



**WHPA Existing Buildings Energy Efficiency Action Plan Committee (EBEE)
Teleconference Summary Minutes
Thursday, July 20, 2017 (Scheduled for 9:00 – 10:30am PDT)**

Call to Order

Per Co-Chair request, WHPA Staff (Wendy Worrell) started the audio recording and called the meeting to order at 9:02 am PDT.

Roll Call

The following 23 participants attended the meeting with a quorum (6+) of voting members.

Organization	First Name	Last Name	WHPA Category	Attendance
CEC Advisors (non-voting)				
CEC (California Energy Commission)	Joe	Loyer+	Government (Other than CPUC)	P (last 29 min)
CEC (California Energy Commission)	Judy	Roberson	Government (Other than CPUC)	P
CEC (California Energy Commission)	Brian	Samuelson+	Government (Other than CPUC)	P (first 60 min)
Voting Members				
Charles Segerstrom Consultant	Charles	Segerstrom	Energy Efficiency Program Consultant	P (Speaker)
Honeywell E&ES (Energy & Environmental Solutions)	Mike	Lawing	Controls (Manufacturer or Distributor)	P (last 39 min)
Indio Cooling & Heating Supply	Tim	Mann	Distributor	P (Co-Chair)
Daniel Jones Consulting	Daniel	Jones	Energy Efficiency Program Consultant	P
SynergyNexGen	Barbara	Hernesman	Energy Efficiency Program Consultant	P (Co-Chair)
Tre'Laine Associates	Pepper	Hunziker	Energy Efficiency Program Consultant	P
Valley Contractors Exchange	Kate	Leyden	Contractor Association	P
Non-Voting Members				
BMA Mechanical+	Dustin	Lane	Other Stakeholder	P (first 60 min)
CalCERTS	Shelby	Gatlin	Certifying Body	P
Cumming Corporation	Brian	Mauleon	Energy Efficiency Program Consultant	P
EGIA (Electric & Gas Industries Association)	Andre	Christian	Contractor Association	P
Goodman Manufacturing	Aniruddh	Roy	HVAC Manufacturer	P
IHACI (Institute of Heating and Air Conditioning Industries)	Scott	Johnson	Contractor Association	P (NEW)
Stone Energy Associates	Nehemiah	Stone	Energy Efficiency Program Consultant	P
Guests				
HHEA (Healthy Home Environment Association)	Susan	Davison	Educator, Trainer	P
Janell Jacks Consulting**	Janell	Jacks+	Other Stakeholder	P
1000 HC (Thousand Home Challenge)**	Linda	Wigington+	Energy Efficiency Program Consultant	P (Speaker)
Healthy Building Research**	Tom	Phillips+	Research Organization	P (Guest of Linda Wigington)
LarryWeingarten.com**	Larry	Weingarten+	Energy Efficiency Organization	P (Guest of Linda Wigington)
WHPA Staff				
InfoPlast	Wendy	Worrell	Other Stakeholder	P (Host/Scribe)

** Organization is Not a Member of the WHPA; + Individual is NOT Registered with the WHPA; (P) after last name = Member/Registrant is Pending Approval from the WHPA Executive Committee

AGENDA

WHPA Staff email distributed the following agenda to the roster prior to the meeting.

GENERAL REMINDERS

- Adherence to the WHPA **Code of Conduct** is required.
- Disclose any potential conflicts of interest as it relates to meeting content, particularly prior to any votes that may occur.
- Identify yourself prior to speaking, clarifying the organization on whose behalf you are speaking, or if you are making a personal comment.
- Mute yourself when not speaking. (*6 will take you on and off mute.)

