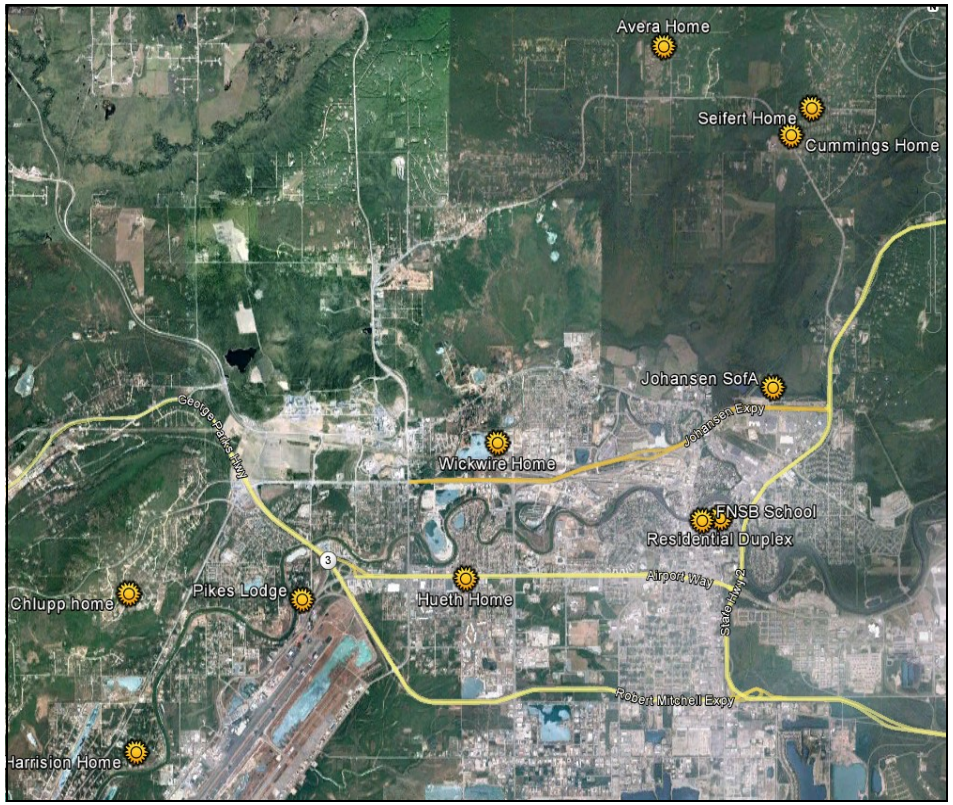
Greater Fairbanks



Chena Hot Springs Rd.

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2012 Fairbanks Solar Tour

Date: 10/06/2012 SATURDAY

Time: 10AM– 4PM

Brought to you By:

Welcome

Energy is the fuel that drives our modern society and for the remote north an essential component of life. The free abundant renewable clean energy sources from earth provide all the energy we will ever need. The technology to harness these sources of energy have in the last couple of years improved in quality and come WAY down in price. This, along with limited federal incentive programs, creates an economic opportunity to invest in building a clean energy economy. The National Solar Tour was created to highlight those homes and businesses that had not only harnessed the sun but the wind and other strategies for smart energy management and generation.

The Fairbanks Solar Tour was started as part of the Alaska movement to join the national tour on October 6th. It is an opportunity for you to check out some of the latest innovation in technology. To speak with homeowners about the pros and cons of their experience and speak with contractors about prices and ideas for your project.

The Fairbanks event is a self directed tour featuring home and business sites in our community that showcase select installations of Solar Thermal, PV (Photovoltaic), and other Renewable Energy and Green building technologies.

No registration required. Get a carload of friends to visit a few of your neighbors' open house sites. Join us in tribute to these trail blazers who have ventured out ahead of the crowd using a cleaner, safer, and renewable source of energy.

Find out how your neighbors are trimming their energy bills, generating their own electricity, and changing the world by living sustainably.

This is a free educational service brought to you by members of our community, the Alaska Center for Appropriate Technology (ACAT), the American Solar Energy Society, local sustainability groups, and our sponsors.

