

Owner/Developer IRA Bootcamp

Session #3:

Decarbonization, Electrification, & Energy Efficiency

AGENDA

- Welcome
 - Michael Miranda, NHT
- Overview of TA Process & Bootcamp Sample Property
 - Joshua Galloway, New Ecology
- Decarbonization & Electrification Case Studies
 - Frank Stone, New Ecology
 - Rebecca Arnold, New Ecology
- Preview of Upcoming Sessions





IRA Bootcamp
7.18.23

Decarbonization, Electrification and Energy Efficiency

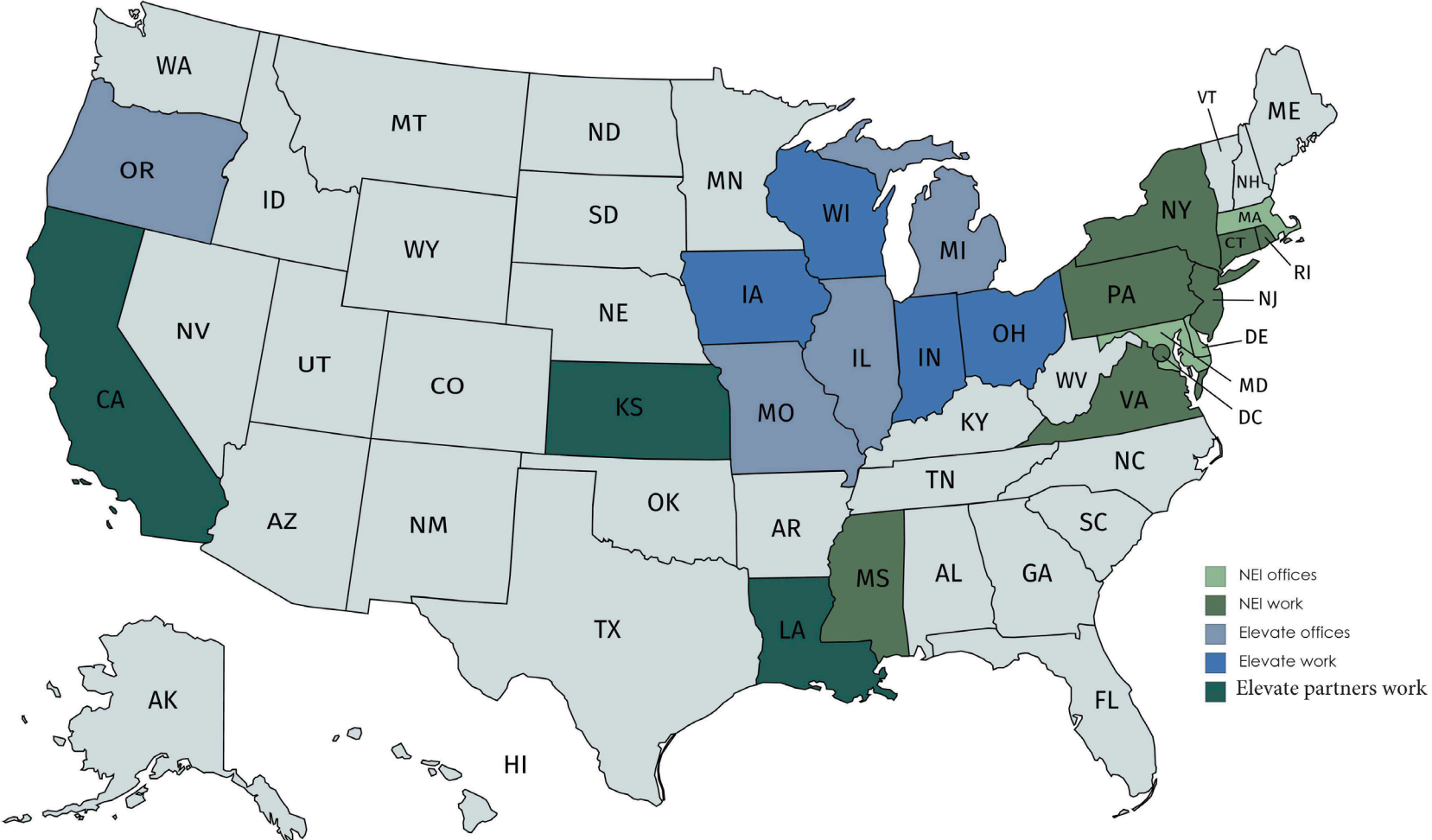
New Ecology works nationally to bring the benefits of sustainable development to the community level, with a concerted emphasis on underserved populations.

A mission-driven non profit, we seek to make the built environment more efficient, healthy, durable, and resilient.

CORE WORK in Buildings:

- Research & Test
- Monitor & Diagnose
- Implement & Solve
- Certify & Verify
- Train & Share

