unalaska	$3,622	$166	21.9	$0.77	$24,623	$364	67.6	$2.52

Appendix C - Calculations

REGION	COMMUNITY	WIND				HYBRID				
		Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
ALASKA										
	Adak Station	$7,633	-$62	9999.0	$0.24	$29,245	-$132	$959	9999.0	$0.80
	Akiachak	$7,633	$469	16.3	$0.83	$29,245	$887	$4,004	9999.0	$2.71
	Alakanuk	$7,633	$621	12.3	$0.63	$29,245	$1,011	$2,598	9999.0	$2.04
	Ambler	$7,633	$405	18.9	$0.95	$29,245	$828	$5,025	9999.0	$3.20
	Anaktuvuk Pass	$7,633	$287	26.6	$0.70	$29,245	$492	$1,424	9999.0	$1.83
	Anchorage	$7,466	$323	23.1	$0.61	$28,641	$499	$1,975	9999.0	$1.87
	Aniak	$7,633	$121	63.1	$2.34	$29,245	$534	$3,945	9999.0	$4.02
	Barrow	$7,424	$497	14.9	$0.43	$28,487	$678	$2,960	9999.0	$1.71
	Beaver	$7,633	$9	835.3	$3.44	$29,245	$240	$3,909	9999.0	$4.10
	Bethel	$7,633	$362	21.1	$0.83	$29,245	$682	$2,156	9999.0	$2.21
	Chevak	$7,633	$723	10.6	$0.55	$29,245	$1,101	$2,800	9999.0	$1.92
	Craig	$7,633	$151	50.5	$1.27	$29,245	$398	$2,524	9999.0	$2.73
	Dillingham	$7,633	$499	15.3	$0.62	$29,245	$820	$1,939	9999.0	$1.82
	Eagle City	$7,633	$18	428.6	$3.19	$29,245	$259	$2,716	9999.0	$3.56
	Elim	$7,633	$333	22.9	$1.09	$29,245	$741	$3,419	9999.0	$2.92
	Fairbanks/Fairbanks North Star Borough	$7,633	$71	106.8	$2.14	$29,245	$338	$2,201	9999.0	$3.12
	Fort Yukon	$7,633	-$4	9999.0	$6.36	$29,245	$382	$3,935	9999.0	$4.51
	Galena	$7,633	$14	551.6	$6.72	$29,245	$546	$3,908	9999.0	$4.67
	Gambell	$7,633	$1,348	5.7	$0.31	$29,245	$1,721	$1,932	9999.0	$1.17
	Glenallen	$7,633	$653	11.7	$0.69	$29,245	$1,122	$1,866	9999.0	$1.94
	Homer	$7,633	$145	52.5	$1.08	$29,245	$341	$2,031	9999.0	$2.39
	Huslia	$7,633	$7	1115.8	$6.26	$29,245	$436	$4,529	9999.0	$5.02
	Juneau	$7,633	$39	195.0	$2.54	$29,245	$269	$2,529	9999.0	$3.43
	Kaktovik	$7,417	$328	22.6	$0.61	$28,464	$513	$1,785	9999.0	$1.82
	Kaltag	$7,633	$0	9999.0	$6.86	$29,245	$424	$4,042	9999.0	$4.80
	Ketchikan	$7,633	$35	221.0	$2.61	$29,245	$279	$2,499	9999.0	$3.27
	King Salmon	$7,633	$267	28.6	$0.60	$29,245	$422	$1,767	9999.0	$1.73
	Kipnuk	$7,633	$830	9.2	$0.40	$29,245	$1,156	$2,058	9999.0	$1.41
	Kodiak	$7,633	$1,010	7.6	$0.38	$29,245	$1,454	$1,585	9999.0	$1.23
	Kotzebue	$7,633	$427	17.9	$0.69	$29,245	$719	$2,470	9999.0	$2.11
	McGrath	$7,633	$296	25.8	$0.93	$29,245	$613	$3,443	9999.0	$2.65
	Metlakatla	$7,633	$27	284.6	$2.61	$29,245	$246	$2,674	9999.0	$3.34
	Mountain Village	$7,633	$556	13.7	$0.70	$29,245	$958	$3,018	9999.0	$2.25
	Napaskiak	$7,633	$649	11.8	$0.83	$29,245	$1,233	$2,156	9999.0	$2.21
	Nome	$7,633	$753	10.1	$0.45	$29,245	$1,068	$1,896	9999.0	$1.52
	Noorvik	$7,633	$573	13.3	$0.69	$29,245	$980	$2,808	9999.0	$2.18
	Prudhoe Bay (Deadhorse)	$7,417	-$62	9999.0	$0.55	$28,464	-$132	$5,181	9999.0	$2.47
	Saint Mary's	$7,633	$549	13.9	$0.70	$29,245	$945	$3,612	9999.0	$2.40
	Saint Paul	$7,633	$2,306	3.3	$0.27	$29,245	$2,938	$1,091	15.8	$0.93
	Sand Point	$7,633	$747	10.2	$0.38	$29,245	$1,042	$1,393	9999.0	$1.22
	Selawik	$7,633	$462	16.5	$0.84	$29,245	$876	$3,147	9999.0	$2.50
	Seward	$7,633	$34	223.8	$2.41	$29,245	$243	$2,214	9999.0	$3.19
	Shishmaref	$7,633	$676	11.3	$0.59	$29,245	$1,047	$2,705	9999.0	$2.01
	Sitka	$7,633	$96	79.8	$1.58	$29,245	$310	$2,101	9999.0	$2.88
	Skagway	$7,633	$55	138.8	$2.69	$29,245	$353	$2,125	9999.0	$3.32
	Tanana	$7,633	$57	133.3	$5.37	$29,245	$732	$2,070	9999.0	$3.76
	Togiak	$7,633	$769	9.9	$0.52	$29,245	$1,183	$2,947	9999.0	$1.84
	Tok	$7,633	$246	31.0	$1.03	$29,245	$562	$1,528	9999.0	$2.16
	Unalakleet	$7,633	$206	37.0	$1.27	$29,245	$518	$3,046	9999.0	$2.98
	Unalaska	$7,633	$1,374	5.6	$0.24	$29,245	$1,741	$1,308	67.5	$0.86

Appendix C - Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Valdez	$2,490	$622	4.0	$16.01	$2,422	$89	27.1	$87.73
	Wainwright	$2,490	N/A	N/A	$14.16	$2,422	$179	13.5	$89.95
	Whittier	$2,490	$463	5.4	$17.57	$2,422	$96	25.3	$82.42
	Wragnell	$2,490	$702	3.5	$16.10	$2,422	$107	22.6	$77.72
LABRADOR									
	Davis Inlet (Utshimassits)	$2,292	$1,059	2.2	$15.09	$2,373	$131	18.1	$70.01
	Happy Valley - Goose Bay	$2,292	$962	2.4	$15.52	$2,373	$146	16.3	$63.37
	Hopedale	$2,292	$1,124	2.0	$15.09	$2,373	$135	17.6	$70.01
	Makkovik	$2,292	$1,050	2.2	$15.13	$2,373	$131	18.1	$70.01
	Nain	$2,292	N/A	N/A	$14.88	$2,373	$132	18.0	$73.57
	North West River	$2,292	$965	2.4	$15.52	$2,373	$146	16.2	$63.37
	Postville	$2,292	$1,005	2.3	$15.32	$2,373	$137	17.3	$67.04
	Rigolet	$2,292	$1,117	2.1	$15.37	$2,373	$143	16.5	$67.82
	Sheshatshiu	$2,292	$965	2.4	$15.52	$2,373	$146	16.2	$63.37
NORTHWEST TERRITORIES									
	Aklavik	$2,106	$1,098	1.9	$13.66	$2,327	$98	23.7	$80.32
	Colville Lake	$2,882	$2,998	1.0	$14.71	$2,520	$194	13.0	$76.46
	Deline	$2,002	$2,004	1.0	$13.68	$2,300	$150	15.3	$71.66
	Dettah	$2,002	$235	8.5	$13.74	$2,300	$86	26.7	$63.55
	Enterprise	$2,001	$323	6.2	$14.07	$2,300	$96	24.1	$61.68
	Fort Good Hope	$2,002	$1,763	1.1	$13.96	$2,301	$158	14.6	$66.83
	Fort Liard	$2,002	$1,224	1.6	$14.57	$2,301	$153	15.0	$62.37
	Fort McPherson	$2,003	$1,841	1.1	$13.67	$2,301	$136	16.9	$75.19
	Fort Providence	$2,002	$463	4.3	$13.90	$2,300	$99	23.3	$63.31
	Fort Resolution	$2,002	$450	4.4	$13.85	$2,300	$101	22.7	$61.24
	Fort Simpson	$2,002	$1,636	1.2	$14.14	$2,300	$164	14.0	$63.55
	Fort Smith	$2,002	$150	13.4	$14.04	$2,300	$87	26.5	$61.24
	Hay River & (Hay River Reserve)	$2,001	$326	6.1	$14.05	$2,300	$96	24.0	$61.46
	Holman	$2,194	N/A	N/A	$13.29	$2,349	$146	16.1	$78.48
	Inuvik	$2,003	$792	2.5	$13.44	$2,301	$90	25.7	$76.55
	Jean Marie River	$2,002	$1,833	1.1	$14.04	$2,300	$172	13.4	$63.55
	Kakisa	$2,001	$412	4.9	$14.11	$2,300	$100	23.0	$62.14
	Lutselk'e	$2,082	$1,845	1.1	$13.91	$2,321	$162	14.3	$65.58
	Nahanni Butte	$2,019	$1,542	1.3	$14.46	$2,305	$166	13.9	$63.66
	Norman Wells	$2,002	$404	5.0	$14.03	$2,300	$88	26.1	$69.30
	Paulatuk	$2,182	N/A	N/A	$13.62	$2,345	$148	15.8	$75.62
	Rae Lakes (Gameti)	$2,028	$2,629	0.8	$13.61	$2,307	$187	12.4	$66.75
	Rae-Edzo (Rae)	$2,002	$235	8.5	$13.73	$2,300	$86	26.8	$63.79
	Sachs Harbour	$2,174	N/A	N/A	$13.72	$2,343	$133	17.6	$84.48
	Trout Lake	$2,001	$1,689	1.2	$14.33	$2,300	$175	13.1	$62.37
	Tsiigehtchic	$2,003	N/A	N/A	$13.63	$2,301	$144	16.0	$73.87
	Tuktoyaktuk	$2,131	N/A	N/A	$13.48	$2,333	$87	27.0	$80.16
	Tulita	$2,002	$1,660	1.2	$14.16	$2,300	$152	15.1	$69.02
	Wekweti	$2,029	$2,698	0.8	$13.63	$2,307	$190	12.2	$67.02
	Wha Ti	$2,024	$2,349	0.9	$13.69	$2,306	$183	12.6	$64.68
	Wrigley	$2,002	$1,667	1.2	$14.07	$2,300	$159	14.5	$65.52
	Yellowknife	$2,002	$235	8.5	$13.74	$2,300	$86	26.7	$63.55
NUNAVIK									
	Akulivik	$2,050	N/A	N/A	$13.71	$2,313	$157	14.8	$70.53
	Aupaluk	$2,050	N/A	N/A	$13.77	$2,313	$136	17.1	$80.99
	Inukjuak	$2,050	N/A	N/A	$13.89	$2,313	$158	14.6	$69.95

Appendix C - Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Valdez	$3,622	$165	22.0	$0.94	$24,623	$362	68.1	$3.08
	Wainwright	$3,622	$67	54.4	$0.97	$24,623	$170	144.6	$3.16
	Whittier	$3,622	$78	46.5	$0.89	$24,623	$192	127.9	$2.89
	Wragnell	$3,622	$101	35.9	$0.84	$24,623	$238	103.6	$2.73
LABRADOR									
	Davis Inlet (Utshimassits)	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Happy Valley - Goose Bay	$3,573	-$5	9999.0	$0.69	$24,330	$30	808.9	$2.24
	Hopedale	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Makkovik	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Nain	$3,573	$84	42.8	$0.80	$24,330	$203	119.6	$2.61
	North West River	$3,573	-$5	9999.0	$0.69	$24,330	$30	808.9	$2.24
	Postville	$3,573	$97	36.7	$0.73	$24,330	$230	105.6	$2.37
	Rigolet	$3,573	$96	37.4	$0.73	$24,330	$227	107.2	$2.40
	Sheshatshiu	$3,573	-$5	9999.0	$0.69	$24,330	$30	808.9	$2.24
NORTHWEST TERRITORIES									
	Aklavik	$3,527	$306	11.5	$0.88	$24,057	$639	37.6	$2.87
	Colville Lake	$3,720	$2,185	1.7	$0.81	$25,201	$4,312	5.8	$2.64
	Deline	$3,500	$362	9.7	$0.79	$23,902	$748	32.0	$2.57
	Dettah	$3,500	$109	32.0	$0.70	$23,903	$254	94.2	$2.28
	Enterprise	$3,500	$108	32.5	$0.68	$23,902	$251	95.4	$2.21
	Fort Good Hope	$3,501	$530	6.6	$0.73	$23,903	$1,077	22.2	$2.40
	Fort Liard	$3,501	$473	7.4	$0.68	$23,903	$965	24.8	$2.24
	Fort McPherson	$3,501	$326	10.7	$0.82	$23,904	$678	35.3	$2.70
	Fort Providence	$3,500	$121	29.0	$0.69	$23,903	$276	86.5	$2.27
	Fort Resolution	$3,500	$240	14.6	$0.67	$23,902	$510	46.9	$2.20
	Fort Simpson	$3,500	$286	12.2	$0.70	$23,903	$599	39.9	$2.28
	Fort Smith	$3,500	$77	45.6	$0.67	$23,903	$190	125.6	$2.20
	Hay River & (Hay River Reserve)	$3,500	$108	32.3	$0.67	$23,902	$252	94.9	$2.21
	Holman	$3,549	$514	6.9	$0.85	$24,186	$1,044	23.2	$2.79
	Inuvik	$3,501	$225	15.5	$0.84	$23,904	$480	49.7	$2.75
	Jean Marie River	$3,500	$1,468	2.4	$0.70	$23,903	$2,910	8.2	$2.28
	Kakisa	$3,500	$125	28.0	$0.68	$23,902	$284	84.1	$2.23
	Lutselk'e	$3,521	$409	8.6	$0.72	$24,021	$840	28.6	$2.35
	Nahanni Butte	$3,505	$2,029	1.7	$0.70	$23,928	$4,008	6.0	$2.28
	Norman Wells	$3,500	$204	17.1	$0.76	$23,902	$439	54.4	$2.49
	Paulatuk	$3,545	$528	6.7	$0.82	$24,168	$1,072	22.5	$2.69
	Rae Lakes (Gameti)	$3,507	$795	4.4	$0.73	$23,941	$1,594	15.0	$2.39
	Rae-Edzo (Rae)	$3,500	$241	14.5	$0.70	$23,903	$512	46.7	$2.29
	Sachs Harbour	$3,543	$607	5.8	$0.92	$24,156	$1,228	19.7	$3.01
	Trout Lake	$3,500	$384	9.1	$0.68	$23,902	$792	30.2	$2.24
	Tsiigehtchic	$3,501	$566	6.2	$0.81	$23,904	$1,146	20.9	$2.65
	Tuktoyaktuk	$3,533	$344	10.3	$0.87	$24,093	$712	33.8	$2.86
	Tulita	$3,500	$645	5.4	$0.76	$23,902	$1,301	18.4	$2.48
	Wekweti	$3,507	$291	12.0	$0.73	$23,943	$610	39.3	$2.40
	Wha Ti	$3,506	$612	5.7	$0.71	$23,936	$1,237	19.3	$2.32
	Wrigley	$3,500	$686	5.1	$0.72	$23,902	$1,382	17.3	$2.35
	Yellowknife	$3,500	$86	40.8	$0.70	$23,903	$208	114.9	$2.28
NUNAVIK									
	Akulivik	$3,513	$12	284.1	$0.77	$23,974	$64	373.0	$2.53
	Aupaluk	$3,513	$3	1072.2	$0.89	$23,974	$46	515.6	$2.90
	Inukjuak	$3,513	$13	271.2	$0.77	$23,974	$65	366.5	$2.51

Appendix C - Calculations

		WIND				HYBRID				
REGION	COMMUNITY	Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
	Valdez	$7,633	$757	10.1	$0.52	$29,245	$1,123	$1,810	9999.0	$1.67
	Wainwright	$7,633	$373	20.5	$0.56	$29,245	$546	$3,723	9999.0	$2.20
	Whittier	$7,633	$641	11.9	$0.35	$29,245	$837	$1,410	9999.0	$1.17
	Wragnell	$7,633	$40	189.2	$2.64	$29,245	$281	$2,482	9999.0	$3.48
LABRADOR										
	Davis Inlet (Utshimassits)	$7,538	$561	13.4	$0.37	$28,903	$782	$1,661	9999.0	$1.21
	Happy Valley - Goose Bay	$7,538	-$29	9999.0	$2.21	$28,903	$5	$2,628	9999.0	$2.93
	Hopedale	$7,538	$561	13.4	$0.37	$28,903	$782	$1,706	9999.0	$1.22
	Makkovik	$7,538	$572	13.2	$0.36	$28,903	$793	$1,640	9999.0	$1.19
	Nain	$7,538	$608	12.4	$0.34	$28,903	$814	$1,682	9999.0	$1.17
	North West River	$7,538	-$29	9999.0	$2.21	$28,903	$5	$2,631	9999.0	$2.93
	Postville	$7,538	$166	45.3	$1.00	$28,903	$400	$2,416	9999.0	$2.29
	Rigolet	$7,538	$168	44.8	$1.00	$28,903	$399	$2,550	9999.0	$2.33
	Sheshatshiu	$7,538	-$29	9999.0	$2.21	$28,903	$5	$2,631	9999.0	$2.93
NORTHWEST TERRITORIES										
	Aklavik	$7,450	$205	36.3	$2.43	$28,583	$848	$2,481	9999.0	$3.56
	Colville Lake	$7,819	$873	9.0	$3.94	$29,921	$5,188	$4,170	29.4	$4.38
	Deline	$7,401	$30	242.7	$7.25	$28,403	$782	$3,429	9999.0	$4.40
	Dettah	$7,401	-$27	9999.0	$6.77	$28,403	$230	$1,757	9999.0	$3.21
	Enterprise	$7,401	-$31	9999.0	$7.38	$28,403	$223	$1,868	9999.0	$3.20
	Fort Good Hope	$7,401	$281	26.3	$2.56	$28,404	$1,362	$3,174	9999.0	$3.42
	Fort Liard	$7,401	$23	323.7	$8.70	$28,404	$991	$2,968	9999.0	$3.74
	Fort McPherson	$7,401	$86	86.3	$4.36	$28,405	$767	$3,258	9999.0	$4.21
	Fort Providence	$7,401	-$31	9999.0	$8.03	$28,403	$249	$1,995	9999.0	$3.35
	Fort Resolution	$7,401	-$6	9999.0	$7.29	$28,403	$507	$1,957	9999.0	$3.21
	Fort Simpson	$7,401	-$6	9999.0	$8.65	$28,403	$597	$3,245	9999.0	$3.93
	Fort Smith	$7,401	-$32	9999.0	$6.18	$28,403	$161	$1,682	9999.0	$3.05
	Hay River & (Hay River Reserve)	$7,401	-$28	9999.0	$6.77	$28,403	$227	$1,863	9999.0	$3.16
	Holman	$7,492	$1,166	6.4	$0.81	$28,735	$2,214	$3,007	9999.0	$2.41
	Inuvik	$7,401	$128	57.7	$2.54	$28,405	$612	$2,188	9999.0	$3.37
	Jean Marie River	$7,401	$186	39.7	$8.70	$28,403	$3,100	$3,396	9999.0	$3.99
	Kakisa	$7,401	-$33	9999.0	$8.85	$28,403	$254	$1,972	9999.0	$3.31
	Lutselk'e	$7,439	$91	81.6	$4.45	$28,542	$935	$3,241	9999.0	$3.74
	Nahanni Butte	$7,409	$350	21.2	$7.18	$28,432	$4,362	$3,270	26.0	$3.88
	Norman Wells	$7,401	$26	288.3	$4.62	$28,403	$468	$1,966	9999.0	$3.40
	Paulatuk	$7,486	$1,589	4.7	$0.59	$28,714	$2,665	$2,674	9999.0	$1.92
	Rae Lakes (Gameti)	$7,413	$128	57.9	$6.67	$28,448	$1,725	$3,865	9999.0	$4.28
	Rae-Edzo (Rae)	$7,401	-$4	9999.0	$7.29	$28,403	$511	$1,761	9999.0	$3.25
	Sachs Harbour	$7,482	$3,079	2.4	$0.40	$28,699	$4,311	$2,304	14.3	$1.47
	Trout Lake	$7,401	$1	12039.0	$9.83	$28,403	$796	$3,389	9999.0	$3.96
	Tsiigehtchic	$7,401	$247	29.9	$3.32	$28,405	$1,397	$3,324	9999.0	$3.98
	Tuktoyaktuk	$7,462	$978	7.6	$0.69	$28,626	$1,694	$1,824	9999.0	$1.93
	Tulita	$7,401	$130	56.9	$5.63	$28,403	$1,435	$3,307	9999.0	$4.08
	Wekweti	$7,414	$93	79.5	$3.36	$28,450	$706	$3,852	9999.0	$3.90
	Wha Ti	$7,411	$71	104.5	$7.26	$28,442	$1,312	$3,659	9999.0	$4.11
	Wrigley	$7,401	$101	73.1	$6.66	$28,403	$1,487	$3,248	9999.0	$3.95
	Yellowknife	$7,401	-$32	9999.0	$6.77	$28,403	$179	$1,757	9999.0	$3.21
NUNAVIK										
	Akulivik	$7,424	$109	67.9	$0.64	$28,486	$177	$2,712	9999.0	$1.97
	Aupaluk	$7,424	$131	56.8	$0.57	$28,486	$180	$2,695	9999.0	$1.95
	Inukjuak	$7,424	$114	64.9	$0.63	$28,486	$183	$2,682	9999.0	$1.93

