Better Buildings Residential Network Peer Exchange Call Series: *Innovation Station: The Latest Advances in Energy Efficiency Technology (301)*

Call Slides and Discussion Summary

July 14, 2016

Agenda

- Agenda Review and Ground Rules
- Opening Poll(s)
- Brief Residential Network Overview
- Featured Speakers
  - **Rick Nortz**, Manager, Strategic Accounts & Utility Programs; Mitsubishi Electric Cooling & Heating *(Network Member)*
  - **Antonio Bouza**, HVAC Water, Heating, and Appliances Technology Manager; U.S. Department of Energy
  - **Teja Kuruganti**, Research & Development, Modeling & Simulation Group; Oak Ridge National Laboratory
- Discussion
  - What are other examples of programs using innovative technology to engage customers?
  - What opportunities are there for integrating new technology innovations into program offerings?
  - What are some of the challenges of integrating new technology innovations into program offerings?
- Closing Poll(s) and Upcoming Call Schedule

Better Buildings Residential Network

Better Buildings Residential Network: Connects energy efficiency programs and partners to share best practices and learn from one another to increase the number of homes that are energy efficient.

Membership: Open to organizations committed to accelerating the pace of home energy upgrades.

Benefits:

- Peer Exchange Calls 4x/month
- Tools, templates, & resources
- Recognition in media, materials
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Residential Program Solution Center guided tours

Commitment: Provide DOE with annual number of residential upgrades, and information about associated benefits.

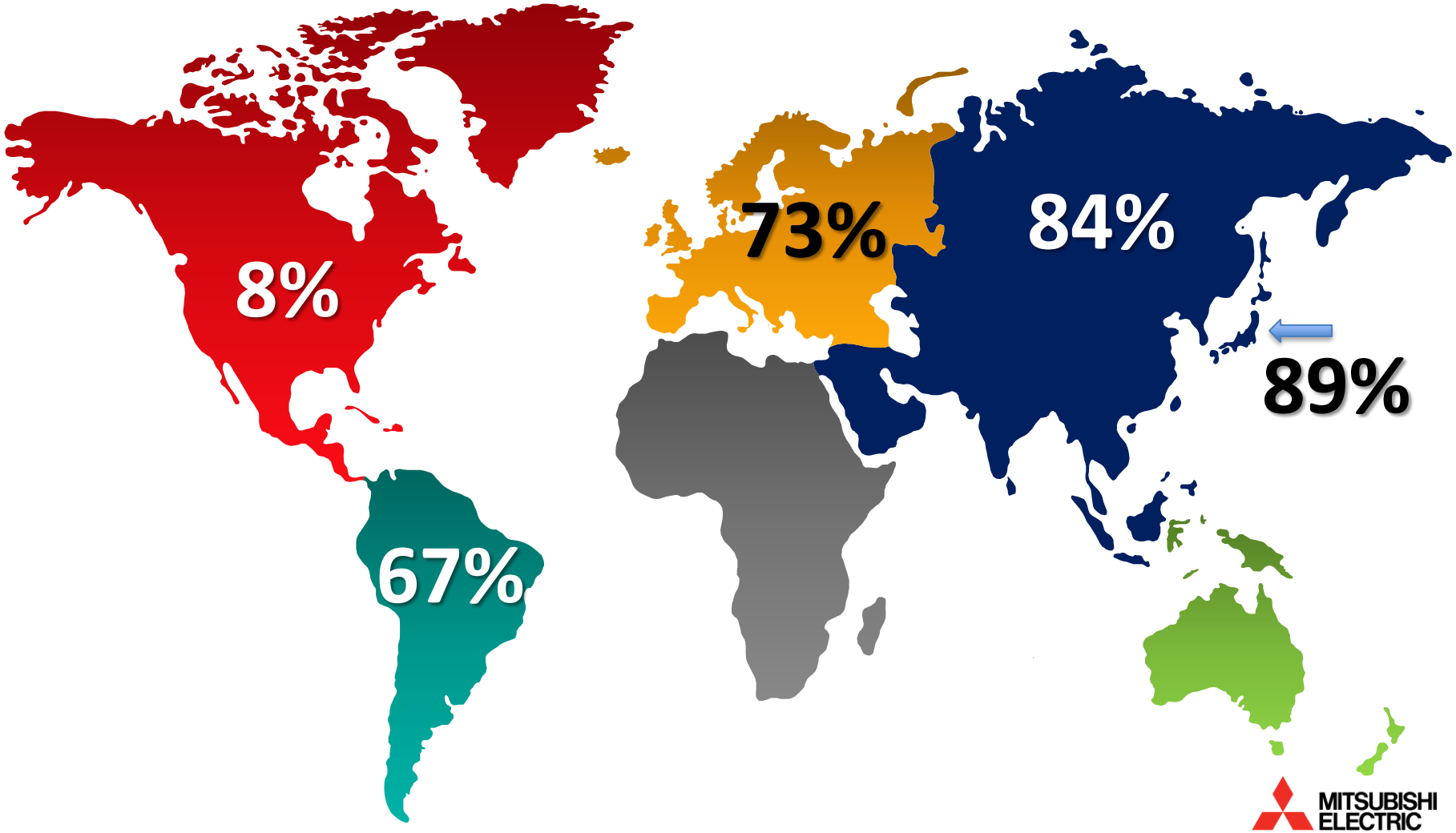
For more information or to join, email bbresidentialnetwork@ee.doe.gov, *or go to* energy.gov/eere/bbrn *and click Join*

Mitsubishi Electric Cooling & Heating

U.S. DEPARTMENT OF ENERGY

Heat Pumps 101| July 14, 2016

Why Ductless???



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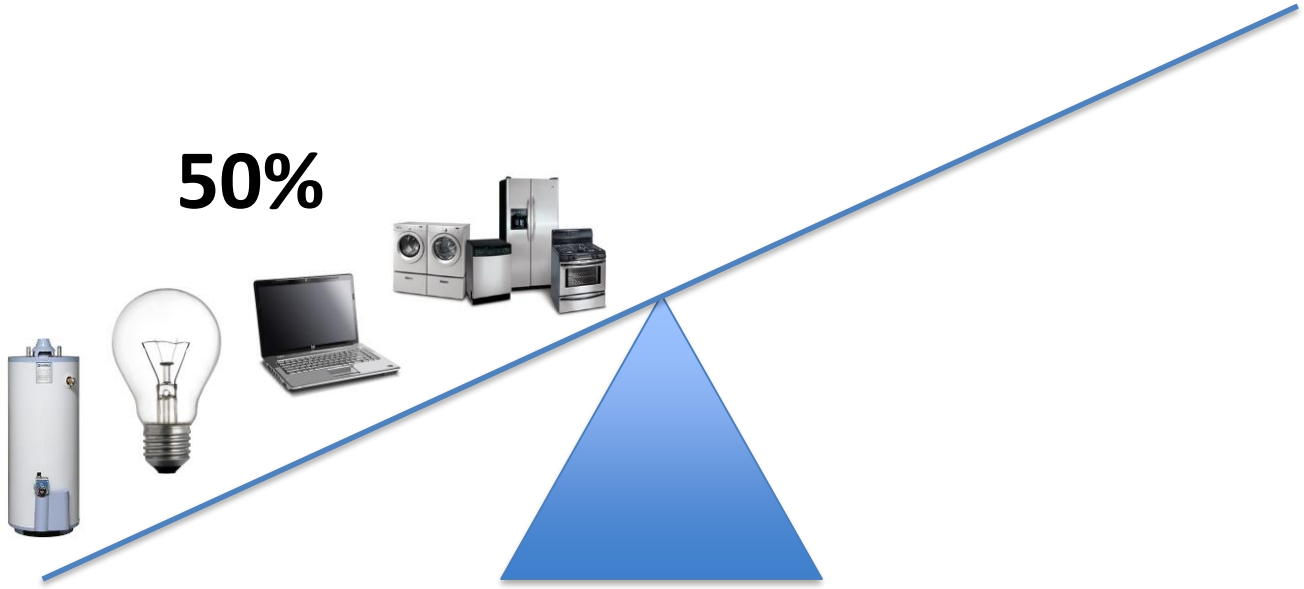
Energy use in American Homes



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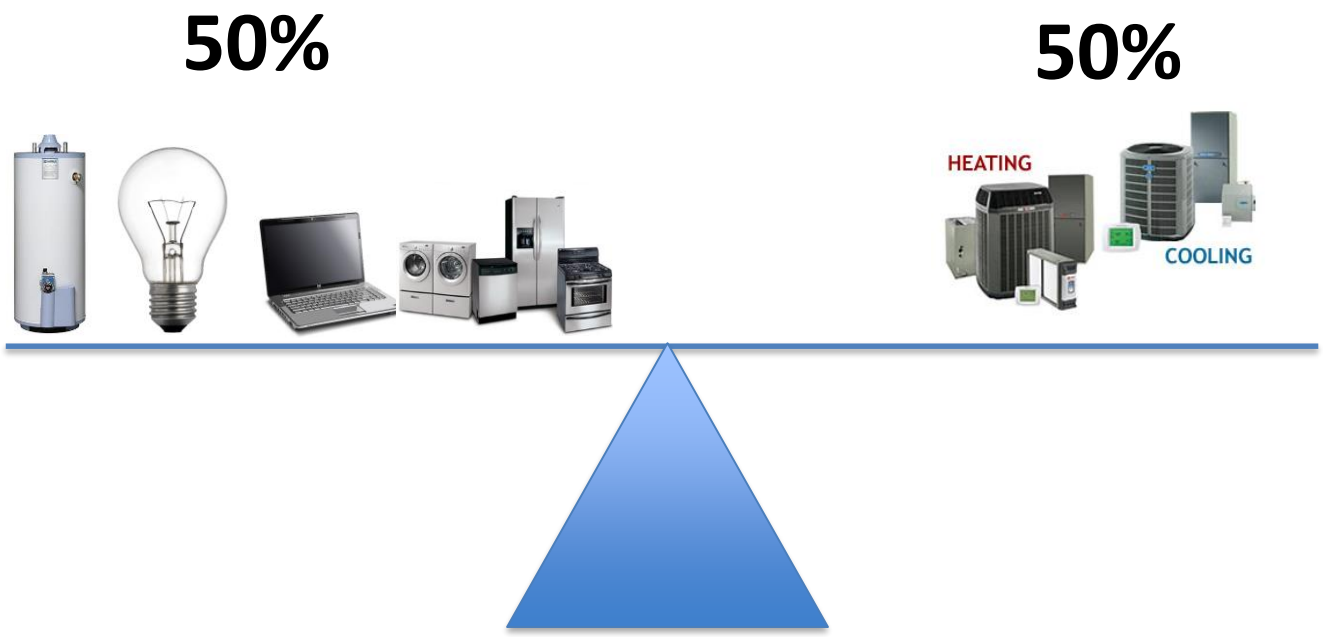
Energy use in American Homes



