Better Buildings Residential Network Peer Exchange Call Series:

How Health is Reshaping the Energy Efficiency Field

June 14, 2018

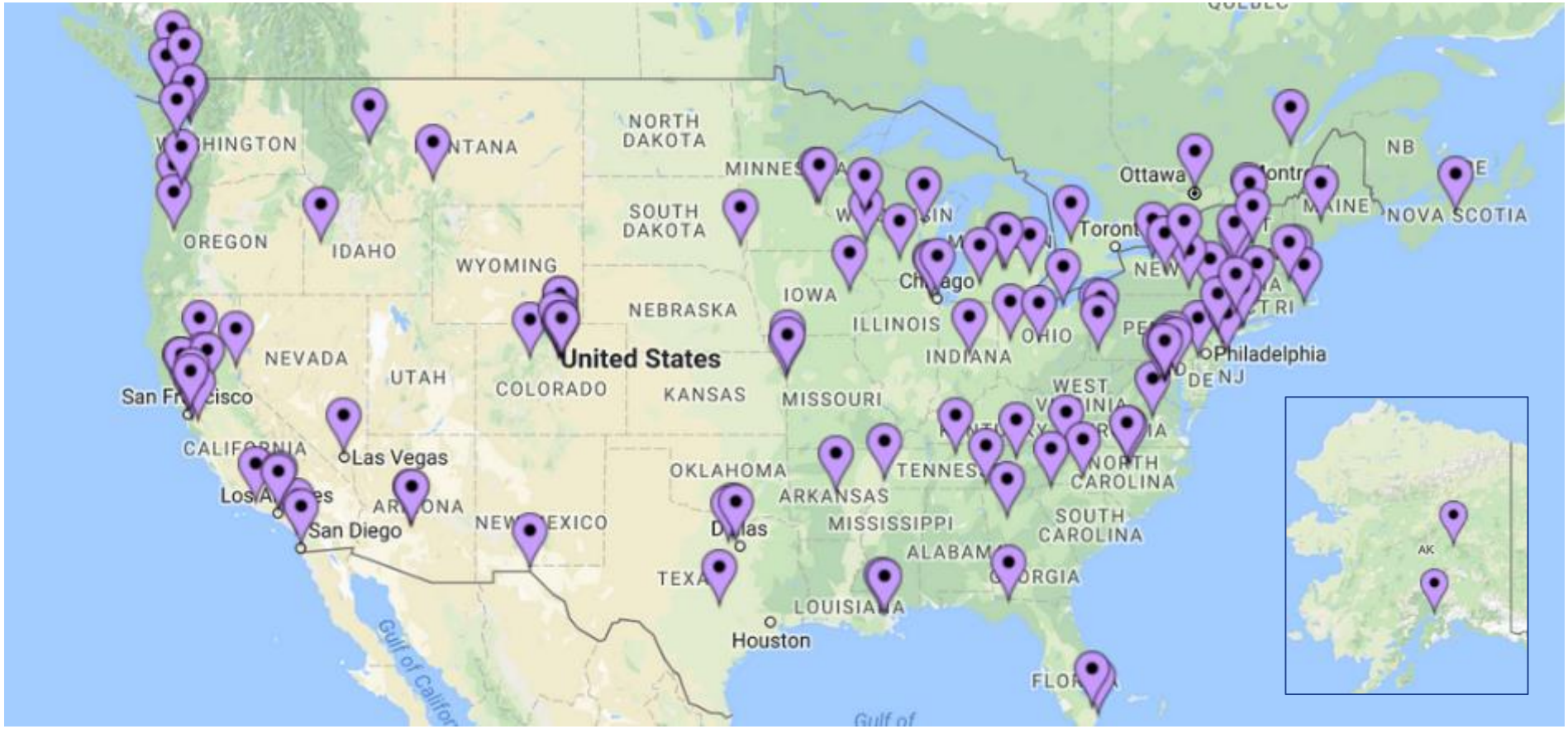
Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers:
  - **Iain Walker**, Lawrence Berkeley National Laboratory
  - **Melanie Paskevich**, NeighborWorks of Western Vermont
  - **Jonathan Waterworth**, AZ Energy Efficient Home
- Open Discussion, Closing Poll, and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.
2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

Peer Exchange Call Registrants



Better Buildings

U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year

Upcoming calls:

- June 28th: Renters and Residential Energy Efficiency
- July 26th: Algorithm-based Home Energy Assessments
- August 9th: The Sustainability of Energy Efficient Products

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, *or go to* energy.gov/eere/bbrn *& click Join*

Iain Walker
Lawrence Berkeley National Laboratory

U.S. DEPARTMENT OF ENERGY

How Health is Reshaping the Energy Efficiency Field

Iain Walker
Lawrence Berkeley National Lab

Better Buildings Residential Network

June 14th 2018

Two Perspectives

1. Health programs incorporate energy efficiency
   - Spend healthcare funds to upgrade homes for better IAQ and take advantage of related energy savings
   - An MD could write a prescription for home upgrades
   - Air sealing, ventilating and filtering cheaper than hospital visits and prescriptions
   - Rare to non-existent
2. Residential energy efficiency programs incorporate health
   - Allow health savings in EE program cost-benefit estimates
   - A good way to sell EE programs: health valued more by occupants

Non-energy health impacts

1. Reduced asthma (lower medical costs);
2. Reduced cold-related thermal stress (lower medical costs and fewer deaths);
3. Reduced heat-related thermal stress (lower medical costs and fewer deaths);
4. Reduced missed days at work (reduction in lost income);
5. Increased home productivity due to improvements in sleep;
6. Reduced carbon monoxide (CO) poisoning (lower medical costs and fewer deaths); and
7. Reduced home fires (fewer fire-related injuries, deaths, and property damage).

