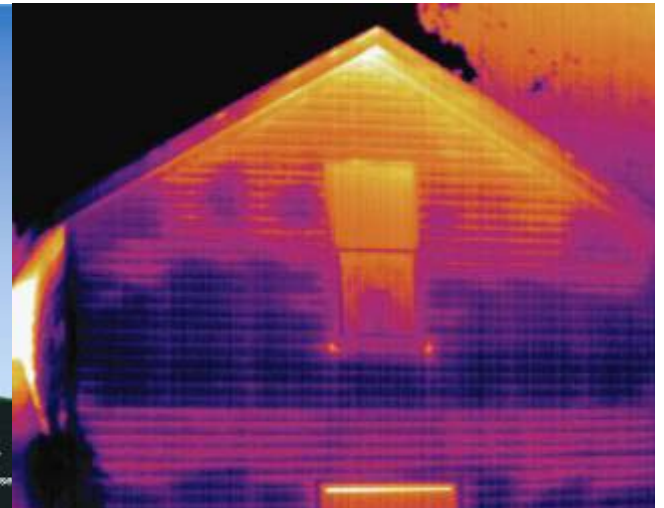


Greening Vancouver's Single Family Homes: Energy & Greenhouse Gas Reduction Strategies



Rachel Moscovich
Sustainability Group
City of Vancouver



Outline

- Greenest City 2020
- Approach to green buildings
- Greenhouse gas reduction strategies
 - Single family homes
 - Resources: DIY energy audit
 - Financing tools
 - Proposed by-law
 - Capacity Building
 - Quality Assurance

Greenest City Goal Areas

1. Green Economy
2. Climate Leadership
3. Green Buildings
4. Green Transportation
5. Zero Waste
6. Access to Nature
7. Lighter Footprint
8. Clean Water
9. Clean Air
10. Local Food



**TALK
GREEN
VANCOUVER**

GOAL #3



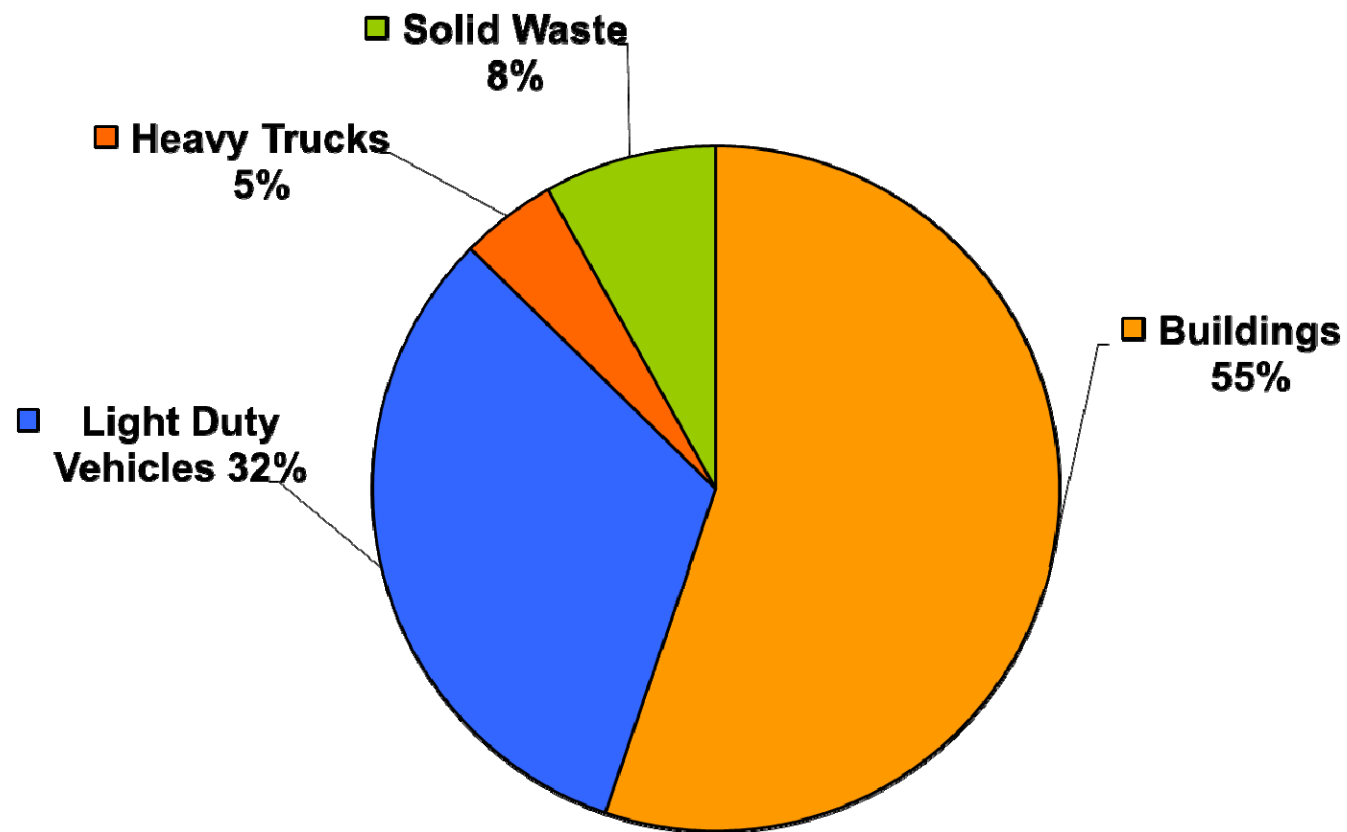
Green Buildings:

Lead the world in green building design and construction

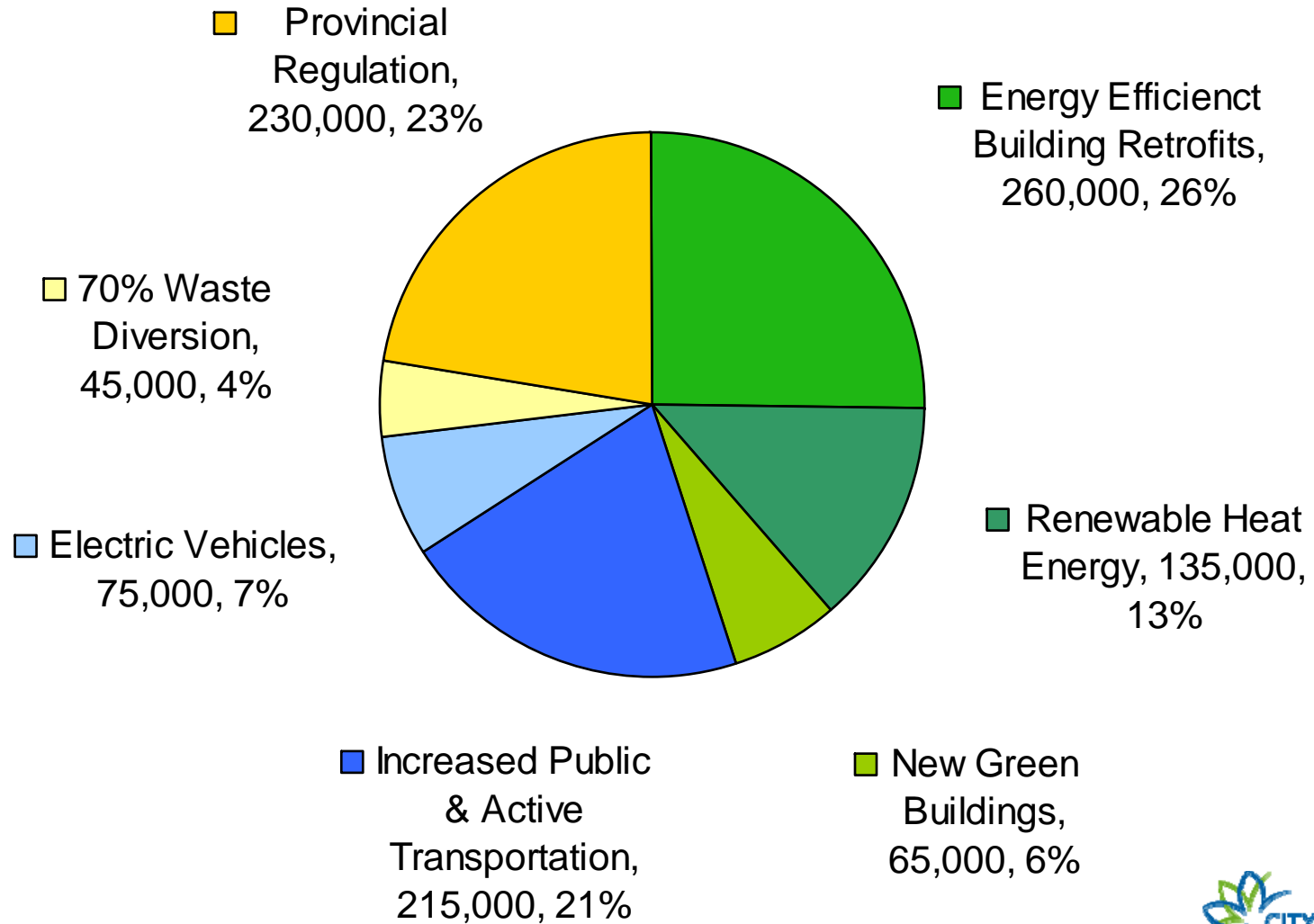
2020 targets:

1. Require all buildings constructed to be carbon neutral in operations
2. Reduce energy use and GHG emissions in existing buildings by 20%