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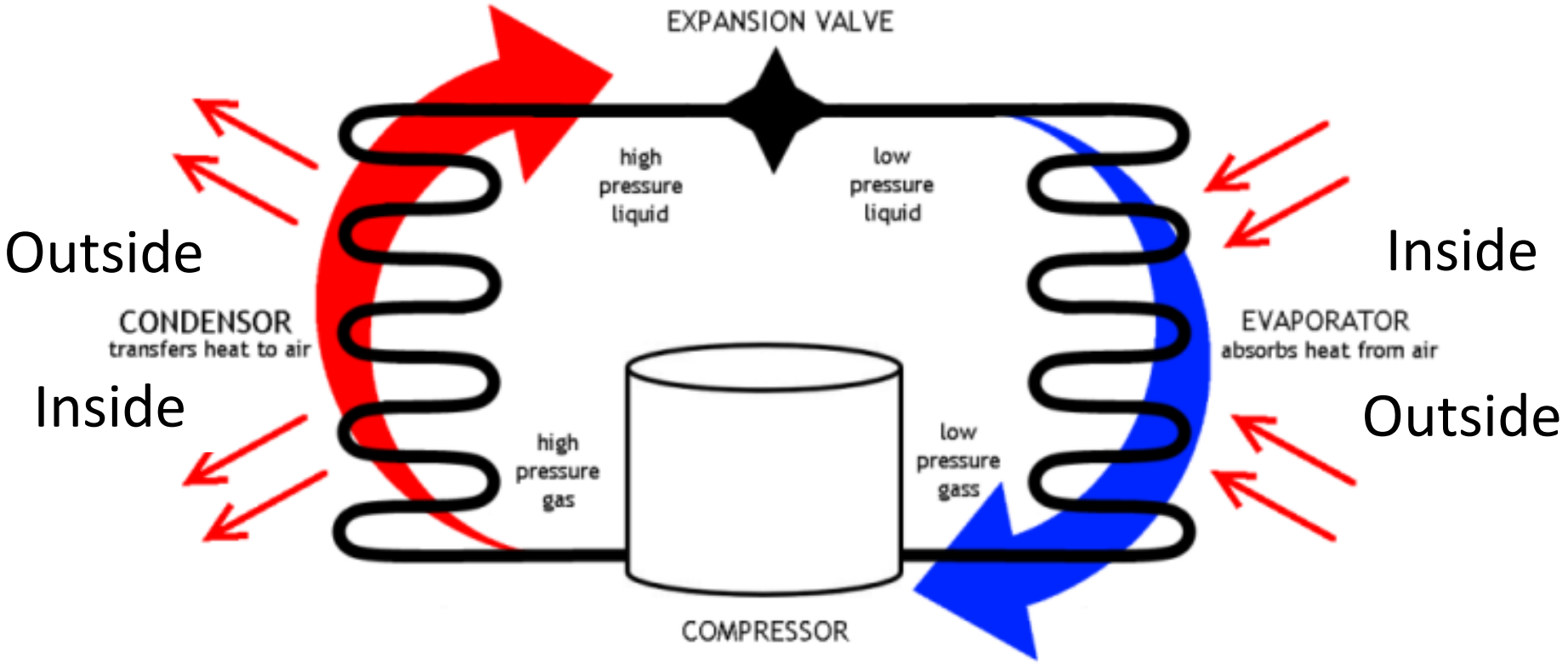
TECHNOLOGY

Basic Refrigeration Cycle



Air Conditioning Mode

Heating Mode

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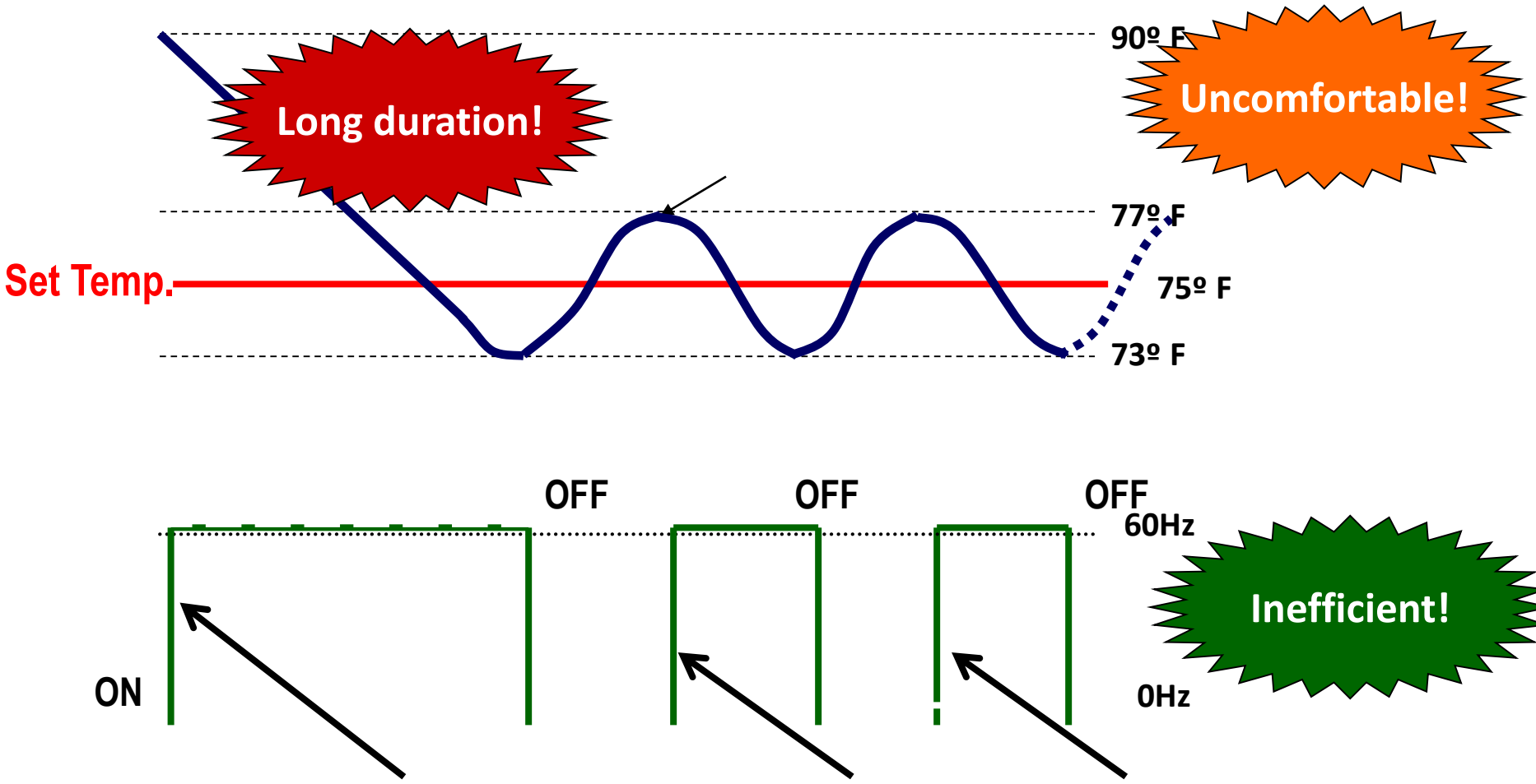
Conventional Compressor Operation



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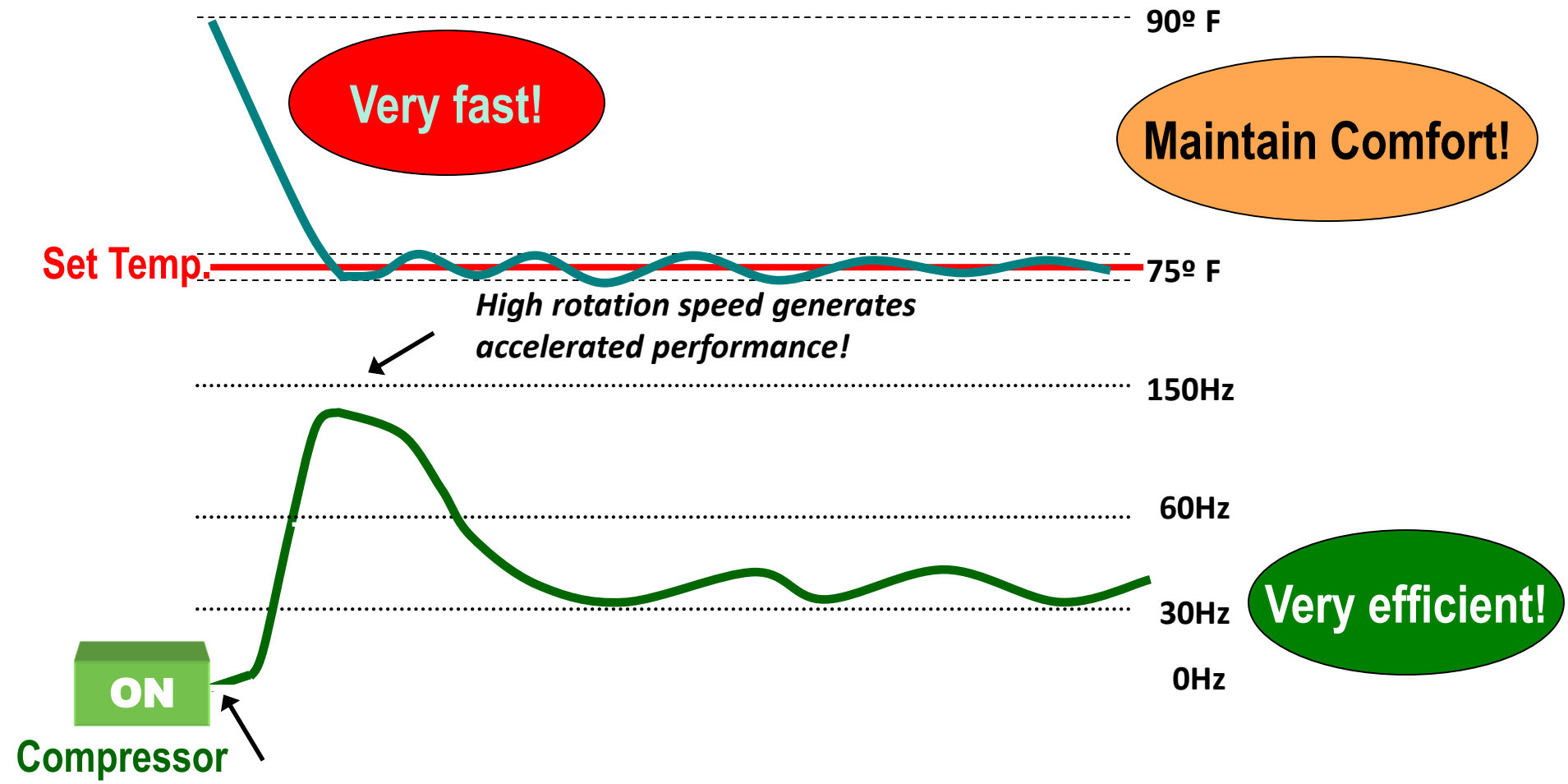
Inverter Compressor Operation



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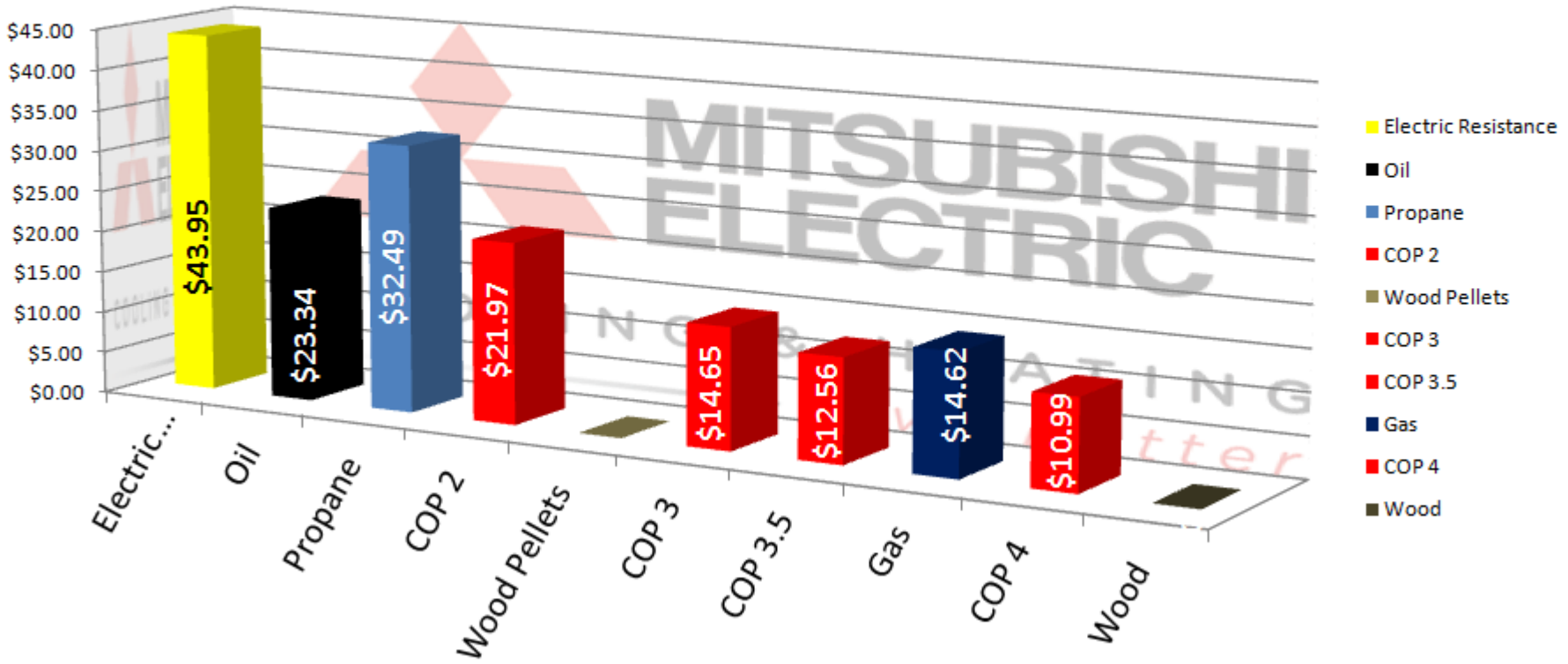
Cost per Million BTU's



