We'll be starting in just a few minutes….

Tell us…

What topics are you interested in for future Peer Exchange calls?

Please send your response to the call organizers via the question box.

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network
Peer Exchange Call Series

Are You Ready? Preparing Homes for Extreme Weather

March 10, 2022

U.S. DEPARTMENT OF ENERGY

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Better Buildings Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
  - **Eliza Hotchkiss,** National Renewable Energy Lab
  - **Andria Jacob,** City of Portland
  - **Brandy Bones and Chris Mewes,** ICF
- 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.

The views expressed by speakers are their own, and do not reflect those of the Dept. of Energy.

Join the Network

Member Benefits:

- Recognition in media, social media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

Commitment:

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

Upcoming Calls (2nd & 4th Thursdays):

- *03/24: All Things Ductless – Everything You Wanted to Know But Didn't Know to Ask*
- *04/14: What Does Electrification at Scale Look Like?*
- *04/28: Homes and Climate – Connecting the Dots*

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

Opening Poll

What is your organization's experience or familiarity with preparing homes for extreme weather?

- Very experienced/familiar
- Some experience/familiarity
- Limited experience/familiarity
- No experience/familiarity
- Not applicable

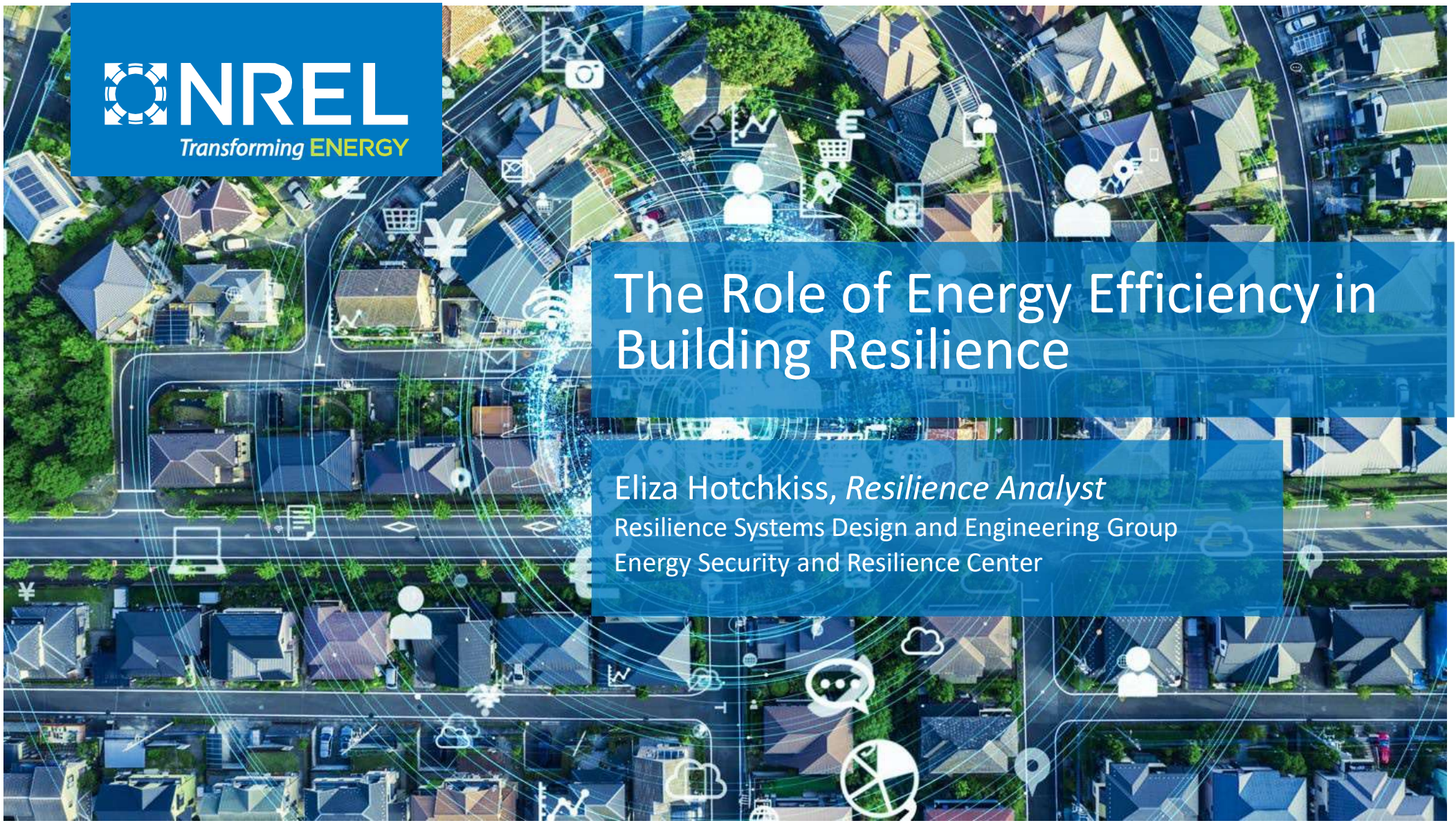
Opening Poll

What is your organization's experience or familiarity with national disaster preparation?

- Very experienced/familiar
- Some experience/familiarity
- Limited experience/familiarity
- No experience/familiarity
- Not applicable

Eliza Hotchkiss
NREL

U.S. DEPARTMENT OF ENERGY



NREL
Transforming ENERGY

The Role of Energy Efficiency in Building Resilience

Eliza Hotchkiss, *Resilience Analyst*
Resilience Systems Design and Engineering Group
Energy Security and Resilience Center

Extreme weather events are becoming
more frequent and more severe

Billion-Dollar Disasters by the numbers (1980-2020)

7 Average number of **billion-dollar disasters per year** since **1980**

15 Average number of **billion-dollar disasters per year** since **2015**

22 Number of U.S. **billion-dollar disasters in 2020,** the most on record

50

Number of states that have had **at least one billion-dollar disaster**

$1.875 trillion

Total cost of **285 billion-dollar disasters,** the total since 1980

8.2 million

Number of customers who **lost power in Hurricane Sandy,** 2012*

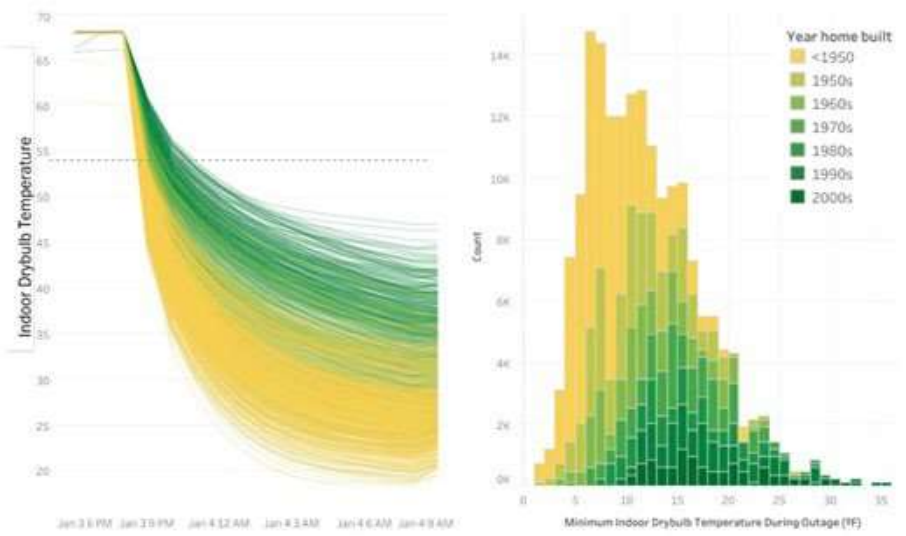
11 months

Duration of power outages in Puerto Rico following Hurricanes Irma and Maria in 2017

125+

Number of deaths in Texas caused or contributed to by the 2021 winter storm

*Source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). https://www.ncdc.noaa.gov/billions/, DOI: 10.25921/stkw-7w73



The Role of Resilience: Energy Efficient Buildings

NEED

No research study has modeled the synergies of energy efficiency in building design and passive survivability to value the resilience benefit.

ACTION

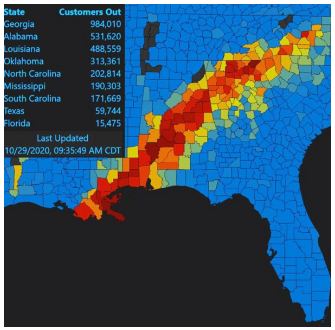
With support from the DOE Buildings Technologies Office, NREL and two other labs are evaluating the impact of simulated power outages on occupants of different types of buildings.