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(907) 457-1297

FNSB SCHOOLS (PG 20) These Whirlwind Solar laminated panels were installed during the summer of 2010. The system was commissioned in October 2010. Whirlwind Solar Energy Systems is an amorphous BIPV (Building Integrated PhotoVoltaic) that is installed directly onto standing seam roof panels. It is also known as a Laminate Solar Panel or a "Peel and Stick" Solar Panel. The Solar Energy system is applied directly onto the metal roof and then connected to the combiner box. The thin film “Peel and Stick” Solar panels then convert solar radiation or sunlight into DC electricity. The inverter changes the DC electricity into AC electricity so it can be readily used in the facility. The electric panel then distributes the AC electricity throughout the building to and from the utility grid. The cost was initially $8,000 per kilowatt, however, the pricing has dropped to nearly half and the efficiency has increased significantly in the years since.

CHLUPP HOME (pg 27) -Sunrise Home -A Passiv Haus at Latitude 64- The home is super insulated with over 12 tons of cellulose and heated by a 480 SF solar thermal system with an internal 5000 Gal annual heat storage tank and a custom masonry heater. There is no conventional fossil fuel source or backup heat. The home features many prototype designs and ideas from the mass loaded foundation system to the diffusion open wall system without a typical vapor barrier. The home was specifically designed to utilize passive solar heat gain as much as possible while maintaining a comfortable indoor temperature.

Besides superinsulation, the home features many Green Building techniques from VOC free adhesives, paints and stains to dual flush toilets and high efficiency appliances. Local materials were used as much as possible during construction and the natural decor creates a connection between the indoors and the outdoors, creating a feeling of 'home". Air filtration with proper ventilation creates a healthy indoor climate. All the systems are networked and integrated with a smart panel which allows for remote monitoring and interaction with the homes systems.

Key elements-The 5.76 kW photovoltaic (PV) system brings the home to a zero energy building. The PV system was built in two sections with 12 panels mounted on the roof and 12 mounted on a pole. Slab at R-63 with 180 tons of insulated internal mass for passive and active heat storage; Walls at R-75 dense packed cellulose; Roof at R-115 blown-in cellulose in cold attic truss; Windows glazed for maximum solar heat gain coefficient on all south facing glassing, no windows due north; Thermal shutters from R-20 to R-40 on all windows; Ventilation air is preheated by a German HRV Zehnder ComfoAir 350 in combination with a comfond 400 LF ground loop.

Stories

KUHN HOME (PG 9) The saga of our home on the SDH begins in 1981. We dreamed of an energy efficient home and Gene took building an energy efficient home classes at UAF. Within a few months of searching, we hired John Hall and Richard Tilly, young innovative builders, to build our perfect home. We have 12" double wall construction with fiberglass insulation in
the walls and ceiling and under the basement floor and the foundation walls. We installed an air-to-air heat exchanger, customized by Sun Air for a domestic residence; a new concept but necessary since our home is considered airtight. A small Jotul wood stove, originally installed as a supplemental room heater has become our primary heat source for the past three years. Our windows are wood casement triple panes, most being replaced in 2010 with low e argon triple panes. We also replaced the oil-fired furnace in 2010. Our home was sited to take full advantage of our southern exposure with no windows on the North and the windows on the East and West located to provide cross ventilation in the summer. When we had our first energy audit done in 1982, the auditor recommended we take advantage of our "perfect" solar location with alternate energy for hot water and for a sunspace (which we still do not have). We were not convinced that solar energy was cost effective at the time, but for 31 years Nancy dreamed of someday having solar collectors. The dream was realized the weekend of : we now have solar 18 photovoltaic collectors on the roof. Gene was concerned about the collectors "looking ugly," but after a short time, we don't even notice them and none of the neighbors have commented on the new addition to our 5 Star home. Finally we have the home that deserves to be on the SDH, the Sun-drenched Hillside. We expect to pay off the cost in 6 years: a good investment for us and the environment, and it helps us to cut our dependence on the coal-generated electricity from GVEA.

SEIFERT HOME (PG 10) This system provides approximately 60 % of hot water use for family of three. System is mostly owner installed and cost a~$8000 and received a $2000 tax credit.

Solar heat is being provided at about $20 per million BTU's , about 2/3 the cost of oil heat. This cost is without the tax subsidy: with that subsidy the cost is $15 per million BTU's about half the cost of fuel oil.

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Directions

Clark Home (pg 8)
2482 Chena Hot Springs Road
(7.2 mile). Rd off to the left.

Kuhn's Home (pg 9)
2060 Amy Dyan Road
5 mile Chena Hot Springs Road turn right onto Herning Road. Take the 3rd left onto Kathleen Road, then turn right onto Rhonda St. Bear right at the Y intersection onto Amy Dyan Road. #2060 will be on your right.