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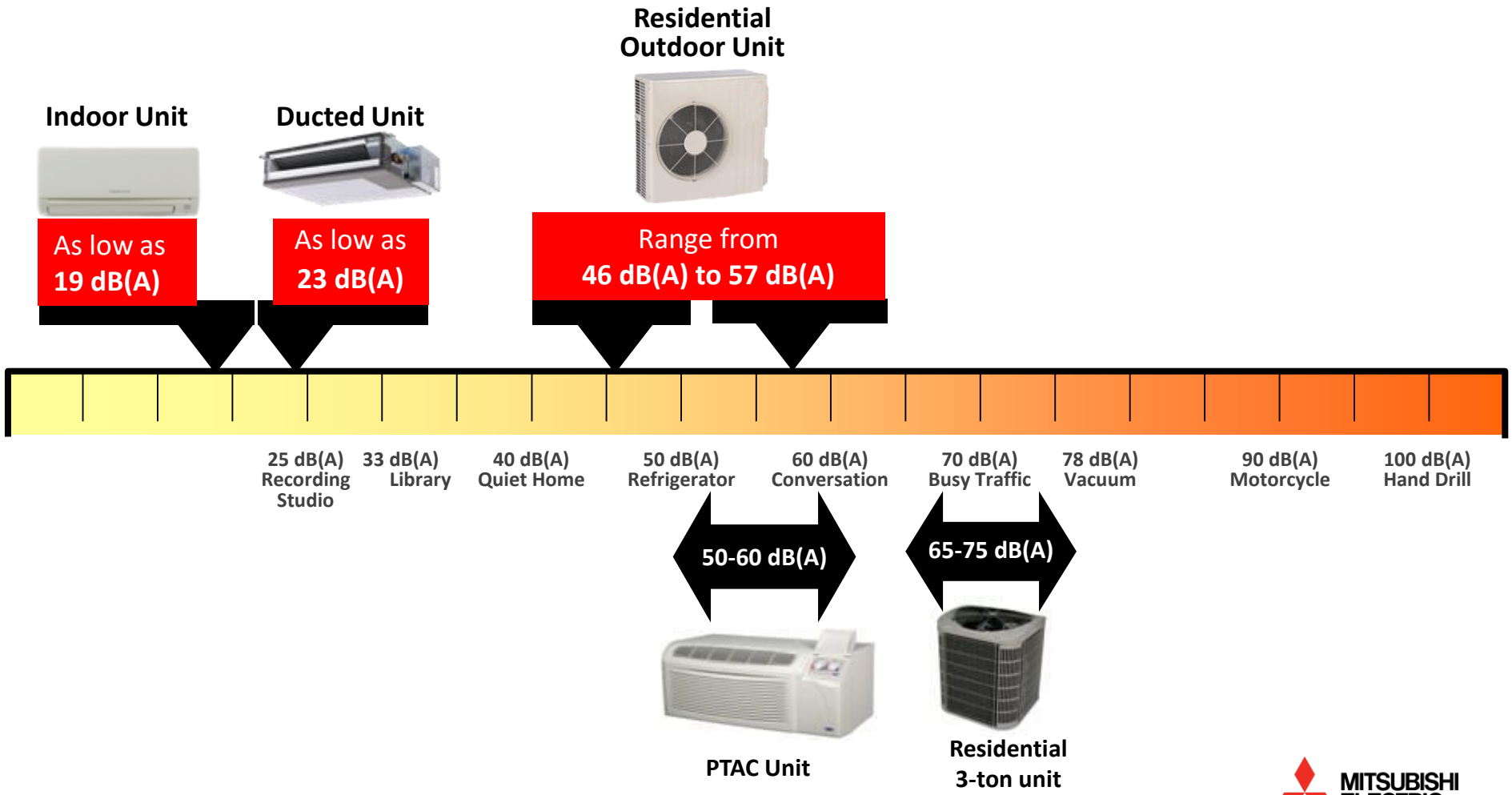
Quiet Operation



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APPLICATIONS

Primary Heating Systems

Keep Existing Heat for Secondary:
Unless sized for heat

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Primary Heating Systems

System Size	% of Total Load	% Displaced
6,000	17%	38%
12,000	33%	70%
18,000	50%	89%
24,000	67%	98%
30,000	83%	99%
36,000	100%	100%

Sole Source Heat

No Back-up

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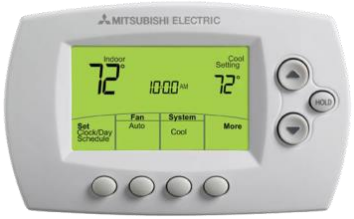
Residential Options



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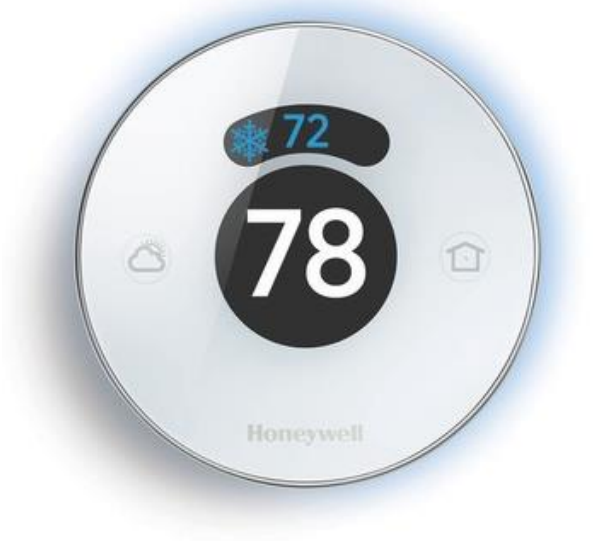
Wi-fi Thermostats



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Single Zone

GE/GL

FH

SLZ

SEZ

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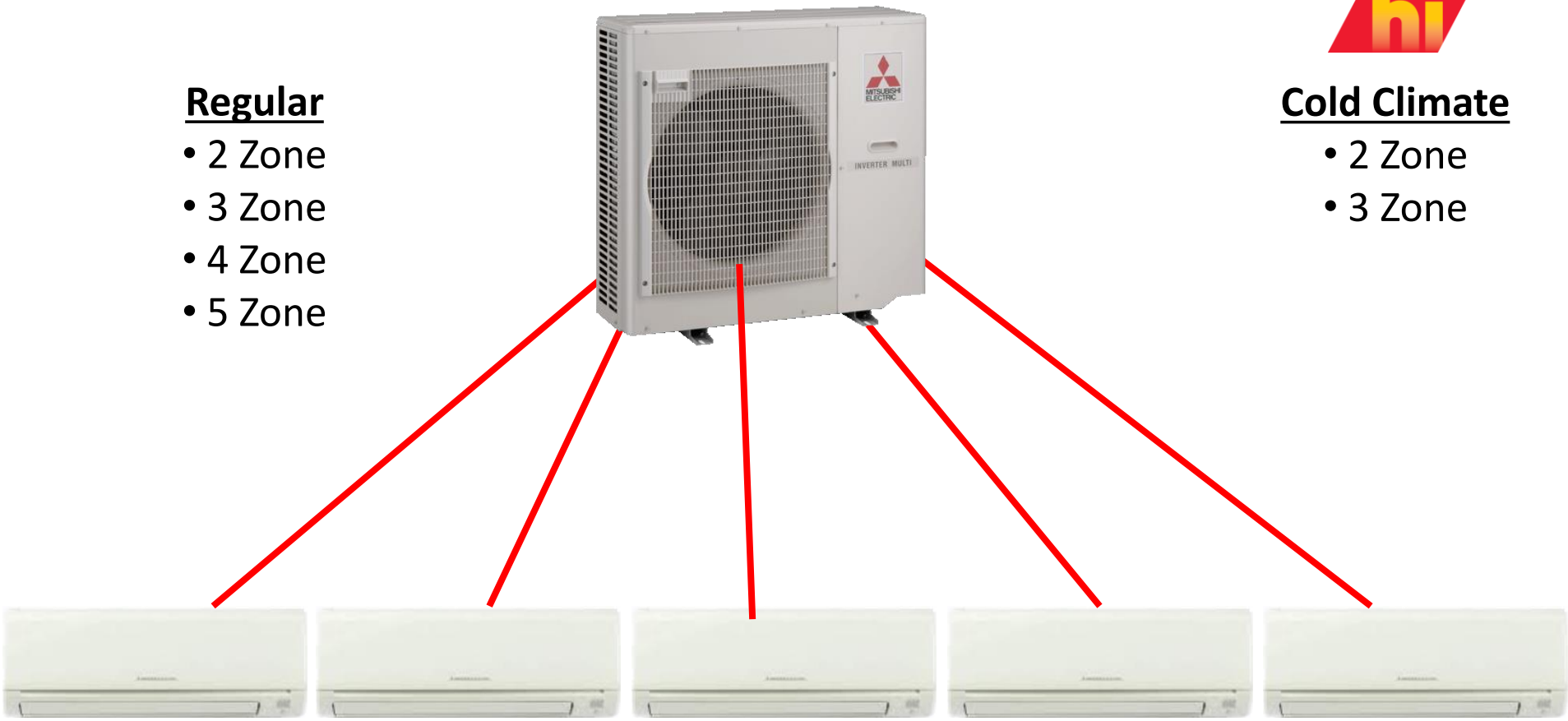
Multi Zone

