

Geothermal Systems versus other Renewable Energy Technologies

Marginalized cost of electricity from various alternate energy technologies

Four common types of renewable energy include:

- Hydro-electric (power generation)
- Wind (power generation)
- Solar (power generation)
- Biomass (power generation)
- GeoExchange systems (power use avoidance)

GeoExchange is a technology that reduces the amount of energy required to heat and cool buildings. It does not “produce” power. Wind generators and Solar Photo-voltaic panels generate electricity. It is possible to estimate the cost effectiveness, or potential return on investment by dividing the capital cost of building a system and calculating the cost of producing one kWh of energy over the expected life of the system. The following chart shows this comparison between three large scale systems, including photo-voltaic cell system, wind generators and a geoechange system. Note that long-term maintenance costs are not included in these calculations and would have a significant impact on wind generators and photo-voltaic systems.

	Hydro	Photo-voltaic	Wind	GeoExchange ¹
Capital cost	\$9,400,000,000	\$1,400,000,000	\$210,000,000	\$3,556,000
kWh generated annually	906,660,000,000 ²	438,000,000 ³	260,172,000 ⁴	6,297,000 ⁵
Cost/kWh over life of system	\$0.013	\$0.107	\$0.036	\$0.001
System life (years)	100	30	20	50



¹ GeoExchange systems avoid the use of electricity rather than produce energy, thereby freeing up electricity for export or other uses.

² kWh production based on estimates for proposed Conawapa Generating Station includes cost of Bipole 3 power line to Southern Manitoba (information from http://www.hydro.mb.ca/projects/conawapa.shtml?WT.mc_id=2607 & http://en.wikipedia.org/wiki/Nelson_River_Hydroelectric_Project)

³ kWh production of photovoltaic system based on full production 20% of the time (4.8 hours / day). Capital cost and energy production figures based on Southern California Edison website. Estimated life of PV cells is 30 years (information from <http://www.nanowerk.com/news/newsid=4496.php>)

⁴ kWh production of wind generator system based on full production 33% of the time (8 hours / day). Capital cost and energy production figures from Manitoba Hydro website regarding St. Leon wind farm. Estimated life of wind generator is 20 years (information from http://www.treehugger.com/files/2008/01/wind_turbine_lca.php)

⁵ kWh energy extraction from ground heat exchanger based on feasibility study completed for the Town of Gibsons, BC District Geothermal Energy System Feasibility Study (estimated life of GHX is 50 years. A number of manufacturers provide a 50 year warranty on HDPE pipe buried in the ground)