About $1400/yr total

This list from: Hawkins, B., Tonn, B., Rose, E., Clendenning, G., and Abraham, L. (2016). *Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts Study*
More General discussion: E4thefuture Inc. White paper (2016) *Occupant Health Benefits of Residential Energy Efficiency*

Weatherization Plus Health (Wx+H) - Washington State Department of Commerce

- Focus on households with asthmatic children
- >500 households so far
- Average savings about $400-500 yr in asthma-related Medicaid costs

NZ study – 4000 households

- 12 months post retrofit : 38% reduction in hospital admissions
- Reduced wheezing key health outcome
- Better temperature and humidity control after energy retrofit

Where are health costs being accounted for?

States including health co-benefit in retrofit cost effectiveness: RI, DC, MD, CA, OR, MA & NY

- Wide range of benefit estimates:
  - OR 2% adder
  - CA 20% multiplier

Financing example

- Capital for Change Inc. (C4C) (formerly the Connecticut Housing Investment Fund)
- Low-Income Multifamily Energy (LIME) Loan for multifamily residential EE improvements
- Allows up to 25% of the loan to be used for non-EE improvements including health and safety. www.chif.org.

Building America Health & Home Upgrades

- Example 1: Cooking and kitchen ventilation
  - Without good kitchen ventilation tighter homes will have high cooking-related contaminant levels
  - Define performance
  - Find ways to do it better – can we design better range hoods that have good capture but low air flow?
- Example 2: Sensing of contaminants
  - Control ventilation/air cleaning systems
  - Lower overall ventilation rates to save energy and serve grid requirements
  - Ensure contaminants are below acceptable levels in individual homes

Cooking & burners emit air pollutants

CO_2 & H_2O

NO,NO_2, HONO, Formaldehyde

Ultrafine particles

Ultrafine particles, NO_X

Ultrafine particles

Formaldehyde

Acetaldehyde

Acrolein

$PM_{2.5}$

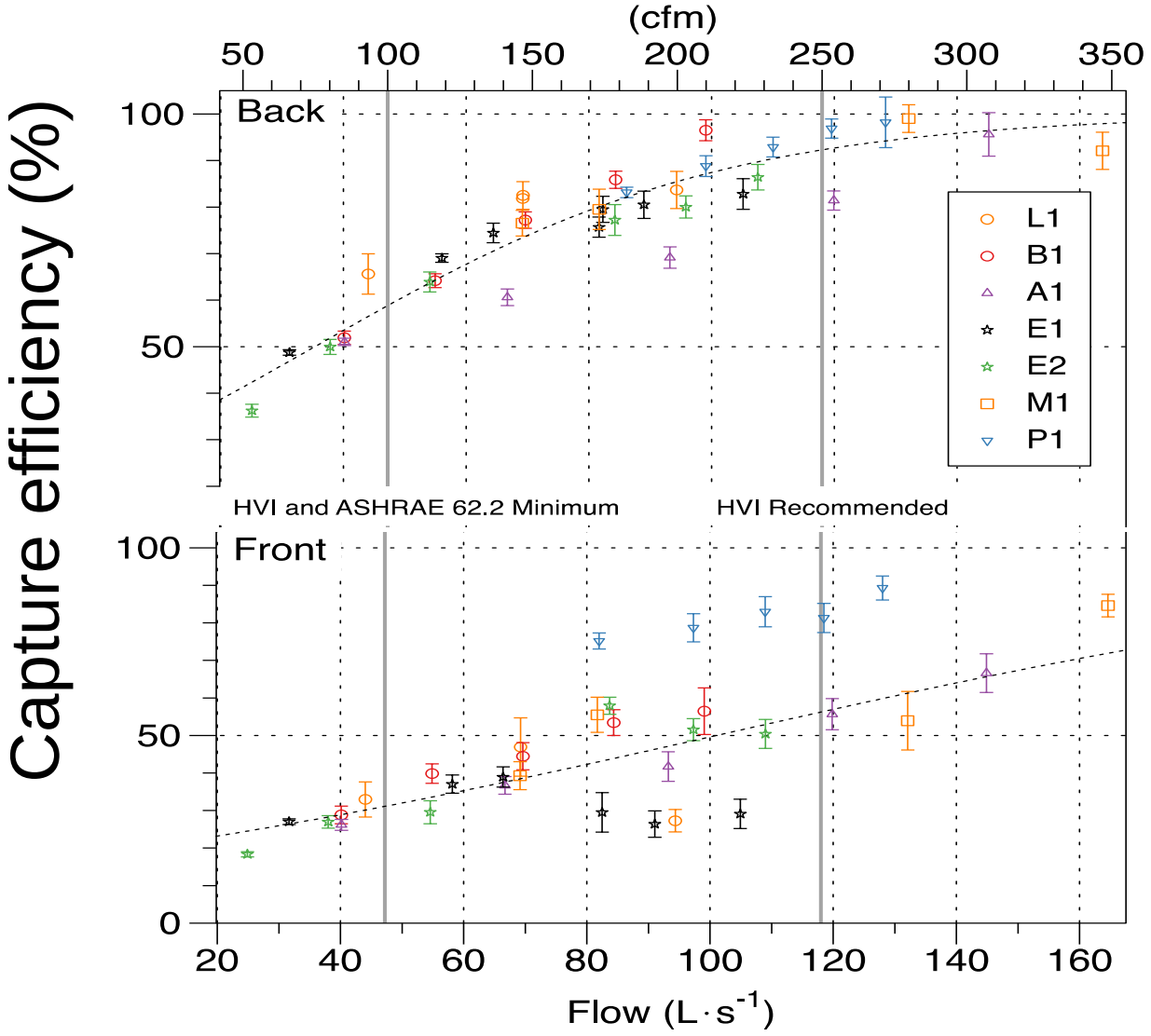
PAH

How can you tell if a hood works well?

