ENERGY STAR Climate Controls: A Potential New Approach

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Agenda

- **Welcome & Introductions**
- What is ENERGY STAR?
- Brief history/background of specification
- Technologies
  - Overview of technologies & commonalities
- Considered Approach & System Criteria
  - Evaluating Effectiveness
- Questions/Next Steps

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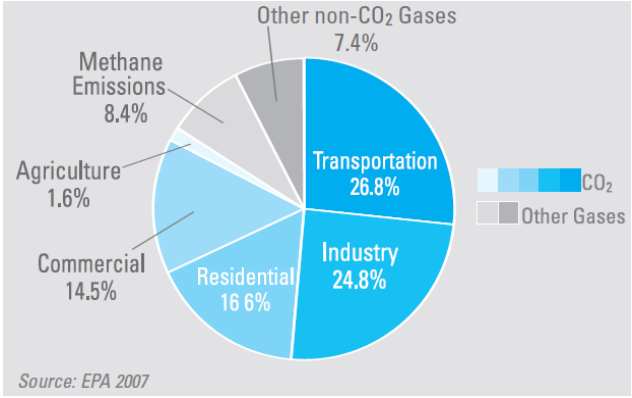
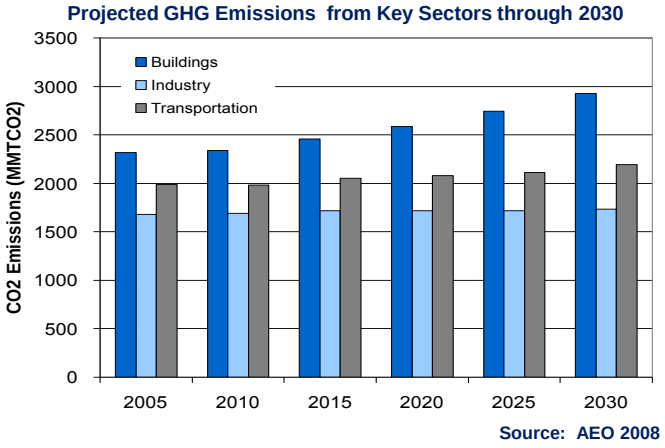
What is ENERGY STAR?

- **ENERGY STAR** is a voluntary government-backed program dedicated to helping individuals protect the environment through superior energy efficiency
- **ENERGY STAR** is the national symbol of energy efficiency, making it easy for consumers and businesses to identify high-quality, energy-efficient products
- **ENERGY STAR** distinguishes what is efficient/better for the environment without sacrificing features or performance
- Products that earn the **ENERGY STAR** meet strict energy performance criteria set by EPA