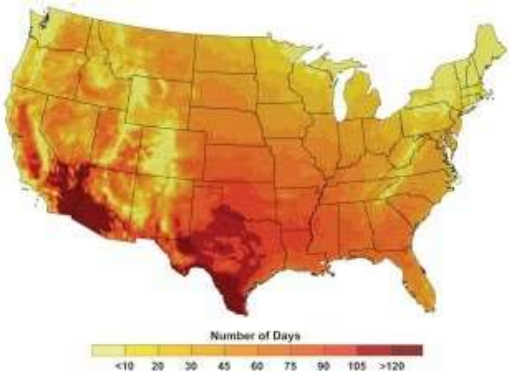
IMPACT

The results inform what energy efficiency measures can be taken to increase human survivability under extreme weather conditions, such as a heat wave or cold snap.

Hazard Region Risk Assessment

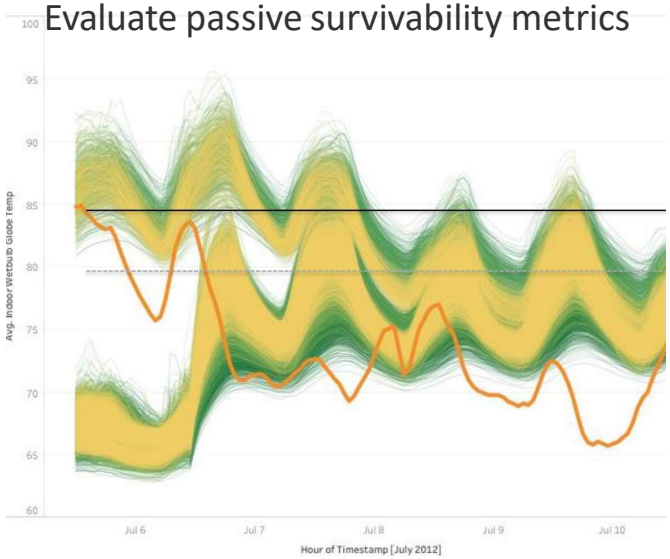
Risk assessment of power disruptions and extreme temperature events





Building Simulation of Mitigation Measures

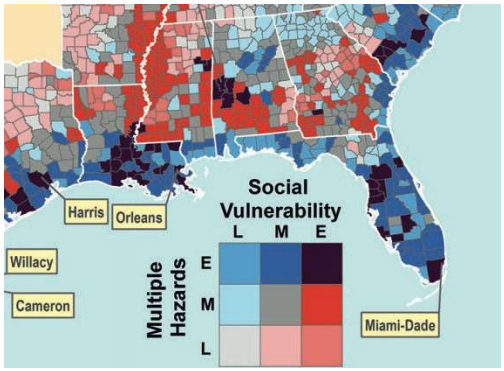
Evaluate passive survivability metrics



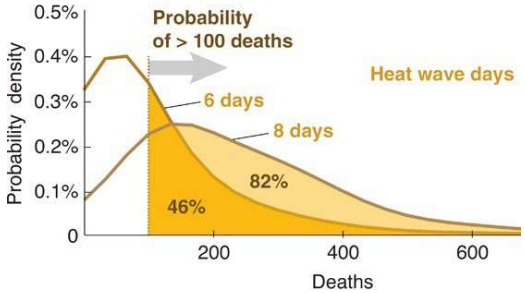
Characterization of efficiency measures and building designs that compliment, conflict, or have no impact on resilience

Vulnerability, Damage, and Loss Analysis

Determine vulnerability of occupants and property



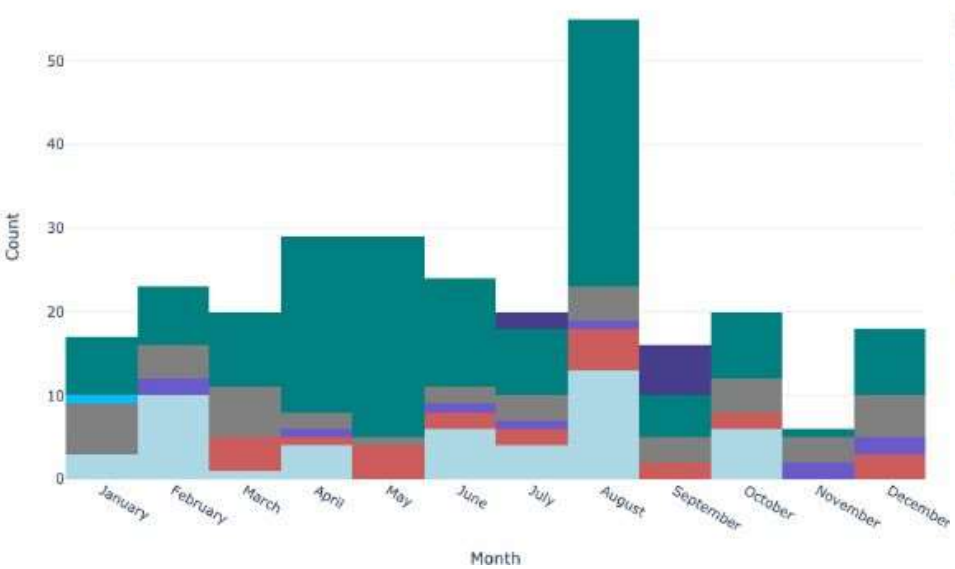
Predict excess mortality rates



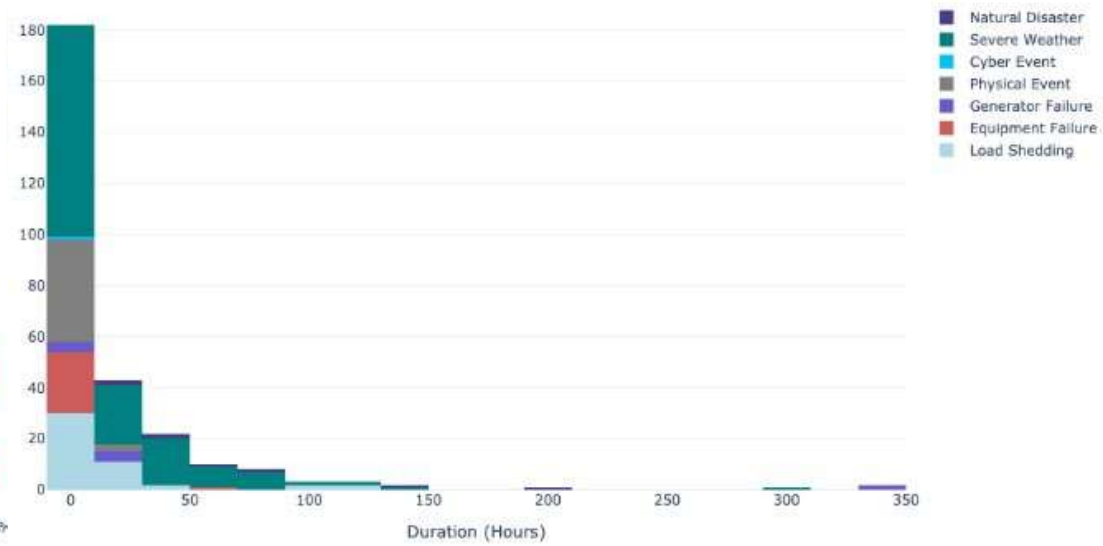
Joint Probability of Power Outage with Natural Hazards

The valuation methodology required determining the coincident probability of an extreme temperature event with a power outage and duration.