The effectiveness of range hoods at capturing cooking pollutants is called capture efficiency

LBNL Lab Testing

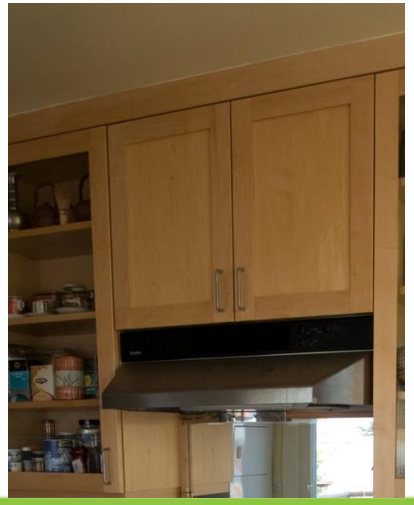
Capture Efficiency—Lab Results



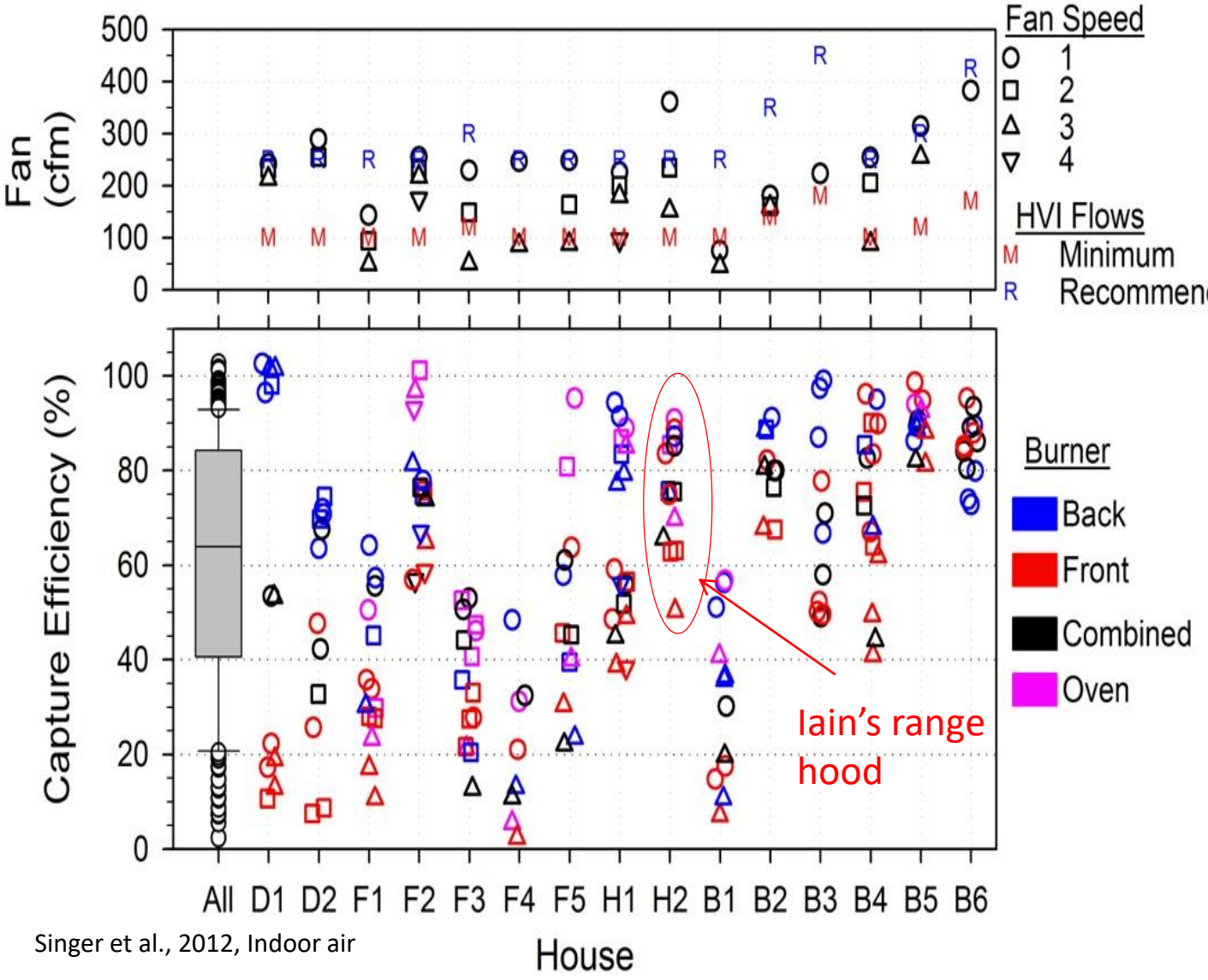
- Front burner capture worse than back burner capture
- Capture increases with flow rate
- Wide range of capture for a given flow rate

In-Home Performance Study

- 15 devices
- Cooktops
  - Pots with water
  - Front, back, diagonal
- Ovens
  - 425 F, door closed
  - Cool between tests



In-Home range hood performance



- Front burner capture worse than back burner capture
- Capture increases with flow rate
- Wide range of capture for a given flow rate

