Average global temperatures are rising, storms are becoming more intense, and weather patterns are becoming more variable. Climate change is affecting Vermonters now as is clearly shown in Vermont’s Climate Dashboard. Are you well prepared for this reality? The well-adapted home is one that demands less energy and other resources while providing secure and suitable living conditions in extreme weather. In this article, the second in a series about the well-adapted home, we will focus on minimizing end use energy demand while maximizing comfort and health.

After a well-insulated and well air-sealed building, our next line of defense against the weather is our heating and cooling systems. The U.S. Energy Information Administration (EIA) reports that “on average, more than half (51% in 2015) of a [U.S.] household’s annual energy consumption is for just two energy end uses: space heating and air conditioning.” In Vermont, we all use heat and, as summer temperatures increase, many of us are finding the need for cooling as well.

With high upfront costs, fuel costs and, in the case of systems like furnaces and boilers, long lifespans, we need to think carefully about how we choose to heat our homes. In general, consider the following when planning to replace a heating system:

- Plan well ahead. By evaluating options a season or two in advance you won’t find yourself forced to make a choice under pressure.
- Don’t depend solely on your plumber and fuel provider for the answer. Do your own research and consult more than one source of information. Efficiency Vermont (EVT) is a good place to start to learn about products and technologies (and rebates), but it is worth speaking to professionals that work in the field too. In the process of replacing my water heater, I consulted EVT, consulted a plumber, and spoke with an energy consultant before deciding that a heat pump water heater was the best fit.
- Consider heating systems (and water heaters and other appliances) that use fossil fuels as the last resort. In order to achieve State greenhouse gas reduction goals, Vermonters need to transition to renewable energy sources. Furthermore, fees on fossil fuels in Vermont are likely to increase to reflect real environmental costs and to incentivize Vermonters to use renewable energy. Perhaps, rather than replacing an oil or propane furnace with a newer model, it is best suited as a secondary or backup heat source to one that uses renewable fuel.
- Look at the complete system. It may be feasible to adapt the heat delivery end of your system – for example if you have a hydronic system (using liquid heat-transfer medium) don’t rule out a system that produces hot air – a heat exchanger can transfer heat from the air to water.

In many cases a heat pump can be a suitable alternative to a furnace and is definitely a more cost effective way to heat your home than conventional electric resistance heaters. Heat pumps (air source and ground source) move heat from one place to another. For example, a cold climate air source heat
pump transfers heat from outside air to inside during the heating season, even in extreme cold weather, and can be used to do the reverse in summer, cooling your house.

While combustion-less heating systems offer advantages, particularly in tight houses, wood is local and renewable and can play a role in heating our buildings. An efficient, low emissions woodstove may be a good choice:

- To supplement heat pumps during periods of extreme cold,
- As a backup to any heating system that relies on electricity, and
- If your house already has a chimney

Modern wood furnaces and boilers can be used to supply central heating. Combined with a bulk pellet or chip system where a truck delivers directly to a storage hopper, thermostatic control, and a local network of trained support professionals, these systems offer efficiency, convenience, and security using renewable fuel.

For cooling, using a whole house fan can be an effective and efficient way to cool your living space. A whole house fan is not suitable for every home, however, so consult a professional when evaluating this option.

After space heating and cooling, the next three largest home energy uses are water heating, refrigeration, and lighting. According to the U.S. EIA, water heating, refrigeration, and lighting “combined accounted for 27% of total annual home energy use” in 2015.

For water heating, refrigeration, and lighting, as with most home appliances and electrical devices, look for energy star rated products. Some products are qualified with more than one energy star rating. For example, a refrigerator in the U.S. can receive an “Energy Star” rating or an “ENERGY STAR Most Efficient” rating. When in doubt, compare the average annual energy use for similar products.

Additionally, when it comes to refrigerators consider the following:

- Generally larger refrigerators use more energy – get the smallest one you can live with.
- Different configurations have different energy demands; for example a top-mounted freezer is the most efficient type.

Heat pump water heaters are not a good fit for every home but if you have a suitable space to locate one, give it serious consideration. There are many models on the market today that can be three and a half times more efficient than an electric resistance water heater. Hybrid models are designed to use electric resistance coils when energy demand exceeds the heat pump’s capacity.

For lighting, use Energy Star rated LED bulbs or fixtures especially for your most used lights and turn them off whenever possible. Sensors or timers on infrequently used lights, like exterior ones, can save electricity and reduce light pollution at the same time.
Even with effective and efficient space heating and cooling, water heating, and appliances, ideally you will use them as little as possible. In the next article we’ll explore practical ways to reduce energy demand with landscaping, window dressings, behavioral changes and much more. Stay tuned.