Occurrence Month



Outage Durations



Texas

Thermal Resilience Metrics

Thermal performance metrics:

- **Standard Effective Temperature (SET) or heat index:** measure of temperature and relative humidity
- **SET degree-hours:** integrated measure of both temperature and duration
- **Hours of Safety:** Number of hours when indoor air temperature drops to a critical threshold since the start of a power outage

Improved building simulation capabilities:

- Improved EnergyPlus reporting features for resilience analysis using the above metrics
- Improved ResStock reporting

Cold Stress Scale (Source: EPA and RMI)

Minimum Safe Temperature for Vulnerable Populations	Minimum Safe Temperature for Healthy Populations	Mild Cold Stress for Healthy Populations	Moderate Cold Stress for Healthy Populations	Severe Cold Stress for Healthy Populations
>64	60	60–50	50–40	<40

Heat Stress Scale (Source: NOAA)

Relative Humidity (%)

°F / Air Temperature	40	45	50	55	60	65	70	75	80	85	90	95	100
110	136												
108	130	137											
106	124	130	137										
104	119	124	131	137									
102	114	119	124	130	137								
100	109	114	118	124	129	136							
98	105	109	113	117	123	128	134						
96	101	104	108	112	116	121	126	132					
94	97	100	103	106	110	114	119	124	129	135			
92	94	96	99	101	105	108	112	116	121	126	131		
90	91	93	95	97	100	103	106	109	113	117	122	127	132
88	88	89	91	93	95	98	100	103	106	110	113	117	121
86	85	87	88	89	91	93	95	97	100	102	105	108	112
84	83	84	85	86	88	89	90	92	94	96	98	100	103
82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	80	81	81	82	82	83	84	84	85	86	86	87

Heat Index (Apparent Temperature)

With Prolonged Exposure and/or Physical Activity

Extreme Danger	Heat stroke or sunstroke highly likely
Danger	Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution	Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution	Fatigue possible

Scenario Development

Upgrade Packages

1. IECC
2. PHIUS

Outage scenario for a city's residential homes
(e.g., Minneapolis 2012 short heat wave)

Base Results

Upgrade #1 Results

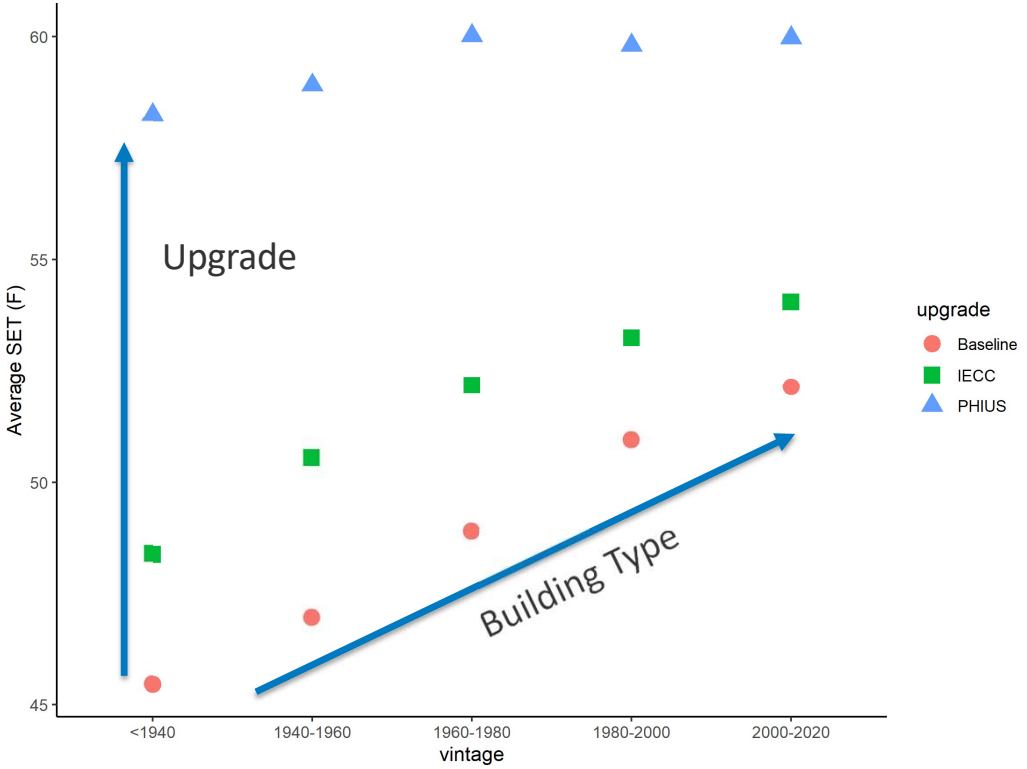
Upgrade #2 Results

Each scenario for each city incorporates individual energy efficiency upgrade packages installed to all applicable homes in addition to an as-is base simulation

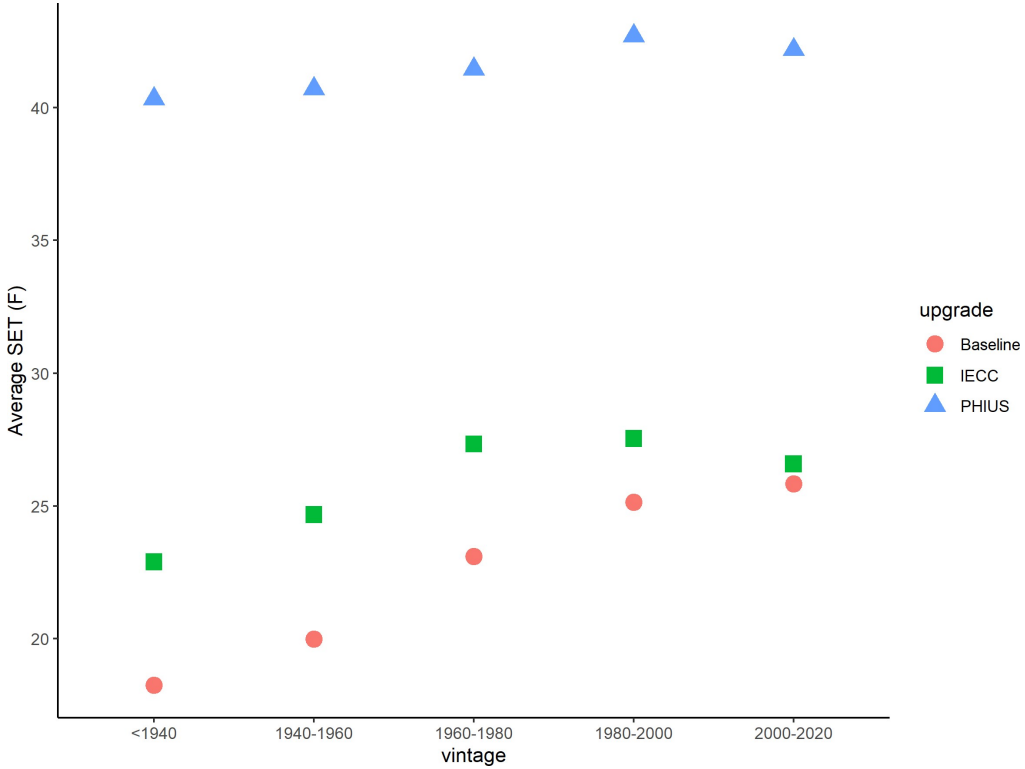
Cold Event – Average Indoor SET Temperatures for 1-week outage

Building performance during cold event depends on building type, upgrade, and location

