



ENERGY STAR®

Residential Climate Controls

Draft 3 Version 1.0
Stakeholder Meeting
April 17, 2012

Abigail Daken, U.S. EPA
Doug Frazee, ICF International



Agenda



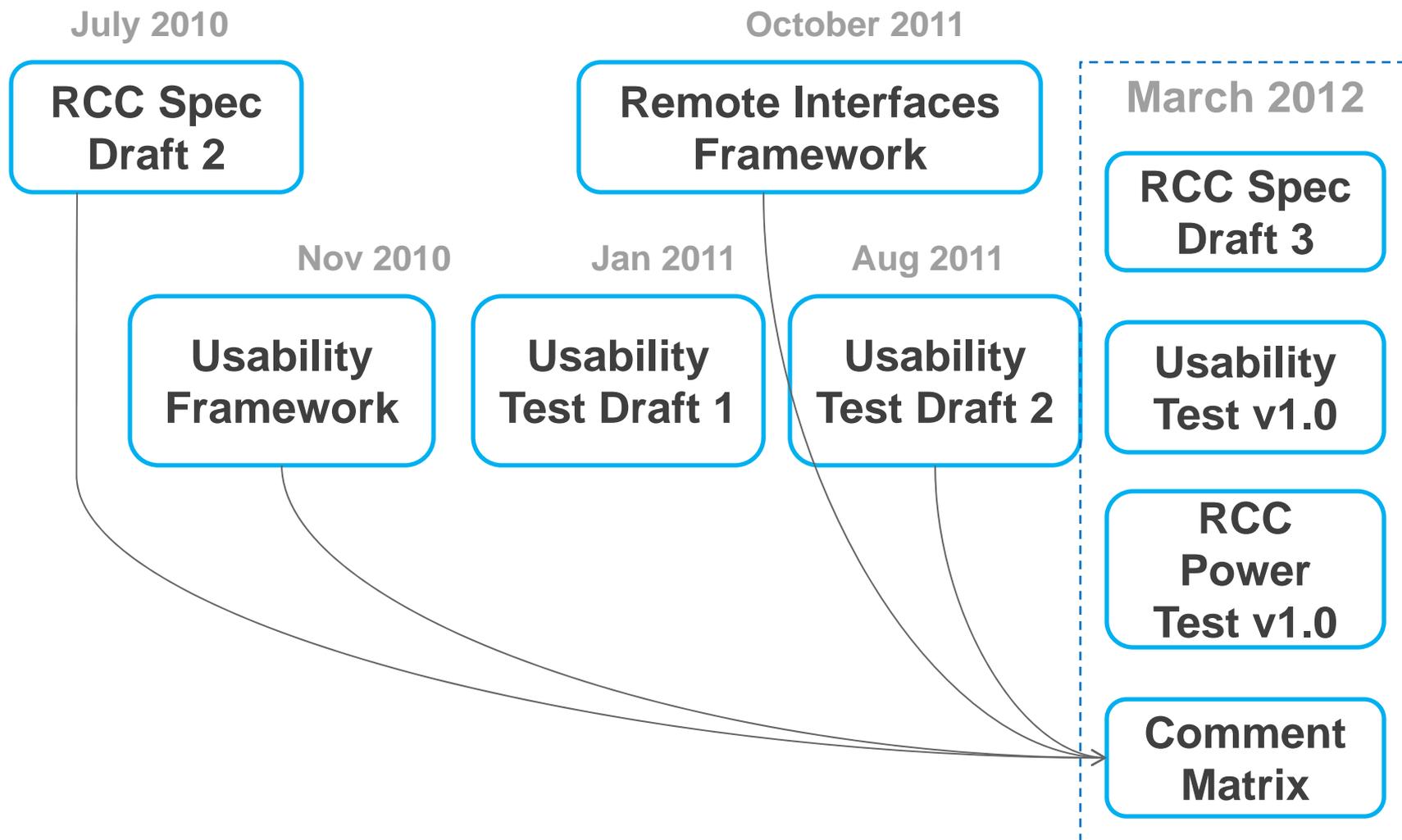
- Overview of the Draft 3 Version 1.0 specification
- Drivers & Context
- Draft 3 Version 1.0 Criteria
- Performance-Based Ease of Use Criteria
- Performance-Based Ease of Use Test Method
- Next Steps
- 3rd Party Certification Requirements
- Schedule
- Q&A

