Building Retrofits: Basics and Benefits

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Elevate

Residential Retrofits for Energy Equity

About R2E2

Residential Retrofits for Energy Equity (R2E2) is a new nationwide initiative that will:

- provide training for…
  - state, local, and tribal governments
  - community-based organizations
- jumpstart energy upgrades for affordable housing that will…
  - lower utility bills
  - reduce greenhouse gas emissions
  - improve residents' health
  - create good-paying local jobs
  - help advance racial equity

A partnership of the American Council for an Energy-Efficient Economy (ACEEE), Elevate, Emerald Cities Collaborative, and HR&A Advisors, R2E2 will offer guidance on:

- energy upgrade financing models
- economic inclusion
- navigating the complexities of the affordable housing sector
- engaging with community-based organizations to ensure policy and program plans reflect community needs.

People's Climate Innovation Center is advising R2E2 on centering equity in the project and its outcomes and on facilitating community-driven planning processes.

Learning Objectives

By the end of this session you should be able to:

- Define the term “retrofit”
- Recognize the general areas covered in a building retrofit
- Identify the stakeholders involved in a building retrofit
- Explain the need for focusing retrofits in affordable housing
- Detail the energy benefits and non-energy benefits resulting from a retrofit
- Describe who receives the benefits and their impact
- Use the concepts presented to begin researching and developing a retrofit program in your area

What is a retrofit?

A retrofit is an addition or update of new technology to an older system. In comparison to a home *remodel*, a home *retrofit* focuses on technology rather than aesthetics.

Remodel

Goal: Make home more attractive

What: Décor and finishes

Who: Interior designer, general contractors, special trades

Retrofit

Goal: Make building more efficient

What: HVAC, plumbing, envelope, ventilation

Who: Mechanical/electrical/plumbing engineer, general contractors, special trades

What areas are included in a retrofit?

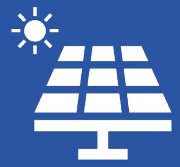
Baseline

Energy Efficiency

Water Conservation

Health & Safety

Electrification



Renewable Energy

Further opportunities

Smart Devices

Energy Storage

EV Charging

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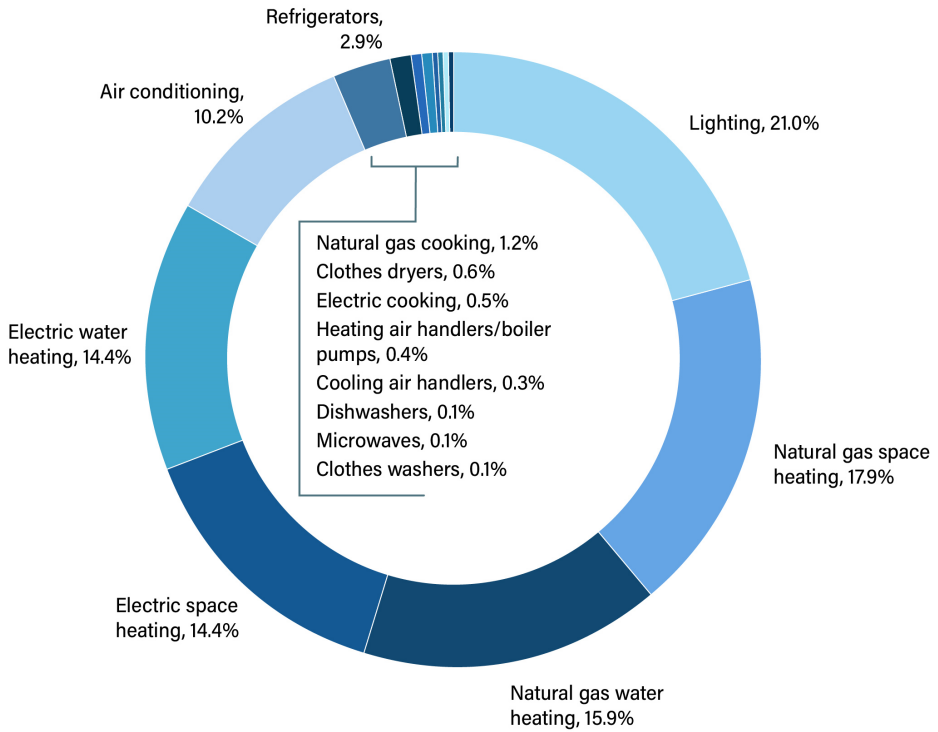
What is included in Energy Efficiency?