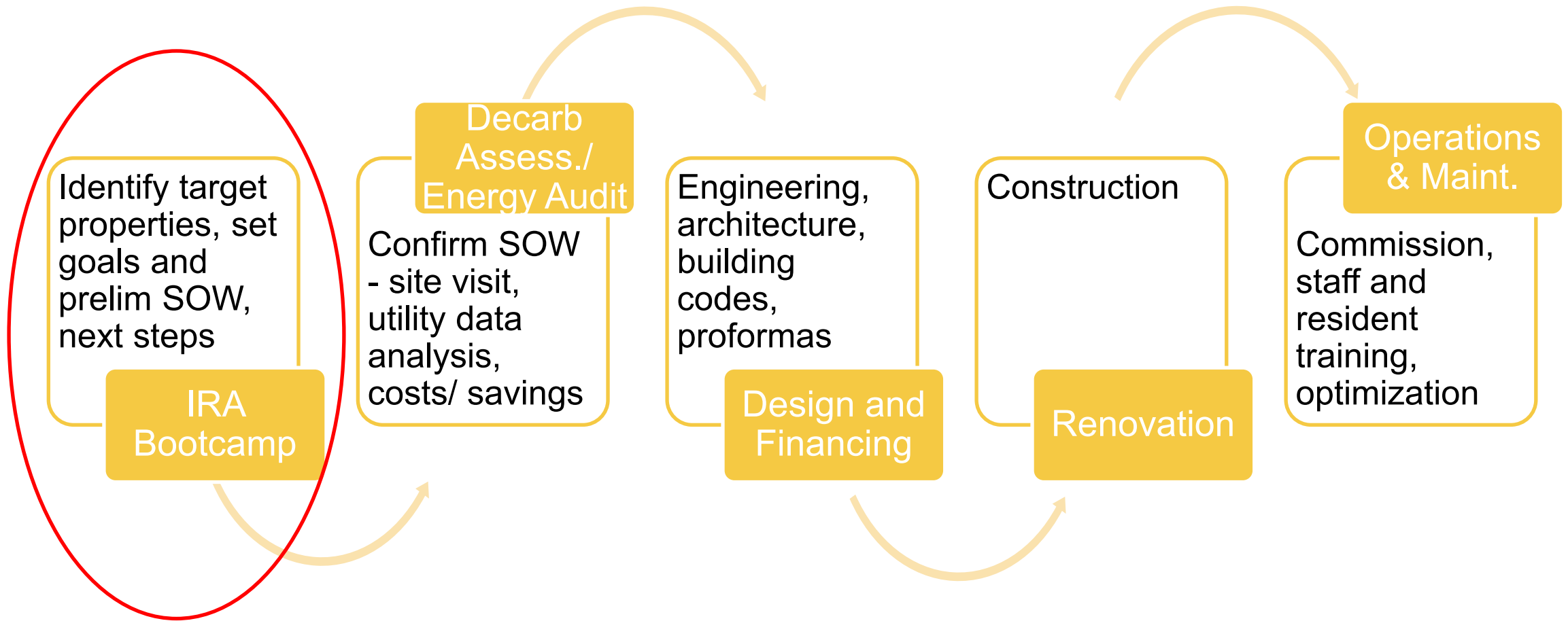
New Ecology Experience



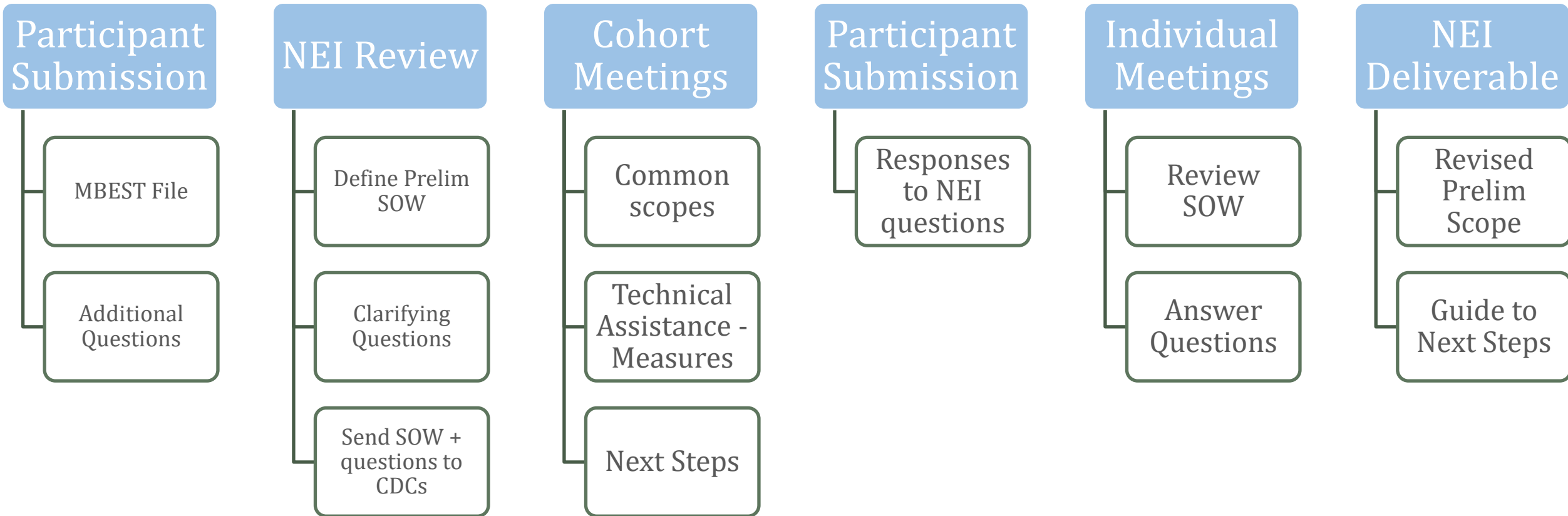
Life is complicated



IRA Bootcamp and the Development Process



IRA Bootcamp Process



IRA Bootcamp Process – 20 Hours per CDC

12 hours

NEI Review

Define Prelim SOW

Clarifying Questions

Send SOW + questions to CDCs

Cohort Meetings

Common scopes

Technical Assistance - Measures

Next Steps

4 hours

Individual Meetings

Review SOW

Answer Questions

4 hours

NEI Deliverable

Revised Prelim Scope

Guide to Next Steps

Participant Submission

MBEST File

Additional Questions

Participant Submission

Responses to NEI questions

Definitions - Electrification

Replace systems that use fossil fuels.

AND

Efficiency improvements (air sealing, insulation door, window and ventilation improvements)

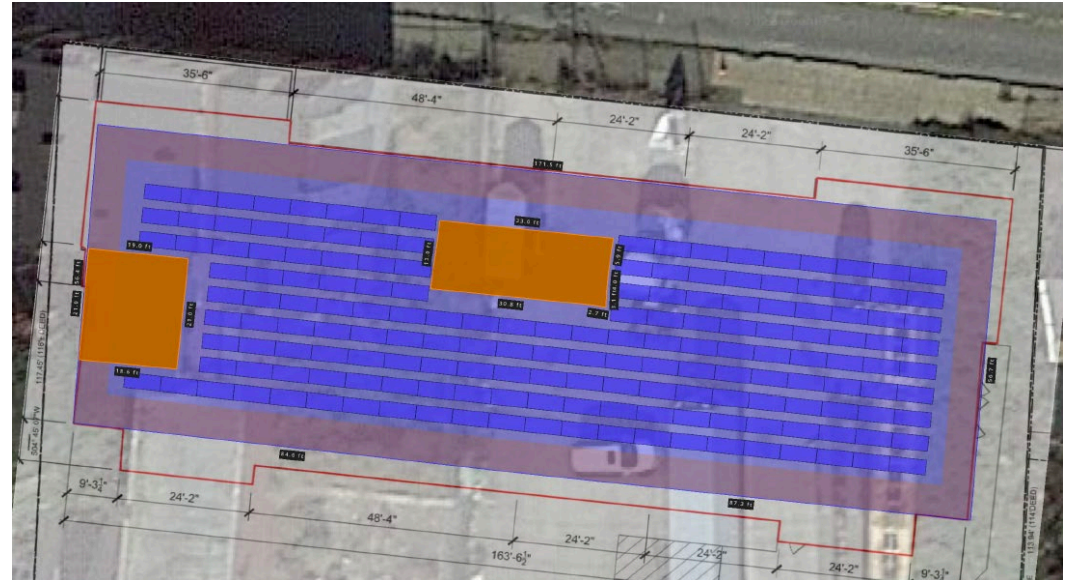
PROJECTED SAVINGS

- 57% energy use reduction
- 44% carbon emissions reduction*
- 42% water use reduction