Vancouver's 2008 Community GHG Emissions



Potential Sources of GHG Savings for Vancouver



Improving Building Performance

Codes

- ASHRAE 90.1 2007
- Performance targets

Capacity Building

- Performance research
- Trades training

Design:

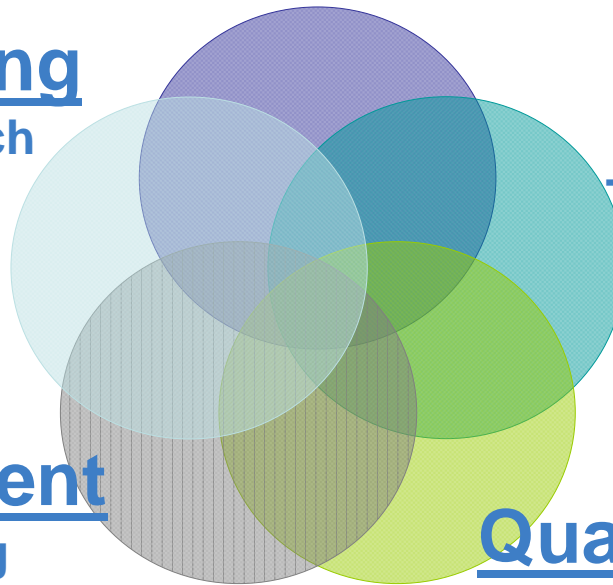
- Passive Design Tool kits
- Performance targets

User Engagement

- Building labeling
- In-suite metering
- One day campaign

Quality Assurance:

- Measurement and Verification
- Performance certification



Reducing GHGs from Buildings

- New Homes
- Existing Homes



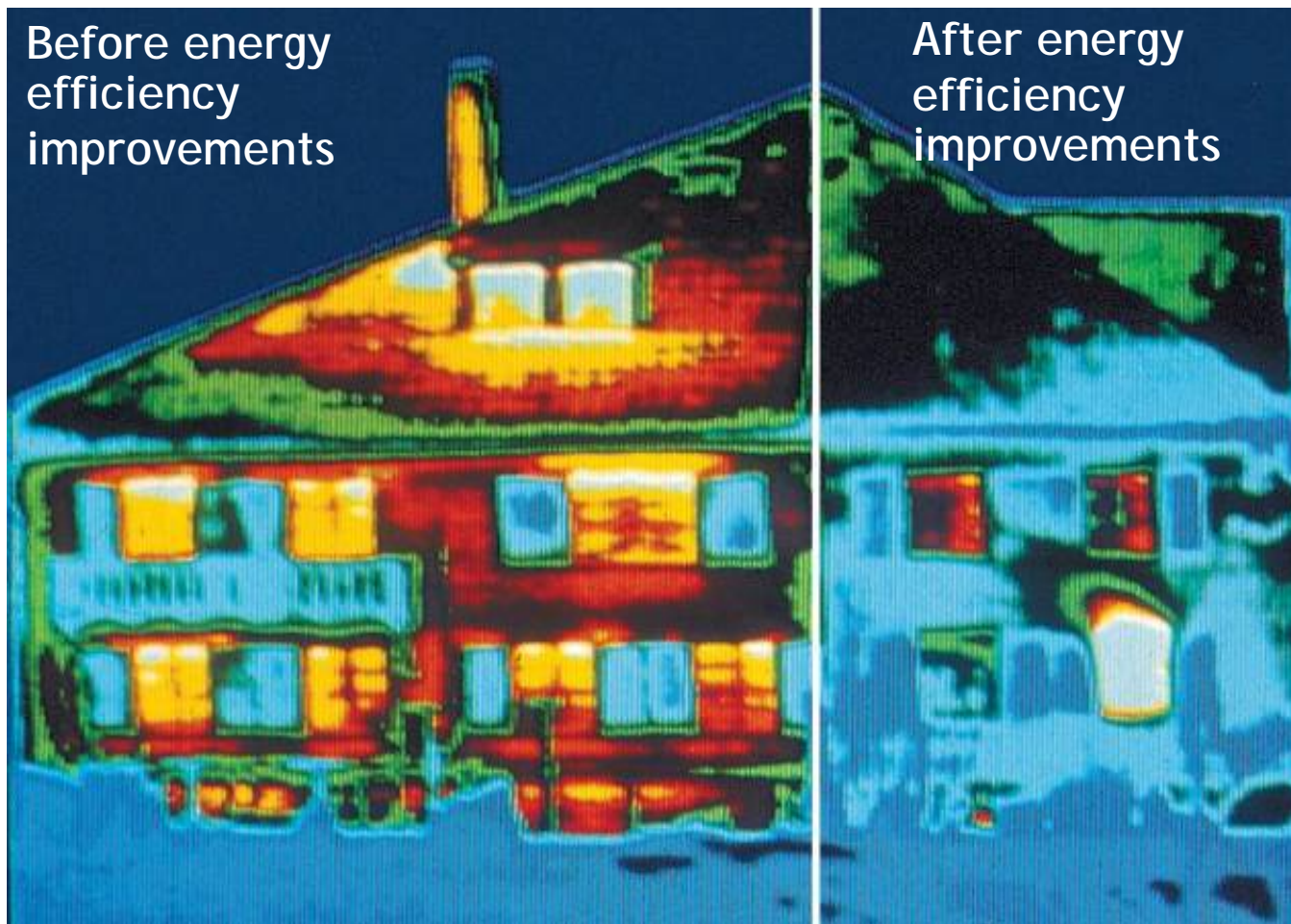
- New Commercial
- Existing Commercial



- District Energy



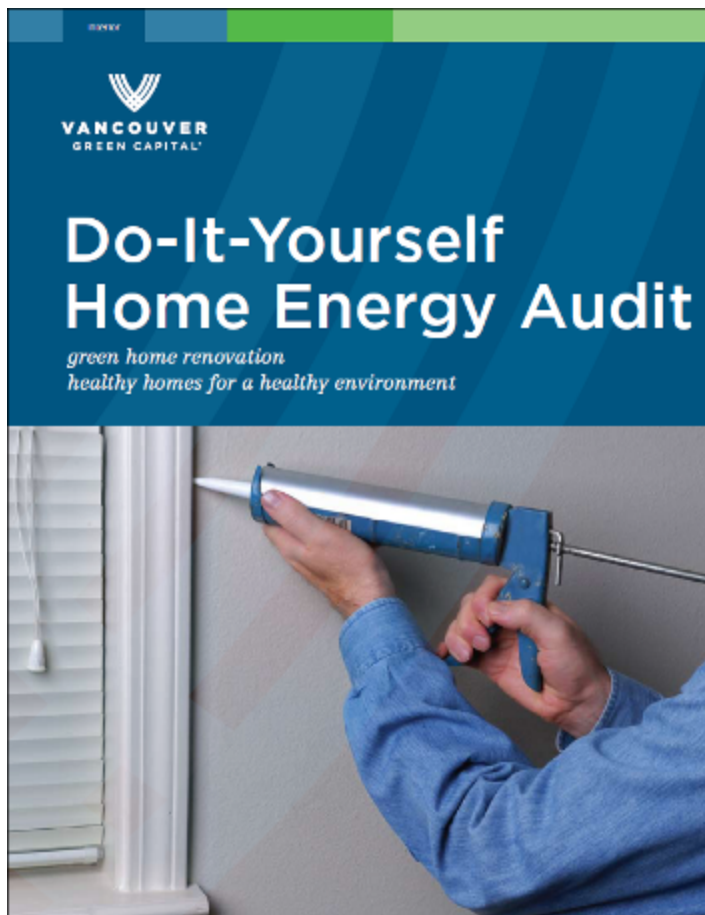
Retrofitting Existing Buildings: 90,000 tonnes from single family homes



Resources: Green Home Renovation Series



Resources: Green Home Renovation Series



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- 3 How To Use This Guide**
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Use this tear-out form to take notes as you conduct your audit.
- 6 The Building Enclosure**
Understand the components of a building enclosure, how to investigate your own home, and what to do to improve its effectiveness.
 - Air Leaks
 - Insulation
 - Moisture Control
- 14 Space and Water Heating**
Understand your home's mechanical systems, how well they are operating, and what improvements should be made.
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 - Water Heating
- 17 Paybacks**
Identify the most cost effective means to make your home energy-efficient.
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Definitions of common terms used throughout the guide.
- 19 Deep Green Considerations**
New energy technologies and products.
- 20 Resources**
Get more information about creating your own high-efficiency home.

Tear-Out Checklist

Use this form to make detailed notes as you inspect the various areas of your home. The checklist is set up by location so you don't have to visit one area more than once. For each area, you will be checking for insulation, air leaks, moisture problems and the heating system components.