Tune up, repair, or replacement of:

- Heating and cooling systems
- Hot water systems
- Air leakage/Building envelope
- Lighting
- Appliances
- Windows

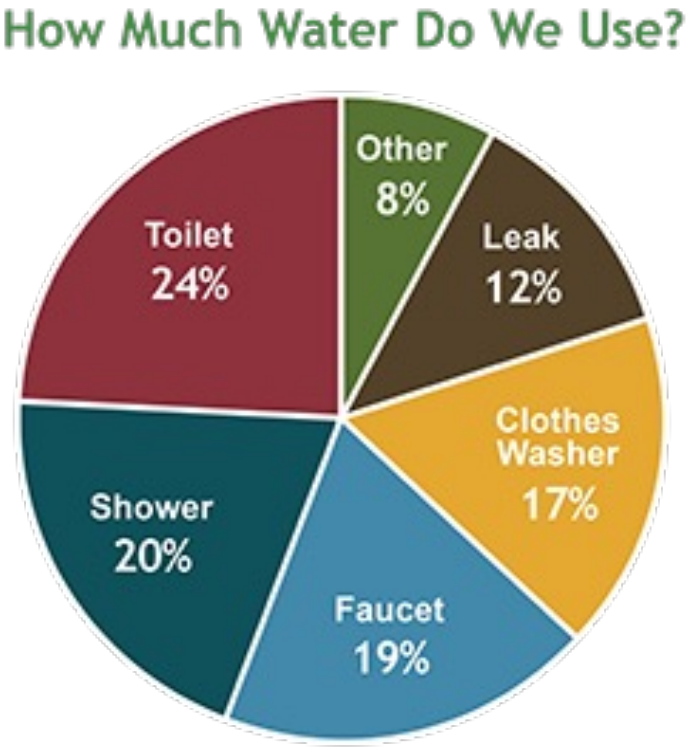
Where do we use the most energy?



https://www.aceee.org/sites/default/files/pdfs/Multifamily%20Home%20Energy%20Efficiency%20Potential%20final%201-22-21.pdf

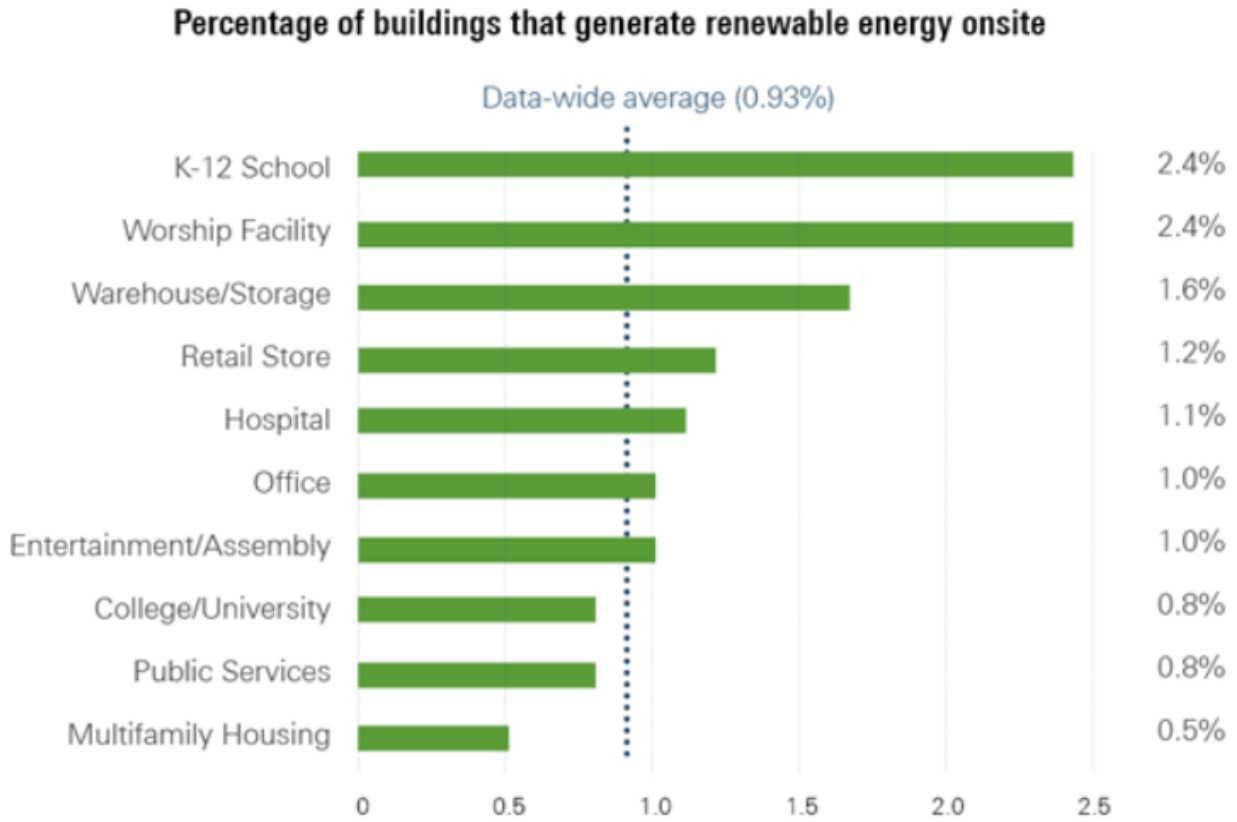
What is included in Water Conservation?