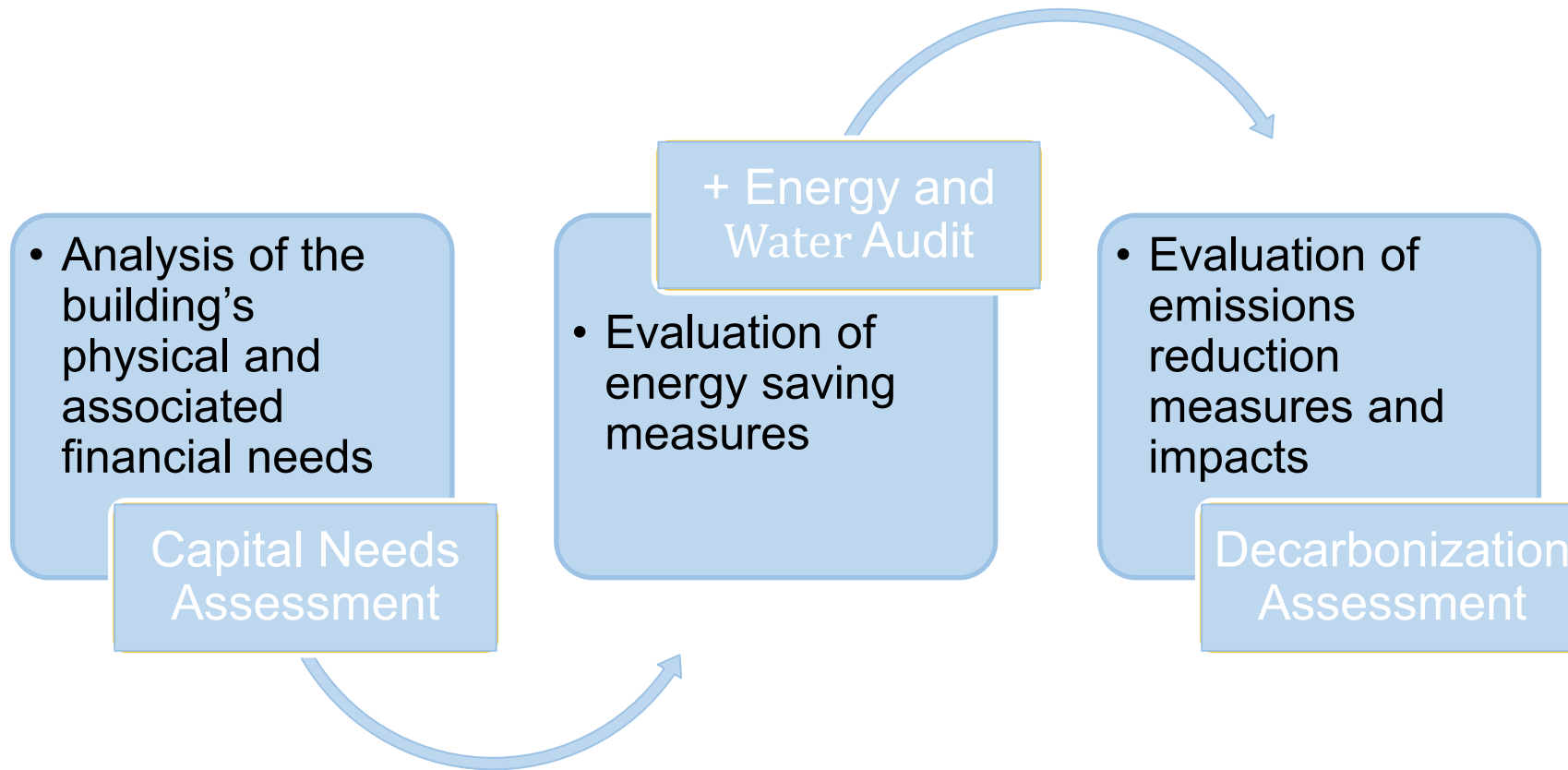


Definitions – Decarbonization

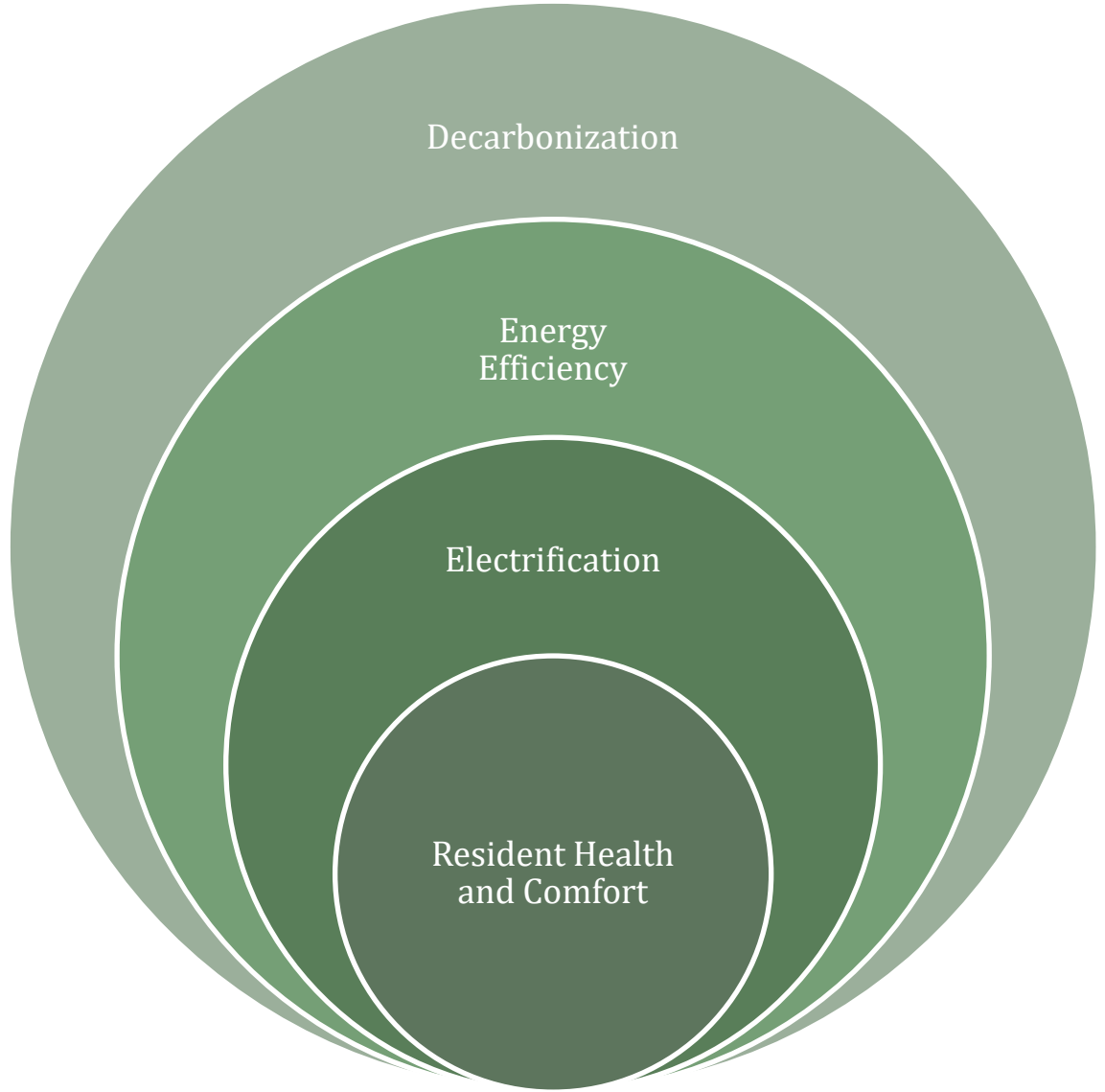
Emissions Reduction is Electrification +
On-site renewables.



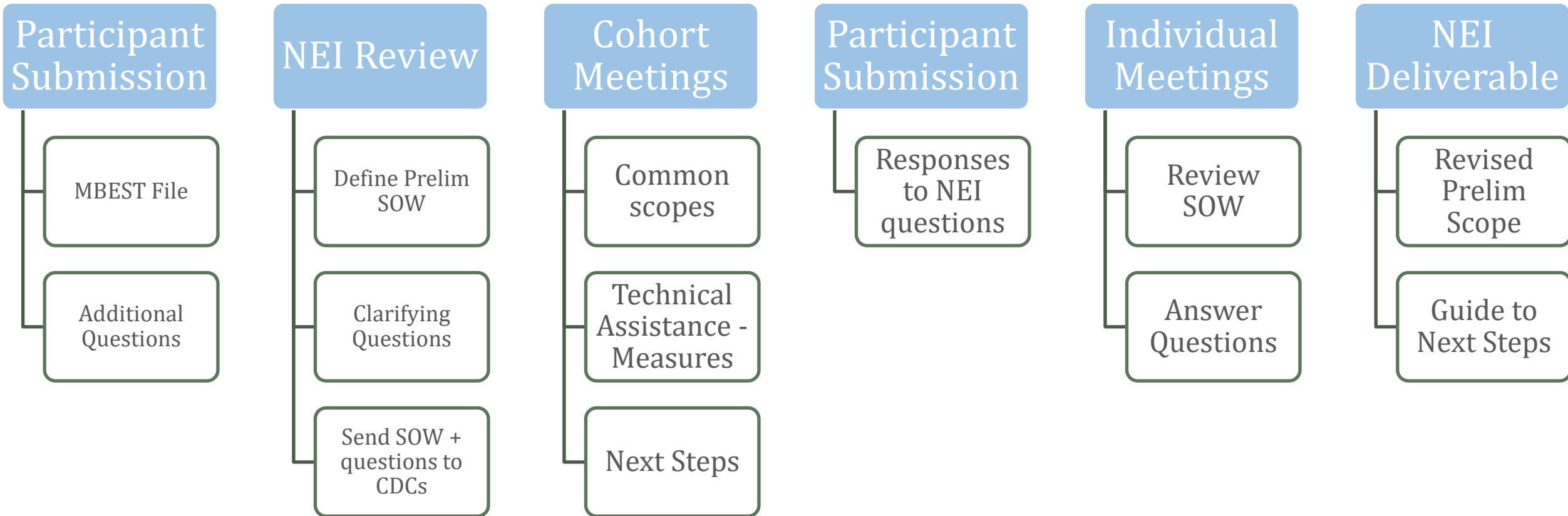
What is a Decarbonization Assessment?