Appendix C - Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Ivujivik	$2,050	N/A	N/A	$13.63	$2,313	$144	16.0	$76.25
	Kangiqsualujjuaq	$2,050	N/A	N/A	$13.96	$2,313	$138	16.7	$79.47
	Kangiqsujuaq	$2,050	N/A	N/A	$13.67	$2,313	$131	17.7	$83.80
	Kangirsuk	$2,050	N/A	N/A	$13.69	$2,313	$132	17.5	$82.98
	Kuujjuaq	$2,050	N/A	N/A	$13.89	$2,313	$140	16.5	$78.37
	Kuujjuarapik	$2,050	N/A	N/A	$14.47	$2,313	$176	13.2	$63.16
	Puvirnituq	$2,050	N/A	N/A	$13.71	$2,313	$161	14.3	$68.53
	Quaqtaq	$2,050	N/A	N/A	$13.68	$2,313	$132	17.5	$82.98
	Salluit	$2,050	N/A	N/A	$13.64	$2,313	$146	15.8	$75.23
	Tasiujaq	$2,050	N/A	N/A	$13.86	$2,313	$141	16.4	$78.00
	Umiujaq	$2,050	N/A	N/A	$14.23	$2,313	$171	13.5	$64.85
NUNAVUT									
	Arctic Bay	$2,052	N/A	N/A	$12.91	$2,313	$111	20.8	$88.64
	Arviat	$2,095	N/A	N/A	$13.61	$2,324	$149	15.6	$69.70
	Baker Lake	$2,095	N/A	N/A	$13.24	$2,324	$153	15.2	$68.86
	Bathurst Inlet	$2,255	N/A	N/A	$13.54	$2,364	$153	15.4	$72.37
	Cambridge Bay	$2,255	N/A	N/A	$13.22	$2,364	$138	17.1	$80.07
	Cape Dorset	$2,051	N/A	N/A	$13.44	$2,313	$118	19.6	$82.58
	Chesterfield Inlet	$2,095	N/A	N/A	$13.48	$2,324	$143	16.2	$72.37
	Clyde River	$2,052	N/A	N/A	$13.23	$2,313	$108	21.3	$89.58
	Coral Harbour	$2,095	N/A	N/A	$13.37	$2,324	$126	18.5	$82.96
	Gjoa Haven	$2,280	N/A	N/A	$13.18	$2,370	$139	17.1	$85.01
	Grise Fiord	$2,052	N/A	N/A	$13.08	$2,313	$111	20.9	$90.05
	Hall Beach	$2,055	N/A	N/A	$12.96	$2,314	$114	20.3	$86.41
	Igloolik	$2,055	N/A	N/A	$12.83	$2,314	$117	19.8	$83.43
	Iqaluit	$2,041	N/A	N/A	$13.55	$2,310	$93	25.0	$78.65
	Kimmirut	$2,051	N/A	N/A	$13.63	$2,313	$123	18.8	$79.48
	Kugluktuk	$2,232	N/A	N/A	$13.52	$2,358	$141	16.7	$74.70
	Nanisivik	$2,052	N/A	N/A	$12.93	$2,313	$135	17.2	$88.64
	Pangnirtung	$2,051	N/A	N/A	$13.46	$2,313	$125	18.4	$78.01
	Pelly Bay (Kugaaruk)	$2,052	N/A	N/A	$12.98	$2,313	$140	16.5	$85.51
	Pond Inlet	$2,052	N/A	N/A	$13.05	$2,313	$116	20.0	$84.23
	Qikiqtarjuaq (Broughton Island)	$2,052	N/A	N/A	$13.43	$2,313	$106	21.8	$85.94
	Rankin Inlet	$2,095	N/A	N/A	$13.55	$2,324	$146	15.9	$71.16
	Repulse Bay	$2,055	N/A	N/A	$13.13	$2,314	$125	18.5	$81.04
	Resolute	$2,052	N/A	N/A	$12.63	$2,313	$120	19.2	$87.27
	Sanikiluaq	$2,056	N/A	N/A	$14.22	$2,314	$134	17.3	$71.47
	Taloyoak	$2,292	N/A	N/A	$13.23	$2,373	$136	17.4	$86.81
	Umingmaktok	$2,255	N/A	N/A	$13.41	$2,364	$147	16.1	$73.60
	Whale Cove	$2,095	N/A	N/A	$13.55	$2,324	$144	16.1	$71.16
YUKON									
	Beaver Creek	$2,006	$783	2.6	$14.34	$2,301	$108	21.3	$70.49
	Burwash Landing	$2,006	$690	2.9	$14.45	$2,301	$106	21.7	$69.33
	Carcross	$2,006	$786	2.6	$14.42	$2,301	$113	20.4	$68.21
	Carmacks	$2,006	$897	2.2	$14.36	$2,301	$118	19.6	$68.48
	Dawson	$2,006	$864	2.3	$14.19	$2,301	$113	20.3	$68.76
	Destruction Bay	$2,006	$690	2.9	$14.45	$2,301	$106	21.7	$69.33
	Faro	$2,006	$985	2.0	$14.43	$2,301	$123	18.7	$68.48
	Haines Junction	$2,006	$661	3.0	$14.60	$2,301	$102	22.7	$72.30
	Mayo	$2,006	$933	2.1	$14.34	$2,301	$118	19.5	$69.05
	Old Crow	$2,709	$1,183	2.3	$14.82	$2,477	$113	21.9	$80.51

Appendix C - Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Ivujivik	$3,513	$7	495.6	$0.83	$23,974	$54	444.4	$2.73
	Kangiqsualujjuaq	$3,513	$4	789.6	$0.87	$23,974	$49	491.4	$2.85
	Kangiqsujuaq	$3,513	$1	2870.6	$0.92	$23,974	$42	564.3	$3.00
	Kangirsuk	$3,513	$2	1940.6	$0.91	$23,974	$44	549.5	$2.97
	Kuujjuaq	$3,513	$5	659.2	$0.86	$23,974	$51	474.6	$2.81
	Kuujjuarapik	$3,513	$21	170.7	$0.69	$23,974	$80	298.5	$2.26
	Puvirnituq	$3,513	$14	243.6	$0.75	$23,974	$68	351.1	$2.45
	Quaqtaq	$3,513	$2	1940.6	$0.91	$23,974	$44	549.5	$2.97
	Salluit	$3,513	$8	440.9	$0.82	$23,974	$56	430.7	$2.69
	Tasiujaq	$3,513	$6	624.8	$0.85	$23,974	$51	469.3	$2.79
	Umiujaq	$3,513	$19	189.6	$0.71	$23,974	$76	314.2	$2.32
NUNAVUT									
	Arctic Bay	$3,513	$342	10.3	$0.97	$23,976	$708	33.9	$3.17
	Arviat	$3,524	$397	8.9	$0.76	$24,040	$816	29.5	$2.49
	Baker Lake	$3,524	$345	10.2	$0.75	$24,040	$715	33.6	$2.46
	Bathurst Inlet	$3,564	$283	12.6	$0.79	$24,276	$594	40.9	$2.57
	Cambridge Bay	$3,564	$327	10.9	$0.87	$24,276	$680	35.7	$2.84
	Cape Dorset	$3,513	$285	12.3	$0.90	$23,975	$598	40.1	$2.96
	Chesterfield Inlet	$3,524	$493	7.1	$0.79	$24,040	$1,004	23.9	$2.59
	Clyde River	$3,513	$292	12.0	$0.98	$23,976	$611	39.2	$3.21
	Coral Harbour	$3,524	$407	8.7	$0.91	$24,040	$836	28.7	$2.97
	Gjoa Haven	$3,570	$392	9.1	$0.92	$24,313	$807	30.1	$3.01
	Grise Fiord	$3,513	$448	7.8	$0.99	$23,976	$916	26.2	$3.23
	Hall Beach	$3,514	$375	9.4	$0.95	$23,982	$773	31.0	$3.09
	Igloolik	$3,514	$236	14.9	$0.91	$23,982	$501	47.8	$2.99
	Iqaluit	$3,510	$237	14.8	$0.86	$23,960	$503	47.6	$2.82
	Kimmirut	$3,513	$601	5.8	$0.87	$23,975	$1,214	19.7	$2.85
	Kugluktuk	$3,558	$491	7.3	$0.81	$24,242	$999	24.3	$2.65
	Nanisivik	$3,513	-$58	9999.0	$0.97	$23,976	-$73	9999.0	$3.17
	Pangnirtung	$3,513	$295	11.9	$0.85	$23,975	$618	38.8	$2.79
	Pelly Bay (Kugaaruk)	$3,513	$492	7.1	$0.94	$23,976	$1,003	23.9	$3.06
	Pond Inlet	$3,513	$414	8.5	$0.92	$23,976	$849	28.2	$3.02
	Qikiqtarjuaq (Broughton Island)	$3,513	$359	9.8	$0.94	$23,976	$741	32.3	$3.08
	Rankin Inlet	$3,524	$282	12.5	$0.78	$24,040	$591	40.7	$2.54
	Repulse Bay	$3,514	$364	9.7	$0.89	$23,982	$752	31.9	$2.90
	Resolute	$3,513	$425	8.3	$0.95	$23,976	$872	27.5	$3.13
	Sanikiluaq	$3,514	$403	8.7	$0.78	$23,983	$828	29.0	$2.56
	Taloyoak	$3,573	$458	7.8	$0.94	$24,330	$935	26.0	$3.08
	Umingmaktok	$3,564	$270	13.2	$0.80	$24,276	$568	42.8	$2.61
	Whale Cove	$3,524	$983	3.6	$0.78	$24,040	$1,963	12.2	$2.54
YUKON									
	Beaver Creek	$3,501	$75	46.7	$0.77	$23,908	$187	128.0	$2.53
	Burwash Landing	$3,501	$58	60.2	$0.76	$23,908	$154	155.5	$2.49
	Carcross	$3,501	$60	58.3	$0.75	$23,908	$158	151.8	$2.45
	Carmacks	$3,501	$60	58.8	$0.75	$23,908	$157	152.7	$2.46
	Dawson	$3,501	$59	59.2	$0.75	$23,908	$156	153.6	$2.47
	Destruction Bay	$3,501	$77	45.4	$0.76	$23,908	$191	125.1	$2.49
	Faro	$3,501	$60	58.8	$0.75	$23,908	$157	152.7	$2.46
	Haines Junction	$3,501	$53	65.6	$0.79	$23,908	$144	165.5	$2.59
	Mayo	$3,501	$59	59.7	$0.76	$23,908	$155	154.5	$2.48
	Old Crow	$3,677	$191	19.2	$0.86	$24,945	$414	60.3	$2.80

Appendix C - Calculations

		WIND				HYBRID				
REGION	COMMUNITY	Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
	Ivujivik	$7,424	$118	62.7	$0.61	$28,486	$176	$2,718	9999.0	$1.98
	Kangiqsualujjuaq	$7,424	$11	651.9	$1.50	$28,486	$64	$3,274	9999.0	$3.32
	Kangiqsujuaq	$7,424	$203	36.6	$0.42	$28,486	$249	$2,358	9999.0	$1.54
	Kangirsuk	$7,424	$173	42.8	$0.47	$28,486	$220	$2,498	9999.0	$1.69
	Kuujjuaq	$7,424	$17	441.7	$1.40	$28,486	$71	$3,238	9999.0	$3.19
	Kuujjuarapik	$7,424	$80	93.3	$0.78	$28,486	$163	$2,780	9999.0	$2.08
	Puvirnituq	$7,424	$113	65.5	$0.63	$28,486	$185	$2,672	9999.0	$1.92
	Quaqtaq	$7,424	$184	40.4	$0.45	$28,486	$231	$2,446	9999.0	$1.63
	Salluit	$7,424	$136	54.7	$0.56	$28,486	$195	$2,624	9999.0	$1.85
	Tasiujaq	$7,424	$9	841.1	$1.56	$28,486	$63	$3,275	9999.0	$3.33
	Umiujaq	$7,424	$37	198.3	$1.11	$28,486	$117	$3,009	9999.0	$2.53
NUNAVUT										
	Arctic Bay	$7,425	$923	8.0	$0.80	$28,489	$1,634	$2,733	9999.0	$2.47
	Arviat	$7,445	$1,582	4.7	$0.43	$28,563	$2,401	$2,131	105.7	$1.43
	Baker Lake	$7,445	$876	8.5	$0.66	$28,563	$1,594	$2,572	9999.0	$1.94
	Bathurst Inlet	$7,521	$717	10.5	$0.70	$28,839	$1,314	$2,724	9999.0	$2.07
	Cambridge Bay	$7,521	$857	8.8	$0.74	$28,839	$1,540	$2,833	9999.0	$2.27
	Cape Dorset	$7,424	$1,421	5.2	$0.43	$28,488	$2,022	$2,125	9999.0	$1.51
	Chesterfield Inlet	$7,445	$1,806	4.1	$0.47	$28,563	$2,814	$2,271	52.6	$1.57
	Clyde River	$7,425	$1,111	6.7	$0.59	$28,489	$1,725	$2,494	9999.0	$2.02
	Coral Harbour	$7,445	$1,417	5.3	$0.58	$28,563	$2,257	$2,579	9999.0	$1.95
	Gjoa Haven	$7,533	$1,032	7.3	$0.77	$28,883	$1,842	$3,088	9999.0	$2.45
	Grise Fiord	$7,425	$1,466	5.1	$0.66	$28,489	$2,386	$2,645	9999.0	$2.21
	Hall Beach	$7,426	$1,482	5.0	$0.54	$28,496	$2,258	$2,420	9999.0	$1.86
	Igloolik	$7,426	$654	11.4	$0.76	$28,496	$1,159	$2,639	9999.0	$2.31
	Iqaluit	$7,419	$750	9.9	$0.64	$28,470	$1,256	$1,880	9999.0	$1.85
	Kimmirut	$7,424	$2,217	3.3	$0.51	$28,488	$3,435	$2,298	25.0	$1.72
	Kugluktuk	$7,510	$866	8.7	$0.97	$28,800	$1,869	$2,835	9999.0	$2.52
	Nanisivik	$7,425	-$62	9999.0	$0.78	$28,489	-$132	$3,267	9999.0	$2.59
	Pangnirtung	$7,424	$921	8.1	$0.62	$28,488	$1,542	$2,461	9999.0	$1.96
	Pelly Bay (Kugaaruk)	$7,425	$1,486	5.0	$0.68	$28,489	$2,492	$3,127	9999.0	$2.31
	Pond Inlet	$7,425	$1,292	5.7	$0.65	$28,489	$2,145	$2,536	9999.0	$2.10
	Qikiqtarjuaq (Broughton Island)	$7,425	$1,945	3.8	$0.40	$28,489	$2,690	$1,936	37.8	$1.42
	Rankin Inlet	$7,445	$1,420	5.2	$0.36	$28,563	$2,014	$1,926	323.4	$1.25
	Repulse Bay	$7,426	$1,071	6.9	$0.67	$28,496	$1,826	$2,630	9999.0	$2.12
	Resolute	$7,425	$911	8.1	$0.96	$28,489	$1,786	$3,003	9999.0	$2.79
	Sanikiluaq	$7,427	$2,181	3.4	$0.33	$28,497	$3,013	$1,655	21.0	$1.13
	Taloyoak	$7,538	$1,295	5.8	$0.73	$28,903	$2,233	$3,053	9999.0	$2.38
	Umingmaktok	$7,521	$684	11.0	$0.71	$28,839	$1,255	$2,690	9999.0	$2.10
	Whale Cove	$7,445	$4,479	1.7	$0.36	$28,563	$6,445	$1,903	6.3	$1.25
YUKON										
	Beaver Creek	$7,403	$101	73.4	$1.28	$28,410	$291	$2,212	9999.0	$2.57
	Burwash Landing	$7,403	-$22	9999.0	$4.45	$28,410	$136	$2,341	9999.0	$3.55
	Carcross	$7,403	$65	113.4	$1.41	$28,410	$226	$2,243	9999.0	$2.62
	Carmacks	$7,403	-$21	9999.0	$4.42	$28,410	$139	$2,538	9999.0	$3.59
	Dawson	$7,403	-$28	9999.0	$5.24	$28,410	$131	$2,475	9999.0	$3.66
	Destruction Bay	$7,403	-$15	9999.0	$4.45	$28,410	$179	$2,341	9999.0	$3.55
	Faro	$7,403	$34	220.6	$1.88	$28,410	$193	$2,525	9999.0	$2.98
	Haines Junction	$7,403	-$19	9999.0	$4.18	$28,410	$129	$2,355	9999.0	$3.65
	Mayo	$7,403	$3	2271.8	$2.75	$28,410	$161	$2,520	9999.0	$3.31
	Old Crow	$7,737	$188	41.1	$1.73	$29,622	$605	$2,559	9999.0	$3.15

Appendix C - Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Pelly Crossing	$2,006	$932	2.2	$14.36	$2,301	$119	19.3	$68.48
	Ross River	$2,006	$984	2.0	$14.43	$2,301	$126	18.2	$66.85
	Tagish	$2,006	$786	2.6	$14.42	$2,301	$113	20.4	$68.21
	Teslin	$2,005	$910	2.2	$14.41	$2,301	$122	18.8	$66.85
	Watson Lake	$2,005	$549	3.7	$14.51	$2,301	$104	22.1	$66.06
	Whitehorse	$2,005	$784	2.6	$14.42	$2,301	$110	20.8	$69.61

Appendix C - Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Pelly Crossing	$3,501	$79	44.4	$0.75	$23,908	$194	123.0	$2.46
	Ross River	$3,501	$78	44.7	$0.73	$23,908	$193	123.8	$2.40
	Tagish	$3,501	$60	58.3	$0.75	$23,908	$158	151.8	$2.45
	Teslin	$3,501	$62	56.1	$0.73	$23,907	$162	147.4	$2.40
	Watson Lake	$3,501	$64	54.8	$0.72	$23,908	$165	144.9	$2.37
	Whitehorse	$3,501	$58	60.7	$0.76	$23,907	$153	156.4	$2.50

Appendix C - Calculations

		WIND				HYBRID				
REGION	COMMUNITY	Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
	Pelly Crossing	$7,403	-$15	9999.0	$4.42	$28,410	$183	$2,576	9999.0	$3.61
	Ross River	$7,403	$57	129.7	$1.71	$28,410	$254	$2,489	9999.0	$2.84
	Tagish	$7,403	$65	113.4	$1.41	$28,410	$226	$2,243	9999.0	$2.62
	Teslin	$7,402	$154	48.1	$0.83	$28,408	$319	$2,156	9999.0	$2.05
	Watson Lake	$7,403	$237	31.3	$0.60	$28,409	$405	$1,670	9999.0	$1.62
	Whitehorse	$7,402	$3	2271.7	$2.75	$28,408	$159	$2,387	9999.0	$3.28

