



Gathering Summary, June 23, 2010: Alternative & Renewable Energy Part 2

A Presentation by Jeff Arcel

Summary [*and additional text*] by Catherine Haug.

This has been divided into two parts to minimize file size. See [Alternative Energy Gathering Summary, Part 1](#).

A 2 MB pdf version of Jeff's slide presentation is available: [Renewable Energy Solutions](#).

[NOTE: Urls for all links shown in References section].

Introduction Recap

(Photo of Local Skystream Installation, above, from Mothers' Power; original source unknown)

Jeff's business, Mothers' Power, specializes in renewable energy system design & installation for residential, commercial and community use.

Jeff opened with a short history of solar and wind energy (see part 1).

The most common types currently deployed are:

Covered in [part 1](#):

- Solar power
- Solar thermal

Covered in part 2:

- [Wind power](#) (mechanical or electrical applications)
- [Hydropower](#) (mechanical or electrical applications)
- [Geothermal](#) (power, heat and hot water)

Jeff also addressed the following topics, which are included in Part 2 of the summary:

- [Emerging technologies](#) (fuel cells, thin film, nano-solar)
- [Community power](#)
- [Financial incentives](#)
- [Electric transportation](#)

Wind Energy

(Images: Windspire and VAWT, below, from Mothers' Power; original source unknown)

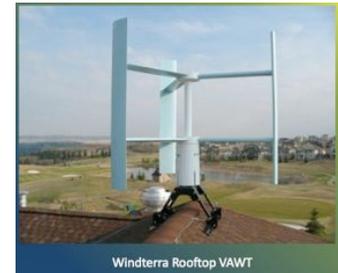
Wind can be used for electric power generation or for mechanical uses (such as pumping). Average cost for a grid-tie residential system is about \$15,000 per turbine.



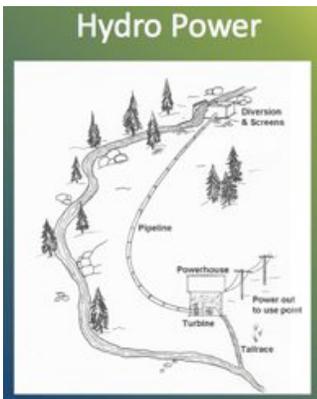
Wind is all about location, and for most of the Flathead Valley, it's not good. Also, the turbine should be about 30 feet above the surroundings to work.

Several types of wind turbines are available including:

- Skystream (page 1)
- Windspire (left)
- Vertical axis or VAWT (right)



See [American Wind Energy Assoc. \(AWEA\) Small Wind FAQ](#) for more info.



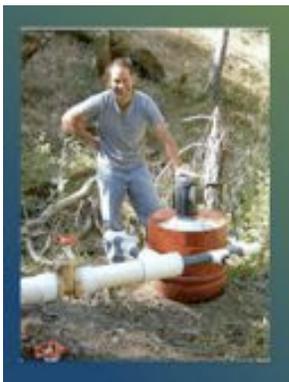
Hydropower

(Images, this section, from Mothers' Power; original sources unknown)

As long as you have the stream, this is the most consistently reliable of all the renewable energy options; it works 24 hours per day and is not season dependent (unless your stream dries up in the summer).

There are permitting issues if fish are in the stream.

Cannot do grid-tie without license from Federal agency



Systems & Costs

- ▶8 KW system is enough for three houses, and costs about \$35,000 for turbine and piping.
- ▶Small-Hydro: 1 - 2 KW systems, 10-feet of head, cost about \$4,000 - \$15,000 installed (pictured left)
- ▶Low-head hydro systems (4 - 6 feet head)
- ▶5 KW in-stream systems (mounted on pontoons) cost about \$25,000. Can be camouflaged. Will work when stream freezes, but ice-breakup can be a problem. See [Riverstar](#) for example (12).

See Mothers' Power [Renewable Energy Solutions](#) slideshow for more hydro-power photos.

Geothermal

NOTE: Jeff did not spend much time talking about geothermal, so the bulk of the text here is from my research.