- Tune up, repair, or replacement of:
  - Hot water systems
  - Plumbing (for leaks)
  - Fixtures, toilets, showers
  - Irrigation systems
  - Stormwater management systems



What is included in Renewable Energy?

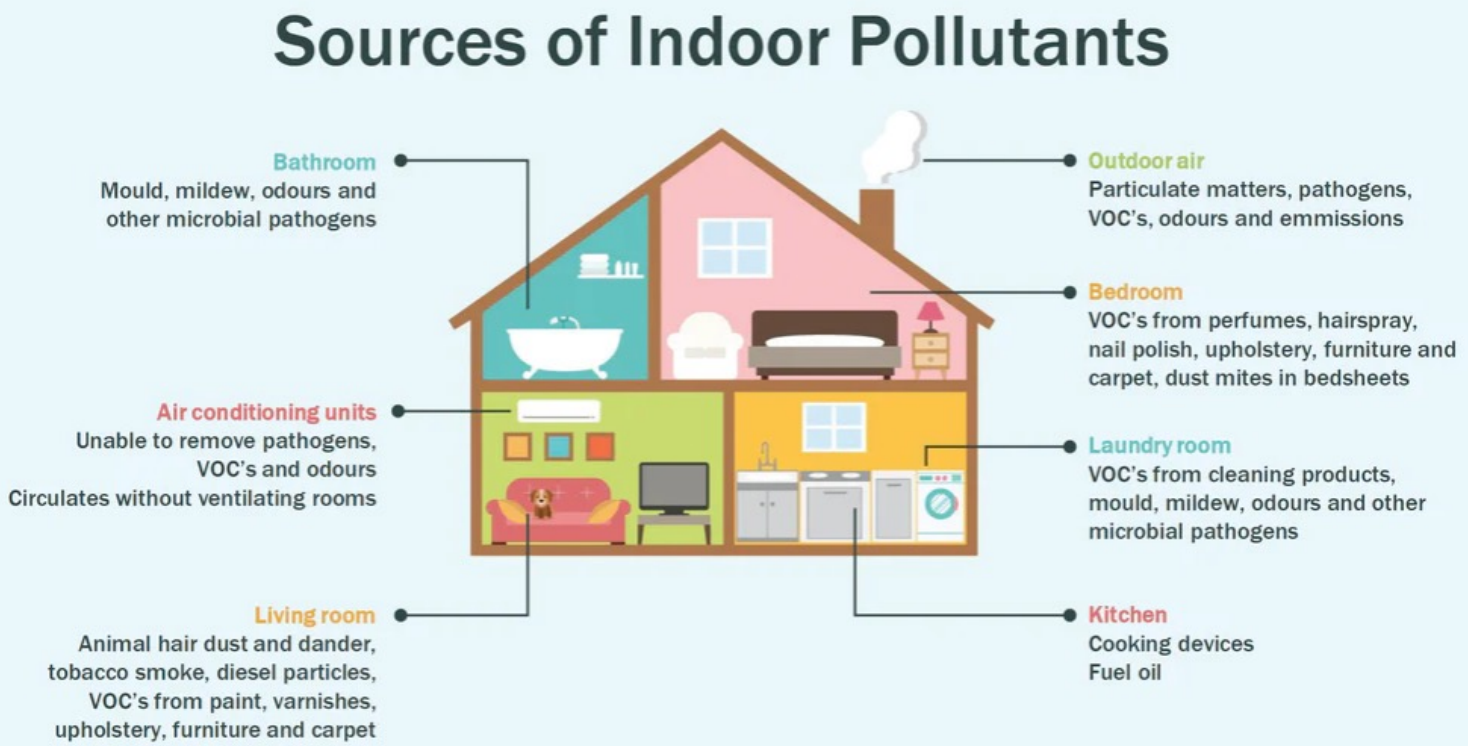
- Solar
- Geothermal
- Battery storage



https://www.energystar.gov/buildings/about_us/datatrends_research/renewable_report

What is included in Health & Safety?

- Combustion safety
- Ventilation
- Pest management
- Active Design
- Toxin abatement (lead, mold, asbestos, radon)



https://www.andatechdistribution.com.au/blogs/resources/indoor-air-quality-infographic

What types of buildings can be retrofitted?

- All types! Residential, commercial, industrial, public facilities
- Focus on affordable housing
  - Types: Public, subsidized, naturally occurring
  - Sizes: Single family, small apartment building, large multifamily
  - Ownership structure: Owner-occupied, renter-occupied, condo/land trust
- Why focus on affordable housing?
  - Lack of dedicated resources/institutions serving affordable housing
  - Most utility retrofit programs best suited to market-rate, owner-occupied and single-family homes
  - Often faces environmental discrimination and injustice
  - Constrained budgets
  - Deferred maintenance of energy and water systems
  - Diminishing stock

How can retrofits be undertaken?

- By building owners for an individual building
- By building owners for part or all of their portfolio of buildings
- By government, utilities, non-profits and community-based organizations for a community building (senior center, recreational facility, library, etc.)