| Ceiling Above Heated Area | Comments/Concerns |
|--|-------------------|
| Attic hatch <input type="checkbox"/> insulated <input type="checkbox"/> weatherstripped _____ | _____ |
| Attic floors <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Attic roof (sloped) <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Dropped ceiling <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Cathedral ceiling <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Flat roof <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Wall top plates <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Attic side walls <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| <input type="checkbox"/> blocked <input type="checkbox"/> sealed _____ | _____ |
| Chimney chase <input type="checkbox"/> sealed _____ | _____ |
| Duct penetrations <input type="checkbox"/> sealed _____ | _____ |
| Pipe & wire penetrations <input type="checkbox"/> sealed _____ | _____ |
| Recessed lights <input type="checkbox"/> sealed <input type="checkbox"/> insulated _____ | _____ |
| <input type="checkbox"/> baffled if not IC rated _____ | _____ |
| Exhaust fan 1 <input type="checkbox"/> working <input type="checkbox"/> vented to outside _____ | _____ |
| Exhaust fan 2 <input type="checkbox"/> working <input type="checkbox"/> vented to outside _____ | _____ |
| Ducts <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| <input type="checkbox"/> joints sealed _____ | _____ |
| Hot water pipes <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Vents <input type="checkbox"/> vents-high # _____ <input type="checkbox"/> total net free area _____ <input type="checkbox"/> cleared/baffled _____ | _____ |
| <input type="checkbox"/> vents-low # _____ <input type="checkbox"/> total net free area _____ <input type="checkbox"/> cleared/baffled _____ | _____ |

Heating System (in Attic or Basement/Crawl Space)

| | |
|---|-------|
| Furnace <input type="checkbox"/> filters clean <input type="checkbox"/> size/type _____ | _____ |
| <input type="checkbox"/> sealed combustion <input type="checkbox"/> flame retention _____ | _____ |
| Boiler <input type="checkbox"/> pipes insulated <input type="checkbox"/> R-Value _____ | _____ |
| <input type="checkbox"/> sealed combustion _____ | _____ |
| Water heater <input type="checkbox"/> insulated shell <input type="checkbox"/> water temperature _____ | _____ |
| <input type="checkbox"/> pipes insulated <input type="checkbox"/> R-Value _____ | _____ |
| <input type="checkbox"/> sealed combustion <input type="checkbox"/> heat traps _____ | _____ |

Floor Below Heated Area (Basement or Crawl Space)

| | |
|--|-------|
| Floor joists <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Rim joists <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Ducts <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| <input type="checkbox"/> connected <input type="checkbox"/> sealed _____ | _____ |
| Hot water pipes <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Ground cover (crawl space) <input type="checkbox"/> fully covered _____ | _____ |

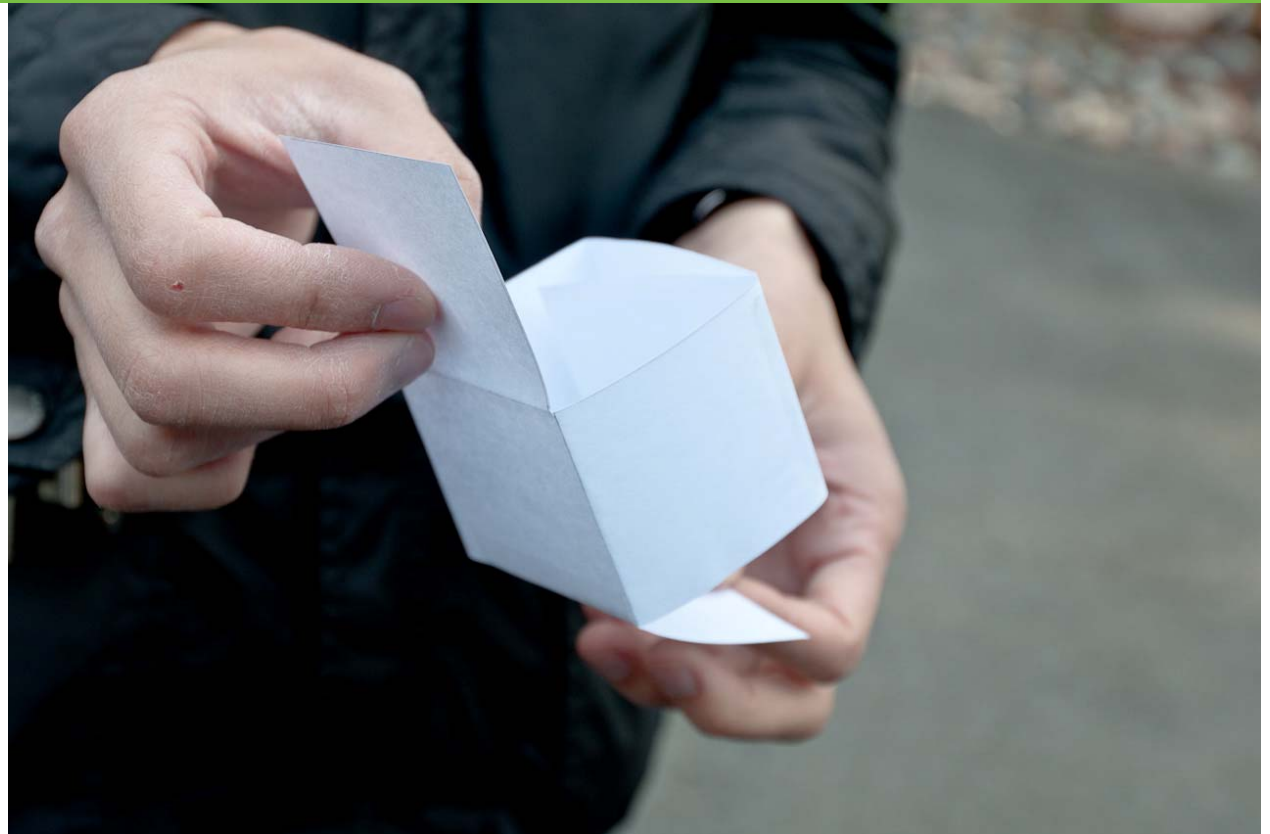
Floor Below Heated Area (Garage and/or Cantilevered Floors)