Houston



Minneapolis Saint Paul



Cold Event – Metrics Across Locations

- **Thresholds:**

  54F – Below set

  40F – Hypothermia risk

  32F – Freezing

  20F – Extreme Pipe Risk

- **High risk of MSP home damage**

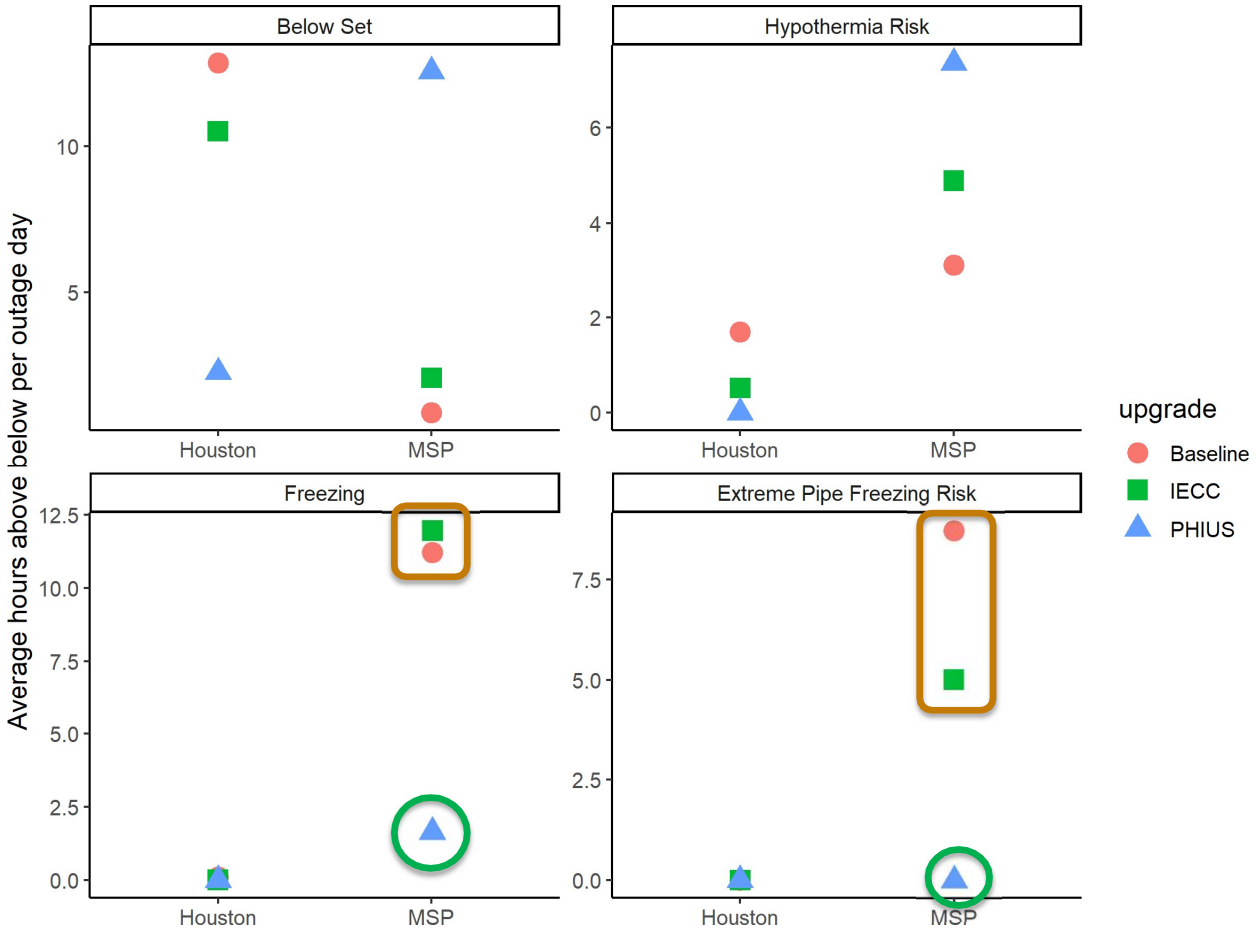
  --PHIUS package reduces freeze risk

  --Does not eliminate health risk

- **Increased Houston Safety**

  --Upgrades reduce hypothermia risk

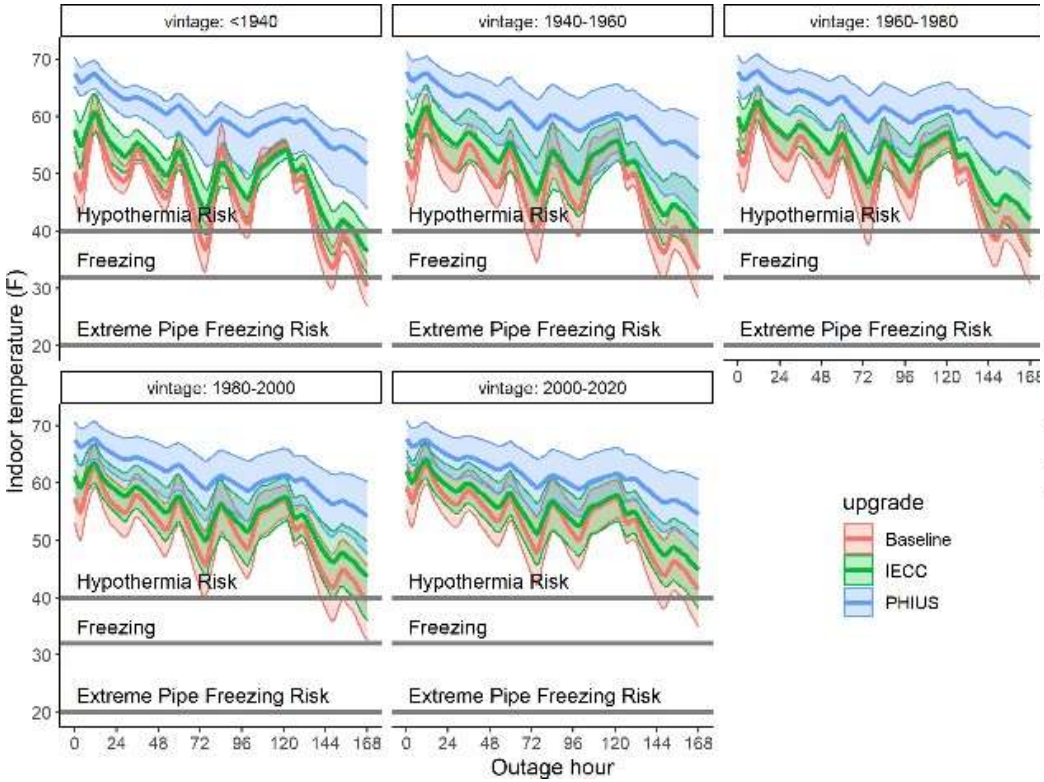
  --Reduce hours outside SET



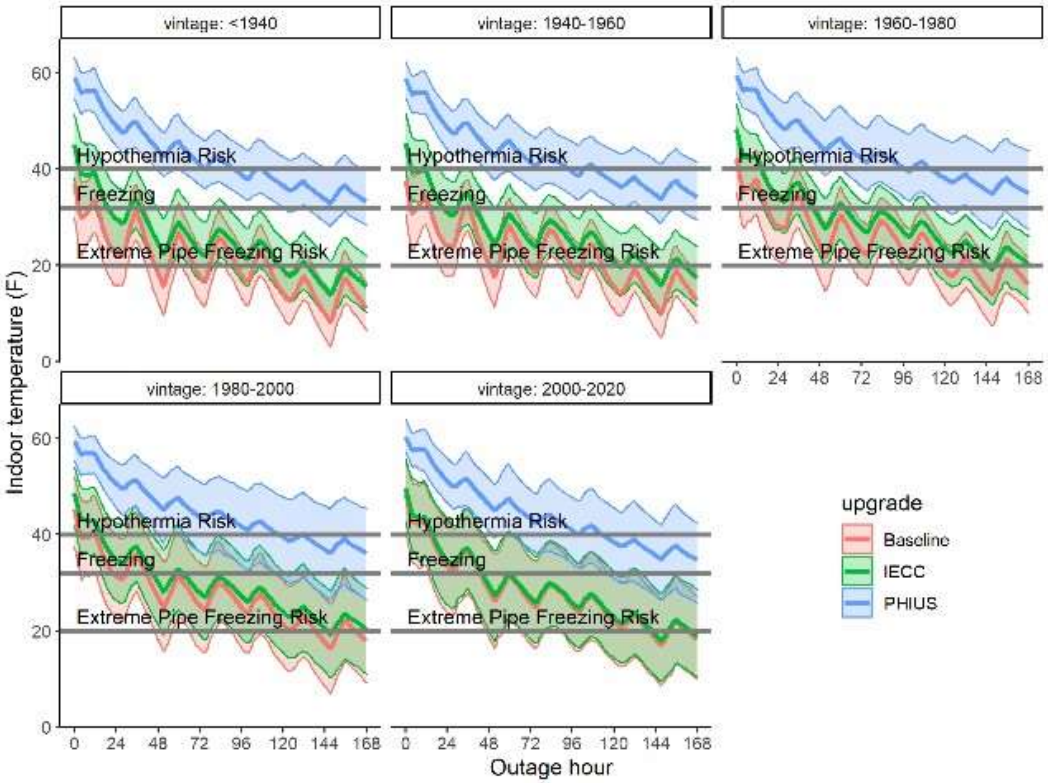
Cold Event Simulation Results (Preliminary)

Starting indoor temperature, outdoor temperature, and insulation determine building performance

Houston



Minneapolis Saint Paul



The Role of Efficiency and Onsite Generation in Resilience

- Preliminary results indicate that building designs (e.g., R-values and U-values) matter
- Passive survivability and safe thresholds matter on a community scale
- Onsite generation paired with energy storage tied to critical loads can help with sustaining outages even further

Thank you!