Seifert Home (pg 10)
475 Panorama Drive
From Farmer's Loop (east end) take Skyline Drive (approximately 100 yards) to second right turn, , Panorama Drive. Home is at 475 Panorama Drive, sixth house on right, only yellow house on panorama Drive.

Cummings Home (pg 11)
545 Fideler Rd.
From Farmers Loop road, turn onto Fideler Road. #545 will be the 2nd home on the left.

Avara Home (pg 14)
925 Vide Way.
North of Dog Mushers Hall on Farmers Loop 1/4 mile up Senate, Vide on the right hand side. The house is on the left.

Spirit of Alaska (pg 15)
495 Harold Bentley Ave
Right on Westbound Johansen Expressway.

Resources

National Renewable Energy Laboratory
www.nrel.gov

US Department of Energy
www.eere.energy.gov

Alaska Sun Coalition
www.alaskasun.org

Alaska Housing Finance Corporation
www.ahfc.us

Home Power Magazine
www.homepower.com

Mother Earth News
www.motherearthnews.com/

Alaska Energy Authority
www.akenergyauthority.org

Database of State Incentives for Renewables and Energy Efficiency.
www.dsireusa.org

Cold Climate Housing Research Center
www.cchrc.org

Alaska Center for Energy and Power
www.uaf.edu/acep

Alaska Center for Appropriate Technology
www.acat.org

Renewable Energy World Magazine
www.renewableenergyworld.com

ABS Alaska	907-452-2002
www.absak.com	abs@absak.com
Alascorp	907-456-6400
www.solarheatalaska.com	alascorp@alaska.net
Arctic Sun-LLC	907-457-1297
www.arcticsun-llc.com	karl@arcticsun-llc.com
Real Smart Developments,	907-456-3324
www.realsmartdevelopments.com	shieldsr@realsmartdevelopments.com
Remote Power, Inc	907-457-4299
www.remotepowerinc..com	greg@remotepowerinc.com

Harrison Home

SNAP
GVEA's Renewable Energy Program

Location: 1254 Crown Rd.

Directions: Take Chena Pump Road past the Pump House. Turn left onto Shanks Mare Road. Take the 2nd right onto Crown Road. #1254 will be on your left.

System specs: 4.32 kW peak; (18)Canadian Solar CS6P-240P modules; (1)Solectria Renewables PVI5000 inverter Subpanel installed to allow for up to an additional 5000 watt inverter for future expansion This roof mounted system is fully seasonally adjustable from 50-85 degrees. System monitoring includes inverter direct web-based monitoring and TED (the Energy Detective) monitoring system.

Installed: Summer 2010

Purpose: To off-set onsite consumption

Comments:

FNSB School District (pg 20)
520 Fifth Ave.
Between Lacey and Cushman. Enter in from either 4th of 5th Ave.

Residential Duplex (pg 21)
335 Fifth Ave.
Turn at 6th Ave and Noble Street and park in the large gravel parking lot. The building is a large green two story was built in the 50's with a detached green garage.

Wickwire Home (pg 22)
2775 Hansen Way
Aurora Subdivision. Hansen is at the south end of Aurora Drive. 1/2 mile down on the left.

Hueth Home (pg 23)
3262 Adams Dr.
From Airport Way Washington Dr. to Adams (directly behind Sears) or Davis by 19th and Kennedy.

Pikes Lodge (pg 26)
1850 Hoselton Drive
West End of Airport Way on the right. Past Parks Highway overpass.

Chlupp home (pg 27)
2595 Allan Adale Rd
From Chena Ridge Loop take Old Chena Ridge to Allan Adale. Sixth drive way on the left.

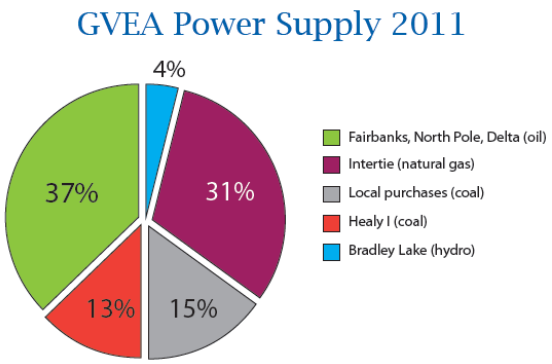
Harrison Home (pg 28)
1254 Crown Rd.
From Chena Ridge Loop take the left of Shanks Mare Rd. Crown Rd is on the right last house.