- By government, utilities, non-profits and community-based organization for multiple buildings in a region

How are they funded?

- Building owner and/or investor capital
- Government, utility or private loans
- Government, utility or non-profit grants or subsidies

Who are the stakeholders?

- Building owners
- Property managers
- Governmental agencies
- Philanthropic, community or private funders
- Nonprofits
- Community-based organizations
- Renters
- Community residents

How can building upgrades benefit underserved communities?

Increase climate resilience

- → Reduce greenhouse gas emissions and air pollution
- → Lessen reliance on fossil fuel equipment
- → Enable families to maintain safe indoor temperatures during extreme weather

Improve health, comfort, and safety

- → Reduce exposure to mold, moisture, and lead
- → Improve indoor air quality
- → Lower risk of gas leaks or explosions
- → Reduce ER visits and missed days of work and school related to asthma and other respiratory diseases
- → Improve mental health

Increase affordability

- → Reduce energy bills for people with low and moderate incomes
- → Improve long-term housing affordability and stability
- → Free up household budgets for essential needs such as food and medicine

Strengthen the local economy

- → Promote equity via women- and minority-owned business development and inclusive procurement
- → Create local jobs through job training

Promote racial equity

- → Ensure retrofits benefit BIPOC communities that have been excluded from past policies
- → Address frontline community priorities
- → Center community leadership, especially voices from BIPOC, renter, and marginalized communities

What are some of the challenges?

