

## *Solar Technologies Comparison*

Below is a side-by-side comparison of three solar systems we commonly install with nearly identical energy output  
St. Cloud, MN is used here as a sample site for electric rates, weather data, and solar resource.



Solar Technology	Solar Air Heat RREAL Solar Powered Furnace (2) SPF 32	Solar Water Heat Solar Skies (2) SS-32	Solar Electric 1.6kW array (8) Solar World 200	Coal Power Plant 854MW plant Plant Washington
Annual Energy Output	7.3 mil BTU (>2100 kWh)	6.8 mil BTU (2000 kWh)	7 mil BTU (2050kWh)	5,956GWh
Total Installed Cost	\$6k	\$10k	\$11k	\$3.91billion
\$/installed W of capacity	\$3.75*	\$6.25*	\$6.75*	\$4.58
External Fuel Costs	\$7.31/yr (\$7.31/>2100kWh) (fan and controller)	\$12.22/yr (\$12.22/2000kWh) (pump and controller)	\$3.29/yr (\$3.29/2050kWh) (Inverter)	\$266 million/yr (\$89.32/2000kWh) (coal)
Operations and Maintenance	\$2/yr (Standard HVAC Filter)	—	—	\$109 million/yr
Solar Efficiency	61%	71%	17%	0%
Coefficient of Performance ("Fuel Efficiency")	27 (2700%)	17 (1700%)	65 (6500%)	<0.5 (<50%)
Annual savings (\$0.104/kWh)	\$218	\$208	\$213.2	\$0
Year of payback	17th (2027)	23rd (2033)	24th (2034)	Never
System Lifespan	>30yrs	>30yrs	>25yrs	<60yrs
Net financial savings (30yr)	\$11,350	\$7,350	\$6,350	- \$15.2 billion
Health	Clean air, healthy rivers and forests and a warm, healthy home	Clean air, healthy rivers and forests, and hot domestic water	Clean air, healthy rivers and forests, and clean, renewable electricity	Respiratory ailments, mercury contam- ination, mountain top removal ...

## Sources, Equations, and Assumptions

\*Prices listed are historically accurate. Actual installation costs will vary and may be substantially less than stated due to constantly updated pricing and variables such as system size, system complexity, and installation location. If you are interested in a quote for a particular system type and installation site, please contact RREAL to request a site visit and proposal.

SAH: [TRNSED](#), [Savings Calculator](#), [Data-logging](#)

COP:  $1895\text{kWh partial season output} / (58.8\text{kWh fan} + 11.5\text{kWh controller}) = 27$  (Tammy, Sebeka, MN 2010/2011 data-logging)

SWH: [RETScreen](#)

COP:  $2000\text{kWh output} / (100\text{kWh pump} + 17.5\text{ kWh controller}) = 17$

Assumes: 7% miscellaneous panel losses, 59.4w pump, 83.8 gallon storage, 90% heat exchanger efficiency, 6% storage losses,

PV: [PVWatts](#), [USNO](#), [Fronius](#).

COP—  $2050\text{kWh output} / 31.65\text{kWh inverter} = 65$

Inverter: Fronius IG2000 ( $7\text{W daytime} * 12.13\text{h/d of sun} * 365\text{ days}$ ) + ( $.15\text{W night} * 11.87\text{h/d} * 365$ ) = 31.65kWh

Coal: [DEQ](#), [CNN](#)

Net Savings:  $\$3.91\text{ bil. installed cost} + (\$375\text{ mil. annual costs} \times 30\text{ yrs}) = -\$15.16\text{ bil.}$

Net financial savings and payback assume historic 15 year trends of:

Electric escalation rate of 3.37% annually [EIA](#)

Inflation rate of 2.44% annually [BLS](#)

System lifespan:

The operational lifespan of all these technologies can be indefinitely extend through replacement of components as long as fuel remains available and affordable. Only a handful of coal plants remain from prior to 1948 and as coal becomes increasingly expensive and difficult to harvest, the lifespan of coal plants will decrease. EIA.