Overview of the Draft 3 Version 1.0 specification

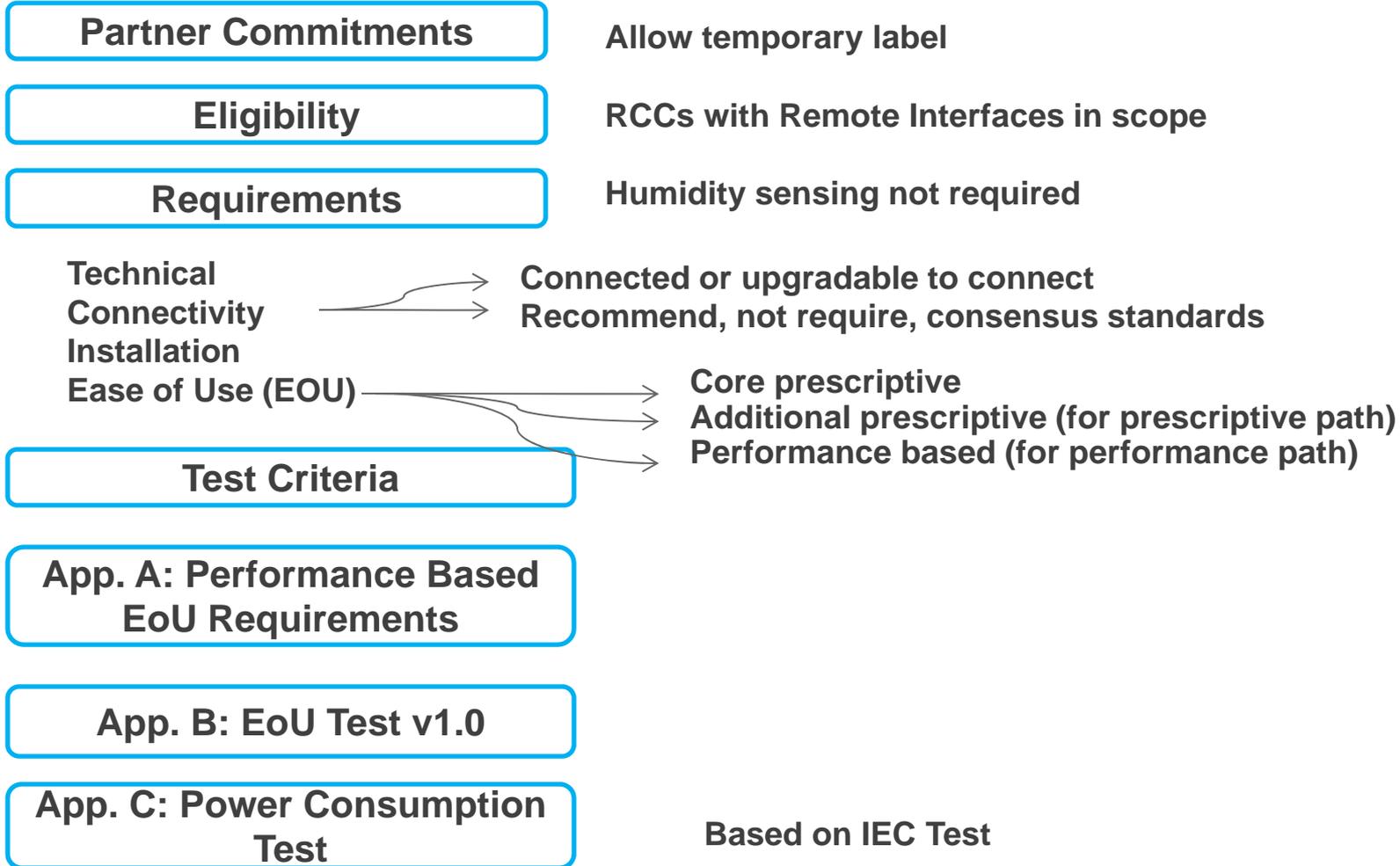


- Brings into a single document:
 - Energy Efficiency Criteria
 - Remote Interfaces
 - Ease of Use Metric & Test Method
 - Power Consumption Test Method

Overview – Our story so far...