Appendix C - RETScreen Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
LABRADOR									
	Davis Inlet (Utshimassits)	$2,292	$988	2.3	$15.40	$2,373	$131	18.1	$70.01
	Happy Valley - Goose Bay	$2,292	$962	2.4	$15.52	$2,373	$146	16.3	$63.37
	Hopedale	$2,292	$1,049	2.2	$15.40	$2,373	$135	17.6	$70.01
	Makkovik	$2,292	$988	2.3	$15.40	$2,373	$131	18.1	$70.01
	Nain	$2,292	N/A	N/A	$15.26	$2,373	$132	18.0	$73.57
	Postville	$2,292	$988	2.3	$15.40	$2,373	$137	17.3	$67.04
	Rigolet	$2,292	$995	2.3	$15.92	$2,373	$143	16.5	$67.82
NORTHWEST TERRITORIES									
	Aklavik	$2,106	$1,015	2.1	$13.90	$2,327	$98	23.7	$80.32
	Colville Lake	$2,882	$2,529	1.1	$15.48	$2,520	$194	13.0	$76.46
	Deline	$2,002	$1,730	1.2	$14.17	$2,300	$150	15.3	$71.66
	Dettah	$2,002	$185	10.8	$14.31	$2,300	$86	26.7	$63.55
	Enterprise	$2,001	$267	7.5	$14.63	$2,300	$96	24.1	$61.68
	Fort Good Hope	$2,002	$1,784	1.1	$13.92	$2,301	$158	14.6	$66.83
	Fort Liard	$2,002	$1,132	1.8	$14.88	$2,301	$153	15.0	$62.37
	Fort McPherson	$2,003	$1,781	1.1	$13.78	$2,301	$136	16.9	$75.19
	Fort Providence	$2,002	$376	5.3	$14.52	$2,300	$99	23.3	$63.31
	Fort Resolution	$2,002	$360	5.6	$14.52	$2,300	$101	22.7	$61.24
	Fort Simpson	$2,002	$1,462	1.4	$14.55	$2,300	$164	14.0	$63.55
	Fort Smith	$2,002	$110	18.1	$14.71	$2,300	$87	26.5	$61.24
	Hay River & (Hay River Reserve)	$2,001	$267	7.5	$14.63	$2,300	$96	24.0	$61.46
	Holman	$2,194	N/A	N/A	$13.61	$2,349	$146	16.1	$78.48
	Inuvik	$2,003	$721	2.8	$13.70	$2,301	$90	25.7	$76.55
	Jean Marie River	$2,002	$1,594	1.3	$14.55	$2,300	$172	13.4	$63.55
	Kakisa	$2,001	$359	5.6	$14.52	$2,300	$100	23.0	$62.14
	Lutselk'e	$2,082	$1,596	1.3	$14.43	$2,321	$162	14.3	$65.58
	Nahanni Butte	$2,019	$1,298	1.6	$15.17	$2,305	$166	13.9	$63.66
	Norman Wells	$2,002	$385	5.2	$14.17	$2,300	$88	26.1	$69.30
	Paulatuk	$2,182	N/A	N/A	$13.93	$2,345	$148	15.8	$75.62
	Rae Lakes (Gameti)	$2,028	$2,122	1.0	$14.35	$2,307	$187	12.4	$66.75
	Rae-Edzo (Rae)	$2,002	$185	10.8	$14.31	$2,300	$86	26.8	$63.79
	Sachs Harbour	$2,174	N/A	N/A	$13.45	$2,343	$133	17.6	$84.48
	Trout Lake	$2,001	$1,594	1.3	$14.55	$2,300	$175	13.1	$62.37
	Tsiigehtchic	$2,003	N/A	N/A	$13.70	$2,301	$144	16.0	$73.87
	Tuktoyaktuk	$2,131	N/A	N/A	$13.70	$2,333	$87	27.0	$80.16
	Tulita	$2,002	$1,681	1.2	$14.12	$2,300	$152	15.1	$69.02
	Wekweti	$2,029	$2,192	0.9	$14.35	$2,307	$190	12.2	$67.02
	Wha Ti	$2,024	$1,946	1.0	$14.34	$2,306	$183	12.6	$64.68
	Wrigley	$2,002	$1,558	1.3	$14.31	$2,300	$159	14.5	$65.52
	Yellowknife	$2,002	$185	10.8	$14.31	$2,300	$86	26.7	$63.55
NUNAVIK									
	Akulivik	$2,050	N/A	N/A	$14.12	$2,313	$157	14.8	$70.53
	Aupaluk	$2,050	N/A	N/A	$14.34	$2,313	$136	17.1	$80.99
	Inukjuak	$2,050	N/A	N/A	$14.12	$2,313	$158	14.6	$69.95
	Ivujivik	$2,050	N/A	N/A	$13.51	$2,313	$144	16.0	$76.25
	Kangiqsualujjuaq	$2,050	N/A	N/A	$14.34	$2,313	$138	16.7	$79.47
	Kangiqsujuaq	$2,050	N/A	N/A	$14.07	$2,313	$131	17.7	$83.80
	Kangirsuk	$2,050	N/A	N/A	$14.07	$2,313	$132	17.5	$82.98
	Kuujjuaq	$2,050	N/A	N/A	$14.29	$2,313	$140	16.5	$78.37
	Kuujjuarapik	$2,050	N/A	N/A	$14.50	$2,313	$176	13.2	$63.16

Appendix C - RETScreen Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
LABRADOR									
	Davis Inlet (Utshimassits)	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Happy Valley - Goose Bay	$3,573	-$5	9999.0	$0.69	$24,330	$30	808.9	$2.24
	Hopedale	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Makkovik	$3,573	$91	39.4	$0.76	$24,330	$218	111.8	$2.48
	Nain	$3,573	$84	42.8	$0.80	$24,330	$203	119.6	$2.61
	Postville	$3,573	$97	36.7	$0.73	$24,330	$230	105.6	$2.37
	Rigolet	$3,573	$96	37.4	$0.73	$24,330	$227	107.2	$2.40
NORTHWEST TERRITORIES									
	Aklavik	$3,527	$306	11.5	$0.88	$24,057	$639	37.6	$2.87
	Colville Lake	$3,720	$2,185	1.7	$0.81	$25,201	$4,312	5.8	$2.64
	Deline	$3,500	$362	9.7	$0.79	$23,902	$748	32.0	$2.57
	Dettah	$3,500	$109	32.0	$0.70	$23,903	$254	94.2	$2.28
	Enterprise	$3,500	$108	32.5	$0.68	$23,902	$251	95.4	$2.21
	Fort Good Hope	$3,501	$530	6.6	$0.73	$23,903	$1,077	22.2	$2.40
	Fort Liard	$3,501	$473	7.4	$0.68	$23,903	$965	24.8	$2.24
	Fort McPherson	$3,501	$326	10.7	$0.82	$23,904	$678	35.3	$2.70
	Fort Providence	$3,500	$121	29.0	$0.69	$23,903	$276	86.5	$2.27
	Fort Resolution	$3,500	$240	14.6	$0.67	$23,902	$510	46.9	$2.20
	Fort Simpson	$3,500	$286	12.2	$0.70	$23,903	$599	39.9	$2.28
	Fort Smith	$3,500	$77	45.6	$0.67	$23,903	$190	125.6	$2.20
	Hay River & (Hay River Reserve)	$3,500	$108	32.3	$0.67	$23,902	$252	94.9	$2.21
	Holman	$3,549	$514	6.9	$0.85	$24,186	$1,044	23.2	$2.79
	Inuvik	$3,501	$225	15.5	$0.84	$23,904	$480	49.7	$2.75
	Jean Marie River	$3,500	$1,468	2.4	$0.70	$23,903	$2,910	8.2	$2.28
	Kakisa	$3,500	$125	28.0	$0.68	$23,902	$284	84.1	$2.23
	Lutselk'e	$3,521	$409	8.6	$0.72	$24,021	$840	28.6	$2.35
	Nahanni Butte	$3,505	$2,029	1.7	$0.70	$23,928	$4,008	6.0	$2.28
	Norman Wells	$3,500	$204	17.1	$0.76	$23,902	$439	54.4	$2.49
	Paulatuk	$3,545	$528	6.7	$0.82	$24,168	$1,072	22.5	$2.69
	Rae Lakes (Gameti)	$3,507	$795	4.4	$0.73	$23,941	$1,594	15.0	$2.39
	Rae-Edzo (Rae)	$3,500	$241	14.5	$0.70	$23,903	$512	46.7	$2.29
	Sachs Harbour	$3,543	$607	5.8	$0.92	$24,156	$1,228	19.7	$3.01
	Trout Lake	$3,500	$384	9.1	$0.68	$23,902	$792	30.2	$2.24
	Tsiigehtchic	$3,501	$566	6.2	$0.81	$23,904	$1,146	20.9	$2.65
	Tuktoyaktuk	$3,533	$344	10.3	$0.87	$24,093	$712	33.8	$2.86
	Tulita	$3,500	$645	5.4	$0.76	$23,902	$1,301	18.4	$2.48
	Wekweti	$3,507	$291	12.0	$0.73	$23,943	$610	39.3	$2.40
	Wha Ti	$3,506	$612	5.7	$0.71	$23,936	$1,237	19.3	$2.32
	Wrigley	$3,500	$686	5.1	$0.72	$23,902	$1,382	17.3	$2.35
	Yellowknife	$3,500	$86	40.8	$0.70	$23,903	$208	114.9	$2.28
NUNAVIK									
	Akulivik	$3,513	$12	284.1	$0.77	$23,974	$64	373.0	$2.53
	Aupaluk	$3,513	$3	1072.2	$0.89	$23,974	$46	515.6	$2.90
	Inukjuak	$3,513	$13	271.2	$0.77	$23,974	$65	366.5	$2.51
	Ivujivik	$3,513	$7	495.6	$0.83	$23,974	$54	444.4	$2.73
	Kangiqsualujjuaq	$3,513	$4	789.6	$0.87	$23,974	$49	491.4	$2.85
	Kangiqsujuaq	$3,513	$1	2870.6	$0.92	$23,974	$42	564.3	$3.00
	Kangirsuk	$3,513	$2	1940.6	$0.91	$23,974	$44	549.5	$2.97
	Kuujjuaq	$3,513	$5	659.2	$0.86	$23,974	$51	474.6	$2.81
	Kuujjuarapik	$3,513	$21	170.7	$0.69	$23,974	$80	298.5	$2.26

Appendix C - RETScreen Calculations

		WIND				HYBRID				
REGION	COMMUNITY	Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
LABRADOR										
	Davis Inlet (Utshimassits)	$7,538	$503	15.0	$0.41	$28,903	$724	$1,775	9999.0	$1.31
	Happy Valley - Goose Bay	$7,538	$0	67973.7	$1.19	$28,903	$34	$2,452	9999.0	$2.38
	Hopedale	$7,538	$503	15.0	$0.41	$28,903	$724	$1,823	9999.0	$1.32
	Makkovik	$7,538	$503	15.0	$0.41	$28,903	$724	$1,775	9999.0	$1.31
	Nain	$7,538	$525	14.4	$0.39	$28,903	$731	$1,855	9999.0	$1.31
	Postville	$7,538	$291	25.9	$0.65	$28,903	$525	$2,169	9999.0	$1.80
	Rigolet	$7,538	$279	27.0	$0.67	$28,903	$509	$2,319	9999.0	$1.87
NORTHWEST TERRITORIES										
	Aklavik	$7,450	$252	29.5	$2.07	$28,583	$895	$2,452	9999.0	$3.38
	Colville Lake	$7,819	$1,481	5.3	$2.39	$29,921	$5,796	$4,054	17.2	$3.89
	Deline	$7,401	$111	66.8	$3.88	$28,403	$862	$3,365	9999.0	$4.02
	Dettah	$7,401	$21	357.4	$2.87	$28,403	$278	$1,700	9999.0	$2.82
	Enterprise	$7,401	-$3	9999.0	$3.88	$28,403	$251	$1,831	9999.0	$2.95
	Fort Good Hope	$7,401	$333	22.2	$2.22	$28,404	$1,413	$3,143	9999.0	$3.30
	Fort Liard	$7,401	$29	254.4	$8.11	$28,404	$997	$2,964	9999.0	$3.72
	Fort McPherson	$7,401	$143	51.8	$3.14	$28,405	$824	$3,212	9999.0	$3.94
	Fort Providence	$7,401	-$25	9999.0	$6.77	$28,403	$255	$1,988	9999.0	$3.30
	Fort Resolution	$7,401	$43	172.4	$3.88	$28,403	$556	$1,920	9999.0	$2.97
	Fort Simpson	$7,401	$36	205.0	$4.97	$28,403	$639	$3,200	9999.0	$3.70
	Fort Smith	$7,401	-$8	9999.0	$3.40	$28,403	$186	$1,646	9999.0	$2.80
	Hay River & (Hay River Reserve)	$7,401	$1	8345.5	$3.62	$28,403	$256	$1,824	9999.0	$2.91
	Holman	$7,492	$1,939	3.9	$0.50	$28,735	$2,987	$2,567	68.5	$1.72
	Inuvik	$7,401	$150	49.2	$2.28	$28,405	$634	$2,172	9999.0	$3.27
	Jean Marie River	$7,401	$373	19.8	$4.97	$28,403	$3,287	$3,349	9999.0	$3.76
	Kakisa	$7,401	-$27	9999.0	$7.34	$28,403	$260	$1,964	9999.0	$3.26
	Lutselk'e	$7,439	$269	27.7	$2.06	$28,542	$1,112	$3,104	9999.0	$3.16
	Nahanni Butte	$7,409	$632	11.7	$4.26	$28,432	$4,644	$3,220	20.0	$3.63
	Norman Wells	$7,401	$87	85.0	$2.72	$28,403	$530	$1,919	9999.0	$3.07
	Paulatuk	$7,486	$966	7.8	$0.95	$28,714	$2,041	$3,025	9999.0	$2.57
	Rae Lakes (Gameti)	$7,413	$380	19.5	$2.87	$28,448	$1,977	$3,744	9999.0	$3.72
	Rae-Edzo (Rae)	$7,401	$77	96.7	$3.07	$28,403	$591	$1,708	9999.0	$2.87
	Sachs Harbour	$7,482	$3,279	2.3	$0.37	$28,699	$4,510	$2,215	12.5	$1.39
	Trout Lake	$7,401	$52	143.7	$5.42	$28,403	$847	$3,344	9999.0	$3.73
	Tsiigehtchic	$7,401	$343	21.6	$2.54	$28,405	$1,492	$3,275	9999.0	$3.73
	Tuktoyaktuk	$7,462	$1,171	6.4	$0.58	$28,626	$1,886	$1,729	181.8	$1.73
	Tulita	$7,401	$276	26.8	$3.20	$28,403	$1,581	$3,236	9999.0	$3.71
	Wekweti	$7,414	$253	29.3	$1.66	$28,450	$866	$3,661	9999.0	$3.21
	Wha Ti	$7,411	$252	29.4	$3.07	$28,442	$1,493	$3,549	9999.0	$3.61
	Wrigley	$7,401	$194	38.2	$4.25	$28,403	$1,579	$3,204	9999.0	$3.72
	Yellowknife	$7,401	$9	809.8	$2.87	$28,403	$220	$1,700	9999.0	$2.82
NUNAVIK										
	Akulivik	$7,424	$208	35.7	$0.41	$28,486	$276	$2,223	9999.0	$1.41
	Aupaluk	$7,424	$134	55.5	$0.56	$28,486	$184	$2,680	9999.0	$1.93
	Inukjuak	$7,424	$212	35.1	$0.40	$28,486	$280	$2,201	9999.0	$1.39
	Ivujivik	$7,424	$189	39.3	$0.44	$28,486	$246	$2,369	9999.0	$1.55
	Kangiqsualujjuaq	$7,424	$56	132.7	$0.94	$28,486	$108	$3,053	9999.0	$2.64
	Kangiqsujuaq	$7,424	$258	28.8	$0.35	$28,486	$304	$2,085	9999.0	$1.30
	Kangirsuk	$7,424	$254	29.2	$0.35	$28,486	$301	$2,098	9999.0	$1.31
	Kuujjuaq	$7,424	$51	146.8	$0.98	$28,486	$104	$3,071	9999.0	$2.69
	Kuujjuarapik	$7,424	$111	66.8	$0.64	$28,486	$195	$2,624	9999.0	$1.85

Appendix C - RETScreen Calculations

		BIOMASS				SOLAR AIR HEATING			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Puvirnituq	$2,050	N/A	N/A	$14.12	$2,313	$161	14.3	$68.53
	Quaqtaq	$2,050	N/A	N/A	$14.07	$2,313	$132	17.5	$82.98
	Salluit	$2,050	N/A	N/A	$13.51	$2,313	$146	15.8	$75.23
	Tasiujaq	$2,050	N/A	N/A	$14.34	$2,313	$141	16.4	$78.00
	Umiujaq	$2,050	N/A	N/A	$14.54	$2,313	$171	13.5	$64.85
NUNAVUT									
	Arctic Bay	$2,052	N/A	N/A	$13.28	$2,313	$111	20.8	$88.64
	Arviat	$2,095	N/A	N/A	$13.59	$2,324	$149	15.6	$69.70
	Baker Lake	$2,095	N/A	N/A	$13.51	$2,324	$153	15.2	$68.86
	Bathurst Inlet	$2,255	N/A	N/A	$13.43	$2,364	$153	15.4	$72.37
	Cambridge Bay	$2,255	N/A	N/A	$13.43	$2,364	$138	17.1	$80.07
	Cape Dorset	$2,051	N/A	N/A	$13.53	$2,313	$118	19.6	$82.58
	Chesterfield Inlet	$2,095	N/A	N/A	$13.59	$2,324	$143	16.2	$72.37
	Clyde River	$2,052	N/A	N/A	$13.44	$2,313	$108	21.3	$89.58
	Coral Harbour	$2,095	N/A	N/A	$13.57	$2,324	$126	18.5	$82.96
	Gjoa Haven	$2,280	N/A	N/A	$13.42	$2,370	$139	17.1	$85.01
	Grise Fiord	$2,052	N/A	N/A	$13.28	$2,313	$111	20.9	$90.05
	Hall Beach	$2,055	N/A	N/A	$13.26	$2,314	$114	20.3	$86.41
	Igloolik	$2,055	N/A	N/A	$13.26	$2,314	$117	19.8	$83.43
	Iqaluit	$2,041	N/A	N/A	$13.74	$2,310	$93	25.0	$78.65
	Kimmirut	$2,051	N/A	N/A	$13.76	$2,313	$123	18.8	$79.48
	Kugluktuk	$2,232	N/A	N/A	$13.76	$2,358	$141	16.7	$74.70
	Nanisivik	$2,052	N/A	N/A	$13.28	$2,313	$135	17.2	$88.64
	Pangnirtung	$2,051	N/A	N/A	$13.76	$2,313	$125	18.4	$78.01
	Pelly Bay (Kugaaruk)	$2,052	N/A	N/A	$13.19	$2,313	$140	16.5	$85.51
	Pond Inlet	$2,052	N/A	N/A	$13.19	$2,313	$116	20.0	$84.23
	Qikiqtarjuaq (Broughton Island)	$2,052	N/A	N/A	$13.53	$2,313	$106	21.8	$85.94
	Rankin Inlet	$2,095	N/A	N/A	$13.59	$2,324	$146	15.9	$71.16
	Repulse Bay	$2,055	N/A	N/A	$13.52	$2,314	$125	18.5	$81.04
	Resolute	$2,052	N/A	N/A	$13.07	$2,313	$120	19.2	$87.27
	Sanikiluaq	$2,056	N/A	N/A	$14.13	$2,314	$134	17.3	$71.47
	Taloyoak	$2,292	N/A	N/A	$13.43	$2,373	$136	17.4	$86.81
	Whale Cove	$2,095	N/A	N/A	$13.59	$2,324	$144	16.1	$71.16
YUKON									
	Beaver Creek	$2,006	$827	2.4	$14.15	$2,301	$108	21.3	$70.49
	Burwash Landing	$2,006	$674	3.0	$14.54	$2,301	$106	21.7	$69.33
	Carcross	$2,006	$646	3.1	$15.16	$2,301	$113	20.4	$68.21
	Carmacks	$2,006	$847	2.4	$14.56	$2,301	$118	19.6	$68.48
	Dawson	$2,006	$827	2.4	$14.34	$2,301	$113	20.3	$68.76
	Destruction Bay	$2,006	$747	2.7	$14.18	$2,301	$106	21.7	$69.33
	Faro	$2,006	$814	2.5	$15.18	$2,301	$123	18.7	$68.48
	Haines Junction	$2,006	$643	3.1	$14.71	$2,301	$102	22.7	$72.30
	Mayo	$2,006	$867	2.3	$14.60	$2,301	$118	19.5	$69.05
	Old Crow	$2,709	$1,267	2.1	$14.55	$2,477	$113	21.9	$80.51
	Pelly Crossing	$2,006	$915	2.2	$14.42	$2,301	$119	19.3	$68.48
	Ross River	$2,006	$814	2.5	$15.18	$2,301	$126	18.2	$66.85
	Tagish	$2,006	$668	3.0	$15.03	$2,301	$113	20.4	$68.21
	Teslin	$2,005	$775	2.6	$15.03	$2,301	$122	18.8	$66.85
	Watson Lake	$2,005	$520	3.9	$14.69	$2,301	$104	22.1	$66.06
	Whitehorse	$2,005	$644	3.1	$15.17	$2,301	$110	20.8	$69.61