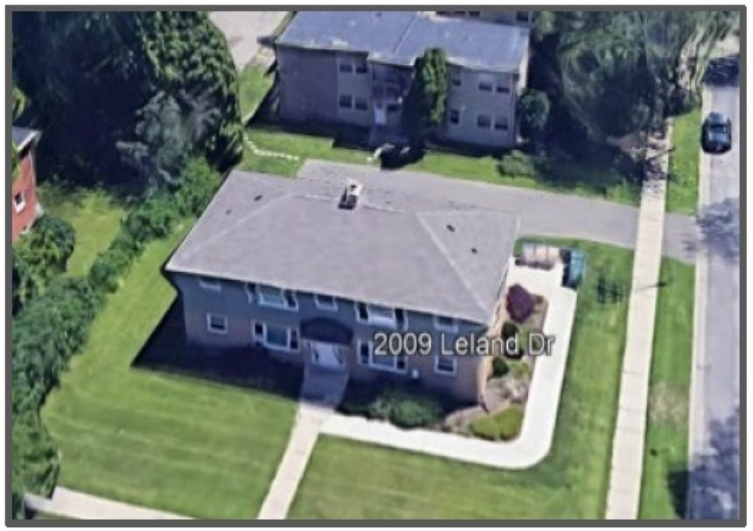
- Difficulty acquiring funding
- Identifying and selecting contractors
- Competing priorities of stakeholders
- Existing building conditions which must be addressed before retrofits can be safely installed
- Existing building systems require significant upgrades or modifications
- Educating tenants on best practices and shifting their behavior
- Climate, existing building issues, and required behavior change can complicate system design and equipment selection

Case Study: Common Wealth Development - Madison, WI

Common Wealth DEVELOPMENT

CITY OF MADISON WISCONSIN

USDN | urban sustainability directors network



Electrification system scope

- 4-unit affordable multifamily
- Air source heat pumps
- Weatherization

Resilience Benefits

- Reduced operating costs
- $0 heating and cooling cost for each residential unit
- Added cooling for each unit

Environmental Benefits:

- Gas to electric heating conversion; **70%** reduction in carbon emissions; **4.2 tons** annually, **63 tons** over 15-year lifetime.

Solar system scope

- 20 KW solar array offsets entire centralized heating and cooling system load

Costs and Savings

- Turnkey costs of **$135,000**
- **$425** annual operating cost reduction
- **$1,166** annual tenant energy cost reduction

RENEW WISCONSIN

SUSTAIN DANE

ELEVATE
Equity through climate action

Wisconsin Efficiency Navigator

Efficiency Navigator

Making multi-family housing affordable and resilient

The Efficiency Navigator helps small to medium-size multi-family housing become more efficient and resilient while reducing operating costs to remain affordable.

Program Goals

Housing Resilience

Foster innovation to help preserve affordable workforce housing

Equity

Address the intersection of environmental, social, and economic justice for cost-burdened residents

Climate change

Reduce energy and water demand in our existing building stock to tackle the effects of climate change

Wisconsin Efficiency Navigator
Wisconsin Public Service Commission Grant for Madison

Completed energy assessments for
86 units

Estimated annual energy usage savings
21%

Estimated annual energy cost savings
11%

Estimated annual greenhouse gas emissions avoided
26,671 tons
Equivalent to 5,747 cars driven for a year

33 energy conservation measures at **10** properties resulting in

- **489 MMBtu** of energy savings
  Equivalent to the annual energy usage for 14 apartment units
- **$5,800**
  in annual cost savings

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Building Retrofit Best Practices

- Include tenants/occupants/residents as a primary stakeholder in the planning process
- Center efforts around equity and inclusion
- Look beyond energy and cost savings when setting goals
- Braid together available funding

Summary

- A retrofit aims to increase the efficiency of a building.
- Building retrofits address many systems within a building, including but not limited to, energy, water, renewable energy, health & safety.
- The stakeholders in funding, planning, and implementation of retrofits are generally property owners, governmental agencies, utilities, non-profits, private funders, and community-based organizations.
- For a variety of reasons, including racial and economic inequity, the need for retrofits in affordable housing properties should be a focus of retrofit programs.
- A variety of benefits, both energy and non-energy, are derived from retrofits which positively impact stakeholders from individual renters to the entire planet.

Resources

- U.S. Department of Energy Better Buildings Challenge
  - https://betterbuildingssolutioncenter.energy.gov/sectors/multifamily
- ACEEE Multifamily Energy Savings Project
  - https://www.aceee.org/multifamily-project
- Building Energy Exchange Low Carbon Multifamily Retrofit Playbooks
  - https://be-exchange.org/lowcarbonmultifamily-main/
- USDN Equity and Buildings: A Practical Framework for Local Government Decision Makers
  - https://www.usdn.org/uploads/cms/documents/usdn_equity_and_buildings_framework_-_june_2021.pdf

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WELLS FARGO

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