Overview – Structure of the Spec



Overview

– Structure of EoU requirements



Core prescriptive

No longer includes period nomenclature

Additional prescriptive

Period nomenclature
No DR/pricing display

Performance based

Moved to App. A to make spec easier to read

App. A: Performance Based EoU Requirements

Tasks (define requirements)
Administrator script (closely tied to tasks)
Metric (to keep control)
Required performance on metric

No DR task
CC w/RI must use performance based path
CC w/RI: minimum disconnected
functionality defined by limited EoU test
performed w/o RI
Full test for CC as controlled through RI

App. B: Ease of Use Test Method v1.0

Procedures
User group requirements
Facility requirements
Equipment requirements
Definition of reported data

No reference device
28 member group – expanded to increase
differentiation, repeatability
No colorblind user
Demographics follow US census

Drivers and Context



- EPA believes there are significant and realizable savings opportunities in Residential HVAC
- Advanced Climate Controls are expected to enable energy saving HVAC behavior thru:
 - Enhanced usability - Increased adoption of setbacks and energy saving modes
 - Connected functionality

Draft 3 Version 1.0 Criteria

– Qualifying Products



- Low-Voltage and Line-Voltage Climate Controls
- Residential Climate Controls only, but...
~~“Residential Climate Control – This product is designed only for use in homes and other dwellings.”~~
- Communicating Climate Control or end-user upgradeable to a Communicating Climate Control

Draft 3 Version 1.0

– Technical Criteria



- Prescriptive schedule period nomenclature eliminated – otherwise HVAC scheduling and default schedule criteria are unchanged
- $\pm 1^{\circ}\text{F}$ Temp. stability criteria retained
- Humidity display no longer required
- Outdoor temperature criteria relaxed

Draft 3 Version 1.0

– Technical Criteria (cont.)



- Selectable Recovery Algorithms – new exception
- Power Consumption

Table 1: Residential Climate Control – Power Consumption Measurement		
Product	Average Power (W)	Measurement Parameters
Climate Control	1.0	<ul style="list-style-type: none">• 5-minute measurement period• Away mode cycled 1x
Connected Climate Control	2.0	<ul style="list-style-type: none">• 5-minute measurement period• Away mode cycled 1x• Connection to device external to HVAC system, at least 1x

Issue – power limits and comms upgradeable Climate Controls



- Current draft: test without communications
- What do when modules (OEM or 3rd party) become available?
- Goal: Avoid or minimize retesting
- Options
 - Do not indicate newly available protocols on QPL
 - Require all RCCs to ship communicating
 - Require test with prototype of all communications modules
 - Require test with prototype, at minimum, of expected most consumptive comms (WiFi?)

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– Communication Criteria



- Open Access
 - API or Interface Spec.
- **Recommended** Connectivity Standards
 - On or being considered for the SGIP COS
 - Adopted by ANSI or other established international SDO
- Security and Data Reporting criteria are unchanged
- 5s Remote Management responsiveness criteria is revised to clarify an assumption that network latency will not exceed 1s

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– Ease of Installation Criteria



- Unchanged
 - Installation Instructions
 - Availability of Documentation
- HVAC Wiring Terminal Designations
 - Terminal labeling that complies with NEMA DC 3-2008 that was previously required is now ***recommended***.

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– Ease of Use Criteria – 3 Paths



- Ease of Use: Paths for Demonstration of Compliance
 - Path 1 – Prescriptive
 - Path 2 – Performance-Based Ease of Use
 - Path 3 – Alternate Performance-Based Ease of Use (with Remote Interface)

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– Prescriptive Requirements



- Core Prescriptive Requirements
 - No required schedule period nomenclature
 - Low Battery Indicator clarification
- Additional Prescriptive Requirements
 - Access to Energy Saving Mode
 - Setpoint Adjustability
 - Operating Mode
 - Current Status
 - Relative Cost Indication
 - Character Size
 - Temperature Resolution

Draft 3 Version 1.0 Criteria

– Performance-Based Ease of Use



- Climate Controls may be evaluated by their performance in Ease of Use tests.
 - Eligible products must comply with core prescriptive requirements and must rate acceptably on a set of six typical tasks designed to evaluate Climate Controls.
- Performance-Based Ease of Use Criteria with Remote Interface (RI)
 - On its own, the Climate Controls is evaluated on fewer tasks to qualify (Appendix A).
 - Controlled thru an RI, it must rate acceptably on all tasks to qualify.