Regular

- 2 Zone
- 3 Zone
- 4 Zone
- 5 Zone



Cold Climate

- 2 Zone
- 3 Zone

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Multi Zone

Regular

- 2 Zone
- 3 Zone
- 4 Zone
- 5 Zone

Cold Climate

- 2 Zone
- 3 Zone

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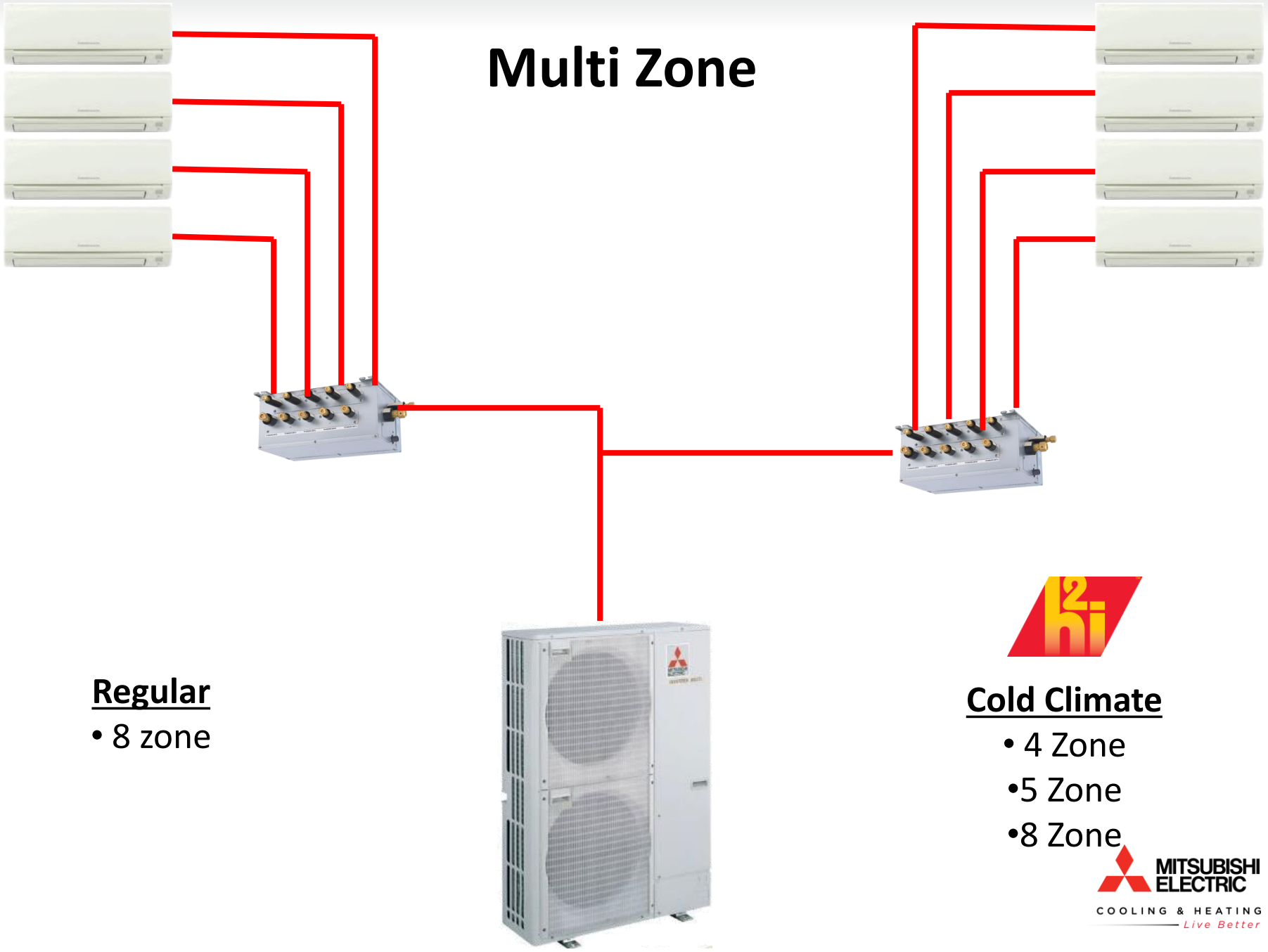
Multi Zone



Regular

- 8 zone

Cold Climate

- 4 Zone
- 5 Zone
- 8 Zone

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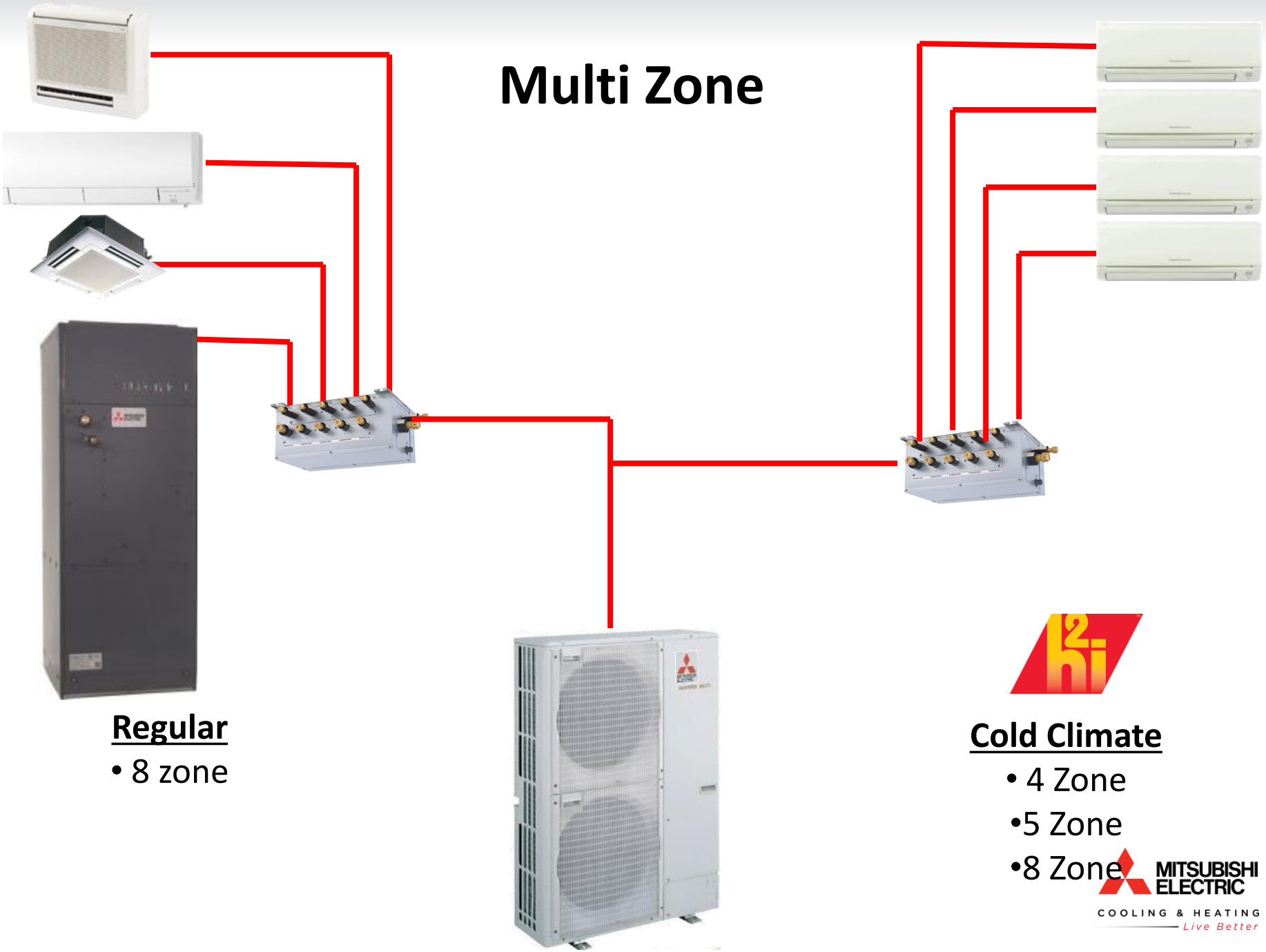
Multi Zone



Regular

- 8 zone

Cold Climate

- 4 Zone
- 5 Zone
- 8 Zone

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Thank You

Rick Nortz
Manager, Strategic Accounts & Utility Programs
617-733-1058

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Presentation Highlights: Mitsubishi Electric – Ductless Heat Pumps

- **The Opportunity:**
  - Two ways to save energy with heating and cooling systems: (1) tighten the building envelope, and (2) install more efficient heating and cooling equipment.
  - Only 8% of households in the U.S. use ductless heat pumps.
- **The Advantage:**
  - A normal system is either on or off (100% or 0%), meaning they shut off completely when the desired temperature is reached – designed to match the hottest day of the year (meaning every other day, the system is oversized).
  - A ductless heat pump has the ability to ramp the compressor up or down to match the load. The system is designed usually to match the hottest day of the year. By matching the load, the heat pump only needs to use as many BTUs as the load.
  - Heat pumps are can be less expensive than using natural gas for heating.
  - Can be used as sole heating/cooling source, or can be used as a primary system with a secondary as backup during extremely cold temperatures.
  - **"Not your grandfather's heat pump."** Ductless heat pumps are operable at low temperatures (some models up to -18 degrees, depending on atmospheric conditions). Additionally, the heat pump is quiet to run and can be controlled with a thermostat.
- **What's Next?**
  - Next major change in this industry are consolidated controls for the primary and secondary heating system. Mitsubishi is also rolling out a combine space and water heating system.

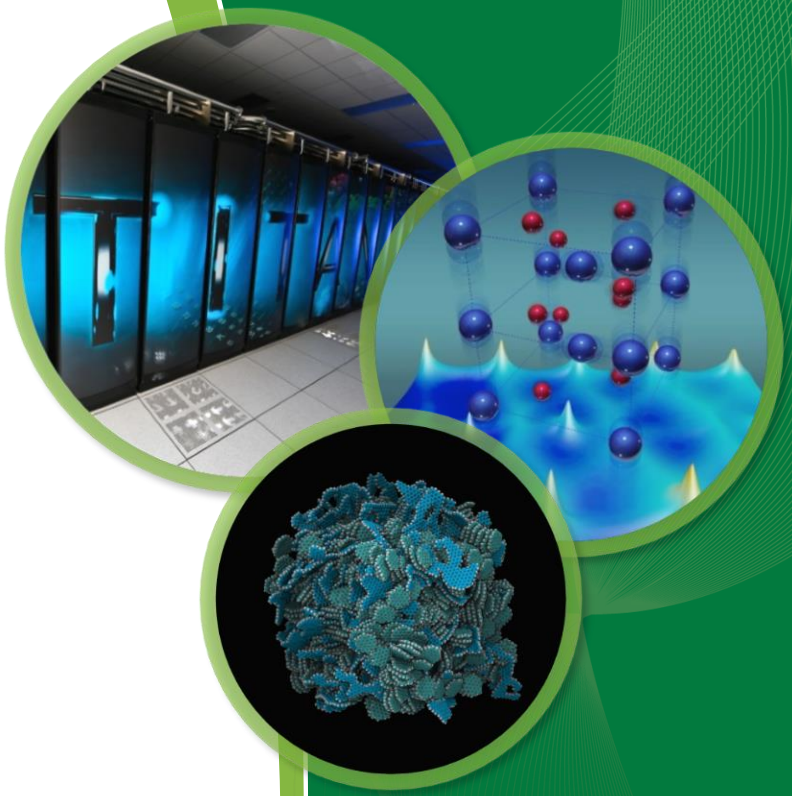
U.S. Oak Ridge National Laboratory

U.S. DEPARTMENT OF ENERGY

Low-cost, Self-powered Wireless Sensors for Building Monitoring Applications

Teja Kuruganti, PhD

Oak Ridge National Laboratory



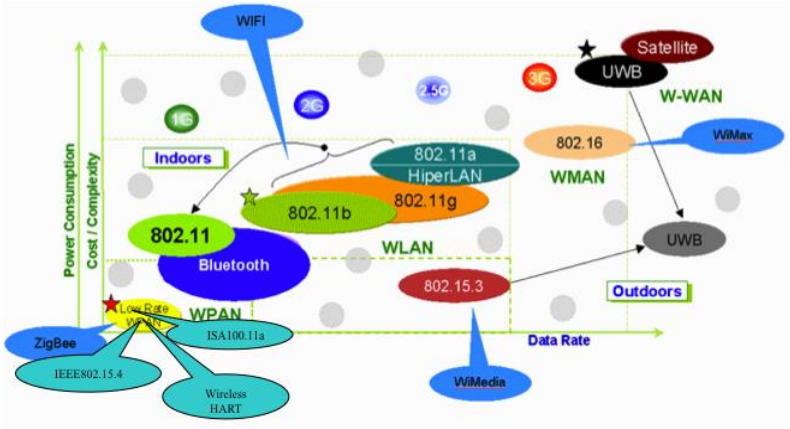
OAK RIDGE National Laboratory

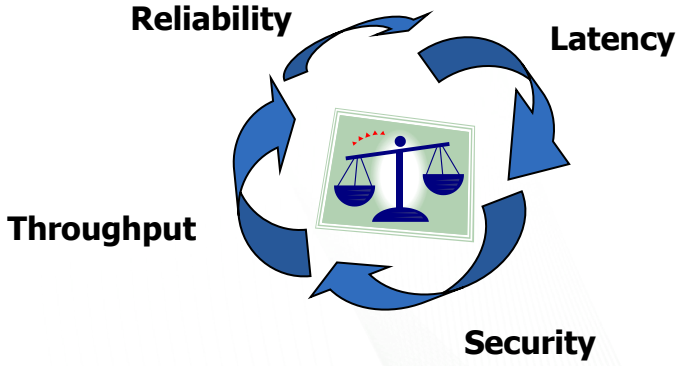
Objective

The objective of the project is to:

- Evaluate manufacturing requirements and design trade-offs for developing self-powered, and multi-sensor wireless platforms
- Manufacture prototypes, in collaboration with our partners, of wireless sensors using innovative manufacturing techniques;
- Evaluate performance of the prototypes and improve platform design to achieve cost-effective wireless sensors applicable to building requirements.