GVEA

SNAP

GVEA's SNAP program allows you to support alternative energy producers in Alaska. If you're a GVEA member, you can sign up to donate between $2-25 a month toward SNAP producers. GVEA give all the member contributions to SNAP power producers. You can sign up as a SNAP subscriber by calling GVEA at (907) 452-1151 or emailing info@gvea.com, or if you receive your electric bill through the mail, you can fill out the SNAP contribution form on the bill.

Golden Valley Electric Association's SNAP program allows people with alternative energy power systems to sell electricity back to GVEA, for up to $1.50 per kilowatt hour, and join in an annual revenue-share program. All money received from SNAP subscribers is divided among the producers, according to how much power each producer contributed in the past year. Providers are also paid an additional fee "based on the average cost of non-firm power purchased by" GVEA. In 2010, SNAP Plus became GVEA's Net Metering Program.



758 Illinois St.. PO Box 71249 Fairbanks, Alaska 99701

SNAP
GVEA's Renewable Energy Program

GVEA Conservation Programs

Home $ense

http://www.gvea.com/resources/energysense

Business $ense

http://www.gvea.com/resources/energysense#businesssense

Builder $ense

http://www.gvea.com/resources/energysense#buildersense

Chlupp Home

Location: 2595 Allan Adale Rd

Directions: From Chena Ridge Loop take Old Chena Ridge to Allan Adale. Sixth drive way on the left.

System specs: (24) Canadian Solar CS6P-240P solar panels; (1) Solectria PV16500 inverter; 12 Sun Earth EC40 flat-plate thermal panels

Installed: Summer 2010

Purpose: The Sunrise home is the northern most “Passiv Haus” in North America and a milestone in energy efficiency.

Comments: See Stories (pg29)

Pikes Lodge

Location: 1850 Hoselton Drive, Fairbanks, AK 99709

Directions: West End of Airport Way on the right. Past the Parks highway overpass.

System specs: Roof mount Adjustable 15kw Solar Array / 6 string 3 Ph Grid tie

Installed: 2007

Purpose: Offset Energy demand as well as provide RE awareness to visitors

Comments: Snap Producer and Snap contributor.

Public Etiquette

If *you will be attending the 2012 Solar Tour, please read the tour etiquette for the Public's Expectations and Responsibilities below.*

Please only visit Tour homes or building sites during the tour day and hours specified by the local host (some sites may have limited hours and accessibility).

Please park legally and treat persons and property respectfully.

If the site indicates "Outside viewing only" please do not go onto the property.

Please do not bring pets or others who may not be able to behave in a proper manner.

Please do not smoke, eat, or litter in the tour sites. Remove footwear if entering a home.

Vendors, installers, and their representatives who staff tour sites should conduct the tour in a manner appropriate to our educational mission.

In the event of inclement weather individual property owners may opt to limit access to their site or close entirely. Alaska Solar Tour does not endorse specific renewable energy or energy efficiency products presented during the Alaska Solar Tour or the National Solar Tour.

Anyone accessing sites on the roof, or by ladder, stairs, stepladder, stool, or other method does so solely at their own risk. Visitors assume full responsibility for their behavior or actions. Tour hosts or related parties will not be held liable for any injury, fatality, damage or property loss that may occur.

Please enjoy yourself, and contact us with any questions or comments.

Clark Home

Location: 2482 Chena Hot Springs Rd.

Directions: (7.2 mile). Rd off to the left.

System specs: 6kw: Multi Dual Axis Tracking Solar array(s)

Installed: Summer 2012

Purpose: Offset energy consumption

Comments:

Hydro

- 37 hydroelectric projects
- 126MW at Bradley Lake; 6MW at Blue Lake; 31MW at Crater Lake; 824 KW at the Tazimina Project near Iliamna
- 2 major projects being considered Susitna 600-1880MW and Chakachamna 330MW
- Ruby testing first in the world in-stream power with a 5KW generator
- Alaska Center for Energy and Power is developing a test center for hydrokinetic technologies in Nenana.
- 35 coastal site have been identified for ocean energy though none developed
- Total wave flux on SE coast is estimated at 1,250TWh/yr

Wind

- Alaska has abundant winds especially in the mountains and the coast
- Many remote power applications are active throughout the state
- First wind farm in Kotzebue online since 1997; AVEC operates 15 turbines with a total capacity of 1364 KW
- In the works-50MW Fire Island; 25MW Eva Creek; AVEC expansion adding 1,200KW; (4) 450KW for the Chaninik Wind Group; Kodiak Electrical Association installing (3) 1.5MW turbines

Solar

- Solar Energy in Alaska is available directly in 3 forms passive solar, solar thermal, and photovoltaic's (PV) electricity
- Passive solar is a design concept and planning tool to capture, retain, or reflect heat as needed.
- Solar thermal is conductive heat transfer for water, pool, and space heating. Complimentary system for reducing yearly costs.
- Photovoltaic’s (PV) are crystal cells that turn solar energy into electrical energy. Technology has advanced nearly to “plug-n-play” however, they are very expensive toys. Good back up power option for hybrid system.