AGENDA ITEMS

- 1) **Roll Call of Voting Members** – WHPA Staff (Wendy Worrell) – 5 min
- 2) **Co-Chairs' Opening Comments** – Co-Chairs (Barbara Hernesman & Tim Mann) – 5 min
 - a. CEC Staff Workshop on Residential HVAC Requirements for 2019 Standards



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- i. Written Comment Deadline July 28th at 5pm
 - ii. Info at [CEC Docket # 17-BSTD-01](#)
- 3) **Educational Presentations: HVAC and the Whole Building Paradigm Shift** – Charles Segerstrom (Consultant) & Linda Wigington (1000 Home Challenge) – 75 min
 - a. Presentations
 - b. Discussion/Q&A
- 4) **Scheduling** – WHPA Staff (Wendy Worrell) – 5 min
 - a. Third Thursdays of Each Month: Next is August 17th from 9:00 a.m. - 10:30 a.m. PDT
 - b. Agenda TBD
- 5) **Adjournment** by 10:30am PDT – Co-Chairs (Barbara Hernesman and Tim Mann)

Opening Comments

The Co-Chairs, Barbara Hernesman (SynergyNexGen) and Tim Mann (Indio Cooling and Heating Supply), overviewed the agenda.

The Co-Chairs brought attention to the July 28th at 5pm written comment deadline following the July 18th “CEC Staff Workshop on Residential HVAC Requirements for 2019 Standards”. Meeting participants were encouraged to review the information at [CEC Docket # 17-BSTD-01](#) and submit comments as CEC Staff has notified WHPA that stakeholder voices will be given “a lot of weight” now and in future development to help facilitate the conversation at the State level.

Community Outreach and Education Presentation: HVAC and the Whole Building Paradigm Shift

With speaker approval, WHPA Staff emailed the draft presentation reference slides to the roster for review prior to the meeting.

Co-Chair Tim Mann (Indio Cooling & Heating Supply) welcomed guest speakers, Charles Segerstrom (Consultant) and Linda Wigington (1000 Home Challenge), and introduced Charles Segerstrom as the first presenter.

PRESENTATION #1: “The Whole Building Approach – A Paradigm Shift”

Charles Segerstrom (Consultant) provided background information for understanding the concept of the Whole Building Approach – A Paradigm Shift in relation to the HVAC industry. The comments presented represent Charles Segerstrom’s “information, perspective, and opinion and has not been endorsed nor approved by past Utility employers or clients.”

Content beyond reference slide content follows:

Slide 2: Paradigm Shift? Shifting to What?

Paradigm is also a concept.

Slide 3: Why Shift the Paradigm?

The aspirational goal of 40% reduction from 2008 is a lofty goal.

Slide 6: What Does the New Paradigm Look Like Through the HVAC Lens

How are we influencing the human factors, behavior factors, and comfort factors? Can we get energy efficiency tight and reach comfort levels?

Slide 7: How Can This Be Done?

We get wrapped around modeled performance, but now the cost of measuring performance puts a new set of tools at our disposal.



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Slide 8: When Are We Supposed to Change?

When looking at the goals overall, the biggest challenge is to look at achieving savings in the overall building. They are unknown paths at this point, but can be determined the same way that “getting a man on the moon was unknown when Kennedy set the goal for it.”

Slide 9: Who Works on This Now?

Are there additional services that can be offered in HVAC?

Slide 10: Are We on the Path?

Get efficiency right first, then make sure the building envelope that HVAC fights against is taken care of. It is important to do things in the right order.

DISCUSSION

There was no discussion specific to the above presentation.

PRESENTATION #2: “Deep Reductions – 1000 Home Challenge Lessons Learned”

Charles Segerstrom (Consultant) introduced guest speaker Linda Wigington, Founder & Director of 1000 Home Challenge (1000 HC). Linda was the founder of Affordable Comfort which offered “the best retrofit, home performance and technical information (Charles) has seen.”. Linda empowers local champions to do low cost monitoring and therefore has a great amount of comment on indoor air pollution. She received the American Council for an Energy Efficient Economy's 2002 Champion of Energy Efficiency Award.