Singer et al., 2012, Indoor air


Good coverage

OK-ish coverage

Bad coverage

What to avoid

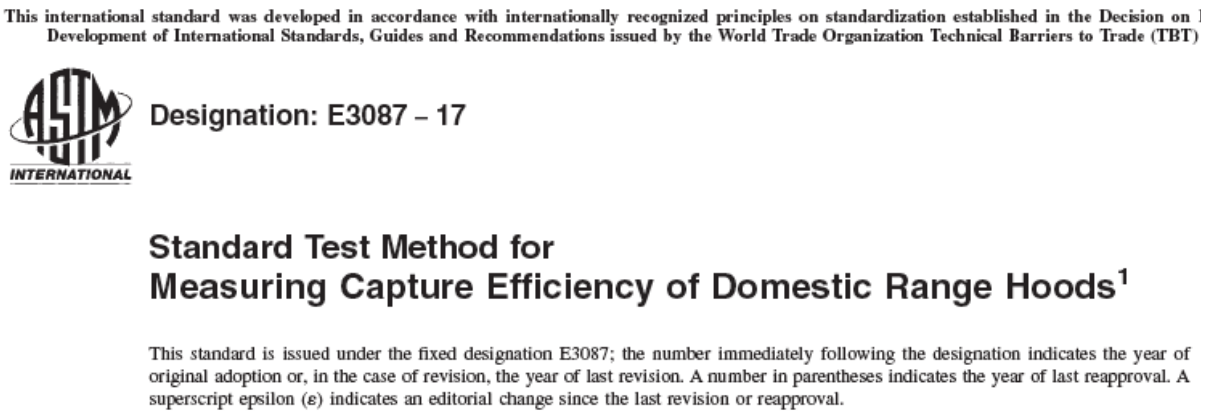
1. Recirculating hoods
2. Microwave ovens as a range hood
   - ***Poor coverage***
   - Noisy
   - Dangerous?
3. Downdraft hoods
4. Large “commercial” grade hoods
   - Need make up air – very important in tighter high performance homes
   - Almost never installed correctly
   - Can backdraft water heater, furnace or fireplace

What to look for

1. Good coverage
2. Decent flow rating (>200 cfm)
3. Quiet
   - some hoods have noise ratings
   - Some building codes require a quiet hood rated for flow
4. Shortest path to outside for ducting
5. What can I do at home?
   - Cook on back burners
   - If too noisy on high use it on low – much better than doing nothing

Other Kitchen Ventilation Notes

Capture ratings coming soon



This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on
Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT)

Designation: E3087 – 17

Standard Test Method for Measuring Capture Efficiency of Domestic Range Hoods[1]

This standard is issued under the fixed designation E3087; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

CERTIFIED HOME VENTILATING PRODUCTS DIRECTORY

HVI HOME VENTILATING INSTITUTE

Certified Ratings in Air Delivery, Sound and Energy for Accurate Specifications and Comparisons