Advanced sensors and controls have the potential to save 20-30% energy consumed by buildings.





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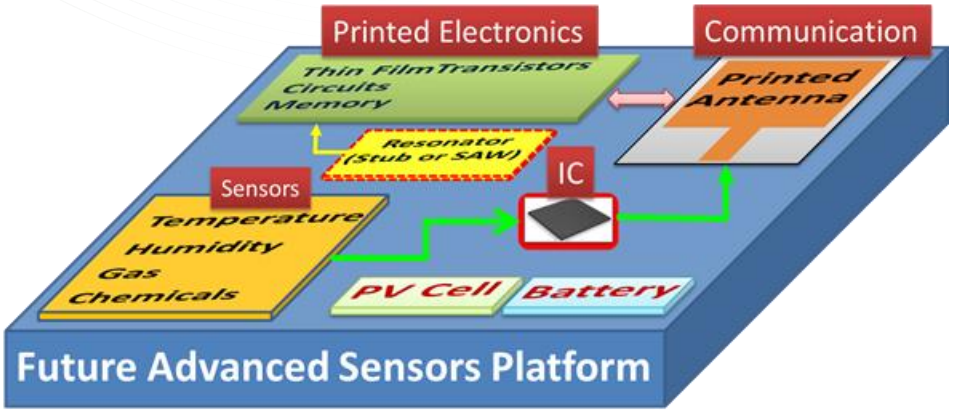
Approach – Multifunctional Wireless Sensors

Multifunctional Sensor Platform

Current wireless sensor Platform: $150-$300/node

Proposed Advanced Sensors Platform: $1-$10/node



Four Key Elements of Technology

1. Low-power Wireless Communication
2. Energy-Harvesting and Storage
3. Integrated System Design
4. Innovative low-cost manufacturing

Key Technology Improvements

→ **Low-power wireless**
→ **Multifunctional sensor**
→ **Advanced materials**

Building Monitoring System Development

In Partnership with Molex

- Develop wireless sensor system to enable increased building energy efficiency
- Provide information for optimal control of energy consuming systems: HVAC, Lighting
- Self-powered “peel & stick” for easy upgrades in existing buildings

Approach

- **Ultra-low power wireless communication**:
  - Printed Antenna, Spread Spectrum Communication
- **Energy harvesting**:
  - Thin Rechargeable Battery, Flexible PV
- **Multiple sensors**:
  - Temperature, humidity and light sensors
- **Thin, light form factor**:
  - Base circuit printed on PET film
  - Low temperature solder based component attach

<u>Success Criteria</u>: Synergy among PV-Battery-Antenna-Sensor components to meet cost/performance objectives for Buildings Applications

OAK RIDGE National Laboratory

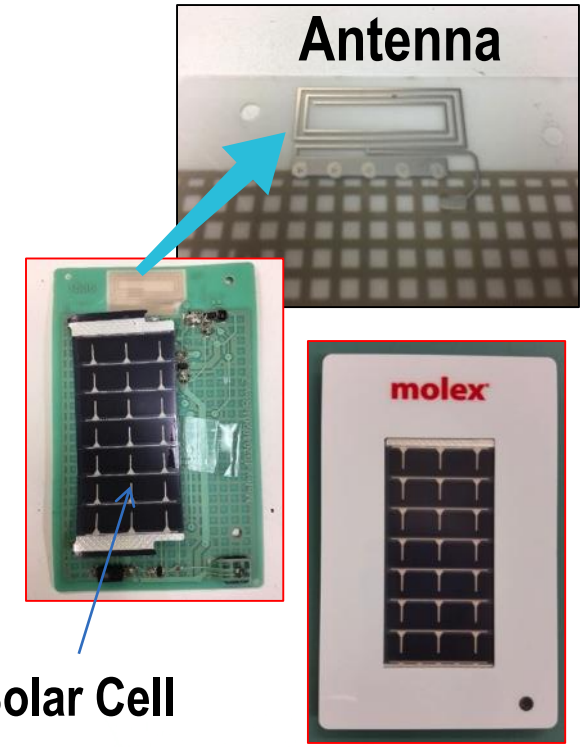
molex

OAK RIDGE National Laboratory

Building Monitoring System

Distinctive Characteristics: Integrated System

- Operational after one hour of charge
- 3 days operation on a single charge broadcasting once per minute in the dark
- Broadcasting once every 15 minutes → 40 days operation!
- 9.5 hours to completely charge the battery
- Current consumption of Tx – 10 mA (time: 1 second)
- Light sensor configured for on/off reporting
- Ongoing work to test temperature and humidity sensors



Addressing Key Issues

- Improve communication performance: reduce networking infrastructure, scalability.
- Increased co-integration: high-resolution printing approaches on flexible substrates.
- Investigate integration of other sensors of interest including indoor air quality sensors.
- Integration of energy harvesting and storage components.
- Working with building equipment and/or building automation manufacturer(s) to identify application specific requirements.

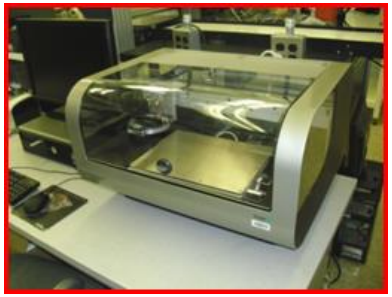
Printing and Low Temperature Curing

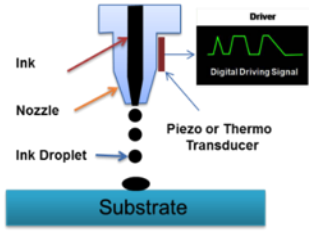
Inkjet Printing

Printing Challenges:
- Resolution
- Process tolerance
- Defect density
- Printing yield

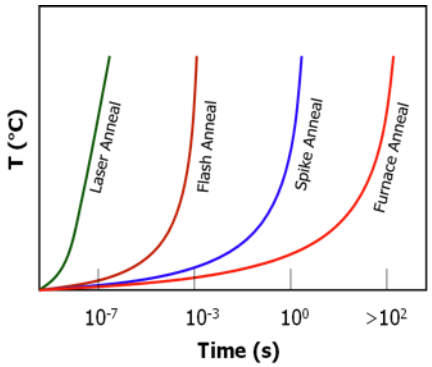
Line Width and Spacing Control
- **Our Target:** down to 100µm

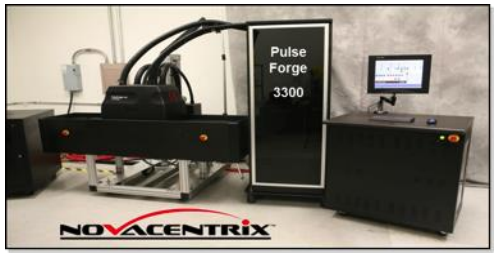
Piezoelectric Head





Curing: Pulse Thermal Processing

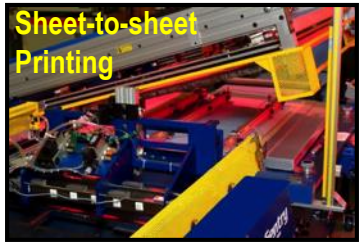




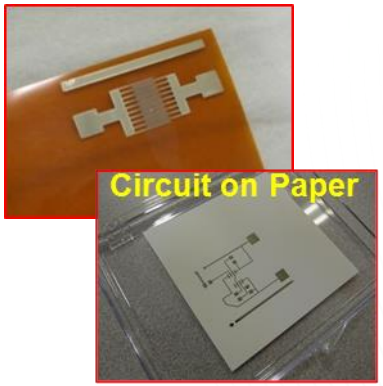
Power Density: >20KW/cm^2
Process Window: µs-milliseconds-continuous

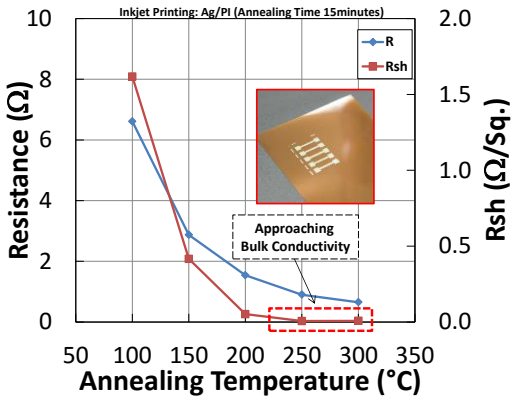
Molex: Integrated Manufacturing

Naperville, Illinois, USA
- Mid range volume manufacturing
- Flat bed printing
- Local design support
- Final Assembly
- 60,000 sq ft
- ISO 9000, ISO14000



Printed Metal





Conductivity approaches the Bulk value

OAK RIDGE National Laboratory

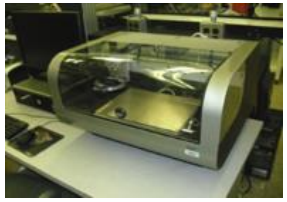
Integration: Information from low-cost wireless sensors enables increased energy efficiency

Self-powered “peel-and-stick” low-cost wireless sensors enable control system upgrades that could potentially reduce energy consumption of buildings by up to 20-30%

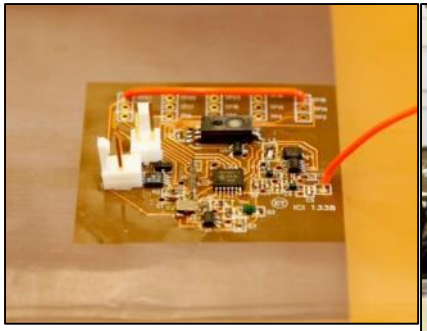
ORNL-developed sensor platform has potential to reduce cost from $150-300/node to $1-10/node while also reducing installation cost.*

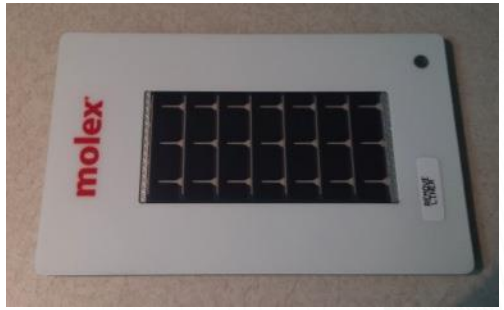
*Price points may vary based on market conditions.

Provide information for optimal control of energy-consuming systems (HVAC, lighting); enable fault detection and diagnostics



molex®





Low-cost wireless sensor prototype on flexible substrate

OAK RIDGE National Laboratory

Lessons Learned : Oak Ridge National Laboratory – Sensors for Building Monitoring

- **The Opportunity:**
  - Oak Ridge National Laboratory is working on reducing the cost of wireless sensors that are used to measure different things in a home—light, energy, etc.—to reduce energy use.
  - 3-D printing has lowered the cost to develop new technologies.
- **The Advantage:**
  - **"Not your grandfather's radio."** Radios can now do innovative things, like talking for more time on less battery. The battery on the wireless sensor lasts 40 days and takes 9 hours to charge using a solar cell.
  - Sensors are low-cost and have a stick-on application. Oak Ridge is currently field testing the sensors and expects them to reach market in 6-8 months.
- **Lessons:**
  - Know the application before selecting a technology, as there are trade-offs to different types of technologies. For example, to increase security, you lose throughput.
- **What's Next?**
  - The lab is continuing to work on solutions to deploying sensors without other infrastructure needs, such as a centralized control system. Oak Ridge is also looking into sensors for air quality and air flow.

Air Source Heat Pumps:
U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

HVAC, Water Heating and Appliance R&D

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Antonio M Bouza
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July 14,2016

Introduction

Program Goals:

BTO's ultimate goal is to reduce the average energy use per square foot of all U.S. buildings by 50% from 2010 levels. Emerging Technologies Program's goal is to enable the development of cost-effective technologies capable of reducing a building's energy use per square foot by 30% by 2020 and cutting a building's use by 45% by 2030, relative to 2010 high-efficiency technologies.