Strategy



IRA Bootcamp Process



St. Stephen's Court Apartments

**.Location: Baltimore,
MD**

.Unit Count: 72

**.# of Buildings: 6 +
Community Center**

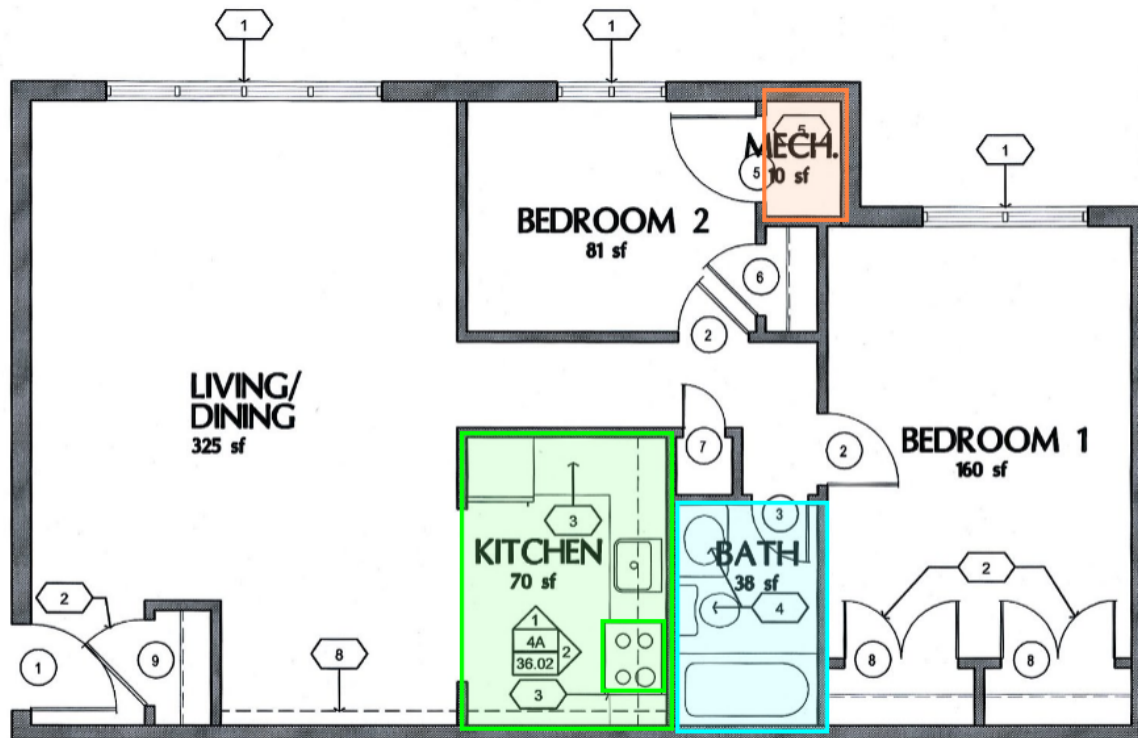
.Year Built: 1972

.Last Renovation: 2011

**.Owner: Episcopal
Housing**



Building Basics/ Systems



6B UNIT TYPE C (2 BEDROOM)
36.01 SCALE: 1/4" = 1'-0" 949 SF.

Mechanical Room:

- Condensing Gas Furnace
- Central AC
- Natural Gas Standard/ Low efficiency Water Heater

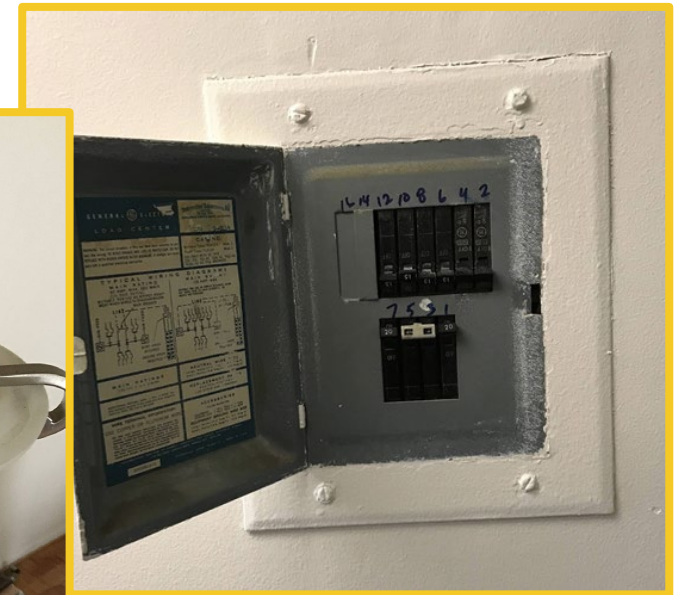
Kitchen

- Gas Range and Oven
- Sink flows avg. 1.5 gpm
- 2010 Refrigerators
- Electrical Panel in each unit
- In-Ceiling Exhaust Fan-switch operated

Bathroom

- In-Ceiling Exhaust Fan
- Sink flows avg. 1.5 gpm
- Shower flows avg 2 gpm

Building Basics/ Systems



Building Envelope/ Lighting

- No wall insulation (and ½” wall cavity)
- Double paned windows (2010)
- Lighting mostly CFL approx. 25% LED

Attic/ Roof

- Gable Roof with attic space
- Some insulation added in 2011
- No attic air sealing

MBEST, Multifamily Building Energy Screening Tool

What is in MBEST?	What is NOT?
General Overview	Analysis
Building Type	Cost Information
Rough Square Footage	Size or Configuration of Units
Lighting & Controls	Building/ Unit Ventilation
Building Systems	Electrical Service Data
Hot Water fixtures	# of Buildings/ Units at a Property
Fuel Types	Appliances/ Laundry
Building Envelope	Water/Sewer

Beyond MBEST

Analysis

of Buildings at the Property

of Units/ # of bedrooms at the property

Size & Configuration of Mechanical Closets

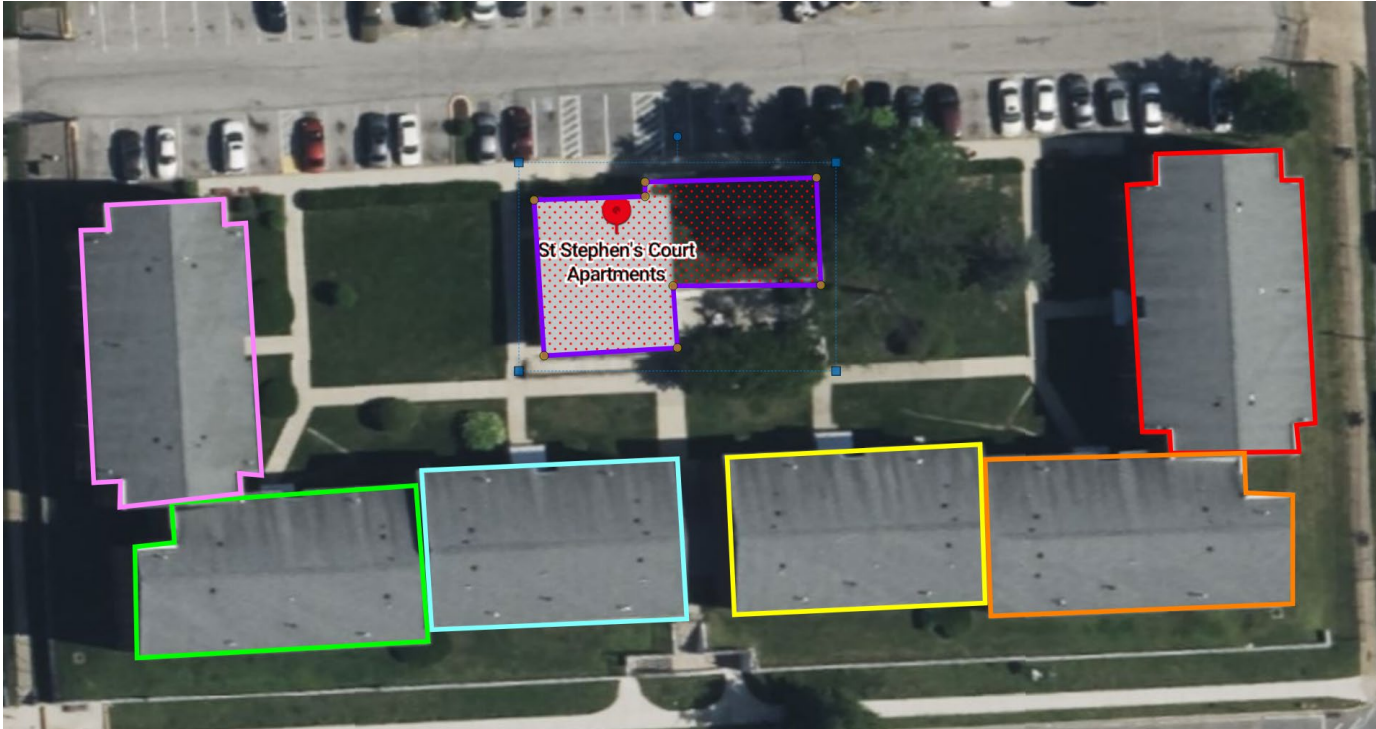
In-Building or In-Unit Laundry Facilities