Automation – currently under development

Assessing Consumer Grade IAQ Monitors

AB

PM, T, RH

1 sec

AVN

$PM_{2.5}$, PM_{10}, CO_2,
T, RH
10 sec – 15 min

AQE

PM, T, RH

1 min

AWA

PM, CO_2, VOC,
T, RH,
10 sec – 5 min

FOB

PM, CO_2, VOC,
T, RH,

5 min

PA

$PM_{1.0}$, $PM_{2.5}$, PM_{10},
T, RH

80 sec

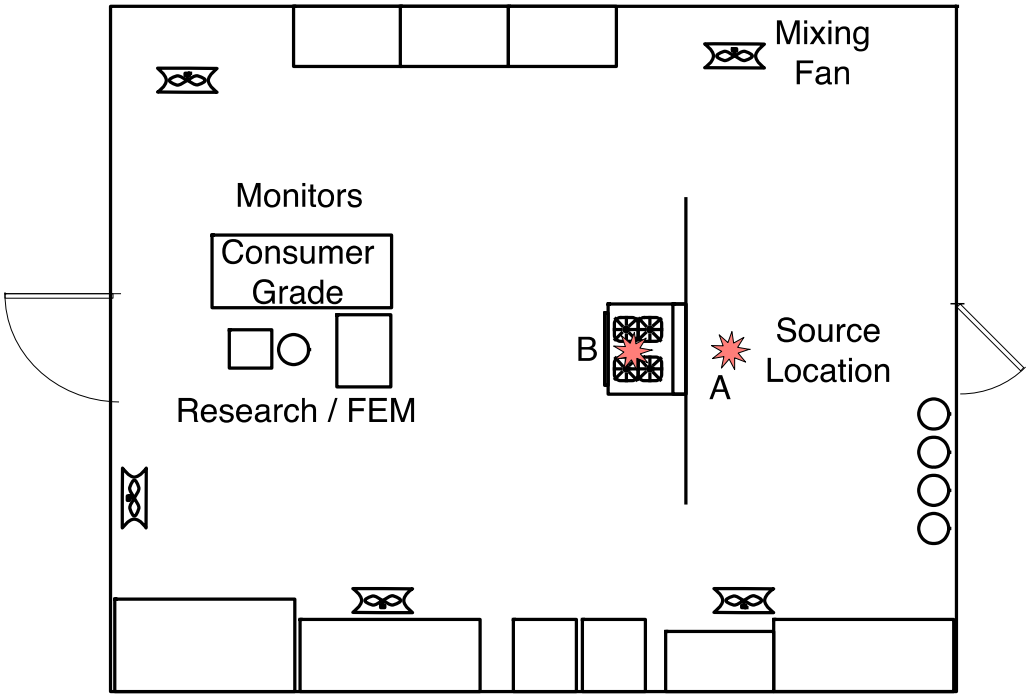
SPK

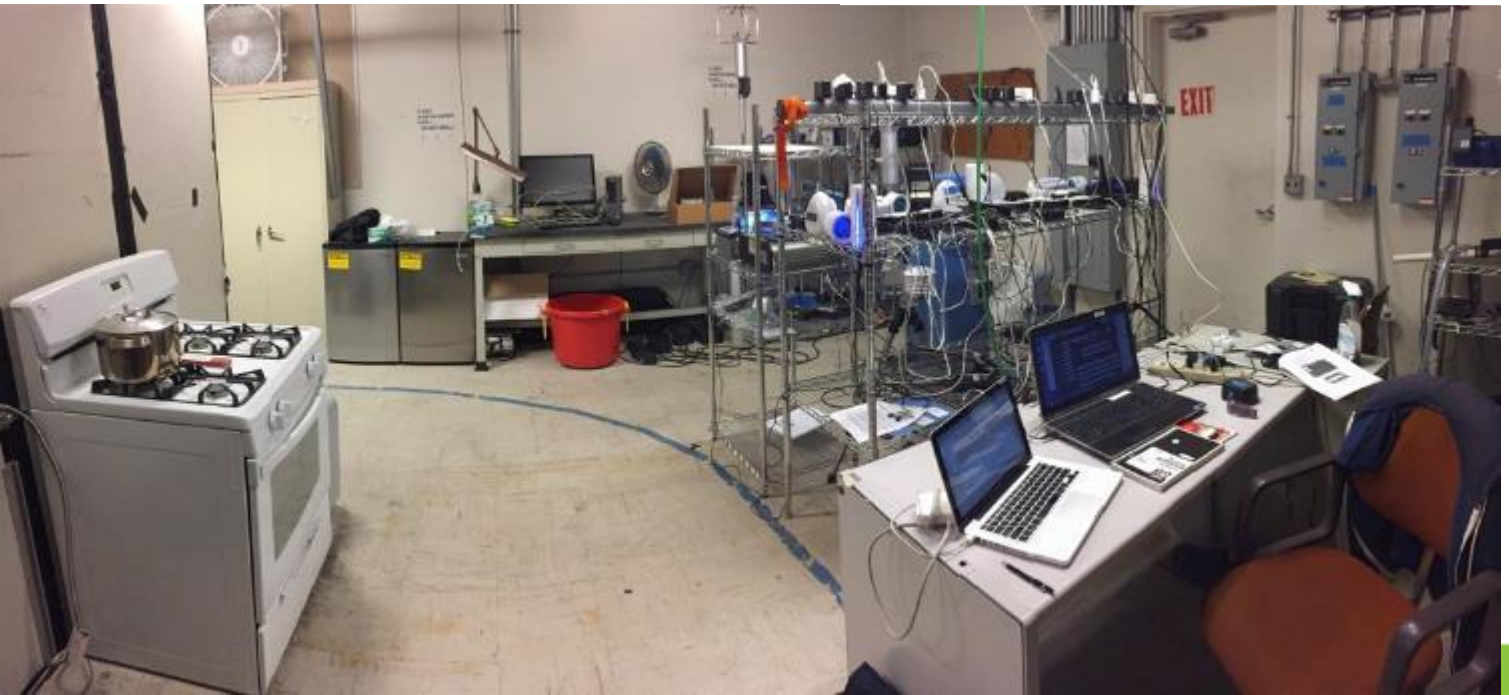
PM, # particles
T, RH

1 min

These use mass-produced particle sensors that cost <$10 to $35

Lab Testing


Mixing Fan
Monitors
Consumer Grade
Research / FEM
B
A
Source Location


EXIT

Sources

Burned incense, candles and cigarettes



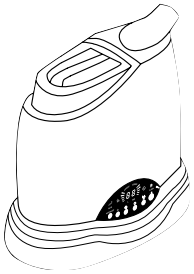



Heated pots of water, an oven, a hair dryer, and an electric burner

Cooked green beans, bacon, pancakes, toast, and a pizza, and heated canola oil







Released AZ test dust, shaked a dust mop, and operated an ultrasonic humidifier using unfiltered tap water

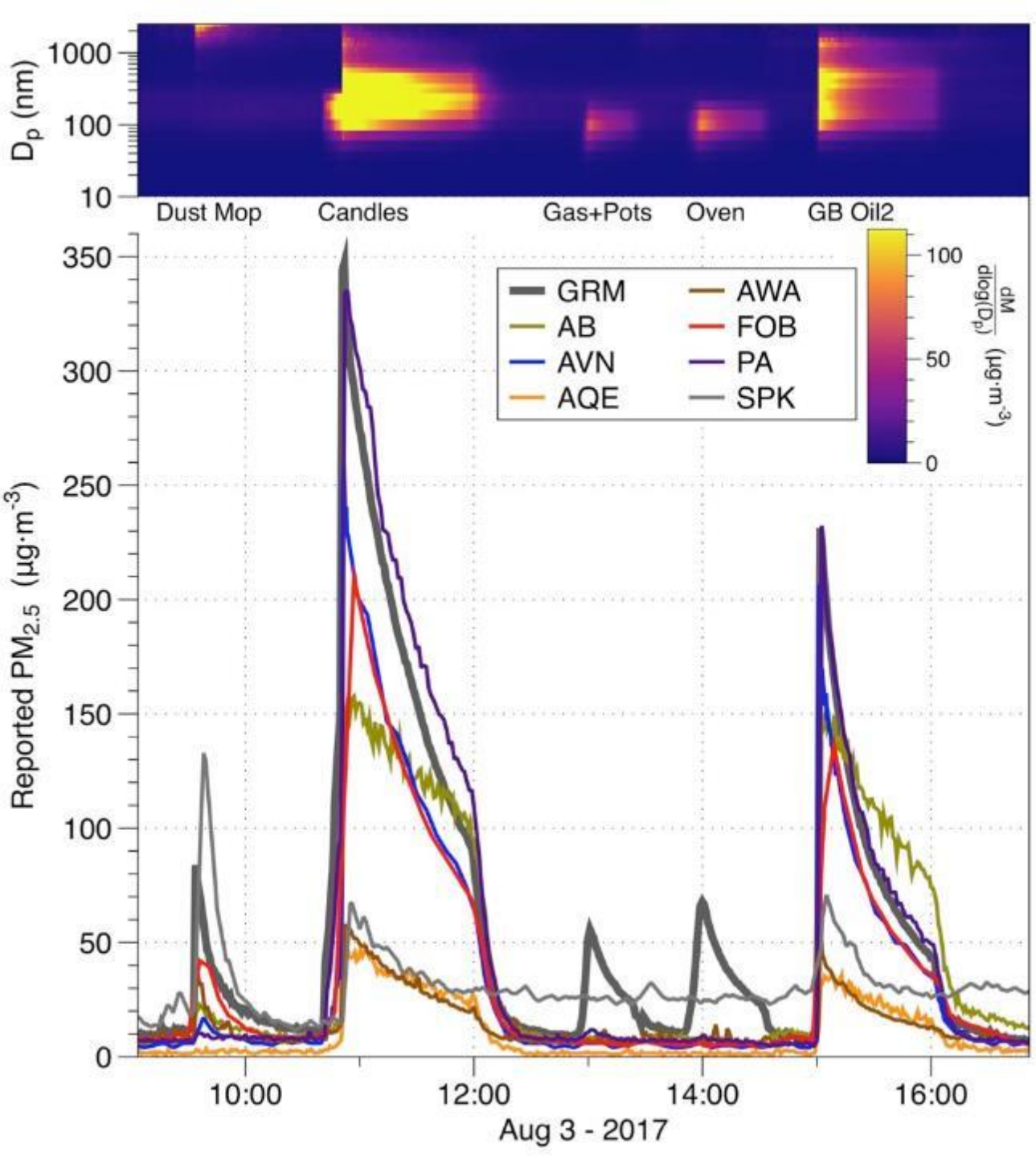
BERKELEY LAB
Lawrence Berkeley National Laboratory