Energy Security

The information obtained from Renewable Energy Atlas of Alaska 2009 provided by Alaska Energy Authority and Renewable Energy Alaska Project provides a baseline by which we can begin to develop a diverse investment portfolio for creating affordable clean energy throughout the state.

State Current Energy Portfolio

• Coal	3%	• Hydro	24%
• Gas	54%	• Solar, Wind, and Biomass	**0.2%**
• Petroleum Residual	10%	**Total Capacity**	**1,340MW**

State Renewable Energy

Biomass

- 100,000 cords burned annually for space heating
- Estimated 13million gallon potential feedstock currently dumped into the ocean
- Alaskans Generate nearly 650,000 tons of garbage (6lbs/person/day)
- Chena Power developing 400KW system to burn paper and cardboard
- Anchorage pulling 3MW of methane from its landfill equal to 2M gallons of diesel; enough to power 3000 homes.

Geothermal

- Much exploration is being done around the state in the four geothermal districts of the state. Best example Chena Hot Springs which has a diverse portfolio of end uses of energy potential such as:
  - 400KW generator displacing 150k g/diesel
  - Heating outdoors baths, swimming pool
  - District Heating
  - Heat and CO2 for greenhouses

Kuhn's Home

SNAP
GVEA's Renewable Energy Program

Location: 2060 Amy Dyan Road.

Directions: 5 mile Chena Hot Springs Road turn right onto Herning Road. Take the 3rd left onto Kathleen Road, then turn right onto Rhonda St. Bear right at the Y intersection onto Amy Dyan Road. #2060 will be on your right.

System specs: 18 Canadian Solar CS6P-230 Watt modules with a Solectria PVI5000 inverter. The UL-Listed rack has all stainless steel hardware and is seasonally adjustable to maximize production.

Installed: July 4th, 2012

Purpose: long-term dream to be energy self sufficient

Comments: See Stories pg 30

Seifert Home

Location: 475 Panorama Dr.

Directions: From Farmer's Loop road (east end) take Skyline Drive (approximately 100 yards) to second right turn, Panorama Drive. Home is at 475 Panorama Drive, sixth house on right, only yellow house on panorama Drive.

System specs: Hot water Solar collector system, Heliodyne Commercial unit, 80 square feet in area, 120 gallon solar storage tank. collectors tilted at 60 degrees, due south, located on Greenhouse roof. Pump is photo-voltaic so entire system functions independent of electric power

Installed: Installed 2008.

Purpose: Provides approximately 60 % of hot water use for family of three.

Comments: See stories pg 30

Hueth Home

Location: 3262 Adams Drive

Directions: From Airport Way Washington Dr. to Adams (directly behind Sears) or Davis by 19th and Kennedy.

System specs: Handmade Wind Turbine and tower. Homemade 12 foot diameter parabolic Solar concentrator. Parabolic Dish: glass lined mir-ror; temperatures at focal point anywhere from to 1200 to 2000 degrees.

Installed: Summer 2008

Purpose: Wind Turbine 16 1/2 foot fan; center of fan 42 feet from ground level; tower homemade; electricity used for heat; voltage and amperage runs wild.

Comments: Statistics regarding the renewable energy and/or home de-sign used for space heat by heating water; space heat stored in insulated box under house – medium river bed sand and gravel.

Wickwire Home

Location: 2775 Hansen Way

Directions: Aurora Subdivision. Hansen is at the south end of Aurora Drive. 1/2 mile down on the left.

System specs: 4.7kw Adjustable roof mount Solar PV

Installed: Summer 2012

Purpose: Offset energy consumption

Comments:

Cummings Home

Location: 545 Fideler Rd.

Directions: From Farmers Loop road, turn onto Fideler Road. #545 will be the 2nd home on the left.

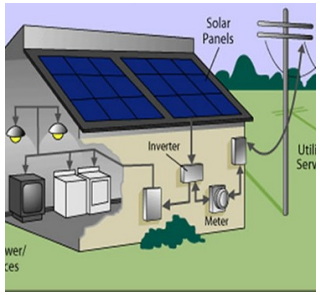
System specs: 5.52 kW peak (24)Sharp ND-230QCJ modules (1) Solectria Renewables PVI7500 inverter

Installed: 2012 by Arctic Sun, LLC.