Common Area Heating and Cooling Equipment Data

Health and Safety Concerns (moisture, radon, lead, etc)

Surprising, atypical architectural or mechanical features (ex. Water lines running through an attic.)

Putting the Property into MBEST



In the image above, the bldgs. configured in the “U” shape are the residential buildings. The central building is the community center.

Details

- 6 residential bldgs. and a community center/offices.
- Residential buildings- 1 bed, 2 bed, 3 bed, and ADA
- All residential buildings were renovated 2011.
- Each unit has the same HVAC and hot water systems.
- The community building was newly built in 2011 at the same time the units were renovated.

II.a. Building Specifications

a. Type of Building Row/townhouse = A structure containing three or more separate living units, each having individual outside entrances at ground level. Each unit may have more than one level. Detached = A structure that consists of a single living unit and is surrounded by permanent open space Semi-detached = A structure containing two separate living units, surrounded by permanent open space Walk-up Multifamily = More than one dwelling on more than one level with one or more entrances at ground level (but not a Semi-detached) Elevator Structure and High-Rise Elevator Structure = Any multistory structure for which an elevator is required under the Minimum Property Standards or local building codes	Walk-up Multifamily
b. Conditioned floor area The gross square footage of the building, measuring from the outside of the exterior walls and including <u>all</u> of the building's conditioned floors. This includes spaces below ground level, such as basements, if conditioned. Select range from dropdown.	5,001 to 10,000 square feet
c. Number of residential units in the building	12 <small>Number of units</small>

Only 1 building will go into MBEST.

- 1 representative for all 6 buildings
- Same building type
- Same renovation dates
- Same building equipment.
- Do not include community/ office buildings.
- Use tabs I, II.a. and II.b.

For the IRA Bootcamp:

When you have multiple building types or conditions on a property, chose the MOST COMMON building type, renovation, and equipment and submit that one type.

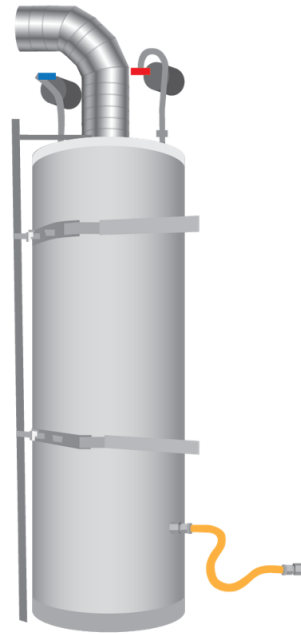
We can only review a maximum of 4 MBEST files per CDC.

V.a. Hot Water



Actual Equipment

- Fuel-fired non-condensing water heater**
It will have metal vent materials (3"-5" diameter) at the top or side of the heater, and there will be no condensate drain.



The Guide Worksheet
(V.b. Hot Water Guide)

The Input Worksheet (V.a. Hot Water)

Section 1. Central or In-Unit Water Heating

First, determine whether your building has central water heating or in-unit water heating. The descriptions in tab V.b Hot Water Guide should guide you.

1. Water Heating System Type

In-Unit

Section 2. Water Heating Equipment Type, Efficiency, and Condition

Now that you have identified if the system is central or in-unit, you need to identify the equipment type, condition, presence of insulation, age, and location.

If your building contains multiple types of water heating systems (for example both fuel-fired and electric water heating), please answer the questions below based on the most common water heating type(s) in the building.

1. Water heater equipment type

You will need to identify which type of water heater is present in your building. Select the option that is closest to yours.

- a. Which type of water heater is present in your building?

Fuel-fired Storage Non-condensing

Preliminary Recommendations Based on the MBEST Review

Priority 1

- Upgrade all remaining lighting to LED
- Install/ upgrade controls on common area and exterior lighting.
- Low flow sink aerators, showerheads.

Priority 2

- Investigate/ upgrade the existing electrical service to the building and the units.
- Replace gas water heater with an electric heat pump water heater.
- Evaluate unit ventilation needs for indoor air quality. Install as necessary. (Assume a tighter building post retrofit.)
- Air sealing and insulation.

Priority 3

- Replace gas furnace and AC with a heat pump system.
- Replace gas range and oven with induction range and electric oven.
- Upgrade appliances to Energy Star or better.
- Install photovoltaics with battery storage.

Revised Individual Recommendations

Priority 1

- Upgrade all remaining lighting to LED.
- Install/ upgrade controls on common area and exterior lighting.
- Low flow sink aerators, showerheads.