Reference: GRM

Wide range of response

Some clearly better than others

Ultrafine (<0.3 micron) sources from gas burning not detected



Particle Performance Summary

Four consumer monitors detected most sources and quantitatively measured all large sources of $PM_{2.5}$

➔May be suitable to manage IAQ.

Two consumer monitors detected many sources but not quantitatively.

One monitor was not informative.

PA

FOB

AB

AVN

AWA

AQE

SPK

Next steps:

- Results should be verified in homes
- How durable are the devices?

Consumer monitors don't detect & ultrafine particles – is this critical?

Questions?

Iain Walker
iswalker@lbl.gov

Three Key Take-Aways

- Particulates released from cooking can be substantial and negatively impact the health of home occupants.
- Monitors are cheap, easily available and can quickly reveal potential issues.
- Improperly sized or installed HVAC systems, including range hoods, are more common than one might think.

Melanie Paskevich
NeighborWorks of Western Vermont

U.S. DEPARTMENT OF ENERGY

Engaging Health Partners: Weatherization + Health

NeighborWorks OF WESTERN VERMONT

Melanie Paskevich, Program Manager

NeighborWorks of Western VT

- **Nonprofit** housing organization
- One-stop-shop
- Provide all the answers and support homebuyers and homeowners need
- Keep customer's best interest front and center
- **Realty, Lending, Financial Counseling and Education, Home Repair, HEAT Squad**
- Part of a national nonprofit network, *NeighborWorks America*

NEIGHBORWORKS REALTY
NEIGHBORWORKS LENDING
NEIGHBORWORKS HOMEOWNERSHIP
NEIGHBORWORKS HOME REPAIR
NEIGHBORWORKS H.E.A.T. SQUAD

Meet the HEAT Squad

- Providing **support** to improve efficiency, comfort, health & safety of homes, regardless of income since 2010
- **Reduced cost audits**, same day audit reports, objective advice, help with contractors, in-house financing
- Available in 8 VT counties, 9 KY counties
- Completed over **4,200 audits and 1,600 projects**
- Partners: Efficiency VT, Green Mountain Power, WAP, Local Contractors, Energy Committees

Healthy Homes Initiative

- **Beginning:** RRMC realized patients homes impacting health, could not address; directors meet at conference, hear needs/services; RRMC realizes healthy home=healthy patient (lower healthcare costs)
- **Program:** pilot with no goals; patients with asthma, COPD, accessibility, fall risk, general housing needs referred by RRMC staff; up to 120% AMI
- **Offering:** grant up to $6,000 with matching loan, in some cases 100% grant up to $6,000 (can be more if need)
- **Process:** referral form emailed, site visit, estimates, connect with contractors, project management
- **Tracking:** health conditions, housing needs, installed measures, costs/grants, reason for no service, impact on health after work

