E3T Energy Efficiency Emerging Technologies

WASHINGTON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

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EMERGING TECHNOLOGIES SHOWCASE WEBINAR:

SMART RESIDENTIAL THERMOSTATS

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Question and Answer session

Q: If a home has multiple thermostats, is there a best practice for programming each zone so as not to interfere with one another?

A: There is a zone by zone temperature control approach appropriate for homes with rooms that have different needs. For example, there may be a north-facing room that calls for heat, a south-facing room with solar gains, and a thermostat in the middle of the house that is calling for heat in all the rooms. Some companies can use thermostats with temperature sensors in all the rooms. When the sensors identify a heating load that would turn on a gas furnace with a minimal firing rate restriction, the company can remotely control the dampers and direct heat to where it's required. There are companies that can provide this feature, but at additional cost.

Pretty much every product that Lee covered has that functionality but he can't speak to best practices for programming.

Q: Is there any evidence that the EcoFactor micro-adjustment strategy actually saves energy? Any engineering justification?

A: The only data is coming from EcoFactor itself. Lee has not seen a third party evaluation.

Gil hasn't seen any good studies either. NVEnergy Study in Las Vegas indicated that it reduced cooling costs by about 13%. A difficulty with the identification of energy savings due to incremental features that one smart thermostat may have and another doesn't have, is that incremental savings may be small and difficult to isolate and ascertain. In addition, weather variations require heating and cooling degree day corrections. There is also tremendous variability house to house and heating zone to heating zone.

Q: What is the approximate price for smart thermostats versus manual or 7-day programmable thermostats?

A: One of Lee's last slides had vendor-quoted prices for each product he covered. The price for the ecobee Smart Si thermostat is approximately $170. Nest is selling their 1.0 version for $189. Basic WiFi smart thermostats can be purchased at hardware stores for prices as low as $100. A simple 5-2 day

(weekdays/weekends) programmable thermostat without WiFi capabilities may be purchased at Home Depot for $25. There is an incremental cost for these smart devices.

Q: How does Washington's Energy Code compare to Oregon, Idaho and Montana?

A: Idaho and Montana base their energy codes on the International Energy Conservation Code (2012). Section R403 discusses residential mechanical systems with section 403.1.1, (entitled Programmable thermostat) providing mandatory requirements for thermostat functionality. "Where the primary heating system is a forced air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. The thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F or up to 85°F".

Washington State Energy Code residential mechanical system control requirements are listed under section 503.8 (Controls) in Chapter 51-11 WAC. Section 503.8.1 states:"The primary space conditioning system within each dwelling unit shall be provided with at least one programmable thermostat for the regulation of temperature. The thermostat shall allow for, at a minimum, a 5-2 programmable schedule and be capable of providing at least two programmable setback periods per day".

The WSU Energy Program codes specialist says that programmable thermostats are required but sometimes local code enforcement authorities don't do as good a job as they should in terms of verifying that the correct type of thermostat is actually installed. Enforcing the thermostat code falls in between the realms of the electrical code inspectors and the ones who inspect the building envelope. But they definitely are required.

Q: Which of the products discussed by Lee Hamilton have software updating from the manufacturer?

A: If the question is about which ones have the capability of updating their software remotely, as far as he knows all of them have that capability. EcoFactor and EnergyHub do that and Nest is always updating their versions.

The ecobee website has a chronology of awards and significant events. They started out in 2007 and have have provided at least 8 free software upgrades to-date. They are constantly improving their product and remotely supplying additional capabilities to their smart thermostat customers.

There may be a similar blog on the Nest website. Some of the manufacturers have additional features that weren't available when they were first released.

Q: Regarding ductless heat pumps (DHP) and code and thermostat requirements, DHP doesn't have what I would consider a programmable thermostat. Can you speak to that.

A: The international energy conservation code states that programmable thermostats are required where the primary heating system is a forced air furnace or one programmable thermostat per dwelling unit. If you retrofitted a DHP onto a unit, a programmable thermostat or a smart thermostat might not be as good a choice in terms of energy savings as for other heating system types. Generally houses with baseboard electric have a natural zoning in the house. These houses are generally equipped with 6 to 8

thermostats. If you put in one programmable thermostat, you're only going to have temperature control over one zone. It would probably be the same with the DHP.

Q: It just sounds like a DHP installation, especially in new construction might be a code violation for WA state.

A: It might be for Washington state. The WA state code does require lockout of strip heating. Some state manufacturers offer different capabilities than others. For example, one manufacturer said they have three ways of doing that – by temperature, by time to temp, and by temperature setpoint differential. In other words, those features are out there. When you're selecting a thermostat, you have to inquire as to its features. Energy Trust of Oregon is doing a demonstration program where they're looking at heat pump control with various smart thermostats on the market, including ones provided by Carrier, Trane, White Rogers and Allerton. Knowledge is still being built.