| | |
|---|-------|
| Floor joists <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Rim joists <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |

| Walls (Inspected From Inside) | Comments/Concerns |
|--|-------------------|
| Between interior/ exterior <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Between heated/ unheated <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |
| Pipe & wire penetrations - baths <input type="checkbox"/> sealed _____ | _____ |
| Pipe & wire penetrations - kitchen <input type="checkbox"/> sealed _____ | _____ |
| Switches & outlets <input type="checkbox"/> gaskets _____ | _____ |
| Baseboards/wall fans <input type="checkbox"/> dusted <input type="checkbox"/> 12" from furniture/ combustibles _____ | _____ |
| Thermostat(s) <input type="checkbox"/> working <input type="checkbox"/> automatic setback _____ | _____ |
| Doors/Windows | |
| Front door(s) <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| <input type="checkbox"/> threshold weatherstripped _____ | _____ |
| Back door(s) <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| <input type="checkbox"/> threshold weatherstripped _____ | _____ |
| Door(s) to unheated area(s) <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| <input type="checkbox"/> threshold weatherstripped _____ | _____ |
| Dog/cat door <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - LR/DR <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - kitchen <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - bath <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - den/office <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - BR 1 <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - BR 2 <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Windows - BR 3 <input type="checkbox"/> weatherstripped <input type="checkbox"/> sealed _____ | _____ |
| Fireplace | |
| Damper <input type="checkbox"/> tightly sealed when closed _____ | _____ |
| Firebox <input type="checkbox"/> heat exchanger or fireplace insert <input type="checkbox"/> insulated panel _____ | _____ |
| Chimney through ceiling <input type="checkbox"/> sealed _____ | _____ |
| Exterior of House | |
| Gutters and eaves <input type="checkbox"/> sealed <input type="checkbox"/> cleared of debris _____ | _____ |
| Downspouts <input type="checkbox"/> connected <input type="checkbox"/> sealed _____ | _____ |
| Window/door flashings <input type="checkbox"/> sealed _____ | _____ |
| Trees or bushes <input type="checkbox"/> trimmed back _____ | _____ |
| Crawl space vents #: _____ <input type="checkbox"/> total net free area _____ <input type="checkbox"/> cleared/baffled _____ | _____ |
| Windows - LR/DR <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - kitchen <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - bath <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - den/office <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - BR 1 <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - BR 2 <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Windows - BR 3 <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Front door trim <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Back door trim <input type="checkbox"/> sealed <input type="checkbox"/> insulated glass _____ | _____ |
| Pipe & wire penetrations - baths <input type="checkbox"/> sealed _____ | _____ |
| Pipe & wire penetrations - kitchens <input type="checkbox"/> sealed _____ | _____ |
| Foundation to walls <input type="checkbox"/> sealed _____ | _____ |
| Chimney to wall <input type="checkbox"/> sealed _____ | _____ |
| Small cantilevered areas (bay/garden window/bump-out) <input type="checkbox"/> insulated <input type="checkbox"/> R-Value _____ | _____ |