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– Other Criteria



- Indicate Supported HVAC Equipment
 - relocated from Qualifying product to other criteria
- RoHS Requirements
 - Additional clarity provided, consistent with RoHS criteria
 - Exempt from testing; but consistent with RoHS, EPA may, at any time, request manufacturer documentation supporting compliance.

Draft 3 Specification Appendices



- To enhance readability, in draft 3 EPA has included the following as Appendices:
 - Appendix A – Performance-Based Ease of Use Criteria
 - Appendix B – Performance-Based Ease of Use Test Method
 - Appendix C – Climate Controls Power Consumption Test Method

Appendices A and B Incorporate results from UCD study



- Method of test generally supported
- Composite tasks confusing – break up
- Larger user group & tighter demographics provide better differentiation
- Timekeeper out of sight of user during test
- More colloquial language in Test Administrator script
- Usability of manual mixed up with usability of device

Appendix A – Performance-Based Ease of Use Criteria



- Climate Control User Tasks:
 1. Set Date & Time
 2. Identify Room Temperature
 3. Identify Setpoint
 4. Turn on Heat
 5. Modify Program Schedule
 6. Activate/Cancel Energy Saving Mode
- Metric calculation and requirements
- Test Administrator script

Appendix A – Ease of Use Metric & Performance-Based Ease of Use Criteria



- A common metric M_i is used for each task
- k_i chosen for each task to balance task success and time to complete
- M_i is a calculated numeric score from 0 to 100, based on time to complete, task success and k_i
- Average M must be ≥ 40 for each task, average M across all tasks must be ≥ 70
- Calculations and requirements may be adjusted based on round robin testing