Linda Wigington (1000 HC) provided an overview of the 1000 Home Challenge as it relates to the “Whole Building Approach - A Paradigm Shift” concept based on the following presentation outline:

1. Context
2. 1000 HC: How Deep is Deep?
3. 1000 HC: Results to Date
4. 1000 HC: Case Studies
5. Bridging the Chasm

Linda Wigington (1000 HC) reported that the slide deck viewed during the meeting was significantly updated from the draft sent for review prior to the meeting. There are many extra slides for review outside the meeting that will not be reviewed during the call.

Content beyond reference slide content follows: (*WHPA Staff Note: The slide reference numbers noted reflect the [final posted reference slide deck.](#)*)

Slide 3: Note for this presentation

Household energy is thought of in kilowatt hours (kWh).

Slide 4: Conclusions

“Deep reductions” refers to the 1000 Home Challenge framework. When Charles Segerstrom (Consultant) referenced 40% reduction, he was referring to the whole building stock. Linda Wigington’s reference is per structure.

Slide 5: New Paradigm – New Thinking

Paradigms are also a broader, world view and representative of “how we see ourselves on more than a professional level. A new mental map allows us to see differently and interact differently.” Without that framework, one cannot discern what is outdated versus where we need to be going.



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Slide 6: Graphic – Decay of Fossil Fuel CO₂ Emission

This 10-year-old slide shows the decay rate in the atmosphere. Air pollution is decaying but it is still there so it is important to remove CO₂ emission.

Slide 7: Graphic: One Ton CO₂ per Capita?

There is a need for full transformation for energy use, not just simple change.

Slide 8: Barriers or Opportunities?

The learning curve needs to be accelerated. The knowledge base embodied by the paradigm shift will make the difference.

Slide 11: Purpose

This refers to measured energy reduction.

Slide 12: Access & Integrate

The renewables category refers to onsite renewables. Community solutions examples cited are efficient laundromats that can be fitted with higher energy efficient machines instead of adjusting in each home, as well as SMUD's efforts to ensure renters had the option for PV on homes they did not own but did not have them before.

Slide 14: Insights from Early Returns

A surprising result was that many continued efforts to go deeper after meeting the challenge threshold because more clarity comes with deeper reductions. Expectation was for a narrower range of costs and strategies, but there was a much larger variety than expected.

Slide 16: Homeowner Priorities Worksheet Exercise

The [Health, Safety, and Durability Priorities Handout](#) clarifies the value proposition for many homeowners on what could be gained by spending a little more money. It ideally allows contractors or a project team to work with homeowners to build solutions to get to "where you want to go".

Slide 18: Value Proposition

Value proposition is about meaning and purpose and not about return on investment.

Slide 20: Key Metric

To determine how deep is deep enough, the 1000 Home Challenge used a key metric that every household would have its own customized energy allowance conveyed as kWh/year that would be transparent and include how people live, and would include 12-month credits/offsets for PV solar and on-site renewables, as well as the BTU of wood, which counts as energy.

Slide 21: The Project Threshold – How Deep is Deep Enough?

Option A was the more difficult to use and refers to an 75% reduction from the prior year from immediate verified energy use. Option B was used more often and was designed to get to the same sustainable level of peak reductions. It was absolute in looking at how much energy a very efficient household would need.

Slide 23: Graphic – Option B Energy Allowance

The presented graphic is useful for understanding 1000 HC in the context of California. California's average single-family household cite energy use was 20,000 kWh last time the presenter checked. The graphic shows low energy allowance thresholds for Option B assuming a 2,000-square foot, finished wood floor area (FFA), electric heat, detached, 3-person household. These are sometimes very difficult to meet.

Slide 31: Project Summary

Activity has slowed down with a slowdown in funding. There are, however, a lot of California projects.



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Slide 32: Home & Household Characteristics

There are a lot of differences in building stock included in the first 31 hours in the 1000 HC.

Slide 34: Threshold vs Actual - Graphic

California had above average results with a 100% actualization rate for the 1000 Home Challenge.