Appendix C - RETScreen Calculations

		SOLAR WATER HEATING				PHOTOVOLTAIC			
REGION	COMMUNITY	Cost	Savings	Payback	5yr payback	Cost	Savings	Payback	5yr payback
	Puvirnituq	$3,513	$14	243.6	$0.75	$23,974	$68	351.1	$2.45
	Quaqtaq	$3,513	$2	1940.6	$0.91	$23,974	$44	549.5	$2.97
	Salluit	$3,513	$8	440.9	$0.82	$23,974	$56	430.7	$2.69
	Tasiujaq	$3,513	$6	624.8	$0.85	$23,974	$51	469.3	$2.79
	Umiujaq	$3,513	$19	189.6	$0.71	$23,974	$76	314.2	$2.32
NUNAVUT									
	Arctic Bay	$3,513	$342	10.3	$0.97	$23,976	$708	33.9	$3.17
	Arviat	$3,524	$397	8.9	$0.76	$24,040	$816	29.5	$2.49
	Baker Lake	$3,524	$345	10.2	$0.75	$24,040	$715	33.6	$2.46
	Bathurst Inlet	$3,564	$283	12.6	$0.79	$24,276	$594	40.9	$2.57
	Cambridge Bay	$3,564	$327	10.9	$0.87	$24,276	$680	35.7	$2.84
	Cape Dorset	$3,513	$285	12.3	$0.90	$23,975	$598	40.1	$2.96
	Chesterfield Inlet	$3,524	$493	7.1	$0.79	$24,040	$1,004	23.9	$2.59
	Clyde River	$3,513	$292	12.0	$0.98	$23,976	$611	39.2	$3.21
	Coral Harbour	$3,524	$407	8.7	$0.91	$24,040	$836	28.7	$2.97
	Gjoa Haven	$3,570	$392	9.1	$0.92	$24,313	$807	30.1	$3.01
	Grise Fiord	$3,513	$448	7.8	$0.99	$23,976	$916	26.2	$3.23
	Hall Beach	$3,514	$375	9.4	$0.95	$23,982	$773	31.0	$3.09
	Igloolik	$3,514	$236	14.9	$0.91	$23,982	$501	47.8	$2.99
	Iqaluit	$3,510	$237	14.8	$0.86	$23,960	$503	47.6	$2.82
	Kimmirut	$3,513	$601	5.8	$0.87	$23,975	$1,214	19.7	$2.85
	Kugluktuk	$3,558	$491	7.3	$0.81	$24,242	$999	24.3	$2.65
	Nanisivik	$3,513	-$58	9999.0	$0.97	$23,976	-$73	9999.0	$3.17
	Pangnirtung	$3,513	$295	11.9	$0.85	$23,975	$618	38.8	$2.79
	Pelly Bay (Kugaaruk)	$3,513	$492	7.1	$0.94	$23,976	$1,003	23.9	$3.06
	Pond Inlet	$3,513	$414	8.5	$0.92	$23,976	$849	28.2	$3.02
	Qikiqtarjuaq (Broughton Island)	$3,513	$359	9.8	$0.94	$23,976	$741	32.3	$3.08
	Rankin Inlet	$3,524	$282	12.5	$0.78	$24,040	$591	40.7	$2.54
	Repulse Bay	$3,514	$364	9.7	$0.89	$23,982	$752	31.9	$2.90
	Resolute	$3,513	$425	8.3	$0.95	$23,976	$872	27.5	$3.13
	Sanikiluaq	$3,514	$403	8.7	$0.78	$23,983	$828	29.0	$2.56
	Taloyoak	$3,573	$458	7.8	$0.94	$24,330	$935	26.0	$3.08
	Whale Cove	$3,524	$983	3.6	$0.78	$24,040	$1,963	12.2	$2.54
YUKON									
	Beaver Creek	$3,501	$75	46.7	$0.77	$23,908	$187	128.0	$2.53
	Burwash Landing	$3,501	$58	60.2	$0.76	$23,908	$154	155.5	$2.49
	Carcross	$3,501	$60	58.3	$0.75	$23,908	$158	151.8	$2.45
	Carmacks	$3,501	$60	58.8	$0.75	$23,908	$157	152.7	$2.46
	Dawson	$3,501	$59	59.2	$0.75	$23,908	$156	153.6	$2.47
	Destruction Bay	$3,501	$77	45.4	$0.76	$23,908	$191	125.1	$2.49
	Faro	$3,501	$60	58.8	$0.75	$23,908	$157	152.7	$2.46
	Haines Junction	$3,501	$53	65.6	$0.79	$23,908	$144	165.5	$2.59
	Mayo	$3,501	$59	59.7	$0.76	$23,908	$155	154.5	$2.48
	Old Crow	$3,677	$191	19.2	$0.86	$24,945	$414	60.3	$2.80
	Pelly Crossing	$3,501	$79	44.4	$0.75	$23,908	$194	123.0	$2.46
	Ross River	$3,501	$78	44.7	$0.73	$23,908	$193	123.8	$2.40
	Tagish	$3,501	$60	58.3	$0.75	$23,908	$158	151.8	$2.45
	Teslin	$3,501	$62	56.1	$0.73	$23,907	$162	147.4	$2.40
	Watson Lake	$3,501	$64	54.8	$0.72	$23,908	$165	144.9	$2.37
	Whitehorse	$3,501	$58	60.7	$0.76	$23,907	$153	156.4	$2.50

Appendix C - RETScreen Calculations

		WIND				HYBRID				
REGION	COMMUNITY	Cost	Savings	Payback	5yr	Cost	Savings	Fuel Cost	Payback	5yr
	Puvirnituq	$7,424	$212	35.1	$0.40	$28,486	$283	$2,186	9999.0	$1.38
	Quaqtaq	$7,424	$254	29.2	$0.35	$28,486	$301	$2,098	9999.0	$1.31
	Salluit	$7,424	$195	38.1	$0.43	$28,486	$254	$2,330	9999.0	$1.51
	Tasiujaq	$7,424	$48	155.0	$1.00	$28,486	$102	$3,082	9999.0	$2.72
	Umiujaq	$7,424	$96	77.4	$0.70	$28,486	$176	$2,719	9999.0	$1.98
NUNAVUT										
	Arctic Bay	$7,425	$756	9.8	$0.96	$28,489	$1,467	$2,838	9999.0	$2.76
	Arviat	$7,445	$1,824	4.1	$0.37	$28,563	$2,643	$1,954	41.4	$1.28
	Baker Lake	$7,445	$1,550	4.8	$0.38	$28,563	$2,269	$2,002	107.3	$1.30
	Bathurst Inlet	$7,521	$1,353	5.6	$0.38	$28,839	$1,950	$2,089	9999.0	$1.33
	Cambridge Bay	$7,521	$1,662	4.5	$0.39	$28,839	$2,345	$2,188	183.6	$1.42
	Cape Dorset	$7,424	$1,079	6.9	$0.55	$28,488	$1,680	$2,391	9999.0	$1.85
	Chesterfield Inlet	$7,445	$2,396	3.1	$0.36	$28,563	$3,404	$1,928	19.4	$1.26
	Clyde River	$7,425	$852	8.7	$0.76	$28,489	$1,466	$2,675	9999.0	$2.40
	Coral Harbour	$7,445	$2,030	3.7	$0.41	$28,563	$2,869	$2,207	43.1	$1.48
	Gjoa Haven	$7,533	$2,017	3.7	$0.41	$28,883	$2,827	$2,409	69.0	$1.51
	Grise Fiord	$7,425	$1,090	6.8	$0.88	$28,489	$2,009	$2,831	9999.0	$2.65
	Hall Beach	$7,426	$2,056	3.6	$0.39	$28,496	$2,833	$2,078	37.8	$1.44
	Igloolik	$7,426	$1,188	6.3	$0.44	$28,496	$1,692	$2,160	9999.0	$1.54
	Iqaluit	$7,419	$976	7.6	$0.50	$28,470	$1,482	$1,718	9999.0	$1.56
	Kimmirut	$7,424	$2,365	3.1	$0.48	$28,488	$3,583	$2,236	21.1	$1.63
	Kugluktuk	$7,510	$1,381	5.4	$0.63	$28,800	$2,383	$2,540	9999.0	$1.94
	Nanisivik	$7,425	-$62	9999.0	$0.95	$28,489	-$132	$3,402	9999.0	$2.92
	Pangnirtung	$7,424	$1,171	6.3	$0.50	$28,488	$1,791	$2,262	9999.0	$1.67
	Pelly Bay (Kugaaruk)	$7,425	$2,570	2.9	$0.40	$28,489	$3,576	$2,510	26.7	$1.52
	Pond Inlet	$7,425	$892	8.3	$0.93	$28,489	$1,745	$2,758	9999.0	$2.61
	Qikiqtarjuaq (Broughton Island)	$7,425	$1,374	5.4	$0.55	$28,489	$2,119	$2,265	9999.0	$1.85
	Rankin Inlet	$7,445	$1,498	5.0	$0.34	$28,563	$2,092	$1,851	118.5	$1.20
	Repulse Bay	$7,426	$1,798	4.1	$0.41	$28,496	$2,553	$2,145	69.7	$1.46
	Resolute	$7,425	$1,837	4.0	$0.49	$28,489	$2,712	$2,484	125.0	$1.77
	Sanikiluaq	$7,427	$1,974	3.8	$0.36	$28,497	$2,806	$1,790	28.0	$1.23
	Taloyoak	$7,538	$2,379	3.2	$0.40	$28,903	$3,318	$2,413	31.9	$1.52
	Whale Cove	$7,445	$4,718	1.6	$0.34	$28,563	$6,684	$1,829	5.9	$1.19
YUKON										
	Beaver Creek	$7,403	$3	2780.7	$3.23	$28,410	$193	$2,392	9999.0	$3.42
	Burwash Landing	$7,403	$7	1008.9	$2.59	$28,410	$164	$2,281	9999.0	$3.18
	Carcross	$7,403	$41	182.6	$1.75	$28,410	$201	$2,297	9999.0	$2.83
	Carmacks	$7,403	$18	422.2	$2.26	$28,410	$177	$2,450	9999.0	$3.11
	Dawson	$7,403	-$31	9999.0	$5.71	$28,410	$128	$2,481	9999.0	$3.71
	Destruction Bay	$7,403	-$26	9999.0	$5.87	$28,410	$168	$2,361	9999.0	$3.69
	Faro	$7,403	$20	378.2	$2.20	$28,410	$180	$2,558	9999.0	$3.13
	Haines Junction	$7,403	-$24	9999.0	$4.67	$28,410	$124	$2,364	9999.0	$3.72
	Mayo	$7,403	-$15	9999.0	$3.85	$28,410	$143	$2,563	9999.0	$3.55
	Old Crow	$7,737	$235	32.9	$1.46	$29,622	$652	$2,512	9999.0	$2.95
	Pelly Crossing	$7,403	-$24	9999.0	$5.50	$28,410	$174	$2,594	9999.0	$3.73
	Ross River	$7,403	$122	60.5	$1.10	$28,410	$319	$2,353	9999.0	$2.39
	Tagish	$7,403	$41	182.6	$1.75	$28,410	$201	$2,297	9999.0	$2.83
	Teslin	$7,402	$83	88.9	$1.24	$28,408	$249	$2,317	9999.0	$2.49
	Watson Lake	$7,403	$129	57.3	$0.94	$28,409	$297	$1,879	9999.0	$2.09
	Whitehorse	$7,402	$52	143.4	$1.58	$28,408	$208	$2,283	9999.0	$2.77

Appendix C - Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
ALASKA					
	Adak Station	N	8.48	95%	2.46
	Akiachak	N	3.39	68%	2.20
	Alakanuk	N	3.77	80%	2.11
	Ambler	N	3.13	64%	2.20
	Anaktuvuk Pass	N	3.44	79%	2.22
	Anchorage	Y	3.99	77%	2.04
	Aniak	N	2.39	34%	2.23
	Barrow	N	4.90	87%	1.99
	Beaver	Y	2.13	26%	2.43
	Bethel	N	3.39	68%	2.20
	Chevak	N	4.20	83%	2.07
	Craig	Y	3.50	43%	2.32
	Dillingham	N	3.79	81%	2.22
	Eagle City	Y	2.21	27%	2.42
	Elim	N	2.96	59%	2.19
	Fairbanks/Fairbanks North Star Borough	Y	2.41	37%	2.34
	Fort Yukon	Y	1.87	16%	2.43
	Galena	Y	1.89	15%	2.34
	Gambell	N	6.73	92%	2.02
	Glenallen	Y	3.55	78%	2.17
	Homer	Y	3.45	51%	2.34
	Huslia	Y	1.90	16%	2.29
	Juneau	Y	2.34	32%	2.31
	Kaktovik	N	3.80	80%	2.06
	Kaltag	N	1.85	15%	2.31
	Ketchikan	Y	2.43	30%	2.47
	King Salmon	N	3.84	83%	2.26
	Kipnuk	N	5.39	88%	2.19
	Kodiak	Y	5.68	88%	2.49
	Kotzebue	N	3.49	79%	2.12
	McGrath	Y	3.20	64%	2.30
	Metlakatla	Y	2.43	30%	2.47
	Mountain Village	N	3.48	78%	2.15
	Napaskiak	N	3.39	68%	2.20
	Nome	N	4.96	85%	2.07
	Noorvik	N	3.49	79%	2.15
	Prudhoe Bay (Deadhorse)	N	3.98	84%	2.07
	Saint Mary's	N	3.48	78%	2.15
	Saint Paul	N	7.46	94%	2.16
	Sand Point	N	5.69	88%	2.35
	Selawik	N	3.25	70%	2.18
	Seward	Y	2.32	34%	2.38
	Shishmaref	N	4.00	81%	2.01
	Sitka	Y	3.25	37%	2.25

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
ALASKA					
	Adak Station	4769	$0.000	$20.16	$2.45
	Akiachak	7597	$0.276	$33.46	$2.45
	Alakanuk	8352	$0.271	$23.17	$2.45
	Ambler	9308	$0.279	$40.76	$2.45
	Anaktuvuk Pass	9723	$0.154	$12.44	$2.45
	Anchorage	7157	$0.150	$17.59	$0.70
	Aniak	8117	$0.270	$28.74	$2.45
	Barrow	11086	$0.157	$30.03	$0.25
	Beaver	9424	$0.154	$28.31	$2.45
	Bethel	7597	$0.221	$18.02	$2.45
	Chevak	7944	$0.270	$26.17	$2.45
	Craig	5742	$0.170	$19.73	$2.45
	Dillingham	7202	$0.219	$17.59	$2.45
	Eagle City	8728	$0.160	$19.73	$2.45
	Elim	8899	$0.271	$27.03	$2.45
	Fairbanks/Fairbanks North Star Borough	8941	$0.179	$16.30	$2.45
	Fort Yukon	9704	$0.233	$27.89	$2.45
	Galena	8772	$0.321	$27.46	$2.45
	Gambell	8747	$0.273	$25.74	$2.45
	Glenallen	8093	$0.310	$16.30	$2.45
	Homer	6019	$0.141	$16.30	$2.45
	Huslia	8967	$0.271	$31.75	$2.45
	Juneau	7806	$0.162	$18.45	$2.45
	Kaktovik	10798	$0.154	$15.87	$0.18
	Kaltag	9007	$0.267	$28.31	$2.45
	Ketchikan	6411	$0.159	$18.45	$2.45
	King Salmon	6982	$0.124	$16.30	$2.45
	Kipnuk	7068	$0.225	$22.74	$2.45
	Kodiak	5481	$0.257	$18.88	$2.45
	Kotzebue	9179	$0.213	$21.45	$2.45
	McGrath	7875	$0.210	$28.31	$2.45
	Metlakatla	6411	$0.146	$19.73	$2.45
	Mountain Village	8419	$0.273	$26.17	$2.45
	Napaskiak	7597	$0.370	$18.02	$2.45
	Nome	8832	$0.232	$19.31	$2.45
	Noorvik	9120	$0.276	$24.45	$2.45
	Prudhoe Bay (Deadhorse)	10620	$0.000	$47.67	$0.18
	Saint Mary's	8419	$0.270	$31.32	$2.45
	Saint Paul	5995	$0.405	$17.16	$2.45
	Sand Point	5079	$0.194	$16.30	$2.45
	Selawik	9106	$0.276	$26.17	$2.45
	Seward	9130	$0.146	$16.30	$2.45
	Shishmaref	9519	$0.273	$24.45	$2.45
	Sitka	6737	$0.157	$15.87	$2.45

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
	Skagway	Y	2.28	31%	2.31
	Tanana	Y	1.97	18%	2.30
	Togiak	N	4.37	84%	2.22
	Tok	Y	3.03	61%	2.40
	Unalakleet	N	2.83	53%	2.22
	Unalaska	N	8.21	95%	2.47
	Valdez	Y	4.52	81%	2.02
	Wainwright	N	4.03	84%	1.97
	Whittier	Y	6.22	88%	2.15
	Wragnell	Y	2.33	31%	2.28
LABRADOR					
	Davis Inlet (Utshimassits)	Y	6.39	80%	2.48
	Happy Valley - Goose Bay	Y	2.37	36%	2.74
	Hopedale	Y	6.39	80%	2.48
	Makkovik	Y	6.50	80%	2.48
	Nain	N	6.62	83%	2.36
	North West River	Y	2.37	36%	2.74
	Postville	Y	3.75	50%	2.59
	Rigolet	Y	3.78	50%	2.56
	Sheshatshiu	Y	2.37	36%	2.74
NORTHWEST TERRITORIES					
	Aklavik	Y	2.55	30%	2.12
	Colville Lake	Y	2.06	24%	2.41
	Deline	Y	1.82	14%	2.35
	Dettah	Y	1.82	15%	2.65
	Enterprise	Y	1.79	14%	2.73
	Fort Good Hope	Y	2.26	32%	2.52
	Fort Liard	Y	1.77	12%	2.70
	Fort McPherson	Y	2.02	21%	2.24
	Fort Providence	Y	1.77	13%	2.66
	Fort Resolution	Y	1.81	14%	2.75
	Fort Simpson	Y	1.78	12%	2.65
	Fort Smith	Y	1.87	16%	2.75
	Hay River & (Hay River Reserve)	Y	1.82	15%	2.74
	Holman	N	3.13	74%	2.19
	Inuvik	Y	2.51	29%	2.20
	Jean Marie River	Y	1.77	12%	2.65
	Kakisa	Y	1.74	12%	2.71
	Lutselk'e	Y	1.99	21%	2.59
	Nahanni Butte	Y	1.84	14%	2.65
	Norman Wells	Y	2.00	20%	2.43
	Paulatuk	N	4.50	70%	2.27
	Rae Lakes (Gameti)	Y	1.85	15%	2.53
	Rae-Edzo (Rae)	Y	1.81	14%	2.64
	Sachs Harbour	N	5.36	88%	2.03

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
	Skagway	8019	$0.198	$15.44	$2.45
	Tanana	8735	$0.403	$14.59	$2.45
	Togiak	7066	$0.271	$28.60	$2.45
	Tok	8502	$0.200	$12.44	$2.45
	Unalakleet	8989	$0.214	$23.60	$2.45
	Unalaska	4724	$0.221	$25.88	$2.45
	Valdez	7044	$0.268	$17.16	$2.45
	Wainwright	10487	$0.154	$34.05	$2.45
	Whittier	5509	$0.154	$17.16	$2.45
	Wragnell	6932	$0.170	$18.02	$2.45
LABRADOR					
	Davis Inlet (Utshimassits)	7865	$0.146	$20.08	$1.46
	Happy Valley - Goose Bay	7213	$0.047	$20.08	$1.46
	Hopedale	7865	$0.146	$20.62	$1.46
	Makkovik	7804	$0.146	$20.08	$1.46
	Nain	8231	$0.146	$21.16	$1.46
	North West River	7213	$0.047	$20.11	$1.46
	Postville	7498	$0.146	$20.08	$1.46
	Rigolet	7428	$0.146	$21.16	$1.46
	Sheshatshiu	7213	$0.047	$20.11	$1.46
NORTHWEST TERRITORIES					
	Aklavik	10575	$0.419	$17.84	$0.53
	Colville Lake	10344	$2.266	$30.00	$4.41
	Deline	10096	$0.435	$24.05	$0.01
	Dettah	9914	$0.154	$12.65	$0.01
	Enterprise	9011	$0.148	$13.51	$0.01
	Fort Good Hope	9312	$0.569	$23.51	$0.01
	Fort Liard	7934	$0.479	$21.35	$0.01
	Fort McPherson	10116	$0.418	$22.97	$0.01
	Fort Providence	9470	$0.164	$14.32	$0.01
	Fort Resolution	9598	$0.264	$14.19	$0.01
	Fort Simpson	8860	$0.316	$23.24	$0.01
	Fort Smith	9083	$0.119	$12.24	$0.01
	Hay River & (Hay River Reserve)	9079	$0.148	$13.51	$0.01
	Holman	12326	$0.636	$25.14	$0.97
	Inuvik	10897	$0.314	$15.78	$0.01
	Jean Marie River	9095	$1.402	$24.32	$0.01
	Kakisa	8933	$0.164	$14.19	$0.01
	Lutselk'e	9716	$0.439	$23.51	$0.41
	Nahanni Butte	8212	$1.918	$23.51	$0.09
	Norman Wells	9131	$0.263	$14.05	$0.01
	Paulatuk	10999	$0.628	$24.59	$0.91
	Rae Lakes (Gameti)	10405	$0.821	$27.57	$0.14
	Rae-Edzo (Rae)	9928	$0.276	$12.65	$0.01
	Sachs Harbour	10638	$0.798	$24.86	$0.87

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
	Trout Lake	Y	1.71	11%	2.70
	Tsiigehtchic	N	2.14	26%	2.28
	Tuktoyaktuk	N	4.05	67%	2.13
	Tulita	Y	1.93	17%	2.44
	Wekweti (Snare Lake)	Y	2.12	26%	2.52
	Wha Ti	Y	1.82	14%	2.61
	Wrigley	Y	1.85	15%	2.57
	Yellowknife	Y	1.82	15%	2.65
NUNAVIK					
	Akulivik	N	3.55	81%	2.40
	Aupaluk	N	4.43	73%	2.09
	Inukjuak	N	3.61	82%	2.42
	Ivujivik	N	3.74	81%	2.22
	Kangiqsualujjuaq	N	2.80	44%	2.13
	Kangiqsujuaq	N	5.05	88%	2.02
	Kangirsuk	N	4.54	87%	2.04
	Kuujjuaq	N	3.15	42%	2.16
	Kuujjuarapik	N	4.17	57%	2.68
	Puvirnituq	N	3.59	82%	2.47
	Quaqtaq	N	4.74	87%	2.04
	Salluit	N	4.00	83%	2.25
	Tasiujaq	N	2.90	41%	2.17
	Umiujaq	N	3.21	52%	2.61
NUNAVUT					
	Arctic Bay	N	3.13	74%	1.91
	Arviat	N	5.23	83%	2.44
	Baker Lake	N	3.49	81%	2.47
	Bathurst Inlet	N	3.36	80%	2.39
	Cambridge Bay	N	3.25	78%	2.16
	Cape Dorset	N	5.07	86%	2.05
	Chesterfield Inlet	N	4.56	86%	2.35
	Clyde River	N	3.85	81%	1.89
	Coral Harbour	N	3.96	81%	2.05
	Gjoa Haven	N	3.21	76%	2.04
	Grise Fiord	N	3.45	81%	1.88
	Hall Beach	N	4.30	80%	1.96
	Igloolik	N	3.38	72%	2.03
	Iqaluit	N	3.60	81%	2.15
	Kimmirut	N	4.32	84%	2.13
	Kugluktuk	N	2.96	65%	2.31
	Nanisivik	N	3.16	75%	1.91
	Pangnirtung	N	3.67	81%	2.17
	Pelly Bay (Kugaaruk)	N	3.47	79%	1.98
	Pond Inlet	N	3.69	77%	2.01
	Qikiqtarjuaq (Broughton Island)	N	5.31	88%	1.97