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NREL
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Andria Jacob

City of Portland

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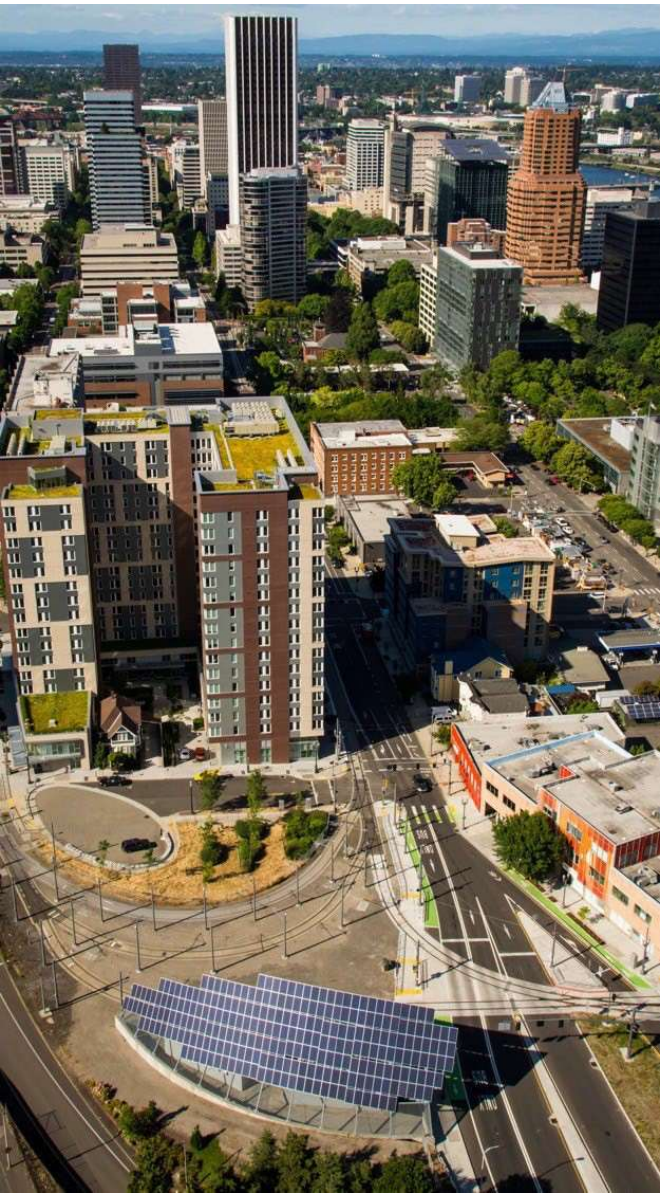

CLIMATE AND HEALTH STANDARDS FOR EXISTING BUILDINGS

PORTLAND, OREGON

Better Buildings Residential Network Peer Exchange

March 10, 2022

ANDRIA JACOB

Climate Policy and Program Manager

THE BUREAU OF PLANNING & SUSTAINABILITY

The climate crisis is taking its toll worldwide

- More frequent and intense human-induced climate extremes
- Our most vulnerable populations are disproportionately affected
- Irreversible impacts to natural and human systems are pushed beyond their ability to adapt

Source: Intergovernmental Panel on Climate Change 6th Assessment Report

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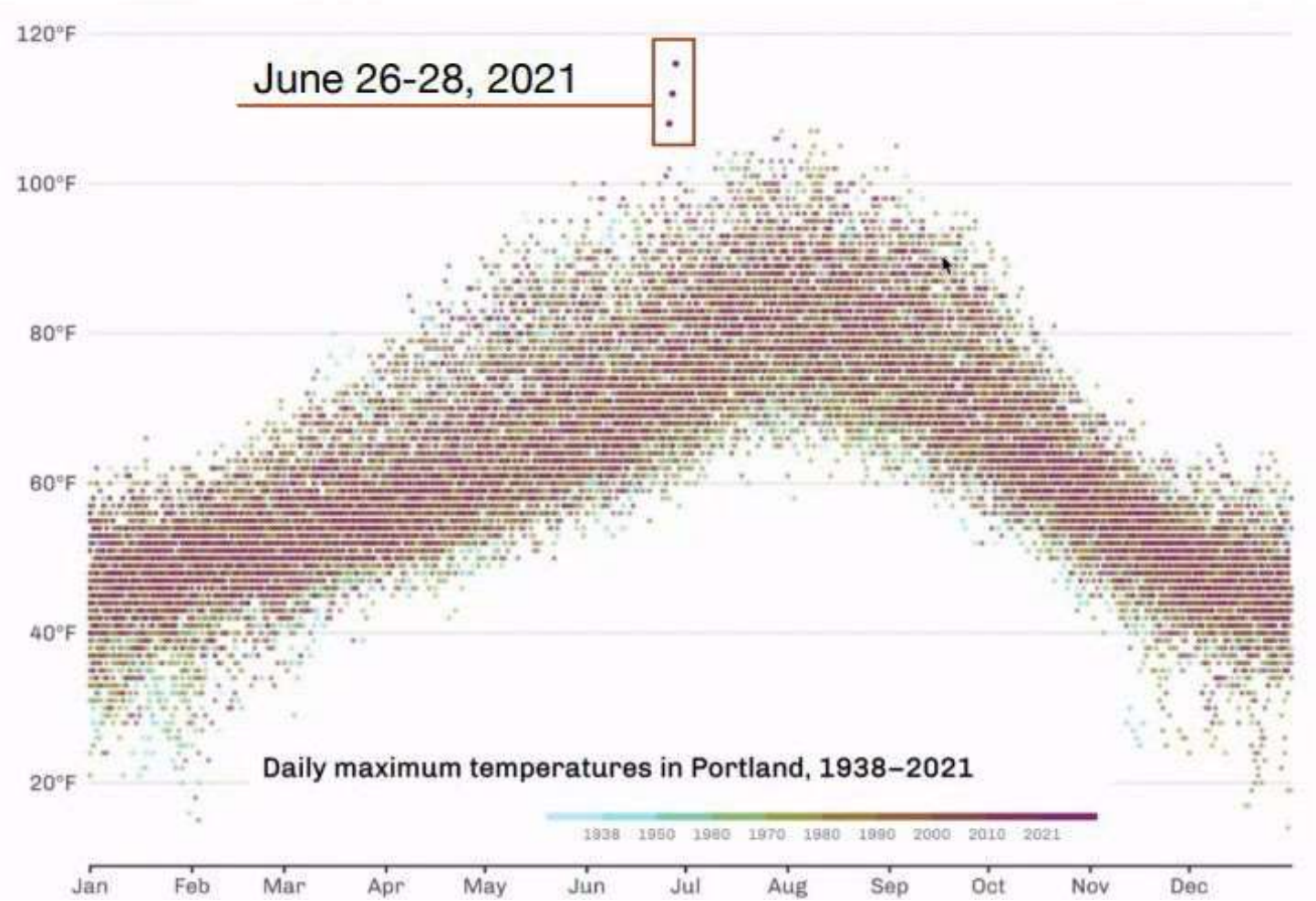
Our Changing Climate

- Heavier winter storms
- Increasing wildfire frequency and size
- More hot days, hotter days, longer heat waves