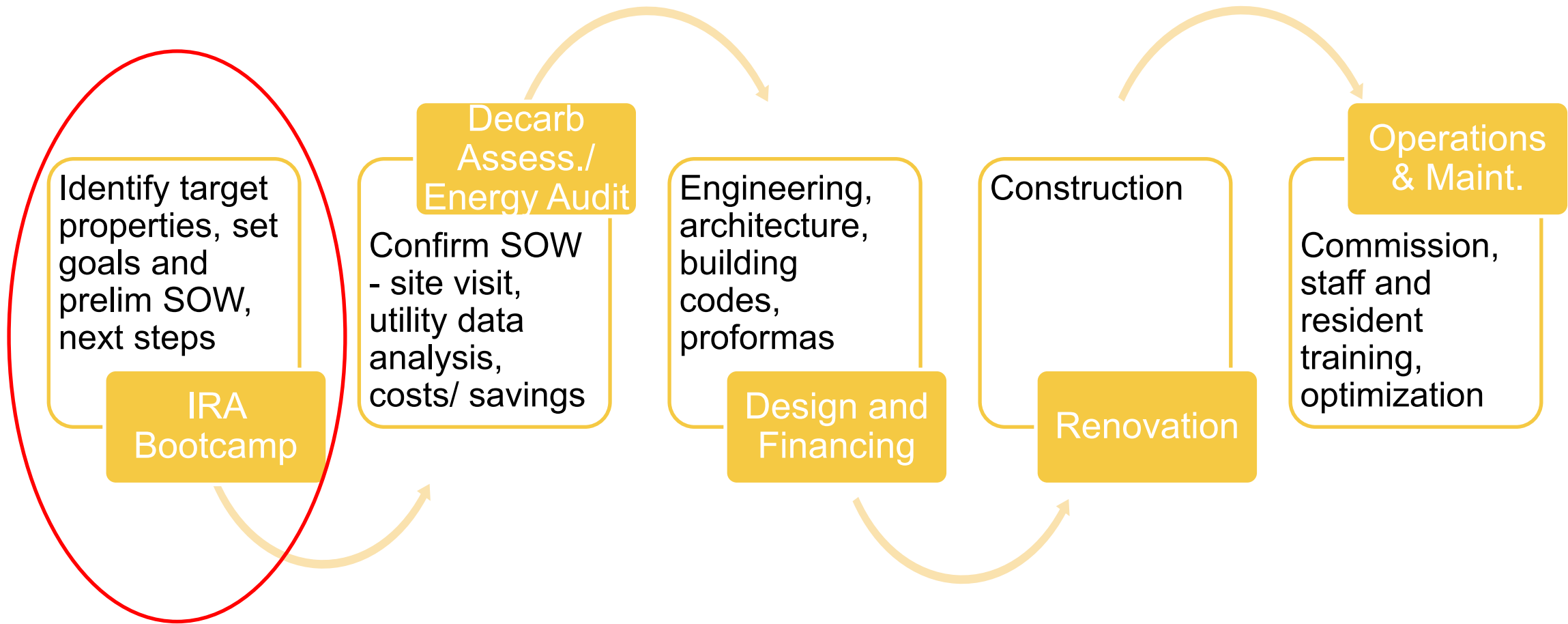
Priority 2

- Upgrade the existing electrical service to the building and the units.
- Replace gas water heater with an electric resistance water heater.
- Evaluate unit ventilation needs for indoor air quality. Install as necessary. (Assume a tighter building post retrofit.)
- Air sealing and insulation.

Priority 3

- Replace gas furnace and AC with a heat pump system.
- Replace gas range and oven with induction range and electric oven.
- Replace gas clothes dryers in ADA units and common areas with electric dryers.
- Upgrade appliances to Energy Star or better.
- Install photovoltaics with battery storage.

After IRA Bootcamp: Next Steps



Break Out Session

What is the best or worst building energy efficiency advice you have received?

What is the most confusing issue within the decarbonization/ electrification process?

Break Out Session - Reporting

What is the best or worst building energy efficiency advice you have received?

What is the most confusing issue within the decarbonization/ electrification process?

Zero Over Time (ZOT)

- Strategic implementation of emissions reduction measures
- Relies on more intervention points over time
- Minimizes capital budget impact
- Longer timeline to realize emissions reduction
- Typically followed when system equipment has useful life remaining and refi is distant

Deep Energy Retrofit (DER)

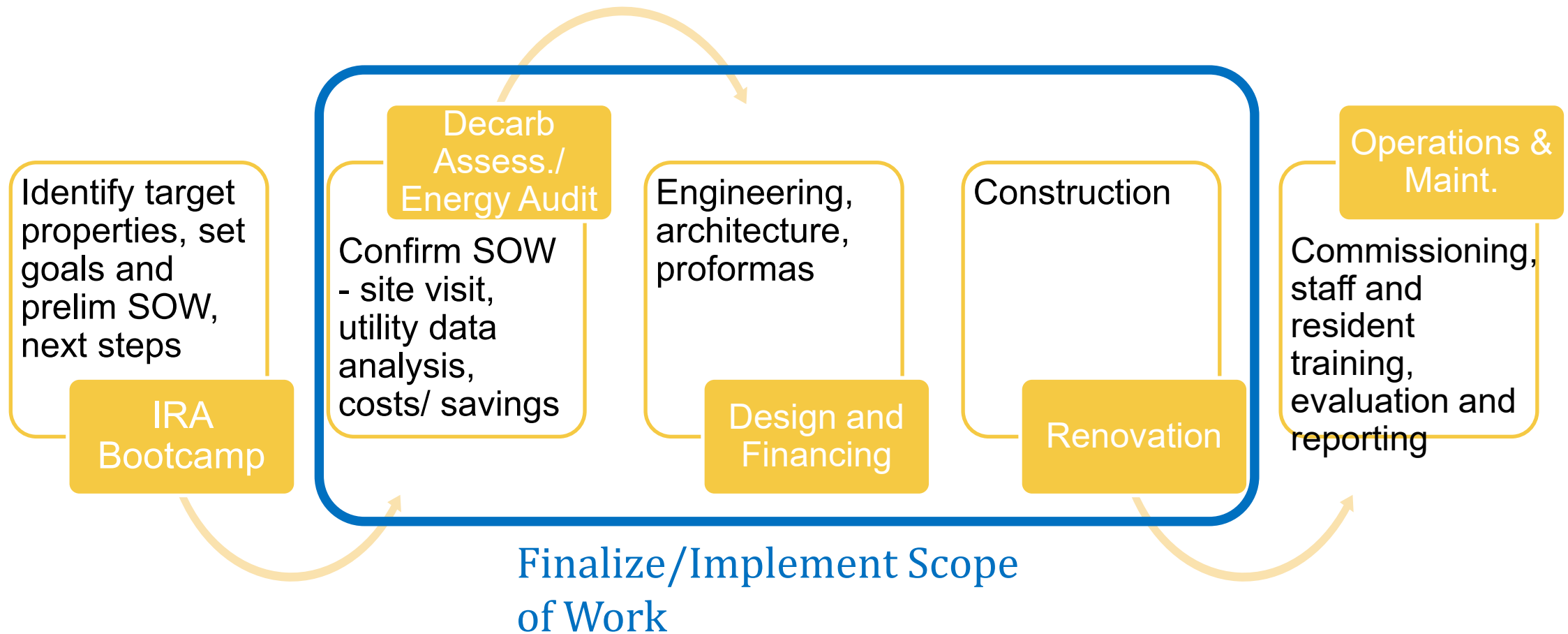
- Leverages retrofit process and measures to the fullest extent
- Minimizes the number of disturbances to residents
- Expensive capital cost
- Immediate emissions reduction achievement
- Potential for competitive resources
- Typically timed with refi/rehab

Nonantum Village Place
Apartments (ZOT)

- .Location: Newton, MA**
- .Project Type: HUD 202
Elderly Supportive**
- .Unit Count: 35 1-BR
Units**
- .Year Built: 2004**
- .Owner: CASCAP/
Homeowners Rehab**



IRA Bootcamp and the Development Process



Systems/Components in Need of Replacement:

- Roof
- Siding and trim repairs
- Cooling units serving apartments
- Apartment-based heating/cooling distribution system
- Common area HVAC equipment



Short-Term Capital Project Efficiency Measures:

•**Replace Degraded Roof:**

- Repair moisture damage, increase insulation to R-50, install white membrane in preparation for future PV system.

•**Install Air Source Heat Pumps:**

- Replace existing cooling units with air source heat pumps (1 per apartment)
- Keep existing gas-fired boilers for hot water and for use during very cold temperatures

•**Replace Common Area HVAC Units:** Replace existing gas fired rooftop units with electric.

- Units provide heating, cooling, and ventilation to common areas

•**Solar + Storage:**

- Install 35kW Solar system and 22.9 kWh battery storage for resilience and operating costs savings

Apartment Heating and Cooling Timeline

1.



2021: Current System

- Central Gas-Fired Condensing Boiler
- Hot Water Coil in Fan Coil Unit
- 80% Efficient Heating, 11 SEER cooling

2.



2022: Hybrid Heat Pump

- Central Gas-Fired Condensing Boiler (Below 30F)
- Apartment Heat Pumps (Above 30F)
- Hot Water Coil and Heat Pump in Fan Coil Unit
- 80% Efficient Gas HW, 3.1 COP Heat Pump, 20 SEER Cooling

3.