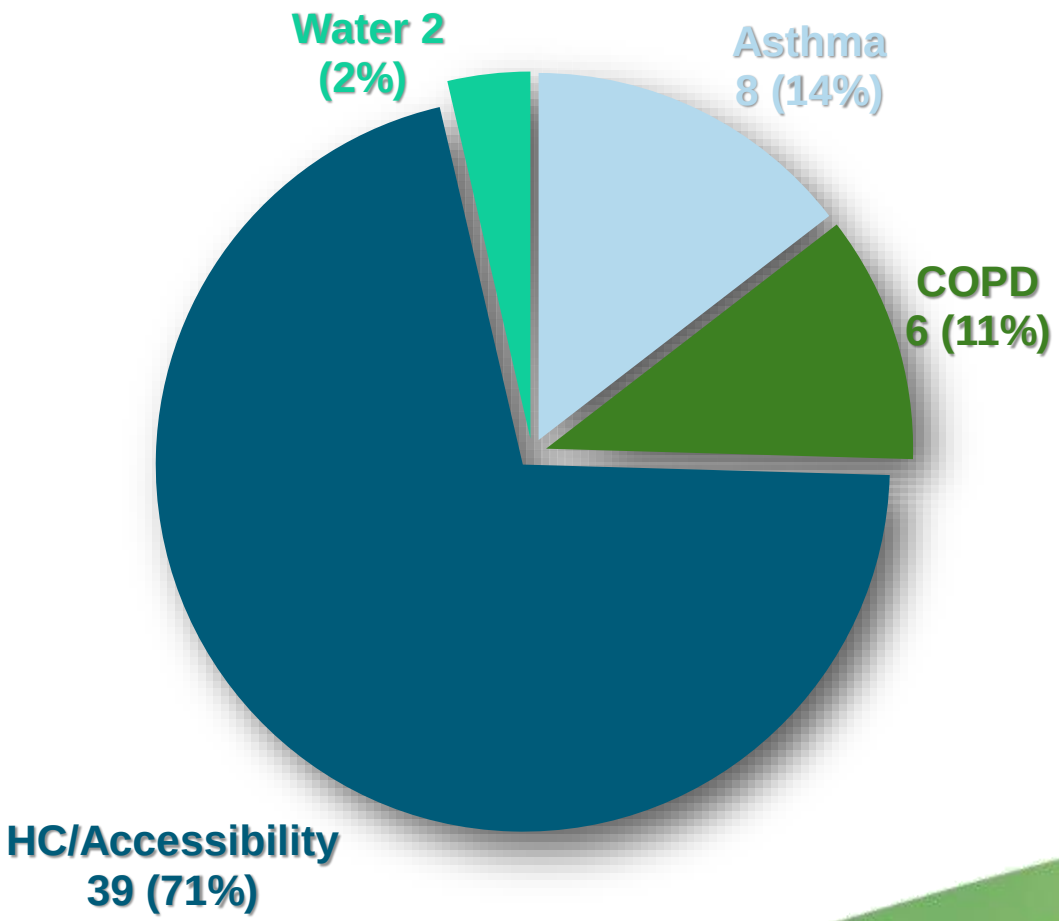
Healthy Homes Initiative

Pilot Program Launch:

- Energy auditors certified: BPI HHE
- Efficiency + Health Training and Falls Training: RRMC staff, contractors, NWWVT staff, agencies
- RRMC Presentations: case workers, pulmonology department, emergency department
- Engage RRMC staff for energy audits on their homes: BEST ADVOCATES
- Establish steering committee; check-in team meetings to gage success, discuss patients, issues

Healthy Homes Initiative

Referrals:



Asthma/COPD Repairs:

- Carpet removal
- IAQ improvements
- Moisture/mold mitigation
- Ventilation
- Weatherization
- Woodstove/pellet removal

Accessibility/Fall Risk Repairs:

- Grab bars
- HC showers, bathroom
- Reduce steps, flr transition
- Railings
- Ramps

Healthy Homes Initiative

Lessons Learned:

- Lengthy program launch
- Patients that rent, difficult to help
- Hard capturing and joining data
- Hand-holding intensive process
- Difficult to get attention of medical staff
- Language: medical vs. construction
- Incorrect info from medical staff to patients
- Hard to maintain communication, relay updates

Thank You!

Melanie Paskevich

802.797.8610

mpaskevich@nwwvt.org

Three Key Take-Aways

- Engage health professionals for energy efficiency on their own homes. They can be the best advocates for the program.
- Never guarantee that weatherization or home repair measures will cure patient condition; we are not healthcare professionals.
- Make sure process is simple and straight-forward for health professionals and patients.

Jonathan Waterworth
AZ Energy Efficient Home

U.S. DEPARTMENT OF
ENERGY

HOW HEALTH IS RESHAPING THE RESIDENTIAL ENERGY FIELD

AZ HEALTHY HOME

FOUR YEARS AGO

MY TURNING POINT

My turning point into a Healthy Home focus was 4 yrs. ago with a client who made no mention of health issues during the pre-audit interview when asked, but subsequently admitted issues later.

IDENTIFICATION

This home had a lot of supply side duct leakage and tongue & groove ceilings along with air barrier and insulation issues that were identified by a new BPI tech. We converted the job to a retrofit and when I lined out the crew and scope in the field I immediately identified an issue that my tech did not catch.

HEALTH ISSUES UNCOVERED

I found mold on the truss' in the attic that was caused by monsoon rains during construction 20 yrs. prior. Her 8 & 5 yr. old had severe sinus issues which included several surgeries and multiple lifelong medications for both. She recently had her first Asthma attack since became stay at home mother. Testing revealed 8 different types of mold of which many were dangerous.

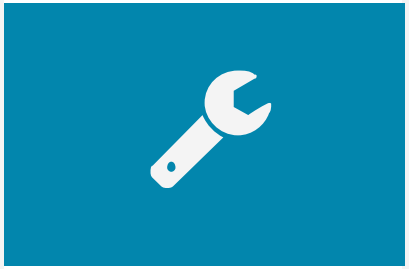
FOLLOW UP

We brought in a remediation crew to address it before we completed our scope of work. When I followed up with her a couple months after, she shared with me that her and her children where feeling great and off all medications

Expanding your home performance business

Additional Training

- BPI Healthy Home Evaluator Certificate
- IAQ SEMINARS & TRAINING



Additional Equipment

- Moisture meters
- IAQ MONITERS
- RADON METERS

Identify opportunity

- Incorporate into your current HP Business
- ADDITIONALLY: WEATHER IMPACTED, URBAN CENTERS, BROWNSTONES, ETC

Persistence

- Educate the public on the connection
- between health and efficiency

Market opportunity

Identify Unique Avenues for Business Growth

services

Incorporate into your current Home performance offerings

education

Efforts to educate the public so when the opportunity arises, relationships are built

opportunities

Identify how you can serve the needs of your community

FOOBOT


foobot


foobot
Your good air guru
VOCs
From 04/30/2017
To 05/06/2017
Global
Day
Night
88.2%
89.4%
Readings
Comments

Mechanical Ventilation in healthy homes

Healthy Home Evaluations Reveal

WATER DAMAGE

RETURN AIR PLATFORM

RAT INFESTATION

TOXIC MOLD

Community outreach

Look for opportunities to build relationships

Being an early adopter best positions you to take advantage of opportunity for market demand. Prioritize the time for education, experience and building relationships you'll need to be successful.