[Geothermal is very efficient; the warmer the source, the higher the efficiency. Many different applications are available including geothermal power, geothermal or ground-source heat pumps, and geo-exchange.]

Geothermal Power

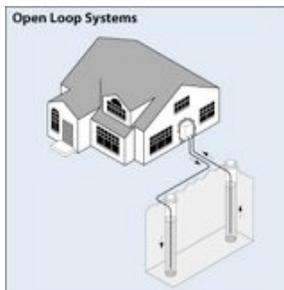
[Geothermal energy can be used to produce electricity. There are 3 types of geothermal power plants: dry steam, flash steam and binary cycle. Of these, flash steam is the most common and sustainable; binary cycle allows use of water at lower temperatures in a heat-exchange system. (16) See [Celsias: World Geothermal Power Generation](#) (15) and [Renewable Energy World: Geothermal Electricity](#) (16) for more.]

Flathead Electric Coop's Hot Springs project is not as hot as geothermal waters in Yellowstone Park.

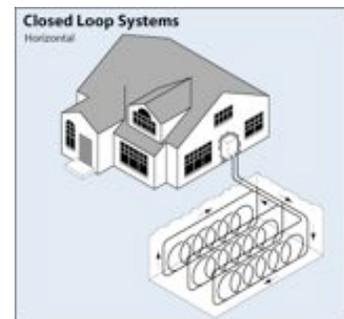
Geothermal Heat Pumps

(Images, right and below, from [US Dept of Energy](#) (4))

[This type of heating system has been in use since the 1940s. It uses the constant temperature of the earth as the exchange medium, instead of outside air temperature (used by air-exchange systems). This allows them to reach 300-600% efficiency (even on cold nights), compared with 175 - 200% for air-exchange systems (4).



They come in both closed loop (right) and open loop types (left). They are relatively expensive, primarily because of the need to dig up so much ground (closed-loop types), or drill wells (open-loop types). For this reason, they are perhaps better suited to serving neighboring homes from the same system, thus lowering the individual cost for each home.].



See [US Dept. of Energy: Geothermal Heat Pumps](#) (4); and [Geothermal Energy Office \(GEO\)](#) (13) for more.

Emerging Technologies

Fuel Cells, for example the Bloom Box discussed on [CBS's 60-Minutes](#) (14) which is a solid oxide fuel cell (SOFC), is quite expensive now, but is targeted to cost \$3,000 within 5 - 10 years.

New concentrating, [Thin-Film PV](#) (19), and [Nanosolar](#) (19) technologies promise significant price drops and production increases.

Community Power *

(Image, right, from Mothers' Power; original source unknown)

[Community Power means larger installations designed to serve a community, or to connect to the power company's grid system.]*

Jeff provided several photos of different types of community solar and wind power installations. See his slideshow: [Renewable Energy Solutions](#) (2 mb pdf).



One of his slides discusses Recent Big Deals in Municipal/Utility Solar Power.

Financial Incentives for Renewable Energy

[Perhaps the greatest incentive is reduction in monthly heating/cooling or electricity costs, which allows for installation cost recovery over a relatively short period of time for many installations.]

Both federal and state governments currently provide tax incentives for renewable energy installations at the residential and commercial level *[NOTE: most of these expire at the end of this year, 2010, and have a limit to the amount you can claim]*. And some power companies also offer rebates. See Jeff's slide: "Financial Incentives for Renewable Energy," [Renewable Energy Solutions; slide 63](#) (2 mb pdf)



Electric Transportation

(Image, left, from Mothers' Power; original sources unknown)

Electric cars and bikes are the future of local transportation. While biodiesel, bioethanol, biomass and biogas produced from 2.5 acres of land can power your car between 21,500 and 67,000 km, PV electricity on the same acreage can power a plug-in hybrid for 3,250,000 km.

Comment from audience: See the 2006 documentary film: Who Killed the Electric

Car? View the trailer on [YouTube](#); read a summary on [wikipedia](#). (18)

[See also my article on the EssentialList: [Rail Transit in the Flathead?](#) (17).]

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