

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

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

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

SWH: [RETScreen](#)

COP: [2000kWh output](#)/(100kWh pump + 17.5 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— [2050kWh output](#)/31.65kWh inverter = 65

Inverter: Fronius IG2000 ([7W daytime](#) * [12.13h/d of sun](#)*365 days)+([.15W night](#) * 11.87h/d*365) = 31.65kWh

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

Net Savings: [\\$3.91 bil. installed cost](#) + ([\\$375 mil. annual costs](#) x 30 yrs) = -\$15.16 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.