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
	Trout Lake	8424	$0.399	$24.32	$0.01
	Tsiigehtchic	10255	$0.666	$23.78	$0.01
	Tuktoyaktuk	11287	$0.459	$15.78	$0.66
	Tulita	8797	$0.702	$23.51	$0.01
	Wekweti (Snare Lake)	10343	$0.338	$28.11	$0.14
	Wha Ti	10138	$0.625	$26.22	$0.12
	Wrigley	9019	$0.705	$23.24	$0.01
	Yellowknife	9914	$0.132	$12.65	$0.01
NUNAVIK					
	Akulivik	10179	$0.071	$24.55	$0.25
	Aupaluk	10016	$0.071	$24.55	$0.25
	Inukjuak	9659	$0.071	$24.55	$0.25
	Ivujivik	10443	$0.071	$24.55	$0.25
	Kangiqsualujjuaq	9473	$0.071	$24.55	$0.25
	Kangiqsujuaq	10311	$0.071	$24.55	$0.25
	Kangirsuk	10245	$0.071	$24.55	$0.25
	Kuujjuaq	9676	$0.071	$24.55	$0.25
	Kuujjuarapik	8285	$0.071	$24.55	$0.25
	Puvirnituq	10190	$0.071	$24.55	$0.25
	Quaqtaq	10284	$0.071	$24.55	$0.25
	Salluit	10407	$0.071	$24.55	$0.25
	Tasiujaq	9736	$0.071	$24.55	$0.25
	Umiujaq	8818	$0.071	$24.55	$0.25
NUNAVUT					
	Arctic Bay	13447	$0.510	$22.24	$0.26
	Arviat	10687	$0.454	$23.05	$0.47
	Baker Lake	12079	$0.398	$23.32	$0.47
	Bathurst Inlet	11598	$0.348	$24.14	$1.27
	Cambridge Bay	12910	$0.434	$24.14	$1.27
	Cape Dorset	11091	$0.408	$21.97	$0.26
	Chesterfield Inlet	11120	$0.571	$23.05	$0.47
	Clyde River	11928	$0.451	$21.97	$0.26
	Coral Harbour	11535	$0.553	$23.32	$0.47
	Gjoa Haven	13184	$0.538	$25.76	$1.40
	Grise Fiord	12595	$0.656	$22.51	$0.26
	Hall Beach	13189	$0.538	$22.24	$0.28
	Igloolik	13919	$0.353	$21.97	$0.28
	Iqaluit	10656	$0.334	$16.65	$0.20
	Kimmirut	10458	$0.753	$21.97	$0.26
	Kugluktuk	11569	$0.578	$23.05	$1.16
	Nanisivik	13350	$0.000	$26.73	$0.26
	Pangnirtung	11027	$0.397	$21.97	$0.26
	Pelly Bay (Kugaaruk)	13065	$0.677	$26.73	$0.26
	Pond Inlet	12727	$0.571	$21.97	$0.26
	Qikiqtarjuaq (Broughton Island)	11126	$0.515	$20.62	$0.26

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
	Rankin Inlet	N	5.70	90%	2.39
	Repulse Bay	N	3.41	81%	2.09
	Resolute	N	2.87	67%	1.94
	Sanikiluaq	N	6.17	92%	2.37
	Taloyoak	N	3.28	79%	2.00
	Umingmaktok	N	3.33	79%	2.35
	Whale Cove	N	5.70	90%	2.39
YUKON					
	Beaver Creek	Y	2.77	52%	2.39
	Burwash Landing	Y	1.98	21%	2.43
	Carcross	Y	2.73	48%	2.47
	Carmacks	Y	1.99	21%	2.46
	Dawson	Y	1.96	18%	2.45
	Destruction Bay	Y	1.98	21%	2.43
	Faro	Y	2.46	40%	2.46
	Haines Junction	Y	2.01	22%	2.33
	Mayo	Y	2.24	30%	2.44
	Old Crow	Y	2.53	44%	2.25
	Pelly Crossing	Y	1.99	21%	2.46
	Ross River	Y	2.52	43%	2.52
	Tagish	Y	2.73	48%	2.47
	Teslin	Y	3.27	68%	2.52
	Watson Lake	Y	3.75	82%	2.55
	Whitehorse	Y	2.24	30%	2.42

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
	Rankin Inlet	10892	$0.346	$23.05	$0.47
	Repulse Bay	12376	$0.492	$22.78	$0.28
	Resolute	15095	$0.607	$23.59	$0.26
	Sanikiluaq	8853	$0.474	$21.43	$0.28
	Taloyoak	13004	$0.628	$25.76	$1.46
	Umingmaktok	12100	$0.340	$23.59	$1.27
	Whale Cove	10892	$1.061	$22.78	$0.47
YUKON					
	Beaver Creek	8427	$0.136	$17.30	$0.03
	Burwash Landing	8180	$0.116	$16.76	$0.03
	Carcross	8255	$0.116	$17.46	$0.03
	Carmacks	8385	$0.116	$18.22	$0.03
	Dawson	8742	$0.116	$17.65	$0.03
	Destruction Bay	8180	$0.136	$16.76	$0.03
	Faro	8235	$0.116	$19.05	$0.03
	Haines Junction	7892	$0.116	$16.76	$0.03
	Mayo	8424	$0.116	$18.46	$0.03
	Old Crow	9588	$0.270	$19.19	$3.54
	Pelly Crossing	8385	$0.136	$18.49	$0.03
	Ross River	8227	$0.132	$19.05	$0.03
	Tagish	8255	$0.116	$17.46	$0.03
	Teslin	8266	$0.116	$18.43	$0.02
	Watson Lake	8078	$0.116	$15.70	$0.03
	Whitehorse	8237	$0.116	$17.46	$0.02

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
LABRADOR					
	Davis Inlet (Utshimassits)	Y	5.80	80%	2.48
	Happy Valley - Goose Bay	Y	4.40	36%	2.74
	Hopedale	Y	5.80	80%	2.48
	Makkovik	Y	5.80	80%	2.48
	Nain	N	5.80	83%	2.36
	Postville	Y	5.80	50%	2.59
	Rigolet	Y	5.60	50%	2.56
NORTHWEST TERRITORIES					
	Aklavik	Y	3.00	30%	2.12
	Colville Lake	Y	3.40	24%	2.41
	Deline	Y	3.40	14%	2.35
	Dettah	Y	4.30	15%	2.65
	Enterprise	Y	3.40	14%	2.73
	Fort Good Hope	Y	2.60	32%	2.52
	Fort Liard	Y	1.90	12%	2.70
	Fort McPherson	Y	2.80	21%	2.24
	Fort Providence	Y	2.10	13%	2.66
	Fort Resolution	Y	3.40	14%	2.75
	Fort Simpson	Y	3.10	12%	2.65
	Fort Smith	Y	3.40	16%	2.75
	Hay River & (Hay River Reserve)	Y	3.40	15%	2.74
	Holman	N	5.10	74%	2.19
	Inuvik	Y	2.80	29%	2.20
	Jean Marie River	Y	3.10	12%	2.65
	Kakisa	Y	2.10	12%	2.71
	Lutselk'e	Y	4.30	21%	2.59
	Nahanni Butte	Y	3.10	14%	2.65
	Norman Wells	Y	3.40	20%	2.43
	Paulatuk	N	2.80	70%	2.27
	Rae Lakes (Gameti)	Y	4.30	15%	2.53
	Rae-Edzo (Rae)	Y	4.30	14%	2.64
	Sachs Harbour	N	5.70	88%	2.03
	Trout Lake	Y	3.10	11%	2.70
	Tsiigehtchic	N	2.80	26%	2.28
	Tuktoyaktuk	N	4.80	67%	2.13
	Tulita	Y	3.40	17%	2.44
	Wekweti (Snare Lake)	Y	4.30	26%	2.52
	Wha Ti	Y	4.30	14%	2.61
	Wrigley	Y	2.90	15%	2.57
	Yellowknife	Y	4.30	15%	2.65
NUNAVIK					
	Akulivik	N	5.60	81%	2.40
	Aupaluk	N	4.50	73%	2.09
	Inukjuak	N	5.60	82%	2.42

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
LABRADOR					
	Davis Inlet (Utshimassits)	7385	$0.146	$20.08	$1.46
	Happy Valley - Goose Bay	7213	$0.047	$20.08	$1.46
	Hopedale	7385	$0.146	$20.62	$1.46
	Makkovik	7385	$0.146	$20.08	$1.46
	Nain	7596	$0.146	$21.16	$1.46
	Postville	7385	$0.146	$20.08	$1.46
	Rigolet	6685	$0.146	$21.16	$1.46
NORTHWEST TERRITORIES					
	Aklavik	9849	$0.419	$17.84	$0.53
	Colville Lake	8782	$2.266	$30.00	$4.41
	Deline	8782	$0.435	$24.05	$0.01
	Dettah	8477	$0.154	$12.65	$0.01
	Enterprise	7830	$0.148	$13.51	$0.01
	Fort Good Hope	9415	$0.569	$23.51	$0.01
	Fort Liard	7389	$0.479	$21.35	$0.01
	Fort McPherson	9804	$0.418	$22.97	$0.01
	Fort Providence	8031	$0.164	$14.32	$0.01
	Fort Resolution	8043	$0.264	$14.19	$0.01
	Fort Simpson	7976	$0.316	$23.24	$0.01
	Fort Smith	7692	$0.119	$12.24	$0.01
	Hay River & (Hay River Reserve)	7830	$0.148	$13.51	$0.01
	Holman	11086	$0.636	$25.14	$0.97
	Inuvik	10040	$0.314	$15.78	$0.01
	Jean Marie River	7976	$1.402	$24.32	$0.01
	Kakisa	8031	$0.164	$14.19	$0.01
	Lutselk'e	8477	$0.439	$23.51	$0.41
	Nahanni Butte	6995	$1.918	$23.51	$0.09
	Norman Wells	8782	$0.263	$14.05	$0.01
	Paulatuk	10040	$0.628	$24.59	$0.91
	Rae Lakes (Gameti)	8477	$0.821	$27.57	$0.14
	Rae-Edzo (Rae)	8477	$0.276	$12.65	$0.01
	Sachs Harbour	11592	$0.798	$24.86	$0.87
	Trout Lake	7976	$0.399	$24.32	$0.01
	Tsiigehtchic	10040	$0.666	$23.78	$0.01
	Tuktoyaktuk	10530	$0.459	$15.78	$0.66
	Tulita	8903	$0.702	$23.51	$0.01
	Wekweti (Snare Lake)	8477	$0.338	$28.11	$0.14
	Wha Ti	8477	$0.625	$26.22	$0.12
	Wrigley	8464	$0.705	$23.24	$0.01
	Yellowknife	8477	$0.132	$12.65	$0.01
NUNAVIK					
	Akulivik	9063	$0.071	$24.55	$0.25
	Aupaluk	8561	$0.071	$24.55	$0.25
	Inukjuak	9063	$0.071	$24.55	$0.25

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
	Ivujivik	N	5.20	81%	2.22
	Kangiqsualujjuaq	N	4.50	44%	2.13
	Kangiqsujuaq	N	6.10	88%	2.02
	Kangirsuk	N	6.10	87%	2.04
	Kuujjuaq	N	4.50	42%	2.16
	Kuujjuarapik	N	5.10	57%	2.68
	Puvirnituq	N	5.60	82%	2.47
	Quaqtaq	N	6.10	87%	2.04
	Salluit	N	5.20	83%	2.25
	Tasiujaq	N	4.50	41%	2.17
	Umiujaq	N	5.10	52%	2.61
NUNAVUT					
	Arctic Bay	N	2.60	74%	1.91
	Arviat	N	6.00	83%	2.44
	Baker Lake	N	6.00	81%	2.47
	Bathurst Inlet	N	6.10	80%	2.39
	Cambridge Bay	N	6.10	78%	2.16
	Cape Dorset	N	3.90	86%	2.05
	Chesterfield Inlet	N	6.00	86%	2.35
	Clyde River	N	3.00	81%	1.89
	Coral Harbour	N	5.60	81%	2.05
	Gjoa Haven	N	6.10	76%	2.04
	Grise Fiord	N	2.60	81%	1.88
	Hall Beach	N	5.90	80%	1.96
	Igloolik	N	5.90	72%	2.03
	Iqaluit	N	4.60	81%	2.15
	Kimmirut	N	4.60	84%	2.13
	Kugluktuk	N	4.60	65%	2.31
	Nanisivik	N	2.60	75%	1.91
	Pangnirtung	N	4.60	81%	2.17
	Pelly Bay (Kugaaruk)	N	5.90	79%	1.98
	Pond Inlet	N	2.60	77%	2.01
	Qikiqtarjuaq (Broughton Island)	N	3.80	88%	1.97
	Rankin Inlet	N	6.00	90%	2.39
	Repulse Bay	N	5.60	81%	2.09
	Resolute	N	5.60	67%	1.94
	Sanikiluaq	N	5.60	92%	2.37
	Taloyoak	N	5.90	79%	2.00
	Whale Cove	N	6.00	90%	2.39
YUKON					
	Beaver Creek	Y	1.10	52%	2.39
	Burwash Landing	Y	3.40	21%	2.43
	Carcross	Y	2.20	48%	2.47
	Carmacks	Y	3.90	21%	2.46
	Dawson	Y	1.80	18%	2.45

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
	Ivujivik	10828	$0.071	$24.55	$0.25
	Kangiqsualujjuaq	8561	$0.071	$24.55	$0.25
	Kangiqsujuaq	9181	$0.071	$24.55	$0.25
	Kangirsuk	9181	$0.071	$24.55	$0.25
	Kuujjuaq	8675	$0.071	$24.55	$0.25
	Kuujjuarapik	8230	$0.071	$24.55	$0.25
	Puvirnituq	9063	$0.071	$24.55	$0.25
	Quaqtaq	9181	$0.071	$24.55	$0.25
	Salluit	10828	$0.071	$24.55	$0.25
	Tasiujaq	8561	$0.071	$24.55	$0.25
	Umiujaq	8160	$0.071	$24.55	$0.25
NUNAVUT					
	Arctic Bay	11693	$0.510	$22.24	$0.26
	Arviat	10768	$0.454	$23.05	$0.47
	Baker Lake	11011	$0.398	$23.32	$0.47
	Bathurst Inlet	11991	$0.348	$24.14	$1.27
	Cambridge Bay	11991	$0.434	$24.14	$1.27
	Cape Dorset	10783	$0.408	$21.97	$0.26
	Chesterfield Inlet	10768	$0.571	$23.05	$0.47
	Clyde River	11097	$0.451	$21.97	$0.26
	Coral Harbour	10828	$0.553	$23.32	$0.47
	Gjoa Haven	12148	$0.538	$25.76	$1.40
	Grise Fiord	11693	$0.656	$22.51	$0.26
	Hall Beach	11810	$0.538	$22.24	$0.28
	Igloolik	11810	$0.353	$21.97	$0.28
	Iqaluit	10050	$0.334	$16.65	$0.20
	Kimmirut	10050	$0.753	$21.97	$0.26
	Kugluktuk	10758	$0.578	$23.05	$1.16
	Nanisivik	11693	$0.000	$26.73	$0.26
	Pangnirtung	10050	$0.397	$21.97	$0.26
	Pelly Bay (Kugaaruk)	12102	$0.677	$26.73	$0.26
	Pond Inlet	12102	$0.571	$21.97	$0.26
	Qikiqtarjuaq (Broughton Island)	10783	$0.515	$20.62	$0.26
	Rankin Inlet	10768	$0.346	$23.05	$0.47
	Repulse Bay	10828	$0.492	$22.78	$0.28
	Resolute	12630	$0.607	$23.59	$0.26
	Sanikiluaq	9063	$0.474	$21.43	$0.28
	Taloyoak	12148	$0.628	$25.76	$1.46
	Whale Cove	10768	$1.061	$22.78	$0.47
YUKON					
	Beaver Creek	8838	$0.136	$17.30	$0.03
	Burwash Landing	8018	$0.116	$16.76	$0.03
	Carcross	6964	$0.116	$17.46	$0.03
	Carmacks	7970	$0.116	$18.22	$0.03
	Dawson	8409	$0.116	$17.65	$0.03

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	TREES AVAILABLE? (Yes or No)	WIND SPEED (average, m/s)	WIND FREQUENCY (% above 3 m/s)	SOLAR INSOLATION kWh/m^2/day (yearly average)
	Destruction Bay	Y	1.50	21%	2.43
	Faro	Y	2.10	40%	2.46
	Haines Junction	Y	1.80	22%	2.33
	Mayo	Y	1.60	30%	2.44
	Old Crow	Y	3.00	44%	2.25
	Pelly Crossing	Y	1.60	21%	2.46
	Ross River	Y	3.90	43%	2.52
	Tagish	Y	2.20	48%	2.47
	Teslin	Y	2.20	68%	2.52
	Watson Lake	Y	2.40	82%	2.55
	Whitehorse	Y	3.90	30%	2.42

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - RETScreen Raw Data

REGION	COMMUNITY	HEATING DEGREE DAYS BELOW 18°C	ELECTRICITY COST ($Can/KWhr)	HEATING COST ($Can/GJ)	SHIPPING COST ($Can/kg)
	Destruction Bay	8773	$0.136	$16.76	$0.03
	Faro	6947	$0.116	$19.05	$0.03
	Haines Junction	7699	$0.116	$16.76	$0.03
	Mayo	7891	$0.116	$18.46	$0.03
	Old Crow	10207	$0.270	$19.19	$3.54
	Pelly Crossing	8251	$0.136	$18.49	$0.03
	Ross River	6947	$0.132	$19.05	$0.03
	Tagish	7167	$0.116	$17.46	$0.03
	Teslin	7167	$0.116	$18.43	$0.02
	Watson Lake	7725	$0.116	$15.70	$0.03
	Whitehorse	6947	$0.116	$17.46	$0.02

*Electricity, Heating and Shipping costs valid at April 2001

Appendix C - Biomass

BIOMASS SYSTEM COST ANALYSIS:

	Woodstove
Initial Purchase ($Can)	$1,500
Shipping Weight (kg)	200
Installation ($Can)	$500
Operation ($/KWHR)	0
Maintenance ($CAN/yr)	$100
Decommission ($Can)	$200
Expected Life (years)	25
SHIPPING WEIGHT (KG)	200
TOTAL INITIAL COST	$2,000
TOTAL YEARLY COST	$108

Sample Calculation

	Heating Degree Days	MJ/HDD	Pecentage of Total Heat	Heat Fuel Cost $Can/GJ	Fuel Conversion Efficiency	Wood Heat Cost $Can/GJ	Wood Conversion Efficiency	Savings/yr (wood no cost)	Savings/yr (purchased wood)
Town Name	9000	24.5	50%	$13.50	80%	$9.09	70%	$1,860.47	$428.65

	Shipping Cost $Can/KG	Total Cost Of Shipping	Total Initial Cost	Yearly Cost		Payback no cost wood (Years)	Payback purchased wood (Years)
	$5.00	$1,000.00	$3,000.00	$108		1.7	9.4

Assumptions

Heating Conversion Efficiency	70%
Percentage of Total Heat	50%
Price of Cord of wood ($Can)	$200
Energy/cord (GJ)	22
Biomass Energy Cost ($/GJ)	$9.09

Appendix C - Photovoltaic

PHOTOVOLTAIC SYSTEM COST ANALYSIS:

	Array	Batteries	Inverter	Other
Initial Purchase ($Can)	$20,000	$0	$2,000	$500
Shipping Weight (kg)	250	0	20	25
Installation ($Can)	$1,000	$0	$200	$200
Operation ($/KWHR)	0	0	0	0
Maintenance ($CAN/yr)	$50	$0	$0	$0
Decommission ($Can)	$500	$0	$100	$100
Expected Life (years)	30			
TOTAL INITIAL COST	$21,000	$0	$2,200	$700
TOTAL YEARLY COST	$67	$0	$3	$3

SHIPPING WEIGHT (KG)	295
TOTAL INITIAL COST	$23,900
TOTAL YEARLY COST	$73

Sample Calculation

	Solar Insolation	Array Size	Efficiency	Days/yr	Electrical Cost	TOTAL SAVINGS /yr
Town Name	2.5	20	0.11	365	$0.50	$1,003.75

Shipping Cost	Total Cost Of Shipping	Total Initial Cost	Yearly Cost	Payback (Years)
$5.00	$1,475.00	$25,375.00	$73	27.3

Assumptions

Solar Conversion Efficiency	11%
Array Size (m2)	20

Assume Grid-Connected System

Appendix C - Solar Air

SOLAR AIR HEATING SYSTEM COST ANALYSIS:

	Complete Kit	
Initial Purchase ($Can)	$1,500	
Shipping Weight (kg)	50	
Installation ($Can)	$800	2 days labour
Operation ($/KWHR)	0	
Maintenance ($CAN/yr)	$0	
Decommission ($Can)	$200	
Expected Life (years)	30	
SHIPPING WEIGHT (KG)	50	
TOTAL INITIAL COST	$2,300	
TOTAL YEARLY COST	$7	

Sample Calculation

	Solar Insolation (KWhr/m2/day)	Solar Heating Conversion Efficiency	Seasonal Resource Factor	Heat Fuel Cost $Can/GJ	Fuel Conversion Efficiency	Savings/yr
Town Name	2.5	75%	75%	$13.50	80%	$93.55

	Shipping Cost $Can/KG	Total Cost Of Shipping	Total Initial Cost	Yearly Cost		Payback (Years)
	$5.00	$250.00	$2,300.00	$7		26.5

Assumptions

Solar Heating Conversion Efficiency		75%
Panel Size (m2)	3	
Specific Heat of Air (J/L*K)	1.19	
Seasonal Resource Factor	75%	
Ventilation Rate (Lps)	50	
Average OAT	-7	
Avg Vent Heat Required (KWHr/Day)	35.2	

Appendix C - Solar Water

SOLAR WATER HEATING SYSTEM COST ANALYSIS:

	Complete Kit
Initial Purchase ($Can)	$3,000
Shipping Weight (kg)	50
Installation ($Can)	$500
Operation ($/KWHR)	0
Maintenance ($CAN/yr)	$50
Decommission ($Can)	$200
Expected Life (years)	25
SHIPPING WEIGHT (KG)	50
TOTAL INITIAL COST	$3,500
TOTAL YEARLY COST	$58

Sample Calculation

	Solar Insolation (KWhr/m2/day)	Solar Heating Conversion Efficiency	Seasonal Resource Factor	Electricity Cost ($Can/KWHR)	Savings/yr	
Town Name	2.5	75%	75%	$0.15	$153.98	
	Shipping Cost $Can/KG	**Total Cost Of Shipping**	**Total Initial Cost**	**Yearly Cost**		**Payback (Years)**
	$5.00	$250.00	$3,500.00	$58		36.5

Assumptions

Solar Heating Conversion Efficiency	75%	
Panel Size (m2)	2	
Specific Heat of Water (KJ/L*C)	4.2	
Seasonal Resource Factor	75%	
Hot Water Temp Rise (C)	45	
Domestic Hot Water Usage	200	L/Day
Avg DHW Heat Required (KWHR/Day)	10.5	

Appendix C - Wind

WIND ENERGY SYSTEM COST ANALYSIS

	Turbine	Batteries	Inverter	Other
Initial Purchase ($Can)	$4,000	$0	$2,000	$500
Shipping Weight (kg)	50	0	20	25
Installation ($Can)	$500	$0	$200	$200
Operation ($/KWHR)	0	0	0	0
Maintenance ($CAN/yr)	$50	$0	$0	$0
Decommission ($Can)	$100	$0	$100	$100
Expected Life (years)	25			
TOTAL INITIAL COST	$4,500	$0	$2,200	$700
TOTAL YEARLY COST	$54	$0	$4	$4

SHIPPING	95
TOTAL INITIAL COST	$7,400
TOTAL YEARLY COST	$62

Sample Calculation

	Wind Speed	Wind Frequency	Output Factor (KW/m/s)	Number of Turbines	Hours/yr	Electrical Cost	TOTAL SAVINGS/yr
Town Name	9	80%	0.095	1	8760	$0.50	$3,003.43

Shipping Cost	Total Cost Of Shipping	Total Initial Cost	Yearly Cost	Payback (Years)
$5.00	$475.00	$7,875.00	$62	2.7

Assumptions

Wind Turbine output factor (KW/m/s)	0.095
Turbine Rated Output (W)	1000
Turbine Rated Speed(m/s)	10.5
Number of Turbines	1

Assume Grid-Connected System

HYBRID PV/WIND/DIESEL ENERGY SYSTEM COST ANALYSIS

	Turbine	PV Array	Genset	Batteries	Inverter	Other
Initial Purchase ($Can)	$4,000	$20,000	$0	$0	$2,000	$500
Shipping Weight (kg)	50	250	0	0	20	25
Installation ($Can)	$500	$1,000	$0	$0	$200	$200
Operation ($/KWHR)	0	0	0	0	0	0
Maintenance ($CAN/yr)	$50	$50	$0	$0	$0	$0
Decommission ($Can)	$100	$500	$0	$0	$100	$100
Expected Life (years)	25					
TOTAL INITIAL COST	$4,500	$21,000	$0	$0	$2,200	$700
TOTAL YEARLY COST	$54	$70	$0	$0	$4	$4

SHIPPING	345
TOTAL INITIAL COST	$28,400
TOTAL YEARLY COST	$132

Sample Calculation

	Wind Speed	Wind Frequency	Output Factor (KW/m/s)	Number of Turbines	Hours/yr	Electrical Cost	Total Savings/yr
Town Name	9	80%	0.095	1	8760	$0.50	$3,003.43

	Solar Insolation	Array Size	PV Cell Efficiency	Days/yr	Electrical Cost	Total Savings/yr
Town Name	2.5	20	11%	365	$0.50	$1,003.75

	Fuel Cost ($Can/L)	Fuel Energy Content (KW*Hr/L)	Conversion Efficiency	Required KW*Hr/yr	Fuel Cost/yr
Town Name	$0.50	10.4	25%	3986	$766.47

Shipping Cost	Total Cost Of Shipping	Total Initial Cost	Yearly Cost	Payback (Years)
$5.00	$1,725.00	$30,125.00	$898	14.3

Assumptions

Wind Turbine output factor (KW/m/s)		0.095
Turbine Rated Output (W)	1000	
Turbine Rated Speed(m/s)	10.5	
Number of Turbines	1	
Solar Conversion Efficiency		11%
Array Size (m2)		20
Genset Efficiency		25%

Assume Grid-Connected System

OIL/PROPANE FURNACE SYSTEM COST COMPARISON:

	Furnace	
Initial Purchase ($Can)	$1,000	
Shipping Weight (kg)	150	
Installation ($Can)	$500	
Operation ($/MJ)	??	Depends on local fuel costs
Maintenance ($CAN/yr)	$100	
Decommission ($Can)	$200	
Expected Life (years)	25	
SHIPPING	150	
TOTAL INITIAL COST	$1,500	
TOTAL YEARLY COST	$108	

Assumptions

Heating Conversion Efficiency	80%

ELECTRIC DOMESTIC HOT WATER SYSTEM COST COMPARISON:

	Heater	
Initial Purchase ($Can)	$500	
Shipping Weight (kg)	50	
Installation ($Can)	$200	
Operation ($/MJ)	Varies	Depends on local electricity costs (see Raw Data)
Maintenance ($CAN/yr)	$50	
Decommission ($Can)	$200	
Expected Life (years)	15	
SHIPPING	50	
TOTAL INITIAL COST	$700	
TOTAL YEARLY COST	$63	

Assumptions

Domestic Hot Water Usage	200	L/Day
Avg DHW Heat Required (KWHR/Day)	10.5	

APPENDIX D

REFERENCES

APPENDIX D

1.1 REFERENCES – PUBLICATIONS

.1 Canadian Renewable Energy Guide, 2nd Edition; Solar Energy Society of Canada Inc., 1999.
.2 Photovoltaics in Cold Climates; Ross and Royer, 1999.
.3 Tap The Sun, Passive Solar Techniques and Home Designs; CMHC, 1999.
.4 Building Science for a Cold Climate; Hutcheon and Handegord, 1989
.5 Independent Energy Guide; Jeffrey, 1995
.6 Solar Design Manual for Alaska; Seifert, 1981
.7 Photovoltaics System Design Manual; CANMET, 1991
.8 Model National Energy Code for Houses; National Research Council, 1997
.9 Renewable Energy Technologies Project Assessment Tool; Natural Resources Canada, 1998
.10 Technologies For Use In On-Site Wastewater Recycling Within Cold And Remote Regions; Johnson and Christensen, 2000
.11 Canadian Solar Energy Catalogue, Soltek Solar Energy Ltd., 2000
.12 Powersource Renewable Energy Guide, Powersource Energy Systems Inc., 2000
.13 Solar Electric Products Catalog, 9th Edition, Kyocera Solar Inc.
.14 Stand Alone Wind Energy Systems, A Buyers Guide
Natural Resources Canada, 2000 (ISBN 0-662-28254-X)

1.2 REFERENCES - WEB SITES

.1 Alternative Energy Organizations & Information Sites

.1	www.cansia.ca	Canadian Solar Industries Association
.2	www.canwea.ca	Canadian Wind Energy Association
.3	www.awea.org	American Wind Energy Association
.4	www.ec.gc.ca	Environment Canada
.5	www.nrcan.gc.ca	Natural Resources Canada
.6	www.iaeel.org	International Association for Energy Efficient Lighting
.7	www.advancedbuildings.org	Advanced Buildings Technologies & Practices
.8	www.ises.org	International Solar Energy Society
.9	www.ases.org	American Solar Energy Society
.10	www.solarenergysociety.ca	Canadian Solar Energy Society
.11	wire.ises.org	World-Wide Information System for Renewable Energy

.12	www.climatechangesolutions.com	Canadian Climate Change Solution Examples
.13	www.pembina.org	Pembina Institute
.14	www.crest.org	Centre for Renewable Energy and Sustainable Technologies
.15	www.ewea.org	European Wind Energy Association
.16	www.nrel.gov	National Renewable Energy Association of the Unites States
.17	www.eren.doe.gov	Energy Efficiency and Renewable Energy Network
.18	www.thenaturalhome.com/passive solar.html	The Natural Home Building Source
.19	www.eren.doe.gov/erec/factsheets /passive_solar.html	Passive Solar Design for the Home, U.S. Dept of Energy
.20	www.nrcan.gc.ca/es/erb/reed/publ ic_e.htm	Solar Water Heating Systems- A Buyers Guide, Natural Resources Canada, 2000
.21	www.eren.doe.gov/erec/factsheets /solrwatr.html	Solar Water Heating Consumer Fact Sheet -US Department of Energy, Energy Efficiency and Renewable Energy Network
.22	www.nrcan.gc.ca/es/erb/reed/air_e .htm	Natural Resources Canada – Solar Air Heating
.23	www.solarwall.com	Conserval Solarwall
.24	www.nrcan.gc.ca/es/erb/reed/woo d/index.html	Guide to Residential Wood Heating, Natural Resources Canada
.25	www.woodheat.org	Wood Heat Organization Inc
.26	www.eren.doe.gov/consumerinfo/ refbriefs/bc8.html	Pellet Fuel Appliances and Pellet Fuels, U.S. Dept of Energy
.27	www.pelletheat.org	Pellet Fuels Institute
.28	www.pellet.org/index.html	B.C. Pellet Fuel Manufacturers
.29	www.eren.doe.gov/RE/solar_phot ovoltaics.html www.eren.doe.gov/pv	Photovotaics, U.S. Dept of Energy
.30	www.sandia.gov/pv/	Photovoltaic Program, Sandia Laboratory
.31	cedrl.mets.nrcan.gc.ca/e/pubs_e.ht ml	CANMET Energy Diversification Research Laboratory (CEDRL) Publications
.32	www.canwea.org	Canadian Wind Energy Association
.33	www.awea.org	American Wind Energy Association
.34	www.eren.doe.gov/wind	Wind Energy Program, U.S. Dept of Energy
.35	cedrl.mets.nrcan.gc.ca/e/index_e.h tml	CANMET Energy Diversification Research Laboratory
.36	www.tracegridtie.com	Trace Grid Tie Information
.37	www.traceoffgrid.com	Trace Off Grid Information
.38	www.twdb.state.tx.us/assistance/c onservation/rain.htm	Texas Water Development Board – Rainwater harvesting
.39	www.aea.nt.ca/main.htm?tips.htm &1	Arctic Energy Alliance - energy saving tips

.40	www.eren.doe.gov/consumerinfo/energy_savers/	U.S. Dept of Energy - energy savers
.41	www.ornl.gov/roofs+walls/insulation	U.S. Dept of Energy - insulation fact sheet
.42	www.naima.org	North American Insulation Manufacturers Association
.43	www.cellulose.org	Cellulose Insulation Manufacturers Association
.44	buildingsgroup.nrcan.gc.ca/PDFs/Guide_e.pdf	Consumers Guide To Buying Energy Efficient Windows – Natural Resources Canada, Office of Energy Efficiency; 1998
.45	www.efficientwindows.org	Efficient Windows Collaborative
.46	energy-publications.nrcan.gc.ca/pub/renovate/Air_Leakage_Control.cfm	Air Leakage Control, Natural Resources Canada
.47	www.southface.org/home/sfpubs/techshts/airseal.pdf	Air Sealing Bulletin, Southface Energy Institute
.48	r2000.chba.ca/consumers/home.html	R-2000 HOME Program Office of Energy Efficiency Natural Resources Canada
.49	energy-publications.nrcan.gc.ca/pub/home/heating_with_gas.cfm	Heating with Gas, Natural Resources Canada
.50	energy-publications.nrcan.gc.ca/pub/home/heating_with_oil.cfm	Heating with Oil, Natural Resources Canada
.51	www.eren.doe.gov/consumerinfo/refbriefs/ea5.html	US Department of Energy, Energy Efficiency and Renewable Energy Network, Reference Brief 'Energy Recovery Ventilation for Residences'
.52	www.hvi.org/directory	Home Ventilation Institute, Certified Products Directory
.53	www.endlessshower.com	GFX Heat Recovery Systems
.54	www.ext.colostate.edu/pubs/garden/07225.html	Landscaping for Energy Conservation-Colorado State University
.55	www.eren.doe.gov/erec/factsheets/landscape.html	Landscaping for Energy Efficiency - U.S. Department of Energy
.56	www.aea.nt.ca/main.htm?tips.htm&1	Arctic Energy Alliance - energy saving tips
.57	www.eren.doe.gov/consumerinfo/energy_savers/	U.S. Dept of Energy - energy savers
.58	www.theledlight.com	The LED light store
.59	www.bulbs.com/lightingguide/homelighting.asp	Home lighting guide, Bulbs.com
.60	energy-publications.nrcan.gc.ca/pub/home/Household_Lighting.cfm	Energy efficient home lighting, Natural Resources Canada
.61	energy-publications.nrcan.gc.ca/	Buying Energy Efficient Appliances, Natural

	pub/home/Buying_and_Using_EE_Appliances.cfm	Resources Canada
.62	www.eren.doe.gov/buildings/buying_appliances.html	Buying Energy Efficient Appliances, U.S. Department of Energy
.63	www.eren.doe.gov/consumerinfo/energy_savers/	Energy Efficiency and Renewable Energy Network, U.S. Department of Energy - Energy Savers
.64	www.toiletology.com/low-flow.shtml	Toiletology 101 – Low Consumption Toilets
.65	www.terrylove.com/crtoilet.htm	Terry Love's Consumer toilet reports, low flow toilets
.66	eartheasy.com/liev_lowflow_aerators.htm	Eartheasy - Low Flow Aerators
.67	www.nrgsc.yk.ca	Energy Solutions Centre, Whitehorse

.2 Alternative Energy Manufacturers and Suppliers Sites

.1	www.kyocerasolar.com	Kyocera Solar Inc.
.2	www.solarwall.com	Conserval Solarwall System
.3	www.lenbrooksolar.com	Lenbrook Energy Systems
.4	www.soltek.ca	Solteck Solar Energy Ltd
.5	www.photowatt.com	Photowatt International
.6	www.thermo-dynamics.com	Thermo Dynamics Limited
.7	www.solcan.com	Solcan Ltd
.8	www.thermomax.com	Thermomax
.9	enviro-fire.com	Sherwood Industries Ltd.
.10	www.harmanstoves.com	Harman Stove Company
.11	www.solarwall.com	Conserval Engineering
.12	www.whitfield.com, www.earthstove.com	Lennox Hearth Products
.13	www.magnumfireplace.com/index.cfm	American Energy Systems, Inc.
.14	www.kyocerasolar.com	Kyocera Solar, Inc.
.15	www.siemenssolar.com	Siemens Solar
.16	www.bpsolar.com	BP Solar
.17	www.windenergy.com	Southwest Windpower Inc
.18	www.almac.co.uk/proven	Proven Engineering Products Ltd
.19	www.bergey.com	Bergey Wind Power Co.
.20	www.able-solar.co.nz/rutland.htm	Rutland Wind Turbines
.21	www.bergey.com/Products/VPkg.Hybrid.7.5.htm	Bergey Wind Turbines
.22	www.tracetechnologies.com	Trace Technologies
.23	www.advancedenergy.com	Advanced Energy Inc

.24	www.owenscorning.com	Owens Corning
.25	www.dow.com/styrofoam	Dow
.26	www.icynene.com	Icynene
.27	www.rayomax.com	Ray-O-Max Windows
.28	www.allweatherwindows.com	All Weather Windows
.29	www.residential.carrier.com/products/set_prod.htm	Carrier Corporation
.30	customer.honeywell.com/catalog/pages/prod_search.asp	Honeywell
.31	www.olsenhvac.com	Olsen
.32	www.lennox.com	Lennox Industries Inc.
.33	www.weil-mclain.com	Weil-McLain
.34	www.lifebreath.com	Nutech Energy Systems Inc.
.35	www.lychonia.com	Stirling Technology
.36	www.broan.com	Broan
.37	www.bryant.com	Bryant
.38	www.carrier.com	Carrier Corporation
.39	www.doucetteindustries.com	Doucette Industries Inc.
.40	www.inventure.ca	The Winston Works
.41	www.gelighting.com	General Electric
.42	www.sylvania.com	Osram Sylvania
.43	www.lighting.philips.com	Philips
.44	www.sunfrost.com	Sun Frost
.45	www.equatorappl.com	Equator appliances
.46	www.craneplumbing.com	Crane Plumbing
.47	www.kohlerco.com	Kohler Plumbing
.48	www.fct.ca	Fuel Cell Technologies
.49	www.enerworks.com	Enerworks Inc.
.50	www.economad.com	Eco-Nomad

.3 Community Information Sites

.1	www.assembly.gov.nt.ca/NewNWT/index.html	NWT Community Information
.2	www.yukoncommunities.yk.ca/home.html	Yukon Community Information
.3	www.dced.state.ak.us/mra/CF_BLOCK.htm	Alaska Community Information
.4	www.nlfm.nf.ca/nlfm.htm	Newfoundland and Labrador Community Information
.5	www.gov.nu.ca/Nunavut/Communities/nc.htm	Nunavut Community Information
.6	www.inuitfinearts.com/images/communities/nunavik/NUNAVIK.htm	Nunavik Community Information

1.3 FIELD RESEARCH

.1 Healthy House Wastewater treatment system, Ndilo, May 20, 2000
.2 Canada's Energy Efficiency Conference: Natural Resources Canada, Office of Energy
.3 Efficiency (OEE), Ottawa, October 10th to 12th, 2000
.4 Tap The Sun: CMHC Passive Solar Design Workshop, Halifax, October 21st 2000
.5 Rise and Shine 2000: Solar Energy Of Canada Inc. (SESCI) Annual Conference, Halifax, October 21st to 24th 2000.
.6 Eco-Solar Home Tour, Edmonton, October 28th, 2000
.7 Off-Grid Northern Home, Prelude Lake, N.W.T. November 12,2001

1.4 CONTACTS/INTERVIEWS

.1 Dr Doug Dale, University of Alberta, Edmonton AB
.2 Mark Ackerman, University of Alberta, Edmonton AB
.3 Dr Brian Fleck, University of Alberta, Edmonton AB
.4 Gordon Howell, Howell-Mayhew Engineering, Edmonton AB
.5 Brian McCluskey, Arctic Energy Alliance, Yellowknife NT
.6 Ron Alward, Natural Resources Canada, Varennes, QC
.7 Sylvain Martel, Natural Resources Canada,Varennes QC
.8 Richard Seifert, University of Alaska, Fairbanks AK
.9 Paul R. Sajko, Thermo Dynamics Ltd., Dartmouth NS
.10 Richard Kadulski, Richard Kadulski Architect, Vancouver BC
.11 Tracey Forest, University of Waterloo, Waterloo ON
.12 Bill Fandrick, Northern Solutions, Yellowknife NT

1.5 SHIPPING INFORMATION SOURCES

.1 Air North Airlines, Whitehorse YK
.2 Northwest Transport Ltd., Edmonton AB
.3 Northern Transport Company Limited, Hay River NT & Iqualuit NU
.4 Lynden Transport Inc., Anchorage AK
.5 Northwest Transport Alaska, Anchorage AK