Purpose: This is a SNAP-Plus system, meaning generated energy will be consumed on site and the balance net-metered by GVEA.

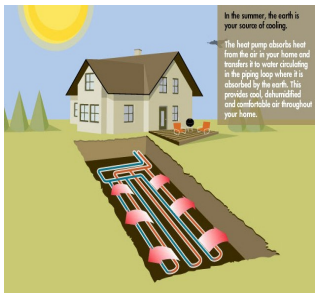
Comments: Array is prewired for future additional 6 module addition, bringing total array peak power to 6.9 kW. This roof mounted system is fully seasonally adjustable from 50-85 degrees. System monitoring includes inverter direct web-based monitoring.

Clean Energy Economy



Photovoltaic systems (**PV system**) use solar panels to convert sunlight into electricity. A system is made up of one or more solar photovoltaic (PV) panels, an AC/DC power converter (also known as an inverter), a racking system that holds the solar panels, and the interconnections and mounting for the other components. A small PV system may provide energy to a single consumer, or to an isolated device like a lamp or a weather instrument. Large grid-connected PV systems can provide the energy needed by many customers.

Solar thermal energy (**STE**) is an innovative technology for harnessing solar energy for thermal energy (heat). Solar thermal collectors are classified by the United States Energy Information Administration as low-, medium-, or high-temperature collectors. Low-temperature collectors are flat plates generally used to heat swimming pools. Medium-temperature collectors are also usually flat plates but are used for heating water or air for residential and commercial use. High-temperature collectors concentrate sunlight using mirrors or lenses and are generally used for electric power production.



Geothermal energy is thermal energy generated and stored in the Earth. Thermal energy is the energy that determines the temperature of matter. Geothermal energy has been used for bathing since Paleolithic times and for space heating since ancient Roman times, but it is now better known for electricity generation. Worldwide, about 10,715 megawatts (MW) of geothermal power is online in 24 countries.

Residential Duplex

Location: 335 5th

Directions: Turn at 6th Ave and Noble Street and park in the large gravel parking lot. The building is a large green two story duplex built in the 50's with a detached green garage.

System specs: (2) panel Enerworks solar system supplies domestic pre-heated water to an oil fired conventional hot water system.

Installed: Summer 2010

Purpose: System saves money by offsetting fuel oil costs to heat Domestic hot water.

Comments: Affordable-appliance uses only one pump- very low operating cost- Can be installed with any domestic heating system (new construction or retrofit) Virtually maintenance free- 20 year expected lifespan Freeze protected panels, remote monitor, total data and energy records in the system Built in automatic stagnation control which uses no power or accessory plumbing Installation available by locally licensed bonded contractors

FNSB Schools

SNAP
GVEA's Renewable Energy Program

Location: 520 Fifth Ave

Directions: Between Lacey and Cushman. Enter in from either 4th of 5th Ave.

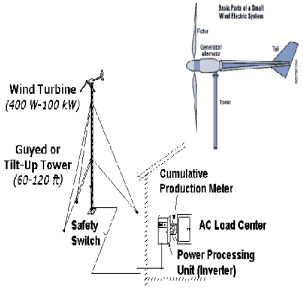
System specs: 5,000 watt Whirlwind Solar Energy BIPV modules Laminated right onto a metal siding; Inverter is a Sunny Boy 5000

Installed: Summer 2010

Purpose: The school district wanted to demonstrate photovoltaic system technology and evaluate its potential for solar power production.

Comments: see stories pg 29

Small wind turbines are wind turbines may be as small as a fifty watt generator for boat, caravan, or miniature refrigeration unit. Small units often have direct drive generators, direct current output, lifetime bearings and use a vane to point into the wind. Larger, more costly turbines generally have geared power trains, alternating current output and are actively pointed into the wind. Direct drive generators are also used on some large wind turbines.



Micro hydro is a type of hydroelectric power that typically produce up to 100 kW of electricity using the natural flow of water. These installations can provide power to an isolated home or small community, or are sometimes connected to electric power networks. There are many of these installations around the world, particularly in developing nations as they can provide an economical source of energy without the purchase of fuel. Micro hydro is frequently accomplished with a pelton wheel for high head, low flow water supply. The installation is often just a small dammed pool, at the top of a waterfall, with several hundred feet of pipe leading to a small generator housing.