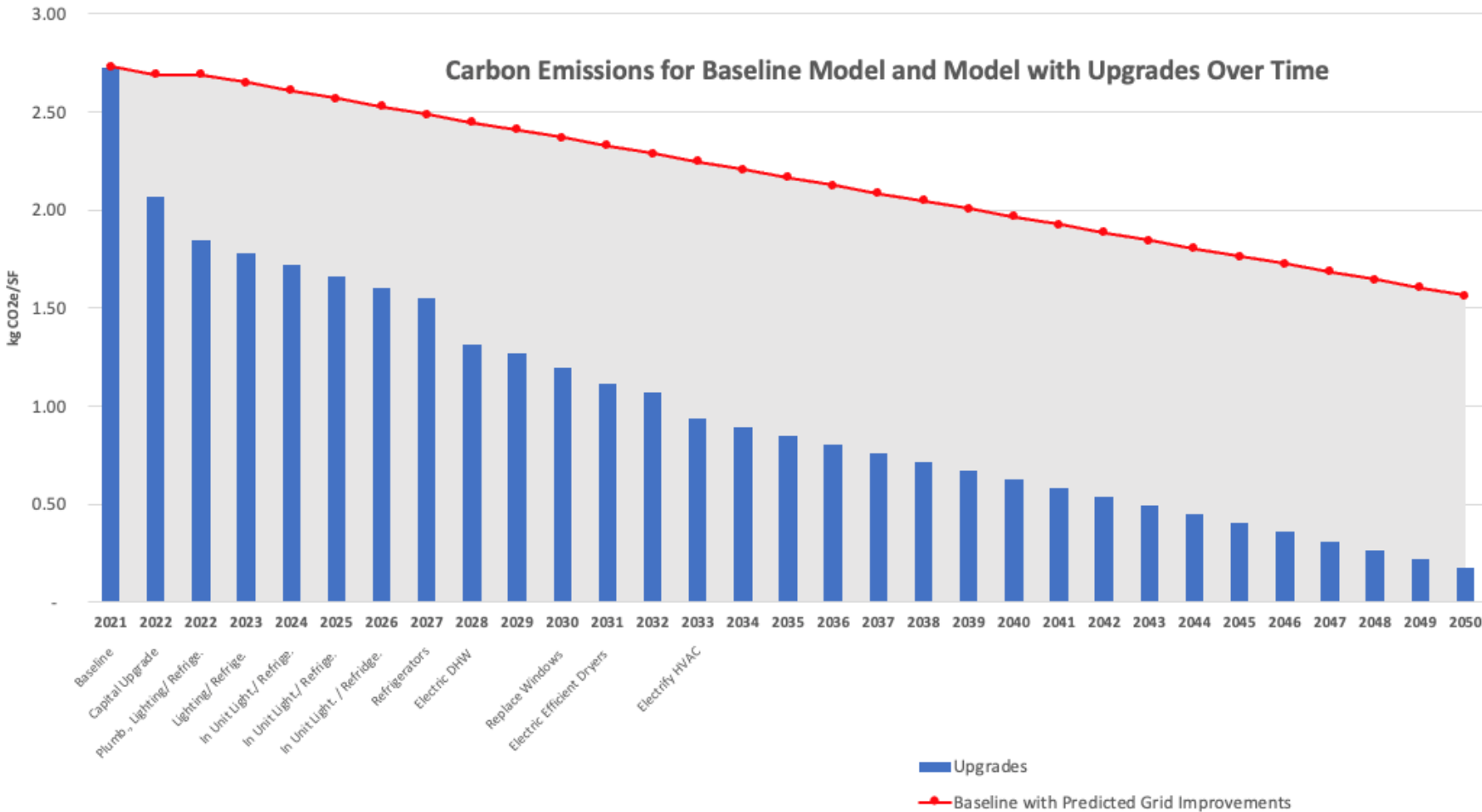
2033: Full Electrification

- Apartment Heat Pumps (All Temperatures)
- Heat Pump in Fan Coil Unit
- Above 30F: 3.1 COP, Below 30F: 2.4 COP, 20 SEER Cooling

Zero Over Time Plan

YEAR	ECM	MOTIVATION/TRIGGER	FUNDING SOURCE
2022-23	Packaged Capital Upgrade	Cooling equipment end of useful life/severe water damage to roof, solar + storage*	Fundraising: City of Newton, LEAN, MA DEP, foundations
2024	Low flow plumbing	Operating savings/low upfront cost	Toilets: Replacement reserves; Faucet aerators and showerheads: Operating reserves
2024-27	LED Lighting Replacement	Operating savings	Operating reserves at unit turnover
2024-28	Energy Star Refrigerators	Operating savings	Replacement reserves
2028	Electric Heat Pump Water Heaters	Domestic hot water tank end of useful life	Fundraising necessary; target future utility incentive programs
2030	Energy Star Windows	Windows end of useful life	Replacement reserves
2031	Electric Dryers	End of laundry equipment lease contract	Resources may be needed to increase the electric capacity of laundry room
2033	Fully Electrified Heating	Boiler end of useful life	Replacement reserves for air source heat pump replacement in 2038 and decommissioning of boiler plant

Modeled Emissions Reduction

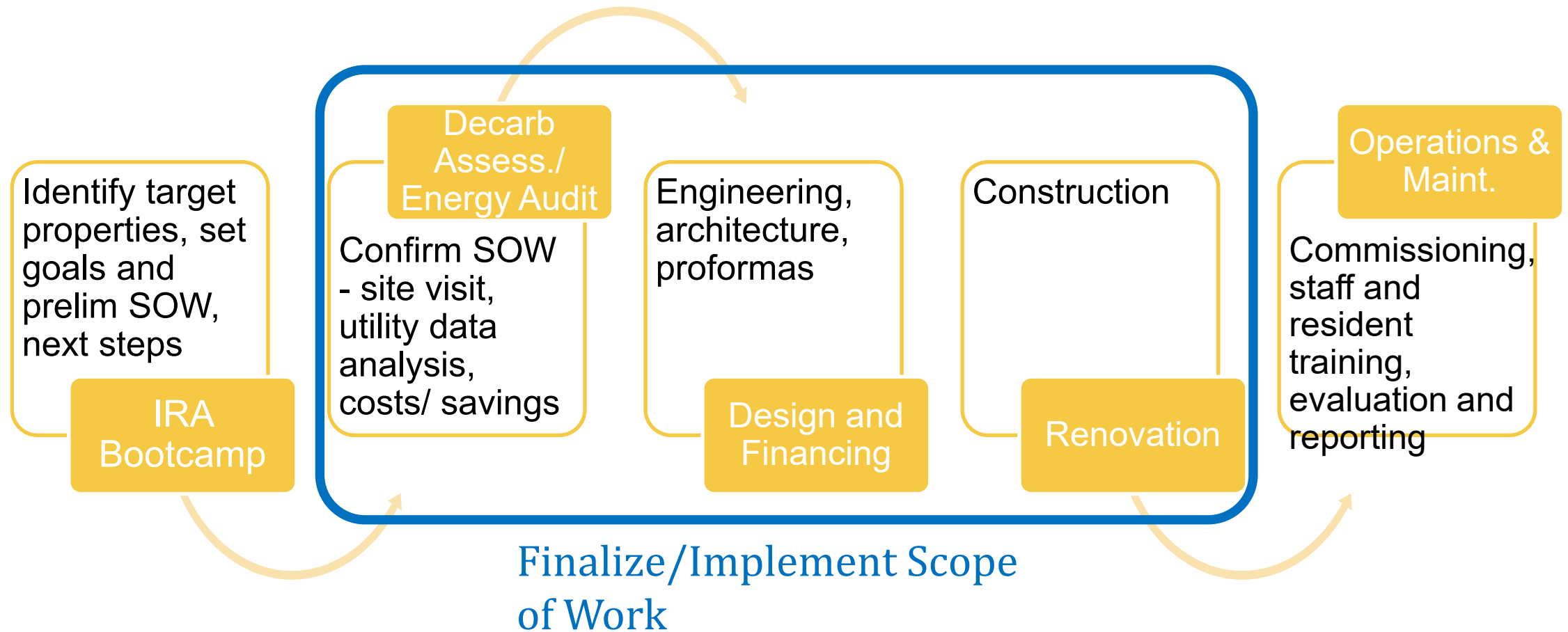


Treehouse Apartments (Deep Energy Retrofit)