APPENDIX A - Detailed Community Data

REGION	COMMUNITY	POPULATION	WIND SPEED (M/S)	FREQUENCY OF WIND SPEED (% above 3 m/s)	SOLAR INSOLATION kWh/m²/day (monthly average) Max/Min/Average (year)			LAT.	LONG.	ELEV.	HEATING DEGREE DAYS BELOW 18°C	CURRENT ELECTRICAL SOURCE	ELECTRICAL COSTS (IN US CURRENCY FOR ALASKA) AS OF APRIL 2001	SUBSIDIES ELECTRICAL	HEATING COSTS	SUBSIDIES HEATING	GEOTHERMAL AVAILABLE	TRANSPORTATION AVAILABLE	AVAILABILITY OF INSTALLATION/MAINTENANCE SKILLED LABOUR RATING (1 to 5)
ALASKA					Avg	Min	Max												
	Adak Station	106	8.48	95	2.46	2.14	2.79	51°45'N	176°45'W	6m	4769	Aleut Corporation	0.0¢/kWh	The goal of the PCE program is to provide economic assistance to customers in rural areas of Alaska where, in many instances, the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state. The program seeks to equalize the power cost per kilowatt-hour statewide. However, even with PCE rural electric costs are 2-3 times higher than urban energy costs.	47¢/litre - 2nd grade fuel		Studies are in progress re. the use of geothermal heat as an alternate source of energy. However, it is not used as yet in Alaska. Hot springs are being used for recreational purposes - Yes Available by Adak	air and water access year round,	In general, contractors must be mobilized from Anchorage and Fairbanks to go to rural communities. The rural communities generally have populations less than 2000 and are not connected to other parts of Alaska through a road system.
	Akiachak	560	3.39	68	2.20	1.82	2.62	60°54'N	161°25'W	8m	7597	Akiachak Native Communities Electric Company	17.4¢/kWh	Yes	78¢/litre - 1st grade fuel; $1.23 - propane		No	air & sea plane access year round; barge delivery during the summer	2
	Alakanuk	677	3.77	80	2.11	1.70	2.61	62°41'N	164°37'W	3m	8352	AVEC	17.1¢/kWh	Yes	.54¢/litre - 1st grade fuel; $1.36 - propane		No	air access year round; barge delivery in the summer	2
	Ambler	298	3.13	64	2.20	1.85	2.55	67°05'N	157°52'W	88m	9308	AVEC	17.6¢/kWh	Yes	95¢/litre - 1st grade heating fuel; $1.39 - propane		No	air year round, barge in the summer	1
	Anaktuvuk Pass	312	3.44	79	2.22	1.90	2.52	68°08'N	151°45'W	643m	9723	North Slope Borough Power & Light	9.7¢/kWh	Yes	29¢/litre - 1st grade heating fuel; $1.05 - propane; gas		No	air year round, barge in the summer	1
	Anchorage	261,446	3.99	77	2.04	1.68	2.45	61° 13' N	149° 53' W	308m	7157	Chugach Electric Association; Anchorage Municipal Light & Power	$6.56/month and 8.803¢/kWh	No	41¢/litre; 39¢/litre; propane: 51¢/litre; natural gas - .11/ccm	0.816 fuel adjustment offered by Anchorage Municipal light and Power	No	air, water, road & rail access year round	5
	Aniak	594	2.39	34	2.23	1.87	2.63	61°34'N	159°31'W	26m	8117	Aniak Light & Power Company	17.0¢/kWh	Yes	67¢/litre - 1st grade heating fuel		No	air access year round; barge in the summer	2
	Barrow	4,541	4.90	87	1.99	1.49	2.43	71° 17' N	156° 47' W	13m	11086	Barrow Utilities & Electric Cooperative - Also Supplies Natural Gas	9.9¢/kWh	No	70¢/litre 1st grade fuel; propane - 31¢/litre		No	air access in the summer	3
	Beaver	126	2.13	26	2.43	2.11	2.70	66°21'N	147°23'W	37m	9424	Beaver Joint Utilities	9.7¢/kWh	Yes	66¢/litre - 1st grade fuel		Yes	air access year round; barge in the summer	1
	Bethel	5,449	3.39	68	2.20	1.82	2.62	60°47'N	161°45'W	23m	7597	Bethel Utilities Corporation	13.9¢/kWh	Yes	42¢/litre - 1st grade fuel; 36¢/litre - 2nd grade fuel; $1.17/litre - propane; $225.00/cord wood		No	air access year round; float plane; barge in the summer	3
	Chevak	769	4.20	83	2.07	1.62	2.62	61°31'N	165°35'W	23m	7944	AVEC	17.0¢/kWh	Yes	61¢/litre - 1st grade fuel		No	air access year round; barge in the summer	2
	Craig	2,124	3.50	43	2.32	1.97	2.71	55°28N	133°09'W	1014m	5742	Alaska Power & Telephone	10.7¢/kWh	Yes	46¢/litre - 1st grade fuel; 43¢ - 2nd grade fuel; 42¢/litre - propane; $75/cord wood		Yes	air access year round;barge and ferry service	2
	Dillingham	2,400	3.79	81	2.22	1.87	2.63	59°02'N	158°27'W	26m	7202	Nushugak Electric Cooperative	13.8¢/kWh	Yes	41¢/litre - 1st grade fuel; .38 - 2nd Grade fuel; 92¢ - propoane; $125/cord wood		No	air access year round; barge in the summer	2
	Eagle City	171	2.21	27	2.42	2.12	2.71	64°47'N	141°12'W	249m	8728	Alaska Power Company	10.1¢/kWh	Yes	46¢/litre - 1st grade fuel; 53¢/litre - propane; $125./cord wood		No	air access year round, road access in the summer	1
	Elim	316	2.96	59	2.19	1.84	2.66	64°37'N	162°15'W	61m	8899	AVEC	17.1¢/kWh	Yes	63¢/litre - 1st grade fuel; $1.58/litre - propane		No	air access year round; freight needs to be lightered in from Nome	1
	Fairbanks/Fairbanks North Star Borough	115,237	2.41	37	2.34	2.00	2.63	64°50'N	147°43'W	132m	8941	Golden Valley Electric Association; Aurora Energy	11.3¢/kWh	No	38¢/litre - 1st grade fuel; 36¢/litre - 2nd grade fuel; 43¢/litre - propoane; $115./cord wood		Yes	air, road, rail access year round	5
	Fort Yukon	565	1.87	16	2.43	2.11	2.66	66°34'N	145°16'W	132m	9704	Gwitchyaa Zee Utility Company	14.7¢/kWh	Yes	65¢/litre - 1st grade fuel; 84¢/litre - propane		No	air access year round; road access in the summer	2
	Galena	592	1.89	15	2.34	2.03	2.69	64°44'N	156°56'W	46m	8772	City of Galena	20.2¢/kWh	Yes	64¢/litre - 1st grade fuel; $1.00/litre - propane		No	air access year round; barge access in the summer	2
	Gambell	653	6.73	92	2.02	1.62	2.58	63°47'N	171°45'W	8m	8747	AVEC	17.2¢/kWh	Yes	60¢/litre - 1st grade fuel; $1.37/litre - propane		No	air access year round	2
	Glenallen	494	3.55	78	2.17	1.84	2.51	62°07'N	145°33'W	496m	8093	Copper Valley Electric Association	19.5¢/kWh	No	38¢/litre - 1st grade fuel; 37¢/litre - 2nd grade fuel; 35¢/litre - propane		No	air and road access year round	2
	Homer	4,205	3.45	51	2.34	1.95	2.71	59°38'N	151°33'W	24m	6019	Homer Electric Association	8.9¢/kWh	No	38¢/litre - 1st grade fuel; 37¢/litre - 2nd grade fuel; 43¢/litre - propane		No	air, water and road access year round	3
	Huslia	283	1.90	16	2.29	1.98	2..67	65°41'N	156°24'W	55m	8967	AVEC	17.1¢/kWh	Yes	74¢/litre - 1st grade fuel; 95¢/litre - propane		No	air access year round; barge access in the summer	1
	Juneau	31,262	2.34	32	2.31	1.99	2.63	58°18'N	134°24'W	6m	7806	Alaska Electric Light & Power Company	10.2¢/kWh	No	43¢/litre - 1st grade fuel; 42¢/litre - 2nd grade fuel; 40¢/litre - propane; $150./cord wood		No	air and water access year round,	5
	Kaktovik	254	3.80	80	2.06	1.55	2.52	70°08'N	143°38'W	15m	10798	North Slope Borough Power & Light	9.7¢/kWh	Yes	37¢/litre - 1st grade fuel; $1.61/litre - propane		No	air access year round	1

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APPENDIX A - Detailed Community Data

REGION	COMMUNITY	POPULATION	WIND SPEED (M/S)	FREQUENCY OF WIND SPEED (% above 3 m/s)	SOLAR INSOLATION kWh/m²/day (monthly average) Max/Min/Average (year)			LAT.	LONG.	ELEV.	HEATING DEGREE DAYS BELOW 18°C	CURRENT ELECTRICAL SOURCE	ELECTRICAL COSTS (IN US CURRENCY FOR ALASKA) AS OF APRIL 2001	SUBSIDIES ELECTRICAL	HEATING COSTS	SUBSIDIES HEATING	GEOTHERMAL AVAILABLE	TRANSPORTATION AVAILABLE	AVAILABILITY OF INSTALLATION/MAINTENANCE SKILLED LABOUR RATING (1 to 5)
	Kaltag	251	1.85	15	2.31	1.98	2.69	64°20'N	158°43'W	61m	9007	AVEC	16.8¢/kWh	Yes	66¢/litre - 1st grade fuel		No	air access year round; barge service in the summer	1
	Ketchikan	8,295	2.43	30	2.47	2.09	2.83	55°20'N	131°38'W	27m	6411	Ketchikan Public Utilities	10¢/kWh	No	43¢/litre - 1st grade fuel; 42¢/litre - 2nd grade fuel; 51¢/litre - propane; $150./cord wood		Yes	air and water access year round	3
	King Salmon	499	3.84	83	2.26	1.89	2.70	58°41'N	156°39'W	17m	6982	Naknek Electric Association	7.8¢/kWh	Yes	38¢/litre - 1st grade fuel; 25¢/litre - propane		No	air access year round	2
	Kipnuk	573	5.39	88	2.19	1.83	2.63	59°56'N	164°03'W	6m	7068	Kipnuk Light Plant	14.2¢/kWh	Yes	53¢/litre - 1st grade fuel		No	air access year round; barge service in the summer	2
	Kodiak	20,864	5.68	88	2.49	2.07	2.87	57°47'N	152°24'W	22m	5481	Kodiak Electric Association	16.2¢/kWh	No	44¢/litre - 1st grade fuel; 43¢/litre - 2nd grade fuel; 88¢/litre - propane; $160./cord wood		No		5
	Kotzebue	3,000	3.49	79	2.12	1.73	2.63	66°54'N	162°35'W	3m	9179	Kotzebue Electric Association	13.4¢/kWh	Yes	50¢/litre - 1st grade fuel; 31¢ - propane		No	air access year round; barge service in the summer	3
	McGrath	408	3.20	64	2.30	1.98	2.64	62°57'N	155°35'W	103m	7875	McGrath Light & Power	13.2¢/kWh	Yes	66¢/litre - 1st grade fuel; $1.29/litre - propane		No	air, water (seasonal)	2
	Metlakatla	1,499	2.43	30	2.47	2.09	2.83	55°07'N	131°34'W	0m	6411	Metlakalta Power & Light	9.2¢/kWh	No	46¢/litre - for 26 litres; 47¢/litre - 13 to 26 litres; 49¢/litre - 12 litres or less		No	air access year round; barge service in the summer	2
	Mountain Village	757	3.48	78	2.15	1.75	2.61	62°05'N	163°43'W	102m	8419	AVEC	17.2¢/kWh	Yes	61¢/litre - 1st grade fuel; $1.25/litre - propane		No	air access year round; barge service in the summer	2
	Napaskiak	395	3.39	68	2.20	1.82	2.62	60°42'N	161°54'W	7m	7597	Napaksiak Electrical Utility	23.3¢/kWh	Yes	Napaskiak gets all of their supply from Bethel 42¢/litre - 1st grade fuel; 36¢/litre - 2nd grade fuel; $1.17/litre - propane; $225.00/cord wood		No	air access year round; barge service in the summer	2
	Nome	3,620	4.96	85	2.07	1.67	2.62	64°32'N	165°25'W	11m	8832	Nome Joint Utility Systems	14.6¢/kWh	Yes	45¢/litre - 1st grade fuel; 44¢/litre - 2nd grade fuel;95¢ - propane		No	air access year round; barge service in the summer	3
	Noorvik	634	3.49	79	2.15	1.77	2.62	66°50'N	161°03'W	25m	9120	AVEC	17.4¢/kWh	Yes	57¢/litre - 1st grade fuel; $1.57/litre - propane		No	air access year round	2
	Prudhoe Bay (Deadho	49	3.98	84	2.07	1.58	2.50	70°22'N	148°22'W	14m	10620	Arctic Utilities Inc.	0¢/kWh	No			No	air access year round; road access for trucks	1
	Saint Mary's	482	3.48	78	2.15	1..75	2.61	62°03'N	163°10'W	95m	8419	AVEC	17¢/kWh	Yes	73¢/litre - 1st grade fuel; $1.26/litre - propane		No	air access year round; barge service in the summer	2
	Saint Paul	585	7.46	94	2.16	1.87	2.53	57°07'N	170°16'W	13m	5995	St. Paul Municipal Electric Utility	25.5¢/kWh	Yes	40¢/litre - 2nd grade fuel		No	air access year round; barge service in the summer	2
	Sand Point	871	5.69	88	2.35	2.08	2.67	55°20'N	160°30'W	6m	5079	San Point Electric Inc.	12.2¢/kWh	Yes	38¢/litre - 1st grade fuel		No	air access year round; barge service in the summer	2
	Selawik	792	3.25	70	2.18	1.80	2.64	66°36'N	160°00'W	8m	9106	AVEC	17.4¢/kWh	Yes	61¢/litre - 2nd grade fuel		No	air access year round; barge service in the summer	2
	Seward	3,085	2.32	34	2.38	2.05	2.67	66°07'N	149°26'W	7m	9130	Seward Electric System	9.2¢/kWh	No	38¢/litre - 1st grade fuel; 37¢/litre - 2nd grade fuel; 42¢/litre - propane		No	air, road and rail access year round	3
	Shishmaref	547	4.00	81	2.01	1.53	2.67	66°15'N	166°04'W	3m	9519	AVEC	17.2¢/kWh	Yes	57¢/litre - 1st grade fuel; $1.52/litre - propane		No	air access year round	2
	Sitka	8,788	3.25	37	2.25	1.93	2.58	57°03'N	135°20'W	6m	6737	Sitka Electric Department	9.9¢/kWh	No	37¢/litre - 1st grade fuel; 33¢ - 2nd grade fuel; 63¢ - propane; $75./cord wood		Yes	air access year round; barge service in the summer	3
	Skagway	880	2.28	31	2.31	2.03	2.63	59°27'N	135°18'W	13m	8019	Alaska Power Company	12.5¢/kWh	Yes	36¢/litre - 1st grade fuel; 33¢/litre - 2nd grade fuel		No	air, water, road and rail service year round	2
	Tanana	300	1.97	18	2.30	1.95	2.62	65°10'N	152°04'W	69m	8735	Tanana Power Company	25.4¢/kWh	Yes	34¢/litre - 1st grade from barge; 55¢/litre - 1st grade from plane; 33¢/litre - 2nd grade fuel; $125./cord wood		Yes	air access year round; barge service in the summer	1
	Togiak	824	4.37	84	2.22	1.85	2.63	59°04'N	160°24'W	6m	7066	AVEC	17.1¢/kWh	Yes			No	air access year round; barge access in the summer	2
	Tok	1,235	3.03	61	2.40	2.08	2.72	63°20'N	142°59'W	509m	8502	Alaska Power Company	12.6¢/kWh	Yes	29¢/litre - 1st grde fuel; 27¢/litre - 2nd grade fuel; 41¢/litre - propane		No	air and road access year round	2
	Unalakleet	757	2.83	53	2.22	1.87	2.68	65°52'N	160°47'W	6m	8989	Unalakleet Valley Electric Cooperative	13.5¢/kWh	Yes	55¢/litre - 1st grade fuel; $1.62/litre - propane		No	air access year round; barge access in the summer	2
	Unalaska	4,283	8.21	95	2.47	2.16	2.84	53°52'N	166°32'W	7m	4724	Unalaska Electric Utility	13.9¢/kWh	Yes			Yes	air, water	3
	Valdez	4,271	4.52	81	2.02	1.68	2.41	61°07'N	146°16'W	36m	7044	Copper Valley Electric Association	16.9¢/kWh	No	40¢/litre -1st grade fuel; 38¢/litre - 2nd grade fuel; 40¢/litre - propane		No	air, water and road access year round	3
	Wainwright	545	4.03	84	1.97	1.52	2.44	70°38'N	160°01'W	9m	10487	North Slope Borough Power & Light	9.7¢/kWh	Yes			No	air access year round; barge access in the summer	2
	Whittier	289	6.22	88	2.15	1.81	2.52	60°46'N	148°41'W	9m	5509	Chugach Electric Association	9.7¢/kWh	No	40¢/litre - 1st grade fuel; 38¢/litre - 2nd grade fuel		No	air, water, road and rail access year round	1
	Wragnell	2,569	2.33	31	2.28	1.89	2.68	56°28'N	132°22'W	13m	6932	Wragnell Municipal Light & Power	10.7¢/kWh	No	42¢/litre - 1st grade fuel; 41¢/litre - 2nd grade fuel; 45¢/litre - propane; $100./cord wood		No	air access and barge service year round	3
LABRADOR																			

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APPENDIX A - Detailed Community Data

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	Davis Inlet (Utshimassits)	550	6.39	80	2.48	2.09	2.89	55° 53' N	60° 54' W	13m	7865	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	74.3¢. Residents use an oil/wood combo of 50/50	No	No	Snowmobile, Air, Boat (in Summer). No Road.	0
	Happy Valley - Goose Bay	8,655	2.37	36	2.74	2.35	3.20	53° 19' N	60° 20' W	46m	7213	Newfoundland and Labrador Hydro	$6./month basic charge and 1st 600 kWh @ 4.1¢/kWh and all hours over 600 at 3.3¢/kWh	No	74.3¢. Residents use 95% electric heat and a 5% oil/wood combo	No	No	Snowmobile, Air, Boat, Road	3
	Hopedale	620	6.39	80	2.48	2.09	2.89	55° 28' N	60° 13' W	10m	7865	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	76.3¢. Residents use 80% oil and 20% wood combo.	No	No	Snowmobile, Air, Boat (in Summer). No Road.	1
	Makkovik	367	6.50	80	2.48	2.12	2.89	55°05'N	59°11W	71m	7804	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	74.3¢. Most residents use wood. Others use a 50/50 oil/wood combo.	No	No	Boat and Plane in Summer, Snowmobile and Air in Winter. No Road.	1
	Nain	995	6.62	83	2.36	1.83	2.86	56° 32' N	61° 41' W	7m	8231	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	78.3¢. Most residents use a 90% oil and 10% wood combo.	No	No	Snowmobile, Air, Boat (in Summer). No Road.	1
	North West River	567	2.37	36	2.74	2.35	3.20	53° 32' N	60° 08' W	13m	7213	Newfoundland and Labrador Hydro	$6./month basic charge and 1st 600 kWh @ 4.1¢/kWh and all hours over 600 at 3.3¢/kWh	No	74.4¢. 60% heated by electricity and 40% are an oil/wood combo.	No	No	Road.	1
	Postville	225	3.75	50	2.59	2.18	3.04	54° 54' N	59° 47' W	59m	7498	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	74.3¢. Residents use 80% wood and 20% oil combo.	No	No	Snowmobile, Air, Summer Boat (in Summer)	1
	Rigolet	225	3.78	50	2.56	2.13	3.03	54° 11' N	58° 26' W	55m	7428	Newfoundland and Labrador Hydro - Diesel Generators	$16.31/month basic charge and 1st 700 kWh @ 6.77¢/kWh and next 300 kWh @ 9.571¢/kWh. All over 1000 @ 12.975¢/kWh	No	78.3¢ Most homes burn wood and a few use oil.	No	No	Snowmobile, Air, Boat (in Summer). No Road.	1
	Sheshatshiu	1108	2.37	36	2.74	2.35	3.20	53° 31' N	60° 09' W	13m	7213	Newfoundland and Labrador Hydro	$6./month basic charge and 1st 600 kWh @ 4.1¢/kWh and all hours over 600 at 3.3¢/kWh	No	74.4¢. 60% heated by electricity and 40% are an oil/wood combo.	No	No	Road, Plane and Boat in Summer, Road and Plane in Winter	1
NORTH																			
	Aklavik	727	2.55	30	2.12	1.74	2.55	68'13'N	135'00W	11m	10575	NWTPC - 1350 kW diesel generated power	$18.00+ 40.07¢ & 40.07¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.66¢/L - P50 Heating		No	Air year round and summer barge, ice roads in winter	2
	Colville Lake	90	2.06	24	2.41	2.08	2.70	67'02'N	126'07'W	274m	10344		$18.00+ 187.66¢ & 224.82¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	$1.11/L - P50 Heating; $1.23/L - P50 low suplhur Diesel		No	Air year round	1
	Deline	616	1.82	14	2.35	2.02	2.76	65'10'N	123'25'W	167.6m	10096	NWTPC - 1280kW capacity diesel power	$18.00+ 41.71¢ & 41.71¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	89¢/L - P50 Heating; $1.01 - low sulphur Diesel		No	Limited air year round and winter road to Tulita	1
	Dettah	195	1.82	15	2.65	2.38	2.94	62'25N	114'18W	205m	9914	Hydro	$18.00+ 13.57¢ for Govt per kWh	No			No	Road year round; road year round except during break-up and freeze-up	1
	Enterprise	94	1.79	14	2.73	2.41	2.96	60'33'N	116'08'W	Unknown	9011	Hydro	$18.00 + Supply Charge of 8.5 cents/kWh + fuel charge of 4.48 cents/kWh	No	.50¢/L - low sulphur Diesel		No	Road year round	1
	Fort Good Hope	644	2.26	32	2.52	2.16	2.81	66'15'N	128'38'W	52m	9312	NWTPC - 810kW capacity diesel generated power	$18.00+ 50.87¢ & 55.06¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.87¢/L - P50 Heating; .98¢/L - P50 low sulphur Diesel		No	Air year round and summer barge, winter road	2
	Fort Liard	512	1.77	12	2.70	2.31	2.99	60'15'N	123'28'W	213m	7934	Diesel	$18.00+ 42.27¢ & 46.09¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.79¢/L - P50 low sulphur Diesel		Yes	Air and road year round	2