Anaerobic digestion is a series of processes in which microorganisms break down biodegradable material in the absence of oxygen. It is used for industrial or domestic purposes to manage waste and/or to release energy. Anaerobic digestion is widely used as a source of renewable energy. This biogas can be used directly as cooking fuel, in combined heat and power gas engines or upgraded to natural gas-quality biomethane. The use of biogas as a fuel helps to replace Fossil fuels. The nutrient-rich digestate also produced can be used as fertilizer.

Avara Home

Location: 925 Vide Way, Senate Loop, Farmers Loop Road

Directions: North of Dog Mushers Hall on Farmers Loop 1/4 mile up Senate Loop, and Vide on the right hand side. The house is on the left.

System specs: Single panel solar thermal system.

Installed: Summer 2010

Purpose: Eliminate summer time boiler use, offset Domestic hot water

Comments:

Investment Portfolio

Renewable energy encompasses a variety of power generation sources. Generally, it refers to electrical power derived from "renewable" resources such as solar or wind energy, as opposed to "single-use" resources such as coal or natural gas. The most common forms of alternative energy available for homeowner use today are solar power, wind power and "micro-hydro" power.

The benefits of using renewable energy sources are considerable. From an environmental standpoint, solar, wind and water power are all non-emission power sources. Unlike coal combustion power plants, no harmful exhaust is produced when using alternative energy generators. There is also no worry about toxic or radioactive waste products, as there is with nuclear power.

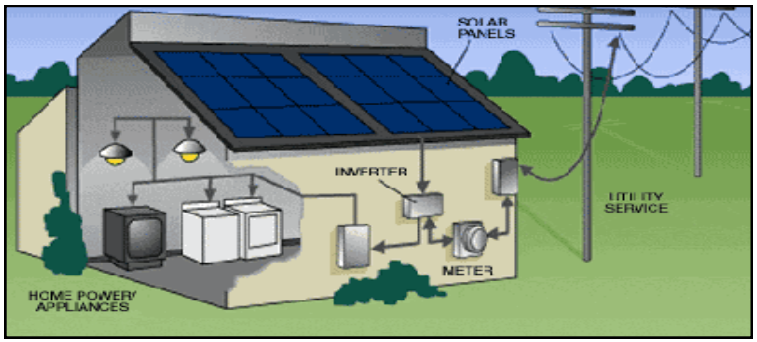
For remote sites currently relying on engine generators for electrical power, alternative energy sources present some other advantages as well. Sunlight, wind and flowing water are all available for free, unlike diesel fuel or propane used to power a traditional generator Also, each of these methods operates virtually silently. Solar panels and underwater turbines make no noise whatsoever, and wind generators produce a low hum at most. Compared to the racket an engine generator makes, even the noisiest would be unnoticeable.

For homes currently relying on grid power, a renewable energy system has still more benefits. Power generated from renewable sources can be stored in a battery bank to provide backup power if utility power fails. In some areas alternative energy generated by a homeowner can be "sold back" to the local utility company, resulting in lower monthly electric bills at the least, and perhaps even generating income for the homeowner with a large renewable energy system.

Many people mistakenly think that Alaska's unique climate renders it an impractical location for alternative energy use. However, renewable energy is entirely viable even in such harsh climates, as long as some additional factors are taken into consideration when designing arctic energy systems.

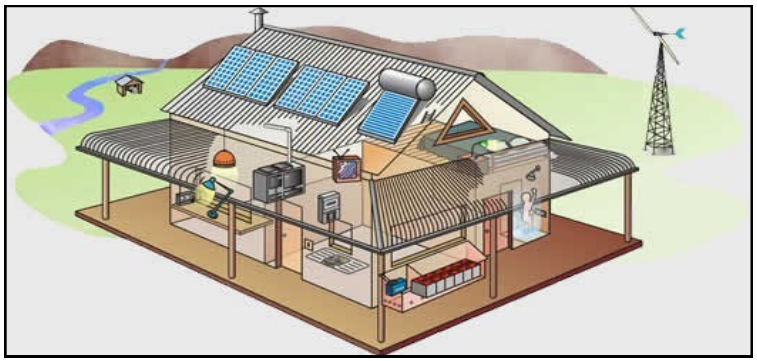
For year-round power in an Alaskan renewable energy system, a 'hybrid' system is the only reasonable choice. Solar panels can provide plentiful power during the long hours of summer sun, but wind generators should be added to help support the system through the winter months.

Stand Alone VS Grid-Tie Systems



To harness this free clean energy of the earth you need storage and there are two distinct ideas about it, although there are many variations and configurations. In a cabin, remote lodge, or frontier community the solution is batteries with a gas generator as back up. This system is independent from any other utility or power sources and thus called “stand alone”. This configuration has many advantages but is primarily set back by initial costs.

