SMART THERMOSTATS: AVOIDING SURPRISES IN THE COST OF INSTALLATION

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Utilities are increasingly looking to deploy demand response solutions on a large scale. At the heart of many of these efforts are deployments of smart thermostats, because growing air conditioning use is the largest driver for peak demand. Those utilities deploying smart thermostats are quickly learning how to deal with some common installation challenges.

Thermostats have traditionally been installed by qualified HVAC contractors, often at the time of a larger installation of new HVAC equipment (only a very small percentage of thermostats are installed by homeowners). Relatively speaking, the time needed to install a thermostat is small compared to what is needed to install a new furnace or air conditioner, even if the installation has some challenges.

However, that's not necessarily the case when it comes to demand response deployments in hundreds or thousands of homes. Utility deployments - where installers are working to deploy multiple smart thermostats every day, always in retrofit situations - are more cost-sensitive to thermostat installation problems, particularly when you consider the costs of customer recruitment and relationship building that can be damaged due to a difficult or failed installation.

The challenges and problems seen frequently include:

• Wiring errors and short circuits.

HVAC equipment wiring normally follows a loose color code convention, however, in retrofit installations, wiring and equipment can be very old and non-standard. Wiring errors can blow fuses, breakers, or even burn the low voltage transformer in the furnace or AC unit when the smart thermostat is activated. This can be difficult for the installer to troubleshoot and repair, and if the smart thermostat being used is difficult to configure and has no inherent protection against short circuits, then it is recommended that installers carry spare transformers so they are able to perform repairs on site.

HVAC wiring colours and purposes vary - common wire may be missing.

• Missing common wire.

Older mechanical, mercury-switch thermostats had no electronics in them, and hence did not need a separate circuit, such as a common wire, to operate. As a result, existing installations can have as few as two wires (a 24VAC supply wire which gets connected to the heating wire when the mercury switch activates). More wires are available in cases where mechanical thermostats were used for heating and cooling, but often have one wire less than is needed for an electronic thermostat, including a smart thermostat. Some jurisdictions will have over 30% of homes with this problem.

The HVAC industry has developed a number of different approaches to solving this problem, including using batteries, or an approach known as "power-stealing", which allows the thermostat to draw small amounts of electric current, using the heating wire as the return connection. This works in many cases, but sometimes the electric current on the heating wire is sufficient to turn on the HVAC equipment (particularly with newer HVAC systems). Installers often complain of "chattering relays" or irregular equipment behavior when power-stealing is incompatible with the furnace or air conditioner. The addition of 2-way radios (and their power requirements) in smart thermostats has further hampered battery and power-stealing. Other approaches include "add-a-wire" kits or other auxiliary devices and have different price points and cover some or all situations.

It is important for utilities and their installers to know and understand how they will deal with this issue, to minimize installation time, and to reduce or eliminate failed installations.

Some utilities are taking a hands-off approach, looking for retail sales of smart thermostats to supply the market, although adoption rates are likely to be slower with this approach. Other utilities are being proactive about these issues and looking at the total cost of installation in selecting their partners and the technologies they are using for demand response.