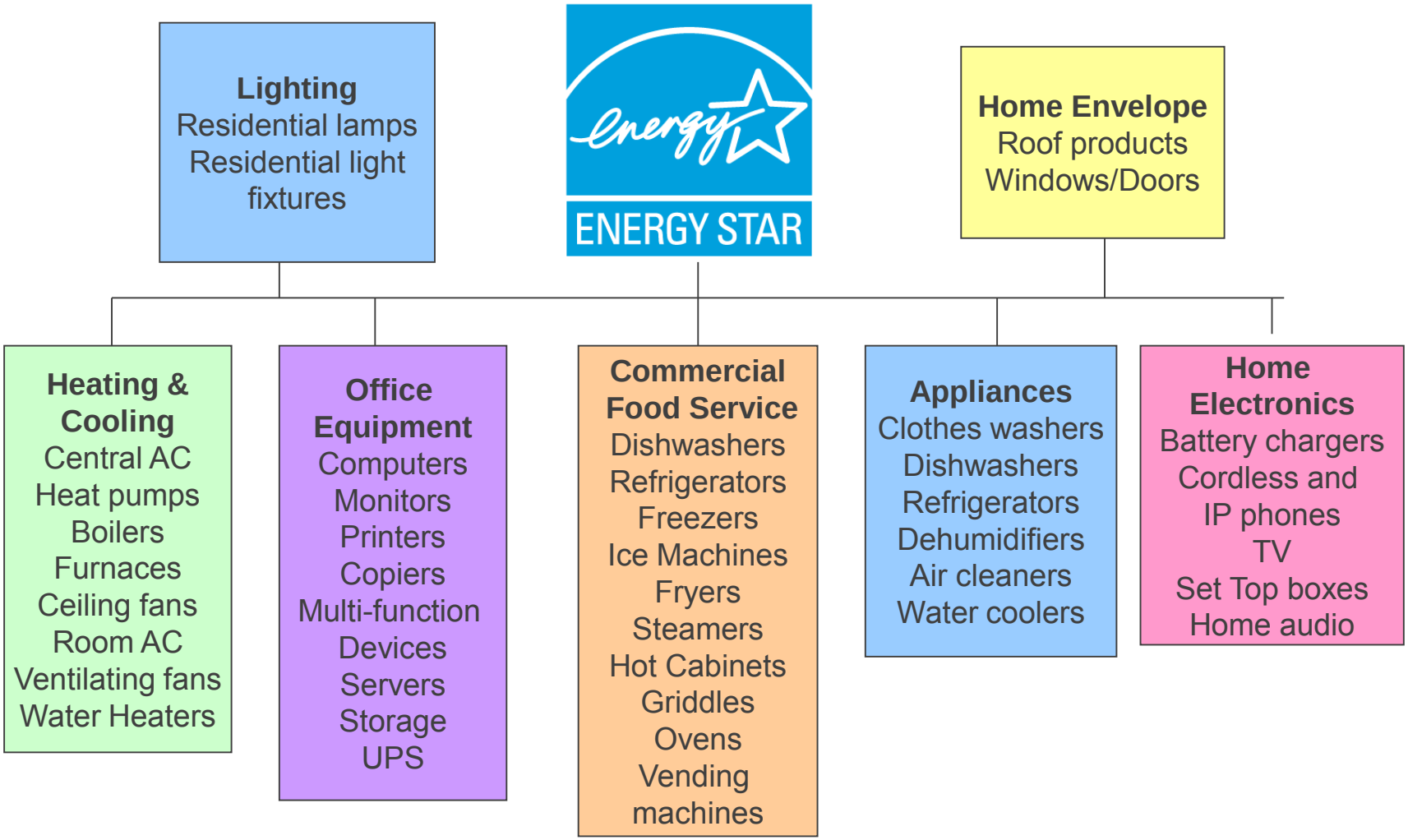
ENERGY STAR

- Started in 1992; voluntary program
- GOAL: Reduce greenhouse gas (GHG) emissions through large win-win-win opportunities with today's energy efficient technologies and practices.
- Provide credible information to buyers
- Work with the marketplace to capitalize on motivations of individuals





70+ Product Categories Are Covered by ENERGY STAR in the US



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Brief history of Climate Controls

April 2010 through April 2012	Traditional specification drafts, Development of Ease of Use (EoU) test and metric
Remainder of 2012	Gather interest and stakeholder support for EoU test round robin; manufacturer tests product in lab with abbreviated EoU test, lab test for EoU does not reflect real user experience
Spring 2013	Decision that relying on EoU testing for ENERGY STAR is not feasible
Summer 2013	LBNL white paper on Climate Controls certification based on field data from connected products
June 2014	New Climate Controls System Approach Memorandum.

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Energy Saving Opportunities

- Communicating climate controls save consumers energy and provide load-balancing benefits to the grid
- Climate controls can encourage reduced consumption through consumers engagement (behavioral)
- Climate controls can reduce consumption through occupancy detection and automation
- Some climate controls can enable energy savings in other loads through integration
- The time is NOW: communicating climate controls that focus on energy savings are spreading through market

Technologies

- Automated savings vs. behavior modification
  - Savings through occupancy detection & automation, or
  - optimization of HVAC control; use less energy for equivalent comfort, or
  - through encouraging occupant behavior change
- Cloud based vs. in the home
  - Solutions may rely on cloud analytics and/or cloud control, or
  - may have extensive capabilities in the hardware/firmware in the home
- Stand alone product vs. relying on integration with HEMS or security systems

Technologies (cont.)