Source: Oregon Climate Change Research Institute



Source: Multnomah County

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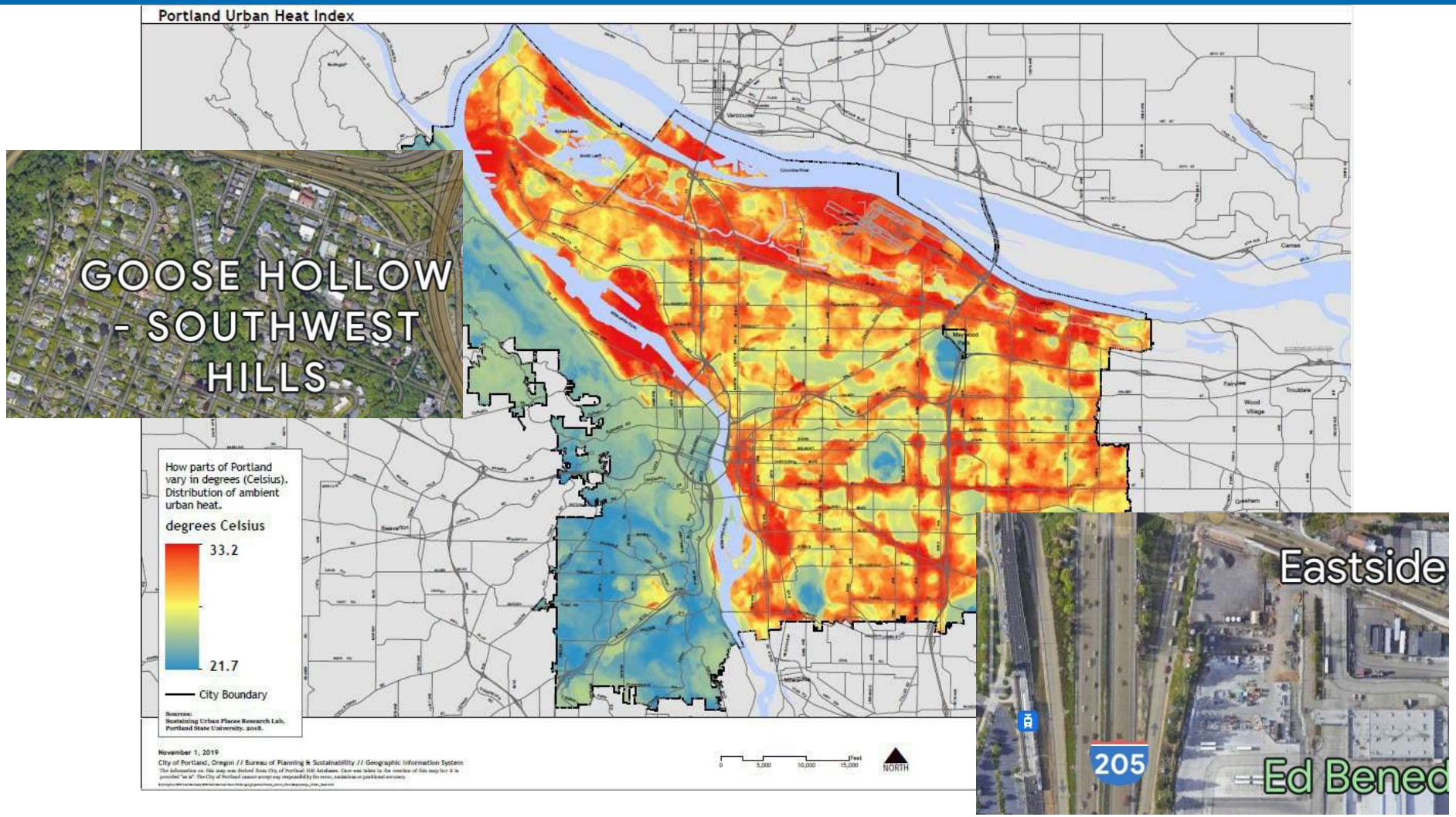

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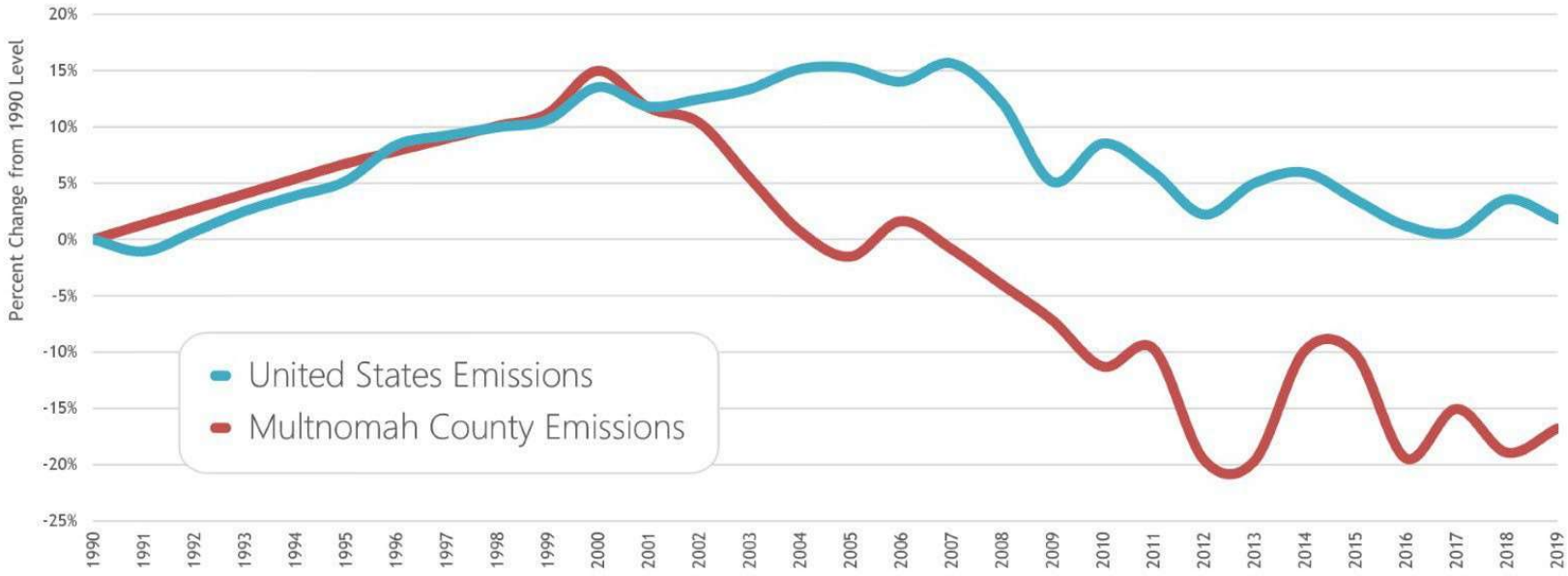
Multnomah County

Change in Carbon Emissions Compared to US

(1990 - 2019)



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Continuing to heat and cool our buildings with fossil fuels is a climate justice issue

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THE SPECTRUM OF COMMUNITY ENGAGEMENT TO OWNERSHIP

Facilitating Power

2

STANCE TOWARDS COMMUNITY	IGNORE	INFORM	CONSULT	INVOLVE	COLLABORATE	DEFER TO
	0	1	2	3	4	5
IMPACT	**Marginalization**	**Placation**	**Tokenization**	**Voice**	**Delegated Power**	**Community Ownership**
COMMUNITY ENGAGEMENT GOALS	Deny access to decision-making processes	Provide the community with relevant information	Gather input from the community	Ensure community needs and assets are integrated into process & inform planning	Ensure community capacity to play a leadership role in implementation of decisions	Foster democratic participation and equity through community-driven decision-making; Bridge divide between community & governance
MESSAGE TO COMMUNITY	***Your voice, needs & interests do not matter***	***We will keep you informed***	***We care what you think***	***You are making us think, (and therefore act) differently about the issue***	***Your leadership and expertise are critical to how we address the issue***	***It's time to unlock collective power and capacity for transformative solutions***

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Black, Indigenous and People of Color (BIPOC) Community-led Engagement

Community Forum
December 2019

Energy Burden Workshop
March 2021

Policy Convenings
July 2021

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Community Climate Priorities for Buildings

Key Findings

→ **Energy burden ranged from 1.8 to 45%**
→ **Unaware of utility programs and other resources**
→ **Family and social network obligations**
→ **Discomfort with landlord interaction**

Policy Priorities

→ **Minimum standards and upgrades for rentals**
→ **Lower utility bills and stable rent** when improvements are made
→ **Incentives to invest in clean energy** without burdening renters
→ **More energy assistance** to low-income individuals and families
→ **Tenant right-to-know** energy information for renting decisions