- **Location:** Easthampton, MA
- **Year Built:** 2007
- **Project Type:** Elderly Supportive
- **Unit Count:** 60 total
 - 48 elderly
 - 12 family units
- **Owner:** Beacon Communities



IRA Bootcamp and the Development Process



Selected Retrofit Measures

- Add Roof Insulation – Added to Underside of Roof
- Add Exterior Insulation – 1.5 inches mineral wool
- Replace Windows – Double Pane, U-0.25
- Add External Air Barrier, Target: 2 Air Changes/Hour
- Replace Gas Furnace and A/C with 1 Heat Pump Unit
 - Benefit: Add a second zone for comfort!
- Replace Gas Water Heaters with Electric Resistance
- Replace Lightbulbs with LED throughout
- Replace faucet aerators and Toilets with Low Flow Models

Add Ventilation – Energy Recovery Ventilation

Building 6 (elderly units)

Building Volume: 17,816 CF

CFM @ 50 : 1,526 CFM

ACH @ 50 : 5 ACH



Attic Hatch without gasket

Modeled Energy Savings

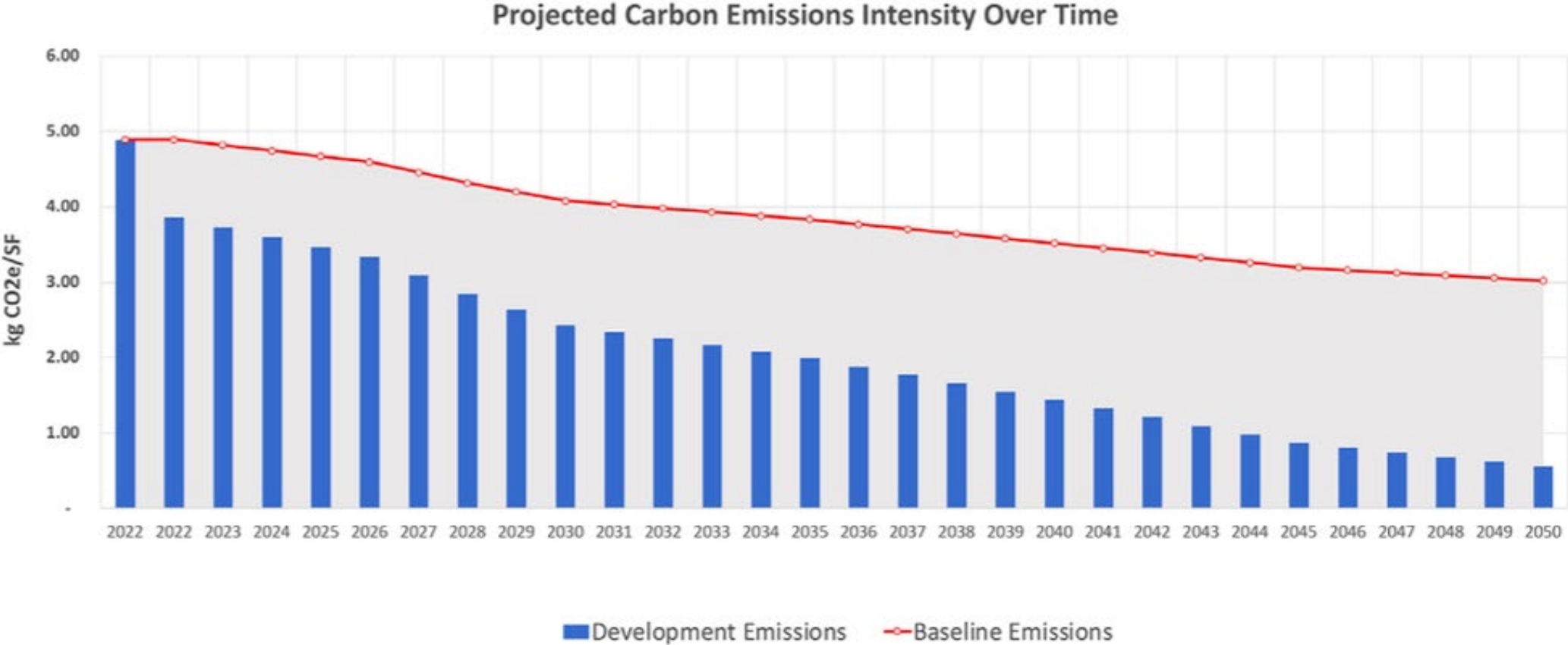
PROJECTED SAVINGS

- 50% energy use reduction
- 24% carbon emissions reduction
- 21% water use reduction

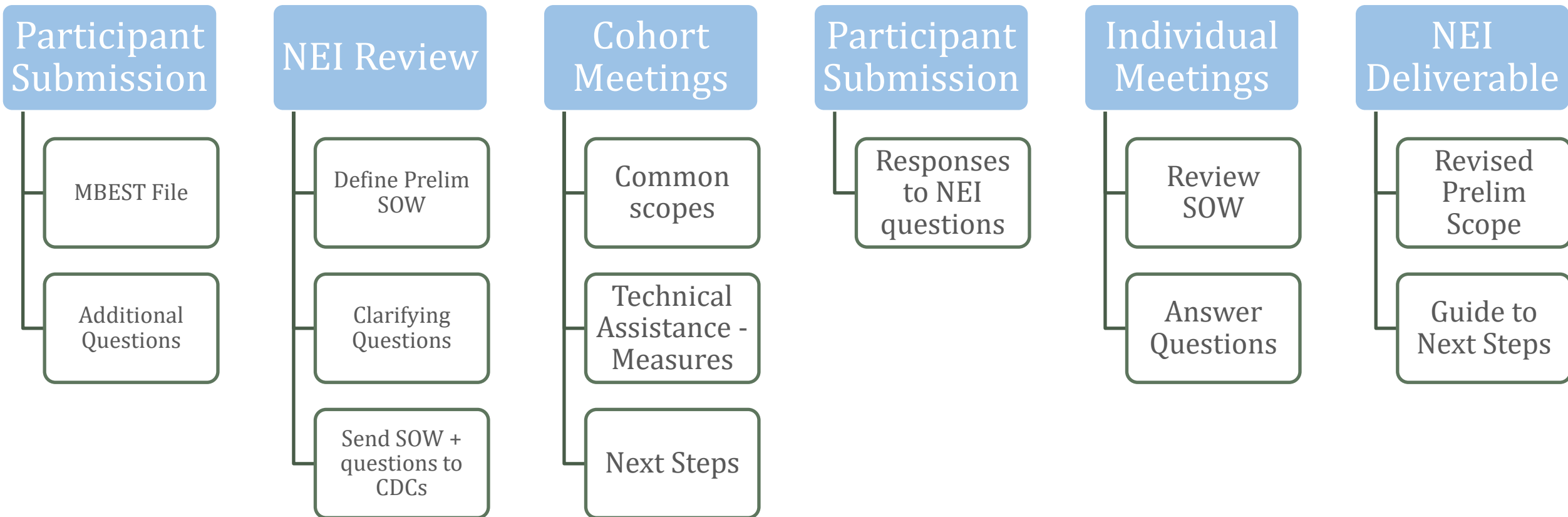
Utility Costs in Mass.

- Modeled cost \$0.24/kWh
- +12% Utility Costs

Modeled Emissions Reduction



IRA Bootcamp Process





Questions and Discussion



Session dates and topics are subject to change

Upcoming Sessions

**July 27,
1-2:30 PM ET**

Climate Resiliency and Solar Solutions

- Overview of how to integrate climate resilience into affordable housing
- Exploring solar solutions: how to make it work in affordable MF housing

**August 31,
1-2:30 PM ET**

Clean Energy Tax Credits

- Overview of tax credits most relevant to affordable housing
- Underwriting impacts

TBD

Greenhouse Gas Reduction Fund

- Understanding EPA's Final Guidance/NOFO

Thank you!
Questions?