- Business models
  - Hardware centric
  - Hardware with external software, cloud/app/web hosted
  - Direct service to consumers
  - Consumer service thru utility partners
- Delivery channels (who is the OEM selling to?)
  - Retail
  - HVAC Contractor
  - Home security, telecom, or other service provider
  - EEPS (in partnership with any of the above)

What do CC systems have in common?

- All claim to provide comfort to consumers while using less energy by:
  - Adjusting set temperatures automatically or through behavior change
  - Avoiding/limiting run time in inefficient modes (e.g. backup heat), optimizing energy source (hybrid systems)
- Some alert residents to equipment faults
- Some seek to facilitate other changes in behavior (e.g. keeping windows and doors closed, closing blinds, etc.)

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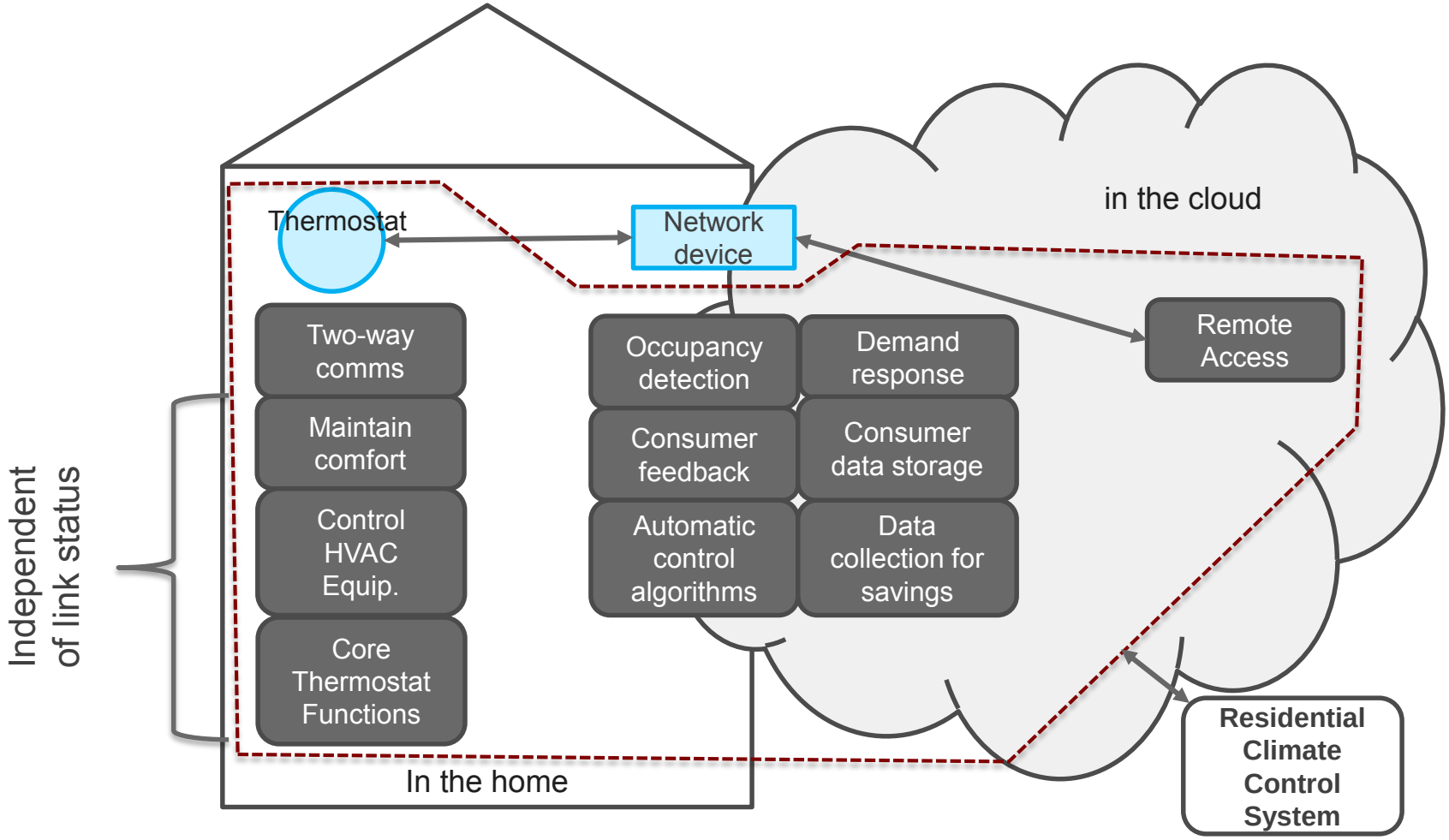
Climate Controls Illustrated