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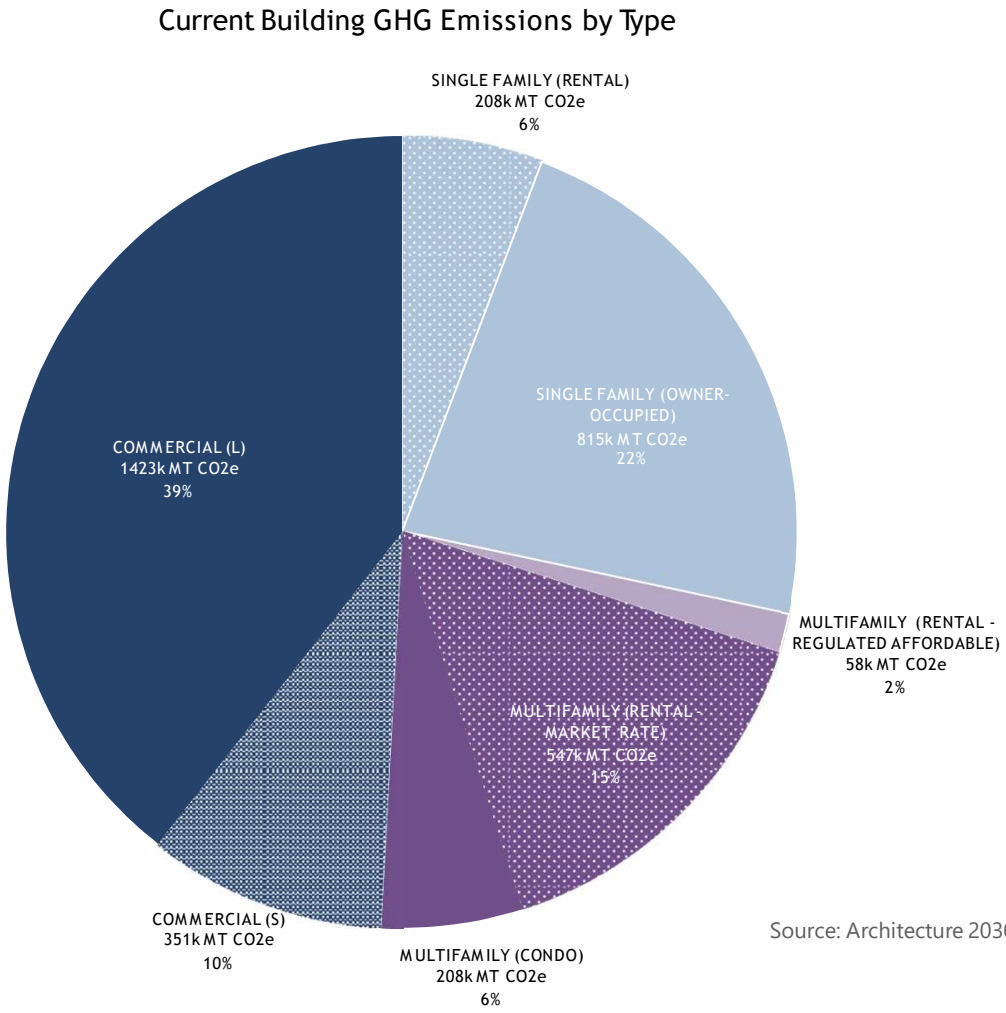
Over 2/3 of Portland Building Carbon Emissions from Commercial and Multifamily



Source: Architecture 2030 Building Stock Assessment

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WHERE WE'RE GOING NEXT...

Climate and Health Standards for Existing Buildings

- Large Commercial Buildings
- Multifamily Apartments
  - Owner-Occupied
  - Rentals

Rental Apartment Focus

The H E A R T Standards

- Health
- Equitable Energy
- Anti-Displacement
- Resilience
- Temperature

Examples of climate and health standards

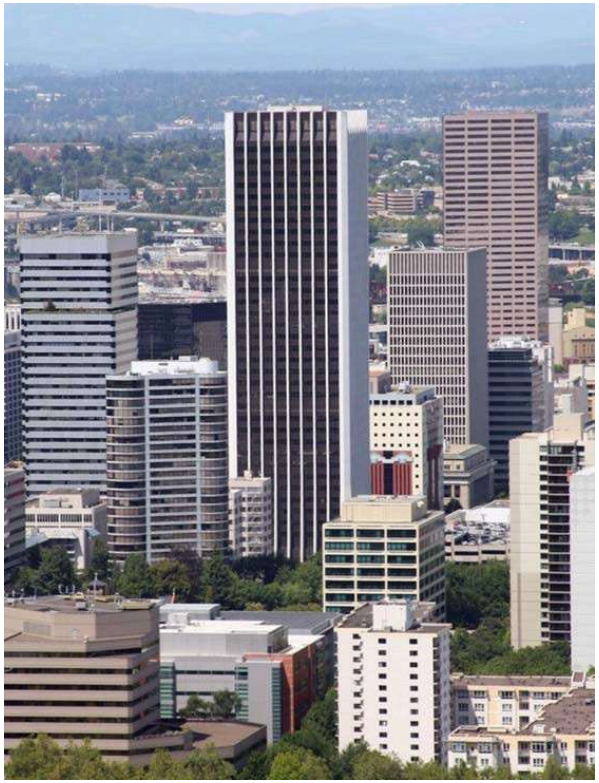
- Natural gas stove ventilation;
- Increased ventilation standards to reduce airborne illnesses;
- Carbon emissions per square foot;
- Maximum indoor temperature for heat wave resilience.

What buildings would they apply to?

- Rental apartments (size TBD)
- Large commercial buildings (20,000+ sf)
- Large multifamily buildings (size TBD)
- Regulated affordable housing (maybe)

NOT covered

New construction
Existing SF owner-occupied
Existing SF rentals



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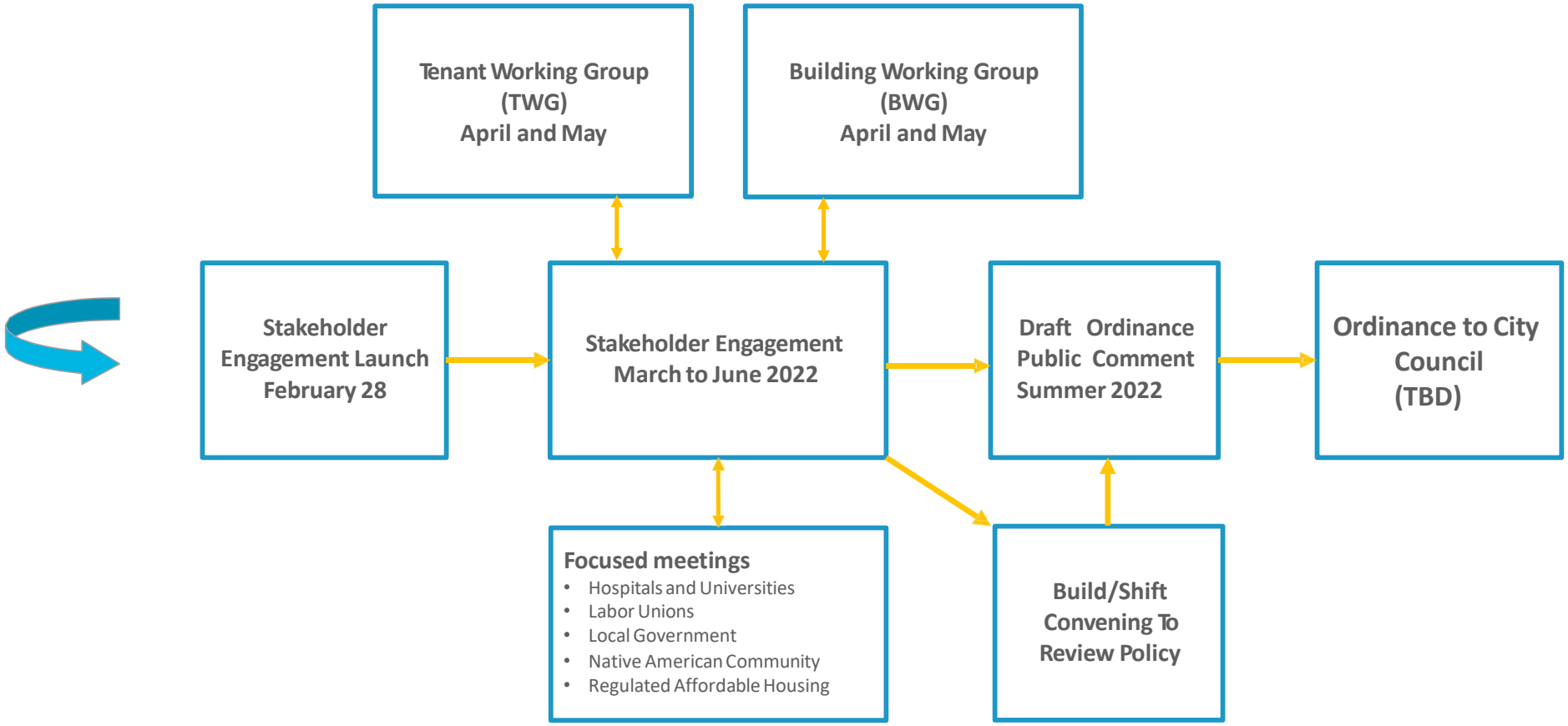

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THE BUREAU OF **PLANNING & SUSTAINABILITY**

Andria Jacob
andria.jacob@portlandoregon.gov

Project email updates:
https://www.portland.gov/bps/climate-action/building-standards

The City of Portland is committed to providing meaningful access. To request translation, interpretation, modifications, accommodations, or other auxiliary aids or services, contact 503-823-7700, Relay: 711.