HVAC/WH/Appliances goals require by 2020 that the potential energy use intensity (EUI) for:

- HVAC would be 60% lower
- WH would be 25% lower
- Appliances would be 15% lower
- All relative to 2010 energy-efficient baseline

Two-pronged approach to accelerate the development of new technologies:

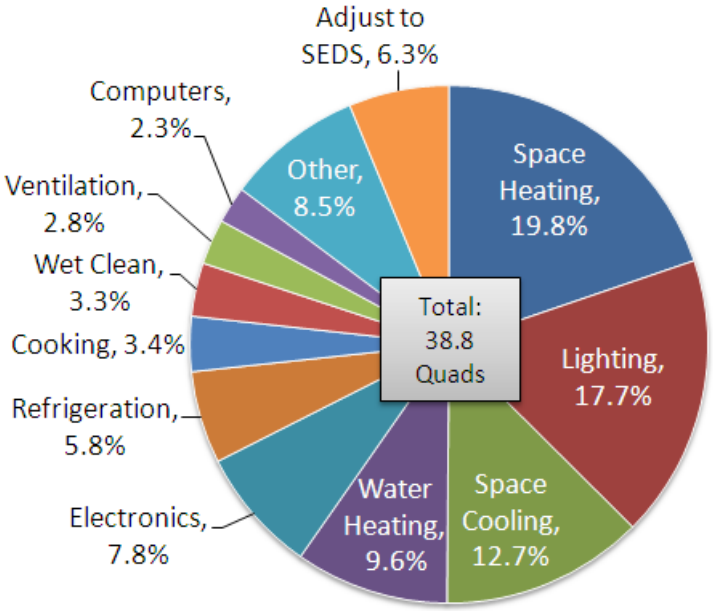
1) Accelerate the development of **near term** technologies that have the potential to save significant amount of energy (including cost reduction activities, bending the cost curve)
2) Accelerate the development of the **next generation** of technologies that have the potential of "leapfrogging" existing technologies by pursuing entirely new approaches (including crosscutting efforts)

The goal is to develop technologies that save energy and reduce our environment burden while introducing them in the simplest application first, highest probability of success.

The challenge…

- In addition to individual end-use solutions, integrated solutions are also pursued
- Energy cascading (using the waste heat from one process as the source of energy for another) is utilized
- Optimizing energy use in a building, an optimum point instead of just a local minimum (single end-use)
- Broad approach includes pursuing crosscutting technologies that enable better HVAC, water heating and appliances
- A **fast way to develop new technologies** and get them into the market is through CRADAs and FOAs (with manufactures as primes or as team members)
- Program seeks to build upon its past results and speed market availability and acceptance of economically viable new technologies
- *Not working in a vacuum*, most equipment is covered by appliance standards
- Engage manufacturers and BTO deployment teams
- ***Efficiency first***

Buildings Primary Energy Consumption



CRADAs: *Collaborative Research and Development Agreements*

Integrated Heat Pump (IHP) Technologies

Integrated Approach

- Energy cascading is the process of using the waste (or residual) heat from one process as the energy source for another
- Concept is to merge several end-use together, generate a new solution, coupling things together
- Good example exists today from BTO's integrated heat pump work where the waste heat from the AC is used to heat water for free with energy saving potentials approaching 50% when HVAC and water heating is coupled
- HVAC Integrated Heat Pump (IHP) Technologies:
  - Air Source (AS)-IHP (2-speed), ***40% to 45%*** energy savings vs. min efficiency equipment suite
  - AS-IHP (variable speed), ***45% to 55%*** energy savings vs. min efficiency equipment suite
  - Multifunction Natural Gas-driven HP (10 to 17.5 kW), 70% peak demand savings; 40% source energy savings vs. minimum efficiency electric heat pump, with power generation
  - Thermolift, effort to demonstrate Vuilleumier heat pump (VHP) technology
  - Developed Standard Method of Test (MOT) for IHP, worked with ASHRAE/AHRI

ClimateMaster CRADA

- Multifunction Electric Heat Pumps, GS-IHP
- Space conditioning, water heating, dehumidification, and ventilation
- Trilogy 45 Q-Mode™ could save about 60% of annual energy use and cost for space conditioning and water heating in residential applications
- 30% more efficient than any other available ground-source heat pump
- Broke the 45 EER Barrier in the USA
- 80% reduction in electricity use
- Award Winning

R&D 100

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Heat Pump Technologies: Regional Solutions (Cold Climates)

Cold Climate Heat Pump Technology

- Target markets: Cold climate regions
  - Where natural gas is unavailable or want to displace oil heat
  - Improving the performance of natural gas systems
- Unlike standard heat pumps, can maintain capacity and efficiency (COP) at low ambient temperatures
- Technology includes multi-stage compressors, non-HFC refrigerants (e.g. CO_2) and absorption systems.
- If electricity generated from low carbon sources, can reduce carbon emissions from gas heating

Image Source: "High Performance Home Technologies – Guide to Determining Climate Regions by County." PNNL and ORNL. August 2010.

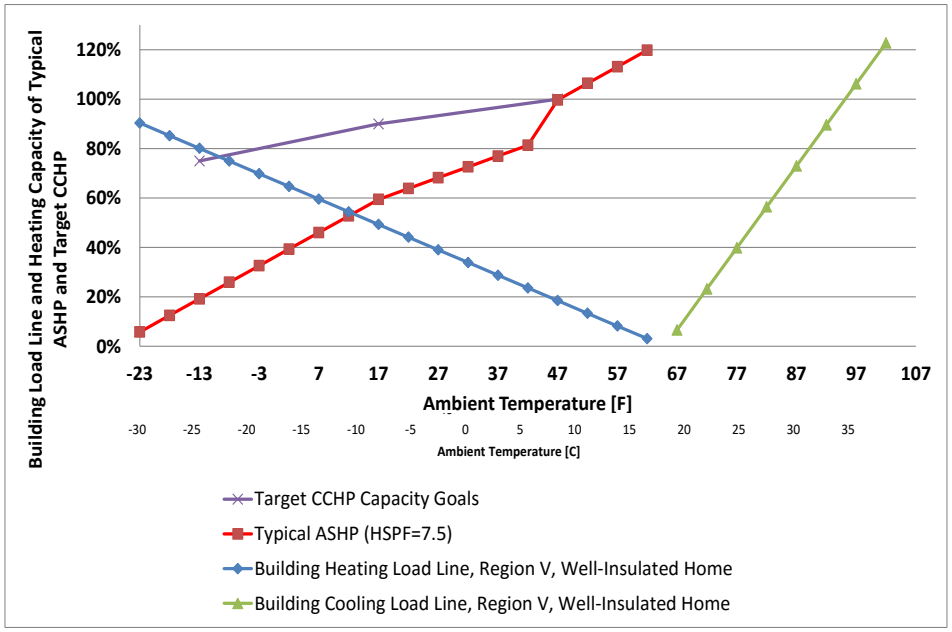
ORNL and Emerson Climate Technologies, Cold Climate Heat Pump

Between 2011 and 2015, researchers at DOE's Oak Ridge National Laboratory (ORNL) and Emerson Climate Technologies engaged in a Cooperative Research and Development Agreement (CRADA) to develop a high efficiency, Cold Climate Heat Pump (CCHP) for the U.S. residential market.

- Exhaustive technology survey and conducted in-depth engineering design and building energy modeling, using the ORNL Heat Pump Design Model (HPDM) and EnergyPlus
- Ultimately, a system was chosen that utilized tandem compressors in combination with a compressor discharge temperature control
- Tandem compressors, i.e. two parallel, equal-size, single-speed compressors, provided by Emerson Climate Technologies, were optimized for heating operation and can tolerate discharge temperatures up to 280°F

Benefits

- Up to 70% energy savings, in comparison to electric resistance heat
- Up to 40% energy savings, in comparison to conventional air-source heat pumps
- Operate down to -13°F (-25°C) while utilizing no supplemental resistance heat
- Achieve a COP > 4.0 (at the 47°F (8.3°C) AHRI rating condition) and maximum efficiency degradation of 50% and capacity loss of 25% at -13°F (-25°C) ambient conditions



DOE Cold Climate Heat Pump R&D Performance Targets (Electricity, Residential)		
Ambient Temperature (°F)	COP	Maximum Capacity Decrease from Nominal (%)
47	4	0
17	3.5	10
-13	3	25

ORNL and Emerson Climate Technologies, Cold Climate Heat Pump

Prototype was built based on the tandem compressors concept and used in a field investigation in an occupied home in Ohio for 12 months, beginning in 2015.

- During the heating season
  - Measured HSPF of 10.8 was achieved
  - Able to operate in temperatures as low as -13°F with no resistance heat use
  - Acceptable comfort level through the heating season,
- During the cooling season, achieved a measured seasonal energy efficiency ratio (SEER) 17.7
- In comparison to the homeowner's previous conventional air-source heat pump (ASHP) >40% energy saving was achieved by the prototype CCHP in a peak heating load month with overall average ambient temperature around 20°F.
- As part of this CRADA, a second "premium" prototype CCHP design using tandem vapor injection (VI) compressors was also developed
  - Laboratory tests, the "premium" prototype reached 4.4 COP at 47°F; 88% heating capacity and 2.0 COP at -13°F, and 3.1 COP at 17°F, with a rated HSPF of 11.8.
  - "Premium" prototype performance is uniformly 5% higher than that of the field-tested prototype with non-VI single-speed compressors.

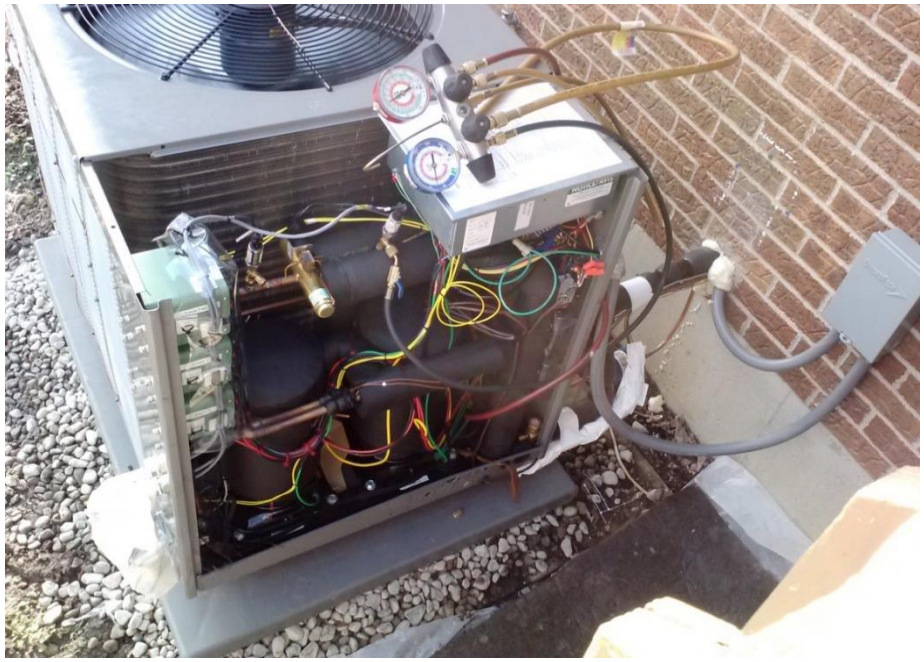


Figure: Photo of the prototype CCHP outdoor unit as installed at the Ohio field test site in January 2015

This project resulted in the development of a split system, CCHP, providing a nominal 36,000 Btu/hr (10.6 kW) heating capacity with a COP > 4.0 (at the 47°F AHRI rating condition) and maximum efficiency degradation of 50% and capacity loss of 25% at -13°F ambient conditions.