Slide 35: Household Site Net Energy – Graphic

The average energy use reduction as of 7-20-17 for 31 projects across North America was 4,180 kWh/year for an 88% reduction.

Slide 36: House Agent & Price \$\$

There was no correlation between age, cost and energy use.

Slides 37: Project Types

The four types of projects in the case studies can help with the market segmentation thought processes.

Slide 39: Old House, Good for 100 More Years (Modernization)

Review Case Studies for understanding of the range of improvements that can be done for improved energy efficiency. Lots of people are redoing old homes with modernization to get savings. Invest in efficiency, then in energy efficient appliances, then electric vehicles to ultimately make zero net energy (ZNE Slide 61). One change/item can make a huge difference.

Slides 40-84 provide details of representative project types in the 1000 Home Challenge, including what worked and what did not.

Slide 87: 1000 HC Insights

There are very different implications from the four different project types. The following insights have particular implications for HVAC system replacement:

- The threshold works to define deep reductions.
- Project cost is highly variable.

Slide 88: Project Challenges

The challenges for how to get to the desired results include getting the signals right to fit the application and the range of loads experienced, and the threats to the 40% reduction goal, as well cost and complexity barriers, and finding experienced professionals and subs who share the project's frame of reference.

Slide 90: Most Polluted Cities

Outdoor pollution affects people in their homes. Per the [American Lung Associations report](#), the top seven polluted cities by year round particle pollution are in California.

Slide 91: Observations – ROCIS Air Handler Inquiry

Linda Wigington (1000 HC) reported that she has been focusing on air quality for the last 1 ½ years. Although that focus has been on typical basement feeding systems with mercury metal ducts rather than on California HVAC systems, there are parallels. Running the air handler while having a call to heat or cool does not do much, but running it for twelve+ hours has a huge reduction on particles for a large health impact, but it also has a huge impact on energy use because the thermostat continuous mode defaults to the highest setting which is air conditioning. This clogged filters quickly and often resulted in high total external static (TESP). In most test situations, the TESP was over the name plate. This enables huge opportunity for reductions in particles as well as for liability to the equipment and the



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energy cross. Based on their experienced, there are four things that provide the greatest potential for energy use improvement:

1. Providing for a bigger filter area with a thicker MERV 13 filter and pre-filter.
2. Modifying the filter drop or duct work to reduce the TESP.
3. Replacing motors with ECM and set the right speeds to optimize performance.
4. Most importantly, downsizing the system at the point of replacement. “Grow down to the existing ductwork”. Air quality and efficiency can be integrated, but the biggest challenge is making sure the system is not being used when it does not need to be used.

Slide 92: Emerging Trends – CA Energy Impacts

There are a lot of emerging trends that could make California energy impacts, but it is critical to know how systems are working and not to assume that just because there is feedback from Wi-Fi enabled equipment, the needed clues are being provided. For example, Smart thermostats could be driving systems to run harder rather than less.

Slide 93: Start with the End in Mind

There are huge implications for HVAC systems. To start with the end in mind, the key questions for staged approaches denoted on the slide should be asked.

Slides 95-97 are opportunities for stakeholders to use to drive opportunities for reduction.

Slide 98: Creative comfort is comfort without sacrifice.

Slides 102-108 provide resources.

Slides 109-126 provide extra information on deep energy reductions and the 1000 Home Challenge.

DISCUSSION/Q&A

Co-Chair Tim Mann (Indio Cooling & Heating Supply) opened the meeting for comments or questions on either presentation. All the questions and comments made related to the 1000 Home Challenge presentation.

QUESTION: Regarding the 1000 HC Pennsylvania Study (Slide 91), Aniruddh Roy (Goodman Manufacturing) asked how they were able to overcome the air penalty with improved indoor air quality. He reported that a Lawrence Berkeley National Lab (LBNL) study clarified that even switching to a BPM or ECM motor would use more energy to maintain airflow across a higher MERV filter. What is the solution to that, particularly as he understood that “even CEC is considering that for the 2019 edition of Title 24.”