The other primary configuration is being connected to the grid. Grid-tie systems use the utility as the energy storage for excess generated power as credits on their accounts. These systems are much cheaper than stand alone systems but if the grid goes down so do you (to protect line-men repairing them). In either configuration combining technologies like wind, and sun are called hybrid power systems.



Spirit of Alaska

Johansen Branch, Fairbanks

SNAP
GVEA's Renewable Energy Program

Location: 495 Harold Bentley Ave

Directions: Right on Westbound Johansen Expressway.

System specs: 16 Sharp 175 Watt monocrystalline modules (2) strings of 8 modules each.

Installed: March 2011

Purpose: An array of fully articulating solar panels have been installed at our flagship Johansen Branch. The panels move and track with the sun to maximize the long daylight hours of the Interior.

Comments: The branch uses the power, as well as participating in the SNAP program and generates 2.8 kW/hr

Facts and Figures

HEATING

The number of heating degree days [HDD] in one day is the number of degrees the day's ambient temperature is below 65 ^{o} F and is used to help determine space heating needs. A mean 24 hour temperature of 55 ^{o} F corresponds to 10 HDD.

Fairbanks has about 14,000 HDD per year. Over 30 years, the average monthly number of HDD varies from 121 in July to 2315 in January. If there were 280 days in a year, a typical daily temperature would be 50 ^{o} F below 65 ^{o}F or 15 ^{o}F. So, with 365 days in a year, our average temperature is close to 27 ^{o}F which is 38 ^{o}F below 65 ^{o}F. Clearly, the way a building is constructed and used is critically important in determining heating load.

SOLAR

In May, the average daily solar insolation [energy from the sun] in Fairbanks is 3.48 kWh/m^2/day on a horizontal surface and 3.7 on a surface tilted 15 ^{o} less than our ~ 65 ^{o} latitude or about 50 ^{o} from the horizontal. The corresponding numbers are 0.1 and 0.7 in January. One kWh equals 3412 Btu. Even on a cold day in, say, February, the heat gain in solar insolation from noon to 3 PM can be much greater than the heat loss through a S facing triple pane window. The peak insolation can exceed 1 kW/m^2 on a surface facing the sun. Photovoltaic cells may convert around 15-16% of this insolation into electricity.

WIND

The kinetic power in the wind is proportional to V^3 where V is the wind speed. So, doubling the wind speed increases the power by a factor of 8. For, a 10 m/s wind speed [20 mph], the power at sea level is about 600 W/m^2. A perfect wind turbine could capture 59 % of that and a real world turbine may capture 30 %. Hence, a turbine with a 1 m diameter set of blades may be able to output 140 watts in a 20 mph wind.

Thanks to UAF professor Ron Johnson for his contribution

NET-ZERO ENERGY

As net-zero energy buildings increase in prominence - with the expectation that they'll be code-mandated some time in the future - standard definitions for what exactly makes a net-zero energy building are critical.

Currently, there are four main types of net-zero energy buildings.

1) Net-Zero Site Energy buildings is the most common type. This is a building that produces at least as much energy - through on-site renewables - as it uses on a yearly basis.

2) Net-Zero Source Energy buildings are buildings that produce as much energy as they use when calculated at the source. What that means is that the building's produced energy must also make up for energy lost in transmission from the source of the energy to the building using it.

3) Net-Zero Energy Cost buildings are those in which the amount of money an owner pays for electricity a building uses is equal to the amount of money the utility pays the owner for renewable energy the building feeds to the grid.

4) Net-Zero Energy Emissions buildings produce and export at least as much emissions-free renewable energy as they import and use from emission-producing sources on an annual basis. According to sources, this is the easiest type of net-zero energy building to achieve, and therefore may be the least environmentally stringent.

SOLAR HOT WATER

In Alaska solar hot water essentially works through closed loop convection with the sun preheating a fluid (glycol). The system uses it to transfer the heat to a storage tank of potable water. This reduces the energy demand on your mechanical heating unit to bring the water to temperature.

Using the sun to heat water has many practical applications in Alaska. It is even possible (through thoughtful design and sufficient storage capacity) to completely heat your home all year long with solar heat captured in the summer time. The most common and cost effective use of solar hot water heating is in heating water for domestic or commercial use, cutting your costs in this area by up to 60%. Some heating systems are also configured to using tubes in the floor for radiant energy with solar as a preheating source.