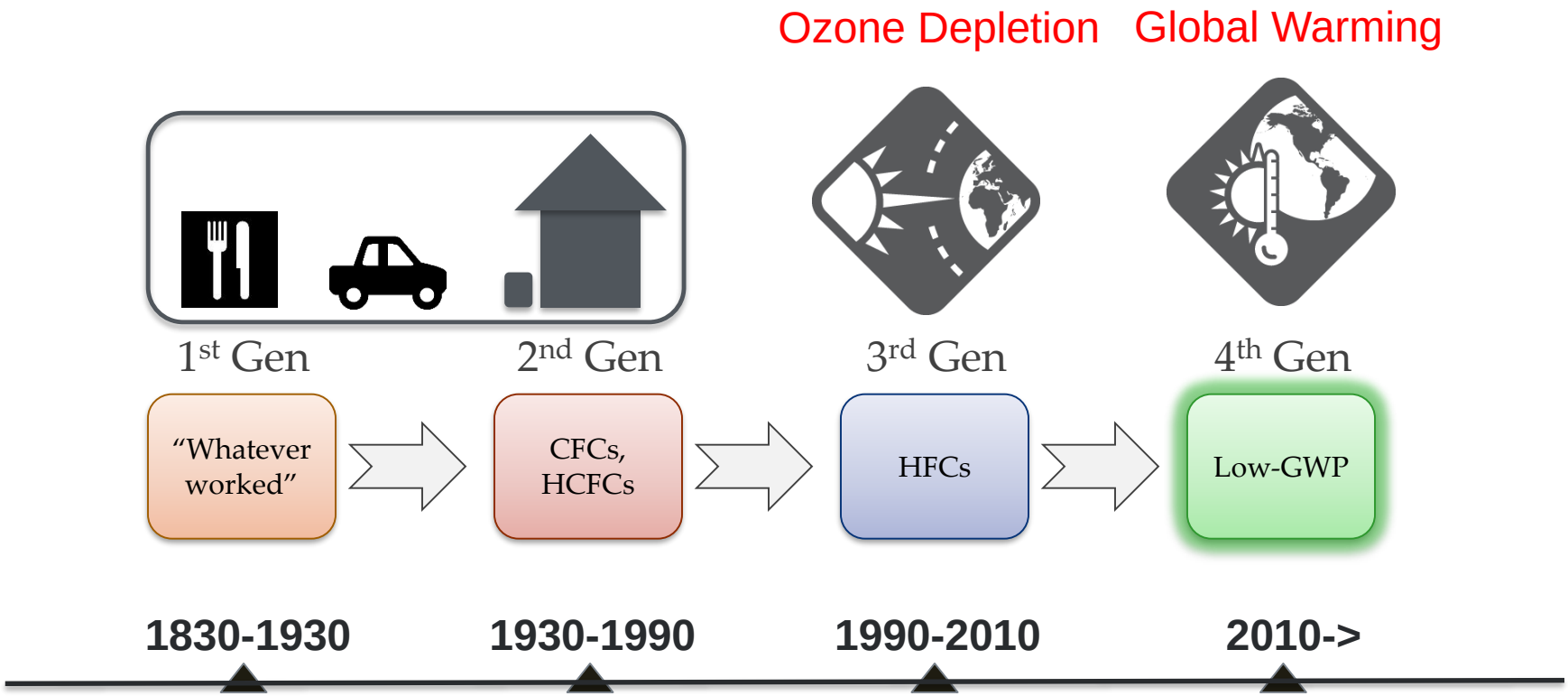
Air Conditioning

World set to use more energy for cooling than heating,
theguardian.com Oct 26, 2015

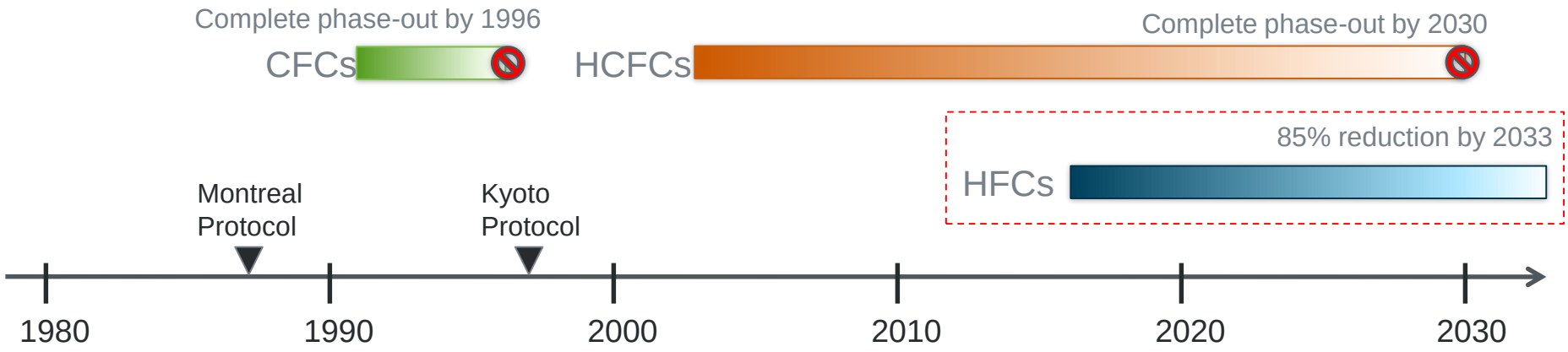
- Demand for air conditioning and refrigeration growing so fast that it threatens to smash pledges and targets for global warming.
- Worldwide power consumption for air conditioning alone is forecast to surge 33-fold by 2100 as developing world incomes rise and urbanization advances.
- Already, the US uses as much electricity to keep buildings cool as the whole of Africa uses on everything; China and India are fast catching up.
- By mid-century people will use more energy for cooling than heating.

"Nearly all of the world's booming cities are in the tropics and will be home to an estimated one billion new consumers by 2025. As temperatures rise, they — and we — will use more air-conditioning.", *NYTimes.com*

Background

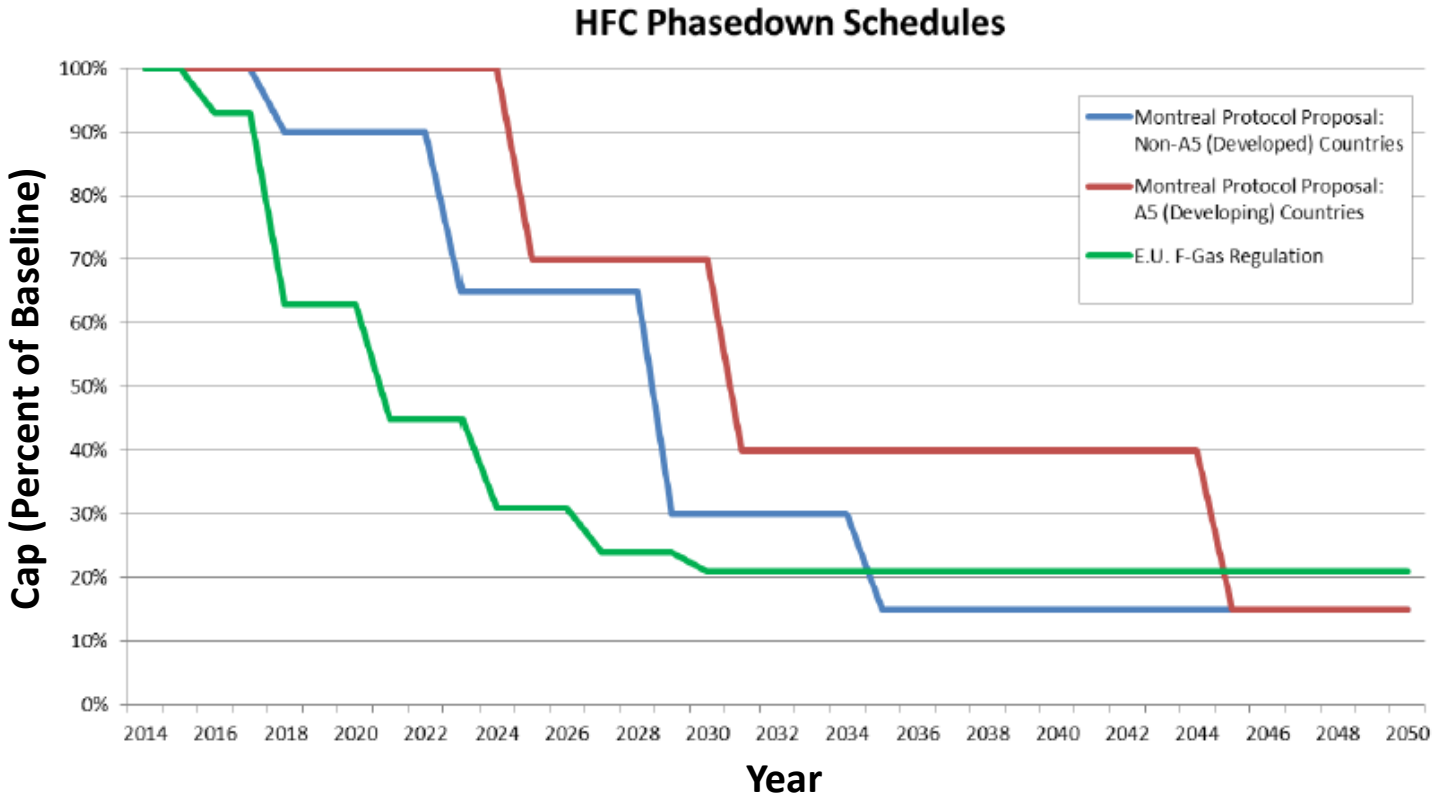


U.S. has successfully achieved similar phase-outs of CFC and HCFC refrigerants



- HFC phase-out is more technically challenging than prior refrigerant transitions
- For some major applications, no HFC-alternatives have been identified that could be used today. (e.g. R-410a replacement for residential and commercial air conditioning)
- The proposed phase-down would plateau at an 85% reduction rather than a complete phase-out

Low-GWP Cooling R&D Plays Major Role in International Agreements



Source: Goetzler et al., 2014, "Research & Development Roadmap for Next-Generation Low Global Warming Potential Refrigerants, http://energy.gov/eere/buildings/downloads/research-development-roadmap-next-generation-low-global-warming-potential

- In response to questions that some countries have raised about whether such refrigerants are viable in high-ambient conditions
- Tested the performance of AC units that use low-GWP refrigerants in high-ambient temperatures at Oak Ridge National Lab
- ORNL designed a test matrix of 84 tests
- http://info.ornl.gov/sites/publications/files/Pub59157.pdf

U.S. DOE low-GWP HVACR strategy

DOE envisions a future where low-GWP HVAC solutions are the new norm and non-vapor compression will be prevalent in several end uses.

Key Driver: DOE's goal to develop next-generation technologies that 'leapfrog' existing technologies and result in dramatically improved efficiency with near-zero GWP cooling fluids.

- **Short Term:** Develop and evaluate low-GWP alternative refrigerants, including flammability characterization and hot climate performance
- **Mid Term:** Develop HVAC&R systems that can handle low-GWP refrigerants
- **Long Term:** Develop non-vapor compression systems that use zero-GWP refrigerants

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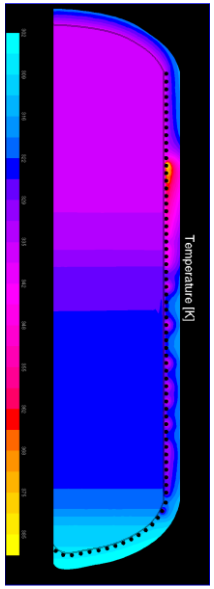
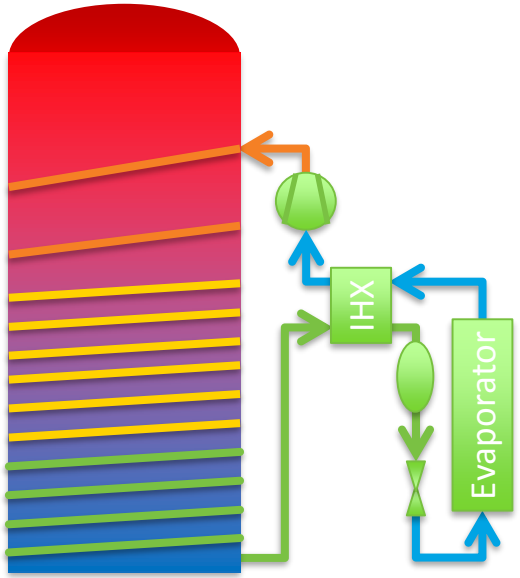
ORNL: CO2 Heat Pump Water Heater

- Project is developing a carbon dioxide (CO2) heat pump water heater (HPWH) that meets ENERGY STAR® standards for HPWHs
- Project team will demonstrate the performance and energy savings of field ready CO2 HPWH prototypes in ORNL research houses and perform Gate 6 evaluation (passage from engineering development to product demonstration).
- Project team will perform a design optimization of wrap-around gas cooler design to improve system reliability and reduce cost
- With full deployment, ORNL estimates that cost-effective CO2 HPWHs could reduce energy use by 0.8 quads a year
- Unlike currently available electric heat pump water heaters, a CO2-based system would have minimal GWP.