- **ANSWER:** Linda Wigington (1000 HC) reported that she has talked with “Brent and Ian” about the LBNL work they have done and that they agree that 1-inch pleated filters (which Linda classified as MERV 8+ or “allergy”) are a major challenge in terms of air flow and clogging. Those filters see a good reduction in particles, but because the static pressure is high, it can lead to high energy use with an ECM. The bottom line is that with a 4-inch MERV 13 high quality filter, there was evidence of better air flow. There was not much difference between MERV 11 and MERV 13, but LBNL “definitely said” not to go anywhere near the MERV 16 because it is way too high for static pressure and was problematic. Both the MERV 8 and the MERV 16 will pull particles out, but the MERV 13 will get more of the small, fine particles. The 1000 HC perspective is that the 4-inch MERV 13 is considered optimal combined with increased area in the filter drop to make room for a bigger filter. LBNL suggested that the 2-inch filters were also an optimal option as the 4-inch filters are more expensive (at a contractor cost of \$30+).

QUESTION: Aniruddh Roy (Goodman Manufacturing) asked about the redesign of the filter grid in the field during the study. Is it okay to discuss the incremental cost of the filter grill sizing to account for the added depth?



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- **ANSWER:** Linda Wigington (1000 HC) clarified that the focus was on basement systems, which has plenum across the ceiling and then a drop, and are not in closets like they are in California. They found it easier to change the filter drop completely. They started the plenum and then had someone fabricate a new drop along with a filter rack, plus a curve at the “heel and the boot” so they have good flow going into the filter. They are not “slamming air into the filter” after running air through a 90-degree turn. They bell out for a bigger filter, slow the air down by increasing the filter drop by 50%, and experience “really big drops” in external static pressure by doing that. Their cost of doing that with an ECM changeout without markup is \$1,000. The filter drop is about \$225. The filter is \$40. The ECM is \$250. It takes 4 to 6 hours to complete. They do not have anything published for the work done in Pennsylvania. It is only observations at this point as it is a work in process and not a research study. Linda reported that in all cases, they tried to get air flow right.

ACTION: Linda Wigington (1000 HC) offered to provide further information on the work done in Pennsylvania to those interested.

COMMENT: Based on decades of experience training HVAC contractors throughout California, Scott Johnson (IHACI) reported that while building out a generic format for HVAC filters is okay, in reality, the only needed steps are measuring the filter or using manufacturer data and then applying fan law to it to figure out how many square inches are needed for that particular resistance of the filter for any application. He noted that there are “all sorts of proven results” in data at SCE to be able to measure into an HVAC system, find out where the defaults are, and correct air flow, maps and room to room. This is not undoable, but he cautioned against throwing out a default number.

- **REPLY:** Linda Wigington (1000 HC) clarified that this is not new, but that the key thing is to check systems to ensure air flow is optimal at every setting. There is also the need to ensure the homeowner would know if their system is using 1,000 watts, 100 watts, or 80 watts. The big question is on how to ensure there is no energy penalty. What is the CFM per watt? It is better at the 5 range. The right metric is needed.

COMMENT: Scott Johnson (IHACI) noted that there are at least 150 premier HVAC contractors in Southern California and Northern California, and that they struggle because there are no resource programs on HVAC to help consumers understand “what is going on” in terms of energy efficiency. On a local level, HVAC contractors are training their competition so they “are not the only ones telling their consumers that there is an alternative to actually getting it right up front.” They do not want to be perceived as a “snake oil salesman” if they are the only one presenting the information. He expressed “hope” that some Utilities would be interested in going further, and noted encouragement for the steps taken by 1000 HC. Even if it is done as a Pilot, there is a need for market place penetration to help consumer understanding of getting an HVAC system in the envelope and proper sizing setup, which would help contractors who want to do it right.

