Q&A Table
Solar hot water
January 2014

Location	Lookout Mountain, Golden, CO 7,500 ft. elevation
Year installed	Feb-2013
Type of collector (i.e. flat plate, evacuated tube)	(8) SunEarth 4' x 8' flat plate solar collectors
Location of collector (i.e. rooftop, ground-mount)	30-35° angle on south facing roof
Type of system (i.e. closed loop glycol, drainback)	Drainback
Type of backup hot water system	Lockinvar Knight WHN155 natural gas boiler (95-98% efficiency) with Lochinvar Squire SIT030 30-gallon indirect DHW sidearm tank.
Size of storage tanks (gallons)	Metro Solar Inc. custom 475 gallon stainless steel stagnating w/internal domestic hot water coils and feed to external heat exchanger for boiler heating system.
Estimated energy offset from project	No energy offset calculated/estimated prior to installation.
For domestic hot water, space heating, or both?	For both domestic and radiant baseboard hot water.
What percent of your DHW/space heating needs are met with this system?	DHW: 100% during summer (May-Sep); 60-70 % during other months, estimated. Baseboard: 30-40% during heating months (Oct-May), estimated.
Energy bill before and after installation (optional)	Still collecting and analyzing consumption and results data. Natural gas calculated reduction (adjusted for weather using local heating degree days): - Feb-May, 2013: 40% average - Jun-Aug, 2013: 100 % - Sep-Nov, 2013: 69% average
Payback period (optional)	Waiting for a full year of system use to identify energy savings compared to previous baseline year.
What made you decide to go forward with the project?	Previous boiler was old and failing and in need of replacement. Have always had an interest in doing solar – since boiler needed replacing and due to Federal solar tax credit (30%), the cost differential between installing a high-efficiency, atmospheric boiler vs. installing a hybrid solar and high-efficiency boiler was in the $5,000 - $10,000 range (depending on bids), and thus, made sense to do the hybrid, as the cost differential could likely be paid back in 10 years or less.

What made you choose solar hot water instead of solar electricity or other renewable energy?	Chose solar hot water as we already had the baseboard radiant hot water pipes in place, so made sense to leverage the existing heating infrastructure vs. replacing with another heat delivery system.
Can you explain how your system works?	Solar Loop -- Via a differential controller, when the solar collectors are hotter than the storage tank water, the solar pump pumps water through the solar collectors until the storage tank hits its high limit or there is no longer heat available for collection. When pump stops pumping all the water in loop drains back to storage tank. Solar DHW loop -- As hot water is used, cold water from the local water district system enters solar instantaneous heat exchange coils located in storage tank before entering the cold inlet of the water heater where boiler (if necessary) heats to desired temp. Solar Heating Loop -- When there is a call for heat if the solar storage tank is at correct temperature the solar heating pump pumps water through an inline heat exchanger the pre-heats water before entering boiler. Boiler then decides how high to fire or not to fire at all.
How was the system sized?	Solar panels and tank were sized based on past experience and knowledge of solar installer. Lochinvar boiler was sized based on solar installer's past experience and a whole house heat loss calculation completed by the homeowner.
How long did the install take/were there any snafus?	2 weeks
How did you finance the system (i.e. cash, bank loan)?	Cash
Did you take advantage of any financial incentives/tax credits for the project?	Federal Residential Renewable Energy Tax Credit for solar hot water heating systems will be used in Tax Year 2013.
Has the performance met your expectations, including financially?	Yes. In the process of calculating natural gas (i.e., therms/heating degree day) and dollar ($) savings. System has been in operation for 10 months, since Feb-2013; and percentage reduction in natural gas use has ranged from 99-100% in the summer months (Jun-Aug), to 41-89% in Sep-Dec, and 37-48% in the Feb-May months.
Did you learn any lessons you'd like to share with others who might be considering a similar project?	1. Plan time for local homeowners association review and approval, if required. 2. Higher water temps are needed for a conventional, fin-tube baseboard radiant system (i.e., 130-180°F) vs. a thermal mass storage (i.e., water, concrete, etc.) radiant system (i.e., 100-110°F). So for our fin-tube baseboard radiant hot water system, the solar/hybrid hot water boiler system was designed to produce, store and deliver hot water in the 130-180 degree range.

Solar thermal flat plat collectors on south facing rooftop	
Solar hot water system – 475 gallon storage tank on left, HE Lochinvar Boiler with 30g side arm DHW tank below boiler on right.	
Usage Chart – Used Therms (UTherm) per Heating Degree Day (HDD) by Month. System Installed in Feb-2013.