To have a program, we need to…

- Differentiate systems that save energy
- Communicate that benefit to consumers
- Enable participation by a broad range of energy saving approaches and business models
- Accommodate innovation
- Encourage service provider participation
- …without compromising consumer privacy or proprietary information

Consideration of a New Kind of Program

- Our initial thoughts on how we might accomplish this….
- Partner is the **service provider**
  - Provides on-going service to consumers
  - Plays a key role in delivering savings
  - Has access to data from units in the field
- Initial qualification of Residential Climate Control System (RCCS) entails examination of system capability
- Ongoing qualification requires service provider partner to periodically submit summary field data demonstrating savings

Initial qualification: Sample RCCS criteria

- Capabilities that can deliver likelihood of energy savings:
  - Temperature stability
  - Bi-directional open-standards based communications
  - Can either accept and act upon external occupancy data or directly detect occupancy and act upon it to reduce HVAC energy consumption
  - Can collect room and set temperatures, HVAC run-times and HVAC performance information from fielded systems
  - Basic DR capability
  - Retains basic thermostat capability, regardless of link status

Ongoing qualification and evaluating effectiveness

- EPA believes an energy savings metric that uses RCCS data to estimate field savings is technically feasible (HVAC run time, set temperatures, measured temperatures)
- Metric calculated for each home, then averaged over statistically significant set of homes representing potential CC users
- Service provider partners periodically submit averaged data to EPA
- Validation of metric with meter data would be particularly valuable.

Why a metric based on RCCS data, not meter data?

- Meter data may not be widely available
- Closely tied to energy savings
- Requires fewest assumptions about how the product saves energy
- Allows service providers to have a direct relationship with EPA, without utility involvement…
- …which ultimately enables companies using retail and service tech channels to use the ENERGY STAR in marketing their product
- Simplest solution that is likely to deliver the information needed for a credible program

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Key Questions for Stakeholders

Send all comments to ClimateControls@energystar.gov by July 14.

1. What is important to your organization about a national program identifying climate controls systems that save energy?
2. Other suggested criteria for initial qualification and/or comments on considered criteria?
3. Are there issues with service providers submitting periodic data?
4. Are further measures needed ensure individual user data privacy?

Next Steps

- Work with stakeholders to:
  - Consider other metrics
  - Develop & refine savings metric
    - Stakeholder participation is key
    - What can you contribute?
- Further clarify Version 1 program design
  - Labeling, what & when
  - Data submission particulars
    - Minimum performance criteria, or
    - Data reporting to inform future level setting, or
    - Data reporting to evaluate program effectiveness

Contact Information

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Thank You

Extra Slides

Potential Metrics

- HVAC Run-Time
  - Furnace Run-Time as a Proxy for Energy Savings
  - Estimates energy savings by examining the elapsed time of furnace (or AC) operation

$$fuel\ use = RT\ x\ furnace\ capacity$$

$$where,$$
$$RT = furnace\ runtime$$

- Saving Degree-Hours
  - Identifies use of energy saving set temperatures
  - Takes into consideration thermal mass of building and outside temperature

$$Savings\ degree \cdot hours, SDH = \sum_{all\ heating\ hours}^{winter} (T_{ref} - T_{obs})$$

$$T_{ref} = reference\ thermostat\ setting$$

$$T_{obs} = observed\ thermostat\ setting$$