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Connected Criteria

Grid communications for ENERGY STAR Products

CEC Appliance Load Flexibility Workshop, December 14, 2020

Abigail Daken, ENERGY STAR HVAC and Connected Product Manager

Why is this part of ENERGY STAR?

Rise of IoT/Smart Home technology

- Opportunity for insight into and control of energy use
- Growing load

Changing grid needs

- Efficiency critical – strong role for ENERGY STAR
- Rising grid importance of insight into and control of loads

Continue to serve our partners as demand-side management evolves.

ENERGY STAR Connected Criteria: Then, Now, and the Future

2011: Industry request for appliance DR

2013: Connected Refrigerators/ Freezers = DR + consumer amenity

Through 2016: Optional connected for all appliances; some tests

End 2016: finalize Connected Thermostats

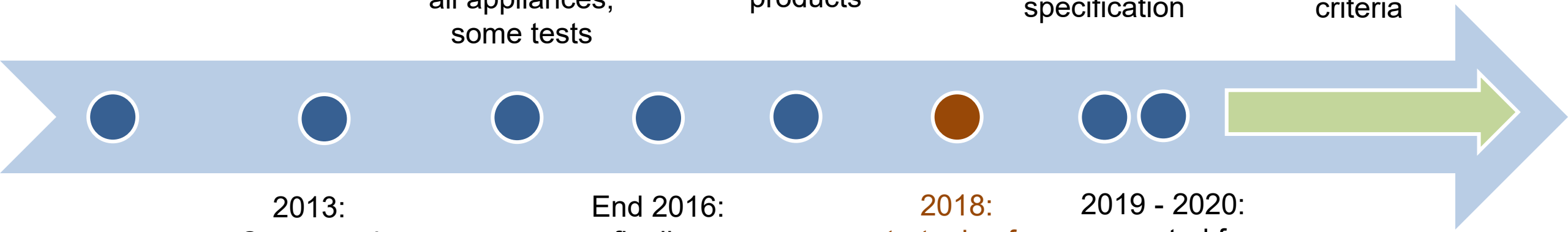
2017: Optional connected for lighting + other products

2018: strategize for IoT and rethink grid strategy overall

2019: SHEMS specification

2019 - 2020: connected for Large Load Products

Maintain and expand criteria



ENERGY STAR Connected Product Type	Connected Required?	DR criteria	DR test	Other energy- or cost-saving criteria
SHEMS & Smart Thermostats	Yes	General	No	Scheduling
Lighting	No	None	--	Standby power limit
Refrigerators/Freezers	No	Specific	Yes	User alerts
Washers, Dryers, Dishwashers	No	Specific	No	User alerts
Room AC	No	Specific	Yes (ADRV†)	Scheduling
EV Chargers	No	Specific†	No	Scheduling
Pool Pumps	No	Specific‡	Yes	Scheduling
Ice Machines	No	General	No	
CAC/HP	No	Specific†‡	No	Installation capability
Water Heaters	No	Specific†‡	Yes†	User alerts

† In development or revision

‡ May be listed as connected with an after-market controller

Right Now and in Near Future

- **Central AC and heat pumps**: Version 6.0 including optional connected criteria will be final in the next month
- **Room AC**: Option for alternative DR validation (ADRV) to reduce test burden will finalize January 2021
- **Residential water heaters**: Version 4.0 including connected (and with DR test for load shifting) will finalize Q1 2021, along with a method to test load shifting
- **Electric vehicle chargers**: Version 1.1 including updated, more useful connected criteria will finalize Q3 2021
- **Pool pumps**: V3.1 with modestly updated connected criteria will launch December 2020
- **Smart thermostats**: V2.0 will launch 2021

Diverse drivers & energy implications

Example products	What connectivity provides	Driver of market adoption	Energy Implication and/or Opportunity
Pool pumps, water heaters	Flexibility of large loads, no consumer impact	Grid services	Enable cleaner grid
Electric vehicle chargers, HVAC	Flexibility of large loads, some consumer impact	Grid services	Enable cleaner grid; protect consumer interest
White goods, HVAC, RAC	Convenience and quality of maintenance	Blended: consumer, brand owner, grid	Better maintenance saves energy
Door locks, window sensors	Safety and security	Consumer interest	Added load; occupancy info?
Color changing lights, smart speakers	Additional functionality	Consumer interest	Added load

Considerations for DR protocols

- Bias towards **interoperability** favors common standards and defining how standards are implemented
- Bias toward **future-proofing**: we know things will change
- Seek to **lower transaction costs** for implementing load flexibility

- What is driving cloud connectivity? Can DR use an existing communication pathway? If the driver for connectivity is powerful enough, can rely on this for DR.

- How valuable is the DR resource? Is the load large? Is it highly coincident with system peaks? Does it inherently include energy storage?

Reducing test burden: Alternate DR Validation (ADRV)

- Proposed adding an option to ease connected test burden for room air conditioners
- Based on tests of 2 basic models, manufacturers may establish a technically sound way to predict that additional basic models will meet DR criteria, and need not test them
- Certification bodies are responsible for ensuring
  - Method to predict models will meet DR criteria is technically sound
  - Records are kept for which models rely on which ADRV
- DR test is run as part of verification testing for connected models
  - A failure on the DR test for one model using a ADRV will potentially affect connected recognition for all models using it
  - Correction of the failure, however, may be a simple firmware update
- Currently applies only to room AC; may consider for other products

Adding Optional Grid Response: Water Heaters and CAC/HP

- Coordinate with other criteria:
  - CAC/HP relies heavily on AHRI 1380 for DR response and signaling
  - Water Heater criteria closely follows JA 13 and similar criteria
- Specify OpenADR and/or CTA-2045 and include tables of how signals are used (following AHRI 1380)
  - Include load up, general curtailment, emergency curtailment, off mode, return to normal operation
  - Include DR messaging and information exchange
  - Price response is optional
- Energy use reporting also required, which departs from AHRI 1380
- WH includes a requirement for load shift, and we have a test method to support it