COMMENT: Co-Chair Tim Mann (Indio Cooling & Heating Supply) interjected that ECM motors and condensers going into the aftermarket stage also seems like a “fantastic energy savings”. He has seen 30% to 40% savings when they have been coupled together. He suggested that they could be done on retrofit and coupled with a UV setup for air quality running in 24 volts. He reported that per personal experience, running ECM blowers with a central system saved his children from needing asthma medication each year and kept his wife from getting sick while going through cancer treatment.

- **REPLY:** Linda Wigington (1000 HC) noted that as a “fantastic” example of using ECM combined with ensuring the right air flow situation. She clarified that if you can further downsize the system, the more potential there is for benefits that will not turn into liabilities. She reported that some of the highest watt draws were ¾ HP ECM because it was extremely restricted. The key is to get the pieces right. There has been some good research on ECM replacements. It is critical to look at what needs to be measured when it is done to get performance.

COMMENT: Scott Johnson (IHACI) reported that manufacturers publish watt penalties. It can all be identified up front, but people need training to understand what it is.



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- **REPLY:** Linda Wigington (1000 HC) agreed and confirmed that the charts are very close to their experience. She noted that, “We work backwards.”

QUESTION: Co-Chair Tim Mann (Indio Cooling & Heating Supply) noted the extreme heat encountered in Coachella Valley for four months of the year. He asked about application for ductless for new construction and existing buildings in terms of cost reduction.

- **ANSWER:** Linda Wigington (1000 HC) noted that she personally likes them. While she has not installed a lot (only about 15 to 18 of them), she has tracked their performance. She is frustrated by the cost of putting in a system that truly gives each room air conditioning, which most people feel they need even if they really do not need it. Dave Robinson with [Green Earth Equities](#) did great work with ductless in the past in the central valley of California. [Ecotope](#) and [Bonneville Power Administration \(BPA\)](#) explored putting in one simple system in the main heating, living area of a house and then offsetting everything else as much as possible. That system ended up with 50% reductions in electrical energy use for heating on average for a sampling of 68 homes. On the other hand, there has been some areas of Stockton that have not worked as well with ductless. The [Northwest Energy Efficiency Alliance \(NEEA\)](#) has good information on ductless, but a lot more data is needed.

COMMENT via WebEx: Janell Jacks (CALCERTS) commented that this was an “Excellent presentation and actual example of why we do this. Thank you!”

Co-Chair Barbara Hernesman (SynergyNexGen) thanked the speakers for their presentations and encouraged participants to share the slides to foster further conversation.

Closing Comments/Scheduling

WHPA Staff reminded EWG members to email their votes on the proposed stakeholder engagement feedback loop for how WHPA can continue to get needed communication flow in relation to EBEE-AP Strategy 1.9 and its Sub-Strategies.

The next EBEE Committee meeting (includes the EWG and “Community” members) was confirmed for Thursday, August 17, 2017 from 9:00am – 10:30am PDT. Potential topics were reported as Daniel Jones’ coordination of financial institutions to discuss available financial options for improved EE, as well as presentation by Adam Brooks for the “boots on the ground” perspective in follow-up to Nehemiah Stone’s presentation from last month on HVAC and multi-family energy efficiency.

WHPA Staff Notes: Future meetings will be the third Thursday of each month. The recordings will be emailed post meeting for those who need to drop off before the full 90 minutes of each meeting. The [WHPA EBEE Committee’s webpage](#) is regularly updated with meeting recordings, notes, and developing work product document(s).

Adjournment

Co-Chair Tim Mann (Indio Cooling and Heating Supply) adjourned the meeting at 10:32 am PDT.

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Summary of Action Items and Key Decisions (from above discussion)

ACTION ITEMS

1. **ACTION:** Linda Wigington (1000 HC) offered to provide further information on the work done in Pennsylvania to those interested.
2. **ACTION:** EWG members to email their votes on the proposed stakeholder engagement feedback loop for how WHPA can continue to get needed communication flow in relation to EBEE-AP Strategy 1.9 and its Sub-Strategies.