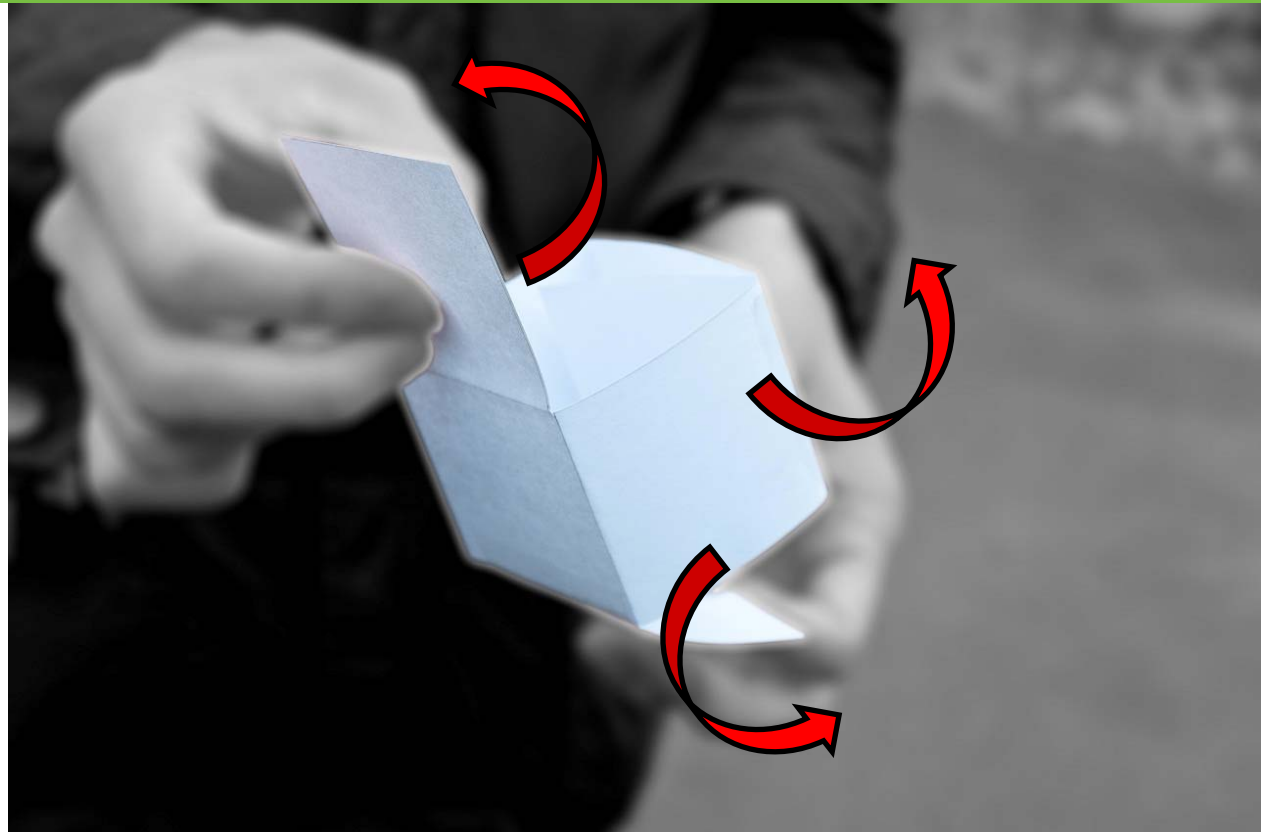
How do you heat your house more efficiently?

Imagine the cube is a house...with walls, a roof and a basement...



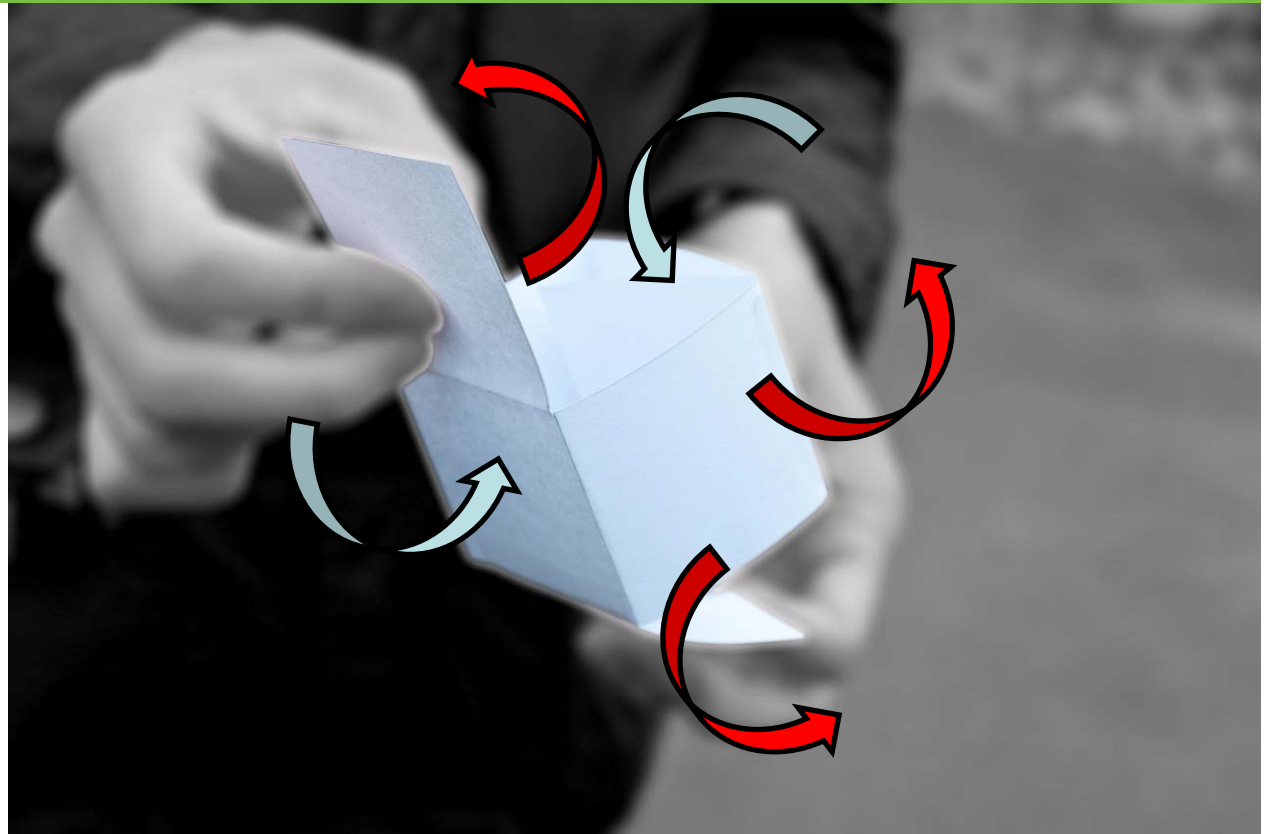
How do you heat your house more efficiently?