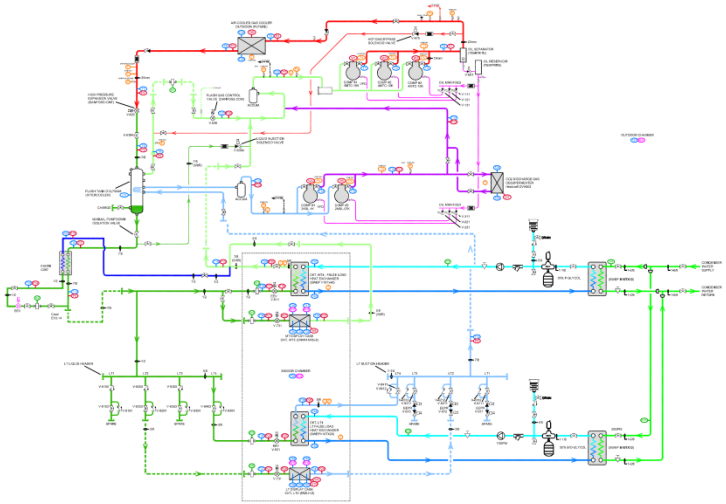


U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

HillPhoenix: Transcritical CO2 Supermarket Refrigeration System (Advansor System)

Research supported by BTO, Oak Ridge National Laboratory's (ORNL's) cooperative research and development agreement (CRADA) with **HillPhoenix**

- Low GWP refrigerant (CO2), with 25 percent lower energy consumption than existing systems, and 78% lower GHG emissions
- Traditional supermarket refrigeration systems found in most grocery stores across the country are vulnerable to issues which can cause significant refrigerant leakage, emitting environmentally harmful greenhouse gases at an average rate of about 25% of their total normal operating charge per year (EPA, 2012).
- ORNL (CRADA with Hillphoenix
- Low-emission, high-efficiency commercial refrigeration system suitable for use in current U.S. supermarkets
- Hillphoenix's Second Nature® "Advansor System" is the first to be UL listed in North America and already has 12 applications in the U.S.



Hillphoenix
A DOVER COMPANY

OAK RIDGE National Laboratory

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Honeywell (R-448A): New Refrigerant Boosts Energy Efficiency of Supermarket Display Cases

Research supported by BTO, Oak Ridge National Laboratory's (ORNL's) cooperative research and development agreement (CRADA) with **Honeywell**

- Alternative refrigerant that minimizes the environmental footprint of supermarket refrigeration systems
- Can retaining their existing hardware and simply replace their current refrigerant with this option, greatly reducing the threat of environmentally harmful greenhouse gas emissions at a modest cost.
- Supported White House initiative to phase down hydrofluorocarbons (HFCs), powerful greenhouse gases that contribute to climate change
- Honeywell and ORNL have developed Solstice N40, a non-toxic hydrofluoroolefin (HFO) -based refrigerant alternative for R-404A, most common refrigerant used
- Offers a lower-global-warming potential and energy-saving replacement for R-404A
    - GWP potential of 1,300, making it 67 percent less potent than R-404A
    - Creates energy savings of 10 percent compared to R-404A

Honeywell

OAK RIDGE National Laboratory

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Thank You and Contact Info…

The HVAC/Water Heating/Appliance subprogram develops cost effective, energy efficient technologies with national labs and industry partners. Technical analysis has shown that heat pumps have the technical potential to save up to 50% of the energy used by conventional HVAC technologies in residential buildings. Our focus is on the introduction of new heat pumping technologies, heat exchanger technologies, and advanced appliances, e.g., refrigerator and clothes dryers. Heat exchangers are used not only in air conditioning, heating, water heating and refrigeration but also in nearly every application that generates waste heat, a major crosscutting research opportunity. We are also pursuing non-vapor compression technologies, which have the potential to replace or be integrated with conventional vapor compression technologies, can provide 50% reductions in energy consumption, and have extremely low-global warming potential.

http://energy.gov/eere/buildings/hvac-water-heating-and-appliances

My Contact Info:

Antonio M. Bouza
Technology Manager | General Engineer
U.S. Department of Energy l Building Technologies Office | EE-5B
202.586.4563

Air Source Heat Pumps: U.S. Department of Energy

- The HVAC/Water Heating/Appliance R&D program is working on both **near-term and next generation technologies** with the aim to introduce the simplest application first, with the highest probability of success.
  - Near-term technological innovation: a new refrigerant fluid that reduces HFC emissions
  - Next-Generation: non-vapor technologies
- **Lessons:**
  - Sometimes researchers develop technology in one area and not realize its applicability in another area.
  - Merging end uses together can lead to innovative systems; for example, using waste heat from an HVAC system to heat water.
- **What's Next?**
  - Heat pumps that operate in extreme cold temperatures (-13 degrees F)
  - Cold climate applications of natural gas
  - Looking at pathways to prevent HFCs in refrigerants, which deplete the ozone
  - Developing a drop-in replacement for refrigerant solution

More Info: Emerging Efficiency Technologies

- HVAC, Water Heating, and Appliances
- Windows & Building Envelope
- Lighting
- Building Energy Modeling
- Sensors & Controls
- Buildings to Grid

For more information visit: http://energy.gov/eere/buildings/emerging-technologies

Explore planning, implementation, & evaluation strategies in the Residential Program Solution Center

- Handbooks - explain *why* and *how* to implement specific stages of a residential program.
- Quick Links - provide easy access to resources on the key issues that many programs face.
- Proven Practices posts - include lessons learned, examples, and helpful tips from successful programs.
  - See the latest post on Time-Limited Incentives.

https://rpsc.energy.gov

The Solution Center is continually updated to support residential energy efficiency programs—**member ideas are wanted**!

Solution Center Seeks Focus Group Volunteers

- Do these criteria describe you?
  - I have used the Solution Center to look for information
  - I am an program administrator or in a decision-making role for a residential energy efficiency program
- If interested, please respond in the chat field, or email BBRPSolutionCenter@ee.doe.gov (by 7/29) with:
  - Name
  - Email address & phone number
  - Organization & title/role
- WHEN: Focus group will take place the week of Aug. 15 by conference call. Time commitment ~1 hour

Peer Exchange Call Series

We hold one Peer Exchange call the first four Thursdays of each month from 1:00-2:30 pm ET

Calls cover a range of topics, including financing & revenue, data & evaluation, business partners, multifamily housing, and marketing & outreach for all stages of program development and implementation

Upcoming calls:

- August 4: Energy Efficiency Olympiad: Best Practices from Around the World (201)
- August 11: Gold Medal Approaches for Obtaining and Using Energy Efficiency Data (101)
- August 18: Vinicius, Quatchi, and You: Using Power Words and Branding to Increase Interest and Participation (301)

Send call topic ideas to peerexchange@rossstrategic.com

See the Better Buildings Residential Network Program website to register

Addenda: Attendee Information and Poll Results

U.S. DEPARTMENT OF ENERGY

Call Participant Locations

Better Buildings
U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY

Call Participants: Network Members

- ABC Energy Savings, LLC
- Alaska Housing Finance Corporation
- Arlington County Government
- Austin Energy
- Boulder County
- Bridging The Gap
- City of Fort Collins
- Civic Works
- CLEAResult
- Cleveland Public Power
- Columbia Water & Light
- Connecticut Green Bank
- County of San Luis Obispo
- Efficiency Nova Scotia
- Energize New York
- FS Energy
- International Center for Appropriate and Sustainable Technology (ICAST)
- Local Energy Alliance Program
- Mitsubishi Electric Cooling and Heating
- NeighborWorks of Western Vermont
- New York State Energy Research and Development Authority (NYSERDA)
- Northeast Energy Efficiency Partnerships (NEEP)
- Seventhwave
- South Burlington Energy Committee
- The Environmental Center
- TRC Energy Services
- Wisconsin Energy Conservation Corporation (WECC)

Call Participants: Non-Members (Slide 1 of 2)

- Adomatis Appraisal Service
- Algonquin College
- Aspen Community Office for Resource Efficiency
- Association for Energy Affordability
- BKi
- Blue Ridge EMC
- Bonneville Power Administration
- California Public Utilities Commission
- Cascade Natural Gas
- Center for Energy and Environment
- City of Bloomington Utilities
- City of Milwaukee
- Clean Efficient Energy
- Consortium for Energy Efficiency
- Corcoran Management
- County of Sonoma - Energy & Sustainability
- CREW Solar
- DC Sustainable Energy Utility (DCSEU)
- Dominion Due Diligence Group
- Emerald Cities Seattle
- Emerson
- Enbridge Gas Distribution
- Energy Analytics
- Energy Branch
- Energy Design Update
- Energy Efficiency Solutions, LLC
- Energy Resources Center
- Energy Smart at Walking Mountains Science Center
- EPA Region 7
- Facility Strategies Group
- Flathead Electric Cooperative
- Franklin Energy
- Greenergy Chicago, Inc.
- HDR Consulting
- Holy Cross Energy
- Home Office Training & Technology
- Honeywell
- HVI
- ID3A, LLC
- Idaho Division of Building Safety
- Island Institute
- Jantilli Design
- John K Holton Architect/Engineer
- John Wesley Miller Companies
- King County
- La Plata Electric Association

Call Participants: Non-Members (Slide 2 of 2)

- LINC Housing / SEED Partners
- Los Alamos National Laboratory
- Louisiana State University
- Massachusetts Department of Public Utilities (DPU)
- Massachusetts Municipal Wholesale Electric Company
- Memphis Light, Gas, and Water
- Mercy Housing
- Michaels Energy
- MPower Oregon
- National Council of Structural Engineers Association
- National Renewable Energy Laboratory
- Natural Resources Canada
- Navigant Consulting, Inc.
- Net Zero Analysis & Design Corp.
- Newport Partners
- No Name Architects
- NORESCO
- North Central Texas Council of Governments
- NorthWestern Energy
- Office of the Peopls's Counsel of DC
- Okaloosa Gas District
- Opportunity Council
- OptiMiser
- Pennsylvania Governor's Green Government Council
- Pennsylvania Public Utility Commission
- PUSH Green
- Rappahannock Electric Coop
- Rheem
- RUPCO
- Seattle City Light
- Smith Enterprises
- Solar Habitats, LLC.
- Southern Energy Management
- SPEER
- Sun Electric
- The Ohio State University
- Therma-Stor LLC
- Thermostat Recycling Corporation
- Thousand Home Challenge
- U.S. Department of Housing and Urban Development
- USG Corporation
- VHR+a
- Virtuelements
- VOCA Off Grid
- Wade Enterprises Inc
- WECTEC

Opening Poll Results

- Which of the following best describes your organization's experience with the call topic?
  - Some experience/familiarity—**54%**
  - Very experienced/familiar—**27%**
  - Limited experience/familiarity—**16%**
  - No experience/familiarity—**2%**
  - Not applicable—**1%**

Residential Network Poll: Technology – Results

- What would you need to embrace new technologies?
  - Studies on the results that technologies can deliver—**48%**
  - Increased available funding—**24%**
  - Technical support—**17%**
  - Nothing – I'm already ready!—**7%**
  - Other (please share)—**4%**

Future Topics Poll Results

- What topics would you be interested in for a future peer exchange call?
  - Energy modeling tools/software—**35%**
  - Innovations in measuring energy use—**33%**
  - Residential electricity storage & solar—**29%**
  - Choosing the right program management software—**2%**
  - Other—**2%**

Closing Poll Results

- After today's call, what will you do?
  - Seek out additional information on one or more of the ideas—**86%**
  - Consider implementing one or more of the ideas discussed—**8%**
  - Make no changes to your current approach—**4%**
  - Other (please explain)—**2%**