

The Economics of Heating and Cooling – My Experience

The principal source of heating and cooling for the house is a “ducted mini-split” heat pump (Fujitsu® model 12RLFCD). Mini-split heat pumps are among the most efficient types available. This model has a rated heating efficiency (HSPF) of 11.5 BTU/hour/watt and a rated cooling efficiency (SEER) of 20 BTU/hour/watt. Its peak heating capacity is 16,000 BTU/hour and cooling capacity of 12,000 BTU/hour.

The calculated annual heating load for the house was 28,482 kBTU and the calculated annual cooling load was 9774 kBTU.¹ Given the specified heating and cooling efficiencies of the heat pump, this should have required 2477 kWh of energy for heating and another 489 kWh for cooling.

Based on my actual heating and cooling energy consumption in the last 11 months I expect to use only 1462 kWh for heating and nothing for cooling. **If I were paying for this power at Clallam County PUD rates (\$0.07/kWh), my average monthly cost would be \$8.53.** Instead that power is provided by 1.2 kW of my solar electric system. There are several possible explanations for using only 59% as much heating energy as estimated, but I believe the principal ones are:

- The sun room was actively managed to provide a portion of the required heat, especially during the spring and fall months. On sunny days the doors between sunroom and house were opened and a fan used to circulate air between them and bring the inside temperature to 3-4 degrees above the heat pump thermostat setting. This typically had the effect of delaying heat pump activation until early morning hours the next day.
- The energy calculations were based on heating the house to 70 degrees F, while the house was heated to only 68 degrees this first year.
- The house is better sealed against uncontrolled air leakage than estimated.
- The house was vacant during the heating season for a total of about three weeks due to out-of-town trips and the thermostats set to 55 degrees at those times.
- The energy calculations did not include a heating contribution from sunlight entering through south-facing windows. While Sequim is often cloudy in the winter, the heat gain during sunny periods is noticeable.

No cooling was found to be necessary. The highest indoor temperature (on a single occasion) was 77 degrees and generally on summer afternoons reached only 73-74. On most summer days the nighttime temperatures dropped below 60 degrees, so cooling, when required, was achieved by simply opening windows.

There are two additional potential sources of heat in the house: there are electric wall heaters in two of the bathrooms (that were never used), and a propane fireplace serves as an emergency backup heat source during power outages, but has rarely been used.

¹ All pre-build energy calculations were done using standard procedures outlined in *Manual J: Residential Load Calculation*, Eighth Edition, Version 2.11, 2011, published by Air Conditioning Contractors of America.