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	Fort McPherson	878	2.02	21	2.24	1.94	2.57	67'26'N	134'53'W	43m	10116	Diesel	$18.00+ 39.95¢ & 39.95¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.85¢/L - P50 Heating; .96¢/L - P50 low sulphur Diesel		No	Ferry, and barge in summer	2
	Fort Providence	748	1.77	13	2.66	2.31	2.93	61'21'N	117'39'W	161.5m	9470	Diesel	$18.00+14.57cents/kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.53¢/L - P50 Heating; 52.5¢/L - P50 low sulphur Diesel		No	Road year round except during break-up and freeze-up; ferry service in summer and ice road in winter; chartered aircraft	2
	Fort Resolution	536	1.81	14	2.75	2.44	3.00	61'11'N	113'41'W	164m	9598	Hydro	$18.00+ 10.14¢ & 24.62¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	52.5¢/L -- P50 low sulphur Diesel		No	Air year round; road year round except during break-up and freeze-up	2
	Fort Simpson	1257	1.78	12	2.65	2.29	2.91	61'51'N	121'22'W	168m	8860	Diesel	$18.00+ 29.81¢ & 29.81¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh			No	Air and road year round	3
	Fort Smith	2441	1.87	16	2.75	2.45	2.98	60° 1'N	111°57'W	203m	9083	Hydro	$18.00+ 10.14¢ & n/a cents for Govt per kWh	No	.4530/L - P40 low sulphur Diesel		No		3
	Hay River & (Hay River Reserve)	3611 (253)	1.82	15	2.74	2.44	2.98	60'51'N	115'44'W	164m	9079	Hydro	$18.00 + Supply Charge of 8.5 cents/kWh + fuel charge of 4.48 cents/kWh	No	.50¢/L - P50 low sulphur Diesel		No	Air and road year round	3
	Holman	423	3.13	74	2.19	1.80	2.55	70'43'N	117'45'W	35.7	12326	Diesel	$18.00+ 59.69¢ & 61.76¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.93¢/L - P50 Heating; $1.05/L - P50 low sulphur Diesel		No	Air year round and summer barge	1
	Inuvik	3296	2.51	29	2.20	1.85	2.55	68'21'N	133'43'W	59m	10897	Mainly natural gas, some low sulphur diesel	$18.00+ 29.55¢ & 29.55¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	Use heating fuel or natural gas. Fuel: 58.4¢/L; Gas: $12.95/gJ(natural gas must be 15% less than heating oil); low sulphur diesel - 55¢/L		No	Road year round except during break-up and freeze-up	3
	Jean Marie River	53	1.77	12	2.65	2.29	2.90	61'32'N	120'38'W	143m	9095	Diesel	$18.00+ 49.86¢ & 138.41¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.90¢/L - P50 Heating; $1.01/L - P50 low sulphur Diesel		No	Chartered aircraft; summer barge and winter ice road	1
	Kakisa	36	1.74	12	2.71	2.38	2.94	60'56'N	117'25'W	Unknown	8933	Wood/Diesel	$18.00+14.63¢/kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	52.5¢/L - P50 low sulphur Diesel		No	Road year round; float plane in summer	1
	Lutselk'e	304	1.99	21	2.59	2.28	2.88	62'24'N	110'44'W	179m	9716	Diesel	$18.00+ 42.12¢ & 42.12¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.87¢/L - P50 Heating; .98¢/L - P50 low sulphur Diesel		No	Air year round and summer barge.	1
	Nahanni Butte	75	1.84	14	2.65	2.25	2.94	61'02'N	123'23'W	183m	8212	Diesel	$18.00+ 56.81¢ & 190.00¢ for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.87¢/L - P50 heating; .98¢/L - P50 low sulphur Diesel		Yes	Air year round; summer barge and winter ice road	1
	Norman Wells	798	2.00	20	2.43	2.11	2.74	65'17'N	126'50'W	67m	9131	Natural Gas	$18.00+ 24.47 & 24.47 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	$5.37/thousand cubic feet - natural gas; .52¢/Litre - P50 low sulphur Diesel		No	Air year round and summer barge, ice roads in winter	2
	Paulatuk	277	4.50	70	2.27	1.84	2.59	69'21'N	124'04'W	5m	10999	Diesel	$18.00+ 61.04 & 61.04 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.91¢/L - P50 Heating; $1.04/L - P50 low sulphur Diesel		No	Air year round and summer barge	1
	Rae Lakes (Gameti)	256	1.85	15	2.53	2.27	2.90	64'09'N	117'20'W	213m	10405	Diesel	$18.00+ 50.77 & 80.26 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	$1.02/L - P50 Heating; $1.12/L - P50 low sulphur Diesel		No	Air year round and winter ice road	1
	Rae-Edzo (Rae)	1662	1.81	14	2.64	2.35	2.95	62'50'N	116'4'W	156m	9928	Hydro	$18.00+ 12.25 & 25.79 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh			No	Air year round and winter ice road	1
	Sachs Harbour	135	5.36	88	2.03	1.52	2.48	71'59N	125'14'W	87m	10638	Diesel	$18.00+ 62.56 & 78.03 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.92¢/L - P50 Heating; $1.04 - P50 low sulphur Diesel		No	Air year round and summer barge	1
	Trout Lake	68	1.71	11	2.70	2.35	2.96	60'266'N	121'156'W	498m	8424	Diesel	$18.00+38.10/kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.90¢/L - P50 Heating; $1.02/L - P50 low sulphur Diesel		No	Chartered aircratt; winter road	1
	Tsiigehtchic	162	2.14	26	2.28	1.98	2.60	67'27'N	133'44'W	23m	10255	Diesel	$18.00+ 64.81 & 64.81 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.88¢/L - P50 Heating; $1.02 - P50 low sulphur Diesel		No	Air year round and summer barge	1
	Tuktoyaktuk	943	4.05	67	2.13	1.77	2.51	69'27'N	133'02'W	18m	11287	Diesel	$18.00+ 44.14 & 44.14 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh			No	Air year round and summer barge, ice roads in winter	1

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APPENDIX A - Detailed Community Data

REGION	COMMUNITY	POPULATION	WIND SPEED (M/S)	FREQUENCY OF WIND SPEED (% above 3 m/s)	SOLAR INSOLATION kWh/m²/day (monthly average) Max/Min/Average (year)			LAT.	LONG.	ELEV.	HEATING DEGREE DAYS BELOW 18°C	CURRENT ELECTRICAL SOURCE	ELECTRICAL COSTS (IN US CURRENCY FOR ALASKA) AS OF APRIL 2001	SUBSIDIES ELECTRICAL	HEATING COSTS	SUBSIDIES HEATING	GEOTHERMAL AVAILABLE	TRANSPORTATION AVAILABLE	AVAILABILITY OF INSTALLATION/MAINTENANCE SKILLED LABOUR RATING (1 to 5)
	Tulita	450	1.93	17	2.44	2.13	2.73	64'54'N	125'34'W	97.5m	8797	Diesel	$18.00+ 60.50 & 68.36 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.87¢/L - P50 Heating; .98¢/L - P50 low sulphur Diesel		No	Air year round and summer barge, ice roads in winter	2
	Wekweti	135	2.12	26	2.52	2.22	2.89	64'116'N	114'116'W	368m	10343	Diesel	$18.00+31.95/kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	$1.04/L - P50 Heating; $1.16/L - P50 low sulphur Diesel		No	Air year round	1
	Wha Ti	418	1.82	14	2.61	2.32	2.96	63'08'N	117'06'W	271m	10138	Diesel	$18.00+ 49.44 & 60.74 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.97¢/L - P50 Heating; $1.08/L - P50 - low sulphur Diesel		No	Air year round and winter ice road	1
	Wrigley	167	1.85	15	2.57	2.24	2.88	63'14'N	123'28'W	150m	9019	Diesel	$18.00+ 46.85 & 68.72 cents for Govt per kWh	This community receives "Territorial Support" in the amount of .17410 for the first 700 kWh	.86¢/L - P50 Heating; .97¢/L - P50 low sulphur Diesel		No	Air year round and summer barge, ice roads in winter	1
	Yellowknife	17275	1.82	15	2.65	2.38	2.94	62'276'N	114'226'W	205m	9914	Hydro	$15.00+ 0.1172/kWh & .0973/ cents for Govt per kWh	No	46.8¢/L - P50 Heating; 47.4¢/L - Propane;		No	Air year round; road year round except during break-up and freeze-up	4
NUNAVIK																			
	Akulivik	411	3.55	81	2.40	2.04	2.72	60° 48' N	78° 12' W	20m	10179	Hydro Quebec - Diesel Generated Power Plant in each community	39¢/day plus 4.74¢/kWh for the first 30 kWh/day and then 5.97¢/kWh for the remaining consumption. Each community has diesel generators.	No on Electricity but Hydro Quebec subsidizes oil to encourage building owners to use oil	Residents use home heating oil - $0.9082/litre	Yes - Cost of oil bill up to 30% less than what it would have cost to heat with electricity - furnace maintenance also reimbursed. All by Hydro Quebec and managed by Makivik. Hydro encourages use of heating oil.	No	No Road. Air and Boat in Summer.	1
	Aupaluk	159	4.43	73	2.09	1.65	2.53	59° 18' N	69° 36' W	36m	10016	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Inukjuak	1184	3.61	82	2.42	2.01	2.82	58° 27' N	78° 06' W	3m	9659	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	2
	Ivujivik	274	3.74	81	2.22	1.86	2.63	62° 25' N	77° 55' W	25m	10443	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Kangiqsualujjuaq	648	2.80	44	2.13	1.64	2.65	58° 41' N	65° 57' W	60m	9473	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Kangiqsujuaq	479	5.05	88	2.02	1.63	2.47	61° 35' N	71° 57' W	156m	10311	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.8760/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Kangirsuk	394	4.54	87	2.04	1.63	2.46	60° 01' N	70° 01' W	117m	10245	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Kuujjuaq	2055	3.15	42	2.16	1.69	2.63	58° 06' N	68° 24' W	34m	9676	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	2
	Kuujjuarapik	1210	4.17	57	2.68	2.33	3.02	55° 17' N	77° 45' W	21m	8285	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	2
	Puvirnituq	1169	3.59	82	2.47	2.11	2.82	60° 02' N	77° 17' W	23m	10190	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	2
	Quaqtaq	257	4.74	87	2.04	1.67	2.46	61° 02' N	69° 37' W	32m	10284	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.8760/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Salluit	1143	4.00	83	2.25	1.91	2.62	62° 13' N	75° 39' W	226m	10407	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	2
	Tasiujaq	191	2.90	41	2.17	1.71	2.65	58° 42' N	69° 56' W	37m	9736	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
	Umiujaq	315	3.21	52	2.61	2.21	3.02	56° 33' N	76° 33' W	74m	8818	Hydro Quebec - Diesel Generated Power Plant	Same As Above	Same As Above	Residents use home heating oil - $0.9082/litre	Same As Above	No	No Road. Air and Boat in Summer.	1
NUNAVUT																			
	Arctic Bay	639	3.13	74	1.91	1.51	2.26	73°02N	85°10W	30m	13447	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4915¢ Non-gov't domestic & .4915¢ for Gov't domestic per kWh	Non-gov't domestic receive "Territorial Support" subsidy. They're charged 15.22¢/kWh on first 700 kWh after which they pay regular rate. An extra fuel stabilization rider of 3.4¢/kWh.	$0.823/L	Yes	No	Air and summer barge	2
	Arviat	1559	5.23	83	2.44	2.04	2.76	61°07'N	94°04'W	9.75m	10687	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ 43.59¢ Non-gov't domestic & 43.59¢ for Gov't domestic per kWh	Same As Above	$0.853/L	Yes	No	Air and summer barge	3
	Baker Lake	1385	3.49	81	2.47	2.13	2.79	64°18'N	96° 5'W	18m	12079	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3796¢ Non-gov't domestic & .3796¢ for Gov't domestic per kWh	Same As Above	$0.863/L	Yes	No	Air and summer barge	2
	Bathurst Inlet	18	3.36	80	2.39	2.00	2.80	66°50'N	108°2'W	12m	11598	Bathurst has its own diesel generator for the lodge and the local people use their own generators	N/A	No	$0.893/L	No	No	Air and summer barge	1
	Cambridge Bay	1351	3.25	78	2.16	1.80	2.51	69° 07'N	105°3'W	27m	12910	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4163¢ Non-gov't domestic & .4163¢ for Gov't domestic per kWh	Same As Above	$0.893/L	Yes	No	Air and summer barge	3

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APPENDIX A - Detailed Community Data

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	Cape Dorset	1118	5.07	86	2.05	1.69	2.62	64°14'N	76°32'W	56m	11091	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3688¢ Non-gov't domestic & .3896¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	1
	Chesterfield Inlet	337	4.56	86	2.35	1.97	2.68	63°20'N	90°43'W	6m	11120	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5530¢ Non-gov't domestic & .5530¢ for Gov't domestic per kWh	Same As Above	$0.853/L	Yes	No	Air and summer barge	1
	Clyde River	708	3.85	81	1.89	1.36	2.39	70°28'N	68°36'W	25m	11928	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4299¢ Non-gov't domestic & .4329¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	2
	Coral Harbour	669	3.96	81	2.05	1.66	2.51	64°12'N	83°22'W	64m	11535	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5347¢ Non-gov't domestic & .5347¢ for Gov't domestic per kWh	Same As Above	$0.863/L	Yes	No	Air and summer barge	1
	Gjoa Haven	879	3.21	76	2.04	1.53	2.49	68°38'N	95°52'W	45.7m	13184	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5015¢ Non-gov't domestic & .5195¢ for Gov't domestic per kWh	Same As Above	$0.953/L	Yes	No	Air and summer barge	2
	Grise Fiord	148	3.45	81	1.88	1.63	2.19	76°25'N	82°54'W	44.6m	12595	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5183¢ Non-gov't domestic & .6375¢ for Gov't domestic per kWh	Same As Above	$0.833/L	Yes	No	Air and summer barge	1
	Hall Beach	534	4.30	80	1.96	1.53	2.57	68°47'N	81°15'W	8m	13189	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4989¢ Non-gov't domestic & .5199¢ for Gov't domestic per kWh	Same As Above	$0.823/L	Yes	No	Air and summer barge	1
	Igloolik	1174	3.38	72	2.03	1.68	2.53	69°23'N	81°48'W	53m	13919	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3346¢ Non-gov't domestic & .3346¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	3
	Iqaluit	4220	3.60	81	2.15	1.81	2.61	63°45'N	68°32'W	34m	10656	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3158¢ Non-gov't domestic & .3158¢ for Gov't domestic per kWh	Same As Above	$0.616/L	Yes	No	Air and summer barge	5
	Kimmirut	397	4.32	84	2.13	1.81	2.52	62°51'N	69°53W	61m	10458	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .7349¢ Non-gov't domestic & .7349¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	1
	Kugluktuk	1201	2.96	65	2.31	1.90	2.72	67°50'N	115°06'W	22.5m	11569	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5261¢ Non-gov't domestic & .5603¢ for Gov't domestic per kWh	Same As Above	$0.853/L	Yes	No	Air and summer barge	3
	Nanisivik	287	3.16	75	1.91	1.53	2.26	73°02N	84°33'W	639.5m	13350	Mine has their own generator and they provide electricity to the town (all houses belong to mine) within the rent.	Free	Yes	Mine brings in 15,000,000L/year and supplies mine & residences at no cost.	Yes	No	Air and summer barge	1
	Pangnirtung	1243	3.67	81	2.17	1.70	2.57	66°09'N	65°43'W	25m	11027	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3506¢ Non-gov't domestic & .3785¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	3
	Pelly Bay (Kugaaruk)	496	3.47	79	1.98	1.53	2.36	68°26'N	89°43'W	322m	13065	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .6589¢ Non-gov't domestic & .6589¢ for Gov't domestic per kWh	Same As Above	$0.989/L	Yes	No	Air and summer barge	1
	Pond Inlet	1154	3.69	77	2.01	1.68	2.35	72°42'N	77°59'W	57m	12727	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5067¢ Non-gov't domestic & .5534¢ for Gov't domestic per kWh	Same As Above	$0.813/L	Yes	No	Air and summer barge	3
	Qikiqtarjuaq (Broughton Island)	488	5.31	88	1.97	1.57	2.34	67°33'N	63°47'W	587m	11126	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4282¢ Non-gov't domestic & .4969¢ for Gov't domestic per kWh	Same As Above	0.763/L	Yes	No	Air and summer barge	1
	Rankin Inlet	2058	5.70	90	2.39	2.00	2.70	62°49'N	92°05'W	32m	10892	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .3282¢ Non-gov't domestic & .3282¢ for Gov't domestic per kWh	Same As Above	$0.853/L	Yes	No	Air and summer barge	4
	Repulse Bay	559	3.41	81	2.09	1.75	2.47	66°32N	86°15'W	24m	12376	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4736¢ Non-gov't domestic & .4736¢ for Gov't domestic per kWh	Same As Above	$0.843/L	Yes	No	Air and summer barge	1
	Resolute	198	2.87	67	1.94	1.47	2.28	74°43'N	94°59'W	67m	15095	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5773¢ Non-gov't domestic & .5887¢ for Gov't domestic per kWh	Same As Above	$0.873/L	Yes	No	Air and summer barge	1

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	Sanikiluaq	631	6.17	92	2.37	1.96	2.80	56°32N	79°14'W	33m	8853	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .4557¢ Non-gov't domestic & .4557¢ for Gov't domestic per kWh	Same As Above	$0.793/L	Yes	No	Air and summer barge	1
	Taloyoak	648	3.28	79	2.00	1.50	2.38	69°32'N	93°31'W	26m	13004	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .5582¢ Non-gov't domestic & .6098¢ for Gov't domestic per kWh	Same As Above	$0.953/L	Yes	No	Air and summer barge	2
	Umingmaktok	51	3.33	79	2.35	1.97	2.72	67°42'	107°57'	12m	12100	Each person who wishes to have power uses their own generator	N/A	No	$0.873/L	Yes	No	Air and summer barge	1
	Whale Cove	301	5.70	90	2.39	2.00	2.70	62°10'N	92°36'W	20m	10892	Nunavut Power Corporation - Diesel Generated Power Plant	$18.00+ .6203¢ Non-gov't domestic & 1.043 for Gov't domestic per kWh	Same As Above	$0.843/L	Yes	No	Air and summer barge	1
YUKON																			
	Beaver Creek	109	2.77	52	2.39	2.11	2.69	62° 23' N	140° 52' W	649m	8427	Yukon Electrical Co Ltd. & Yukon Energy Corp.- Small Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 12.36 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 64.0; Propane: 63.4 (500 gallon tank cost)		No	Road year round	1
	Burwash Landing	81	1.98	21	2.43	2.13	2.75	61° 21' N	138° 59'W	799m	8180	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 62.0; Propane: 61.4 (500 gallon tank cost)		No	Road year round	1
	Carcross	423	2.73	48	2.47	2.17	2.79	60° 10' N	134° 42' W	659m	8255	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace oil: 64.6; Propane: 58.2 (500 gallon tank cost)		No	Road year round	1
	Carmacks	461	1.99	21	2.46	2.20	2.73	62° 05' N	136° 17' W	525m	8385	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 67.4; Propane: 61.4 (500 gallon tank cost)		No	Road year round	2
	Dawson	2057	1.96	18	2.45	2.17	2.74	64°04'N	139°25'W	370m	8742	Yukon Electrical Co. Ltd. & Yukon Energy Corp. - Large Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace oil: 65.3; Propane: 68.7 (500 gallon tank cost)		No	Road year round	2
	Destruction Bay	34	1.98	21	2.43	2.13	2.75	61° 15' N	138° 48' W	781m	8180	Yukon Electrical Co Ltd. & Yukon Energy Corp.- Small Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 12.36 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 62.0; Propane: 61.4 (500 gallon tank cost)		No	Road year round	1
	Faro	350	2.46	40	2.46	2.19	2.74	62°12'N	133°22'W	717m	8235	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000	Yes - a subsidy on all non-government residential	Furnace Oil: 70.5; Propane: 62.4 (500 gallon tank cost)		No	Road year round	2
	Haines Junction	800	2.01	22	2.33	2.04	2.66	60° 45' N	137° 30' W	599m	7892	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000	Yes - a subsidy on all non-government residential	Furnace Oil: 62.0; Propane: 61.4 (500 gallon tank cost)		No	Road year round	3
	Mayo	484	2.24	30	2.44	2.17	2.73	63° 35' N	135° 53' W	504m	8424	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 68.3; Propane: 63.5 (500 gallon tank cost)		Yes	Road year round	1
	Old Crow	300	2.53	44	2.25	1.97	2.53	67° 34' N	139° 50' W	250m	9588	Yukon Electrical Co Ltd. & Yukon Energy Corp.- Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 25.77 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential			No	Air year round, no road (Assume goods trucked to Whitehorse, then flown in)	1
	Pelly Crossing	287	1.99	21	2.46	2.20	2.73	62° 49' N	136° 34' W	454m	8385	Yukon Electrical Co Ltd. & Yukon Energy Corp.- Small Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 12.36 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 68.4; Propane: 62.4 (500 gallon tank cost)		No	Road year round	1
	Ross River	397	2.52	43	2.52	2.21	2.85	61° 59' N	132° 26' W	705m	8227	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 11.98 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 70.5; Propane: 62.4 (500 gallon tank cost)		No	Road year round	2
	Tagish	158	2.73	48	2.47	2.17	2.79	60° 18' N	134° 16' W	650m	8255	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace oil: 64.6; Propane: 58.2 (500 gallon tank cost)		No	Road year round	1
	Teslin	454	3.27	68	2.52	2.21	2.84	60° 10' N	132° 43' W	705m	8266	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace Oil: 68.2; Propane: 60.3 (500 gallon tank cost)		No	Road year round	1
	Watson Lake	1690	3.75	82	2.55	2.23	2.89	60° 03' N	128° 42' W	689m	8078	Yukon Electrical Co. Ltd. & Yukon Energy Corp. - Large Diesel	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000	Yes - a subsidy on all non-government residential	Furnace Oil: 58.1; Propane: 57.7 (500 gallon tank cost)		No	Road year round	3
	Whitehorse	19,157	2.24	30	2.42	2.13	2.73	60° 43' N	135° 03' W	703m	8237	Yukon Electrical Co Ltd. & Yukon Energy Corp. - Hydro	$11.90/month and 9.86 ¢/kWh 1st 1,000 kWh then 10.45 ¢ over 1,000 kWh	Yes - a subsidy on all non-government residential	Furnace oil: 64.6; Propane: 58.2 (500 gallon tank cost)		Yes	Road year round	5

Note: All weather information from NASA satellite data