To do this effectively you must commit to do it and do it well!

Home Performance is not an easy business to be in but most are in it to help society. What better gift to give than a possibility for improved health?

There are opportunities all around you, identify where they are and how you can best serve the need!

Healthy home service projections

3

What is happening?

Rise in popularity

As the correlation between environment and health continues to strengthen, we may have medical providers recommending assessments.

Similar to:

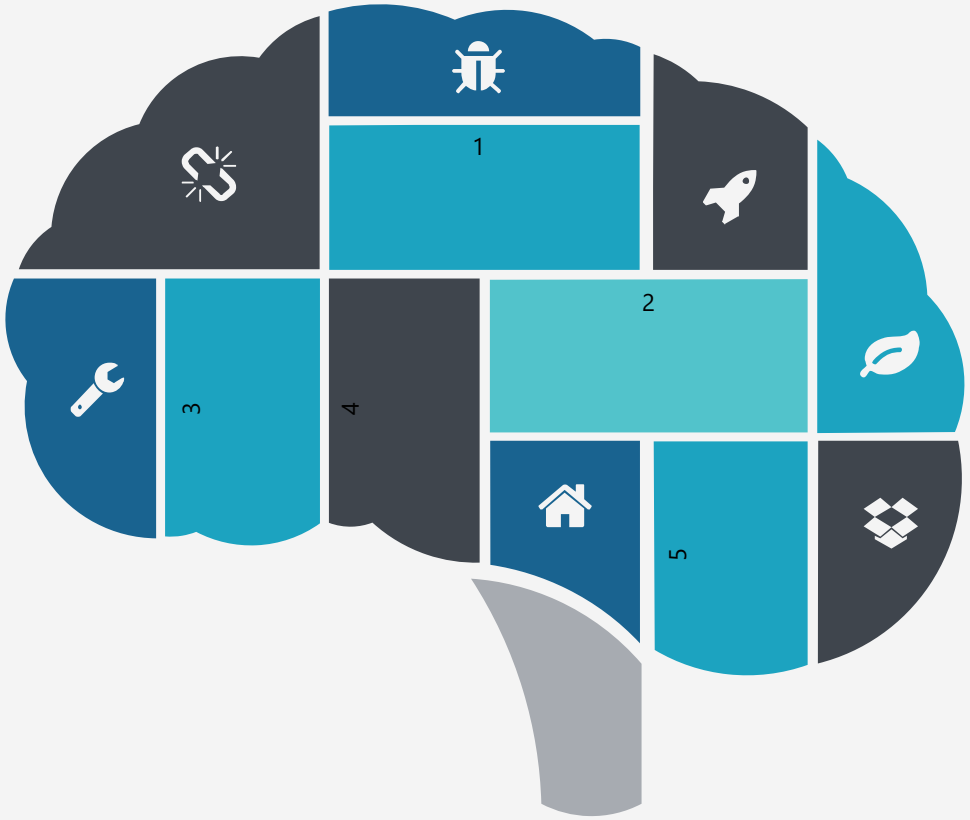
WEATHERIZATION

One could look at it like weatherization but better & more profitable with the scope of work broader and more holistic. This may require more sub-contractors, suppliers, possibly project management experience.

WHAT DOES THE FUTURE HOLD?

The Healthy Home service will continue to gain popularity. We may eventually have medical providers recommending assessments. In that case we would have insurance companies paying for improvements. This leads to the potential for higher ticket prices and a larger demand. I also feel that there will be a greater call for action marketing “Healthy Homes” versus the traditional Home Performance call to action of “Cost/Comfort” and it will look like “Health, Comfort & Efficiency”.

LESSONS LEARNED



BE PERSISTENT

People are slowly catching on that the health and energy efficiency connection. Stay persistent in your efforts.

Incorporate

As a Home Performance Contractor, your best leads are current clients. Use these warm connections to educate people about your mission.

AZ ENERGY EFFICIENT HOME

Contact information

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www.AZEnergyEfficientHome.com

Three Key Take-aways

- Homeowners often don't approach contractors with health issues, but careful questioning can reveal potential opportunities for improvement.

- Awareness of health issues and their relationship to home performance is growing, and this represents a great opportunity for forward-looking contractors.

- Community engagement can position you as a perceived leader in the area of healthy homes.

Three Key Take-Aways

- Homeowners often don't approach contractors with health issues but careful questioning can reveal potential opportunities for improvement.
- Awareness of health issues and their relationship to home performance is growing and this represents a great opportunity for forward-looking contractors.
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Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!

Department of Energy

Health in Buildings for Today and Tomorrow: Making Connections

Register at Eventbrite with case-sensitive password HiBR

- **2018 Energy Exchange and Better Buildings Summit**
- August 21st-23rd in Cleveland, OH
- Registration is open! Early bird registration ends June 15th
- Highlights include:
  - Panel sessions and technical trainings (earn CEUs)
  - Peer-to-peer discussions
  - Ask-an-Expert/FEMP Lounge
  - Networking opportunities
  - Pre- and post-conference workshops
  - Better Buildings Partner sessions
  - Building Tours

For more information and to register:
2018energyexchange.com

Explore the Residential Program Solution Center

Resources to help improve your program and reach energy efficiency targets:

- Handbooks - explain *why* and *how* to implement specific stages of a program.
- Quick Answers - provide answers and resources for common questions.
- Proven Practices posts - include lessons learned, examples, and helpful tips from successful programs.
- Technology Solutions NEW! - present resources on advanced technologies, **HVAC** & **Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.

https://rpsc.energy.gov

Thank You!

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bbresidentialnetwork@ee.doe.gov