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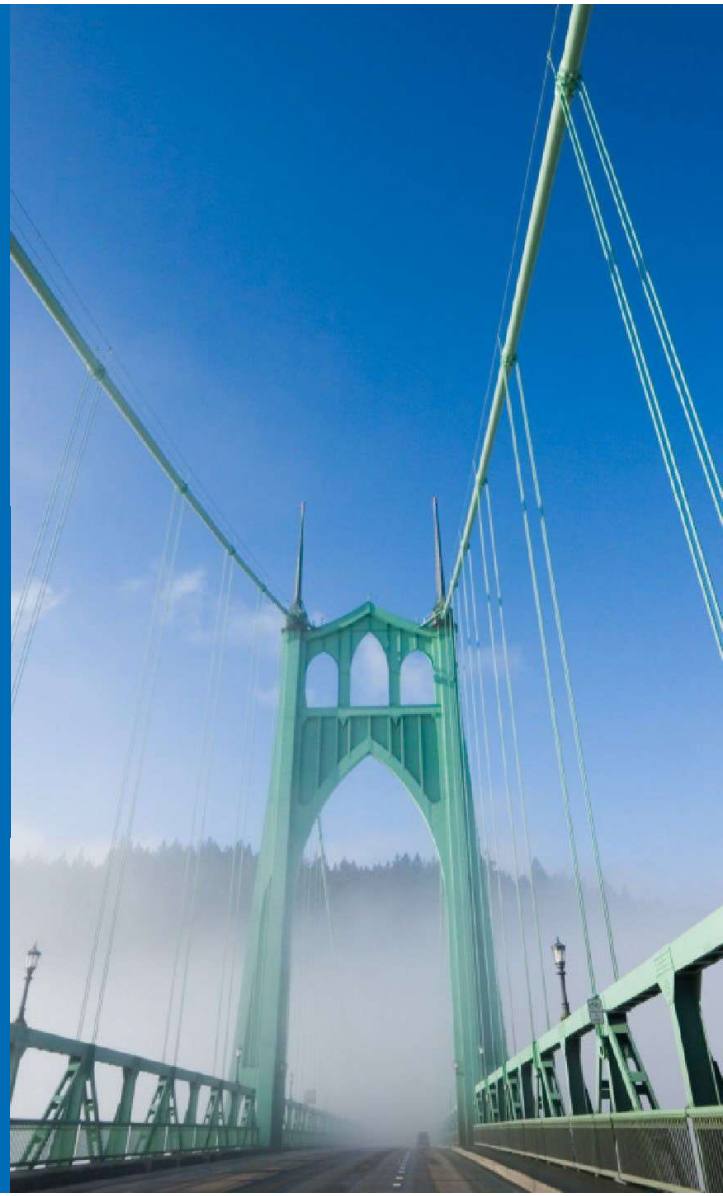

Brandy Bones
ICF

Chris Mewes
ICF

U.S. DEPARTMENT OF ENERGY

Building Back Better with FEMA and HUD Funding

Brandy Bones
Vice President, Mitigation and Resiliency

Chris Mewes
Senior Disaster Recovery and Resilience Consultant

3/10/2022

ICF

FEMA Funding and Incentives for Housing Rehabilitation

FEMA Hazard Mitigation Assistance

- Provides funding for eligible mitigation measures that reduce disaster losses
- Encourages nature-based solutions, including site scale projects (e.g., green roofs and rainwater harvesting)
- Projects must be cost-effective
- CDBG can be used for local cost-share

Eligible Activities	HMGP	PDM	FMA
1. Mitigation Projects	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects	✓		
Miscellaneous/Other[1]	✓	✓	✓
2. Hazard Mitigation Planning	✓	✓	✓
Planning Related Activities	✓		
3. Technical Assistance			✓
4. Management Cost	✓	✓	✓

BRIC

- $1 billion competitive grant program
- Projects must mitigate risk to Community Lifelines
- Incentivizes adoption of latest building codes
- Prioritizes benefits to disadvantaged communities (e.g., those with limited water and energy access and high energy cost burden)

Ignition-Resistant Construction

- >4,103 structures funded for FY 2020
- Sealing gaps and penetrations in exterior walls and roofs
- Installation of Class A roofing products e.g., asphalt shingles, metal, clay tile
- Ignition resistant siding e.g., rock wall, stucco, or cement board
- Non-combustible doors, dual pane windows

HUD CDBG-DR/MIT Funding and Standards for Housing Rehabilitation

CDBG-DR

- Flexible source of funds to help states, territories, counties, and cities recovery from Presidentially declared disasters
- More than $90 billion in CDBG-DR funds allocated since 1992
- Can fund activities related to housing, infrastructure, and economic recovery
- Integrated 15% mitigation set-aside in February 2022

Before and after photos of residential repair and reconstruction in Puerto Rico

HUD Green Building Requirements and Resources

- Grantees must follow HUD CPD Green Building Retrofit Checklist
- Includes water and energy conservation and indoor air quality measures
- Products and appliances must be ENERGY STAR or WaterSense-labeled or Federal Energy Management Program (FEMP)- designated
- HUD's Community Resilience Toolkit

U.S. Department of Housing and Urban Development
Community Resilience Toolkit

Texas Resilient Home Program (RHP)

RHP

- Administered by the Texas General Land Office using CDBG-MIT funds
- Replaces owner-occupied single-family homes damaged by Hurricane Harvey with a reconstructed home that meets additional resiliency and mitigation standards
- Serves as a showcase for more resilient residential construction practices
- Disseminates these practices through the residential construction industry

Poured In-Place 3D

Increased speed means less waste and more design freedom

No drywall or particle board

Consistent thermal envelope creates comfort and high energy efficiency

Proprietary concrete provides thermal mass that slows heat transfer

Wind and impact-resistant

Steel-Frame

More durable than wood-frame

Better resistant to insect, warp, rot, and mold

Fire-resistant

More energy-efficient than wood or brick

Can be made from 100% recyclable BlueScope steel

Tilt-Wall

- Energy efficient
- High wind-load rating
- Fireproof slab
- Reduced noise
- Pest and mold resistant

Building Back Better with FEMA and HUD Funding

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ICF is a global consulting services company, but we are not your typical consultants. We help clients navigate change and better prepare for the future.

Our team helps communities prepare for, respond to, and recover from natural disasters. As an established leader, we bring deep on-the-ground experience from nearly every major natural disaster in recent U.S. history. Over the last two decades, we've successfully supported recovery efforts in New Jersey, New York, Georgia, Louisiana, Puerto Rico, Texas, and more, often exceeding project requirements. From over 20 years of partnership with HUD and FEMA to our many state and local partners, we are well-known and trusted for our ability to process hundreds of thousands of applications and assist grantees in awarding over $12 billion to affected property owners over the years. Learn more at icf.com/work/disaster-management.

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

DOE Health + Home Performance Infographic

- **WHO**: Res EE programs, partners (contractors+)
- **WHAT**: Visual aid, trusted source
- **WHERE**: IRL or digitally
- **WHY**: Most do not get link btw home, health & efficiency
- **CONTRACTORS:** Find qualified networks

Do You Have a "Healthy Home?"

A qualified contractor can help you assess and address indoor air quality, improve your comfort, and cut your utility bills.

Answers to a few basic questions can help you get started:

- **How old are your heating and cooling systems?**
  Ensuring your system is updated and well maintained can save money and improve health and comfort.
- **Is your home insulated?**
  Properly installed insulation in your walls and attic, at levels recommended for your home's climate, will cut bills, and improve comfort.
- **Have you ever noticed mold in your home?**
  Visible mold likely means humidity levels need to be better addressed or indicates a potential leak or water damage.
- **Are your windows caulked and doors weather-stripped?**
  These relatively simple fixes reduce air leaks and help maintain indoor temperature levels.
- **Are your appliances ENERGY STAR® rated?**
  ENERGY STAR appliances are energy efficient and help you save money.
- **Do you know if your home's heating and cooling systems include proper levels of ventilation?**
  Effective ventilation is important for both health and safety. Ventilation, along with frequently replaced air filters, can help make sure your home is bringing in fresh air as needed, and keep out pollutants when outdoor air quality is poor due to ozone, fire, or other factors.

GET **started**

FIND A **QUALIFIED CONTRACTOR**:

- Home Performance with ENERGY STAR® at ENERGYSTAR.gov/HomePerformance
- Building Performance Institute at bpi.org/locator-tool

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY
BUILDING TECHNOLOGIES OFFICE

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HOME PERFORMANCE WITH ENERGY STAR

Thank You!

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Please send any follow-up questions or future call topic ideas to:
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