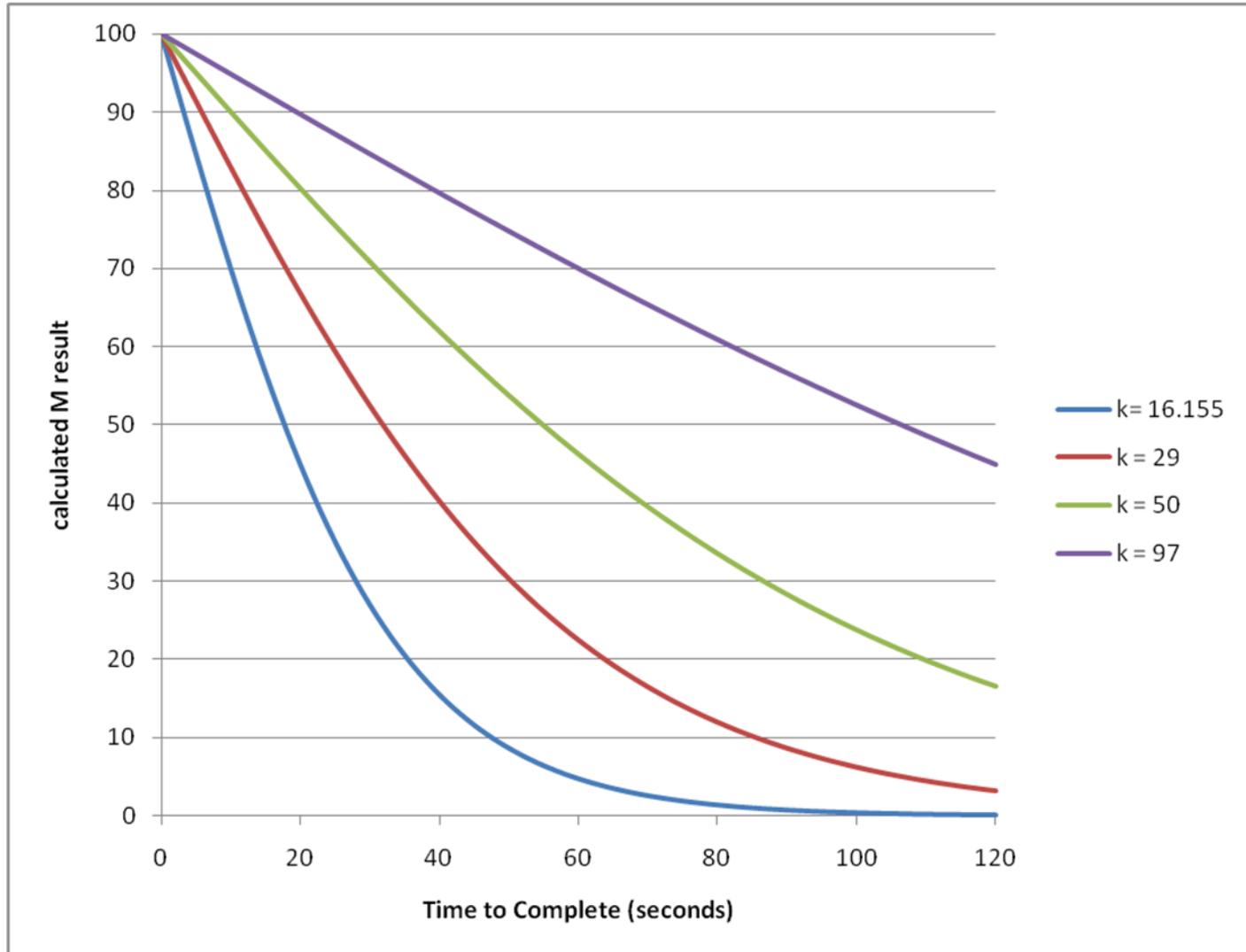
Appendix A – Use of time to complete



- UCD report highlighted some problems with maximum time to complete per task
 - No correlation demonstrated with success
 - Manual/familiarization as confounding factor
- Originally included because
 - Test labs need a sense of how long to budget
 - As a proxy for subjective Ease of Use (harder to quantify)
- Formula for M means that, past a certain point, essentially a failure anyway

Appendix A

– M, time to complete and k



Appendix B – Test Method – Performance – Based Ease of Use



- Test parameters including user group composition.
 - Age Groups
 - Age 21–34 – 28.6% of users
 - Age 35–49 – 28.6% of users
 - Age 50–64 – 28.6% of users
 - Age 65–79 – 14.2% of users
 - Gender
 - Male – 50% of users
 - Female – 50% of users
 - Level of Education
 - Less than High-School Education – 14% of users
 - High-School Graduate & Less than Bachelor's Degree – 57% of users
 - Bachelor's Degree or Higher – 29% of users

Next Steps

– Round Robin Usability Testing



- Next step – can begin now that draft is released
- Will be administered by ACEEE
 - Introduction to ACEEE & Dr. Susan Mazur-Stommen
 - Recruitment and setting up protocols April and May
 - Testing over the summer
 - Hope to complete by September

Next Steps

– Round Robin goals



- Show that results are repeatable at different labs
 - Minimum 3 devices tested at 3 labs
- Gather data
 - Examine data analysis questions raised by UCD report
 - Confirm levels
- Improve test method
- Develop testing infrastructure

Third-Party Certification Requirements



- Enhanced qualification and verification testing requirements across ENERGY STAR program.
- www.energystar.gov/testingandverification
- Qualification: Test reports from recognized labs will be reviewed prior to qualification.
- Verification: third-party testing of products acquired from distribution channels.

Schedule – best estimate



- Apr 2012 Labs start accreditation
- Sep 2012 Round Robin Results
Face to face meeting?
- Dec 2012 Draft 4, webinar, comments
- Feb 2013 Final Draft requirements
V2.0 Usability Test?
- Mar 2013 Final Version 1.0
Residential Climate Controls
- Effective immediately, if labs are ready

Contact Information



Abigail Daken
EPA ENERGY STAR Program
202-343-9375
daken.abigail@epa.gov

Doug Frazee
ICF International
410-279-1093
dfrazee@icfi.com

And for the Round Robin....
Susan Mazur-Stommen
ACEEE Behavioral Programs
202-507-4026
smazur@aceee.org



Thank you