...heat can escape...by air leaking out or through surfaces that are not insulated.



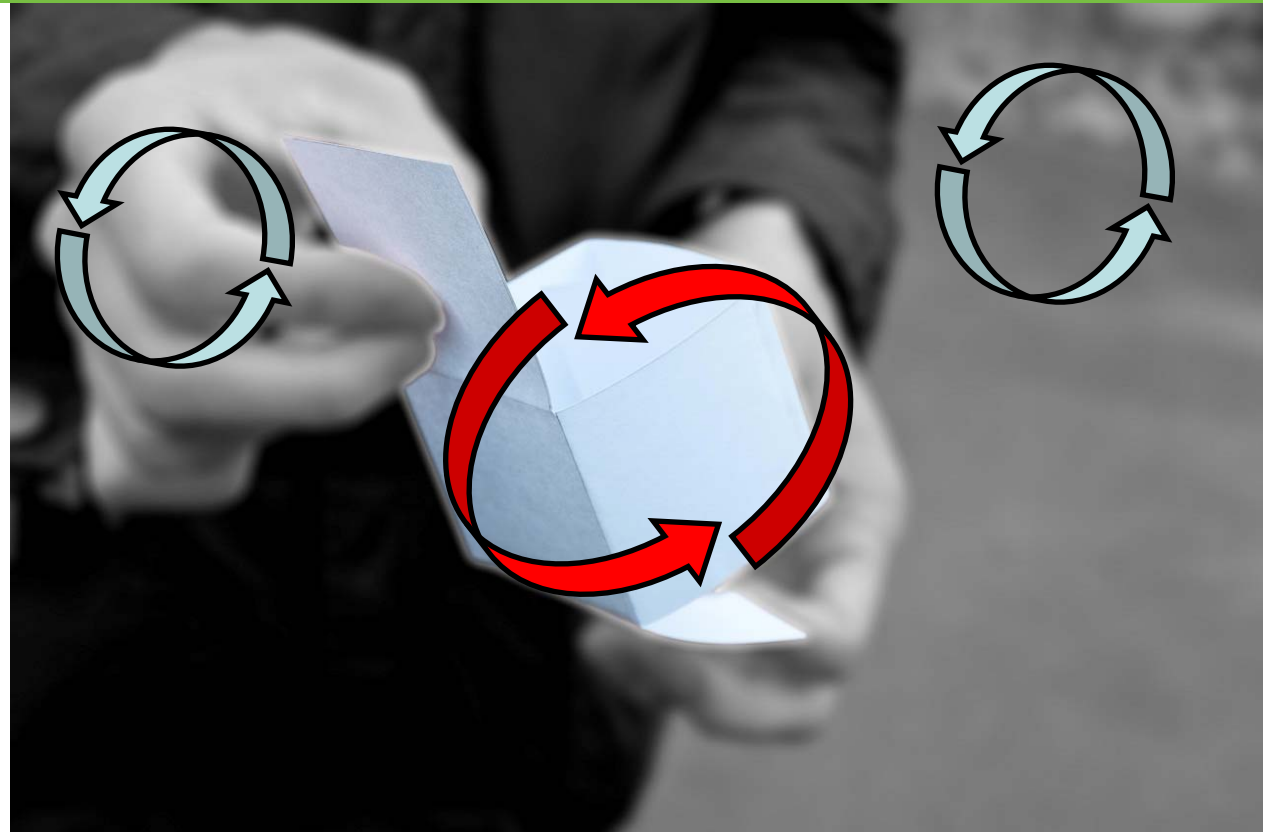
How do you heat your house more efficiently?

...and cold drafts enter through gaps and holes in the roof, walls, windows and doors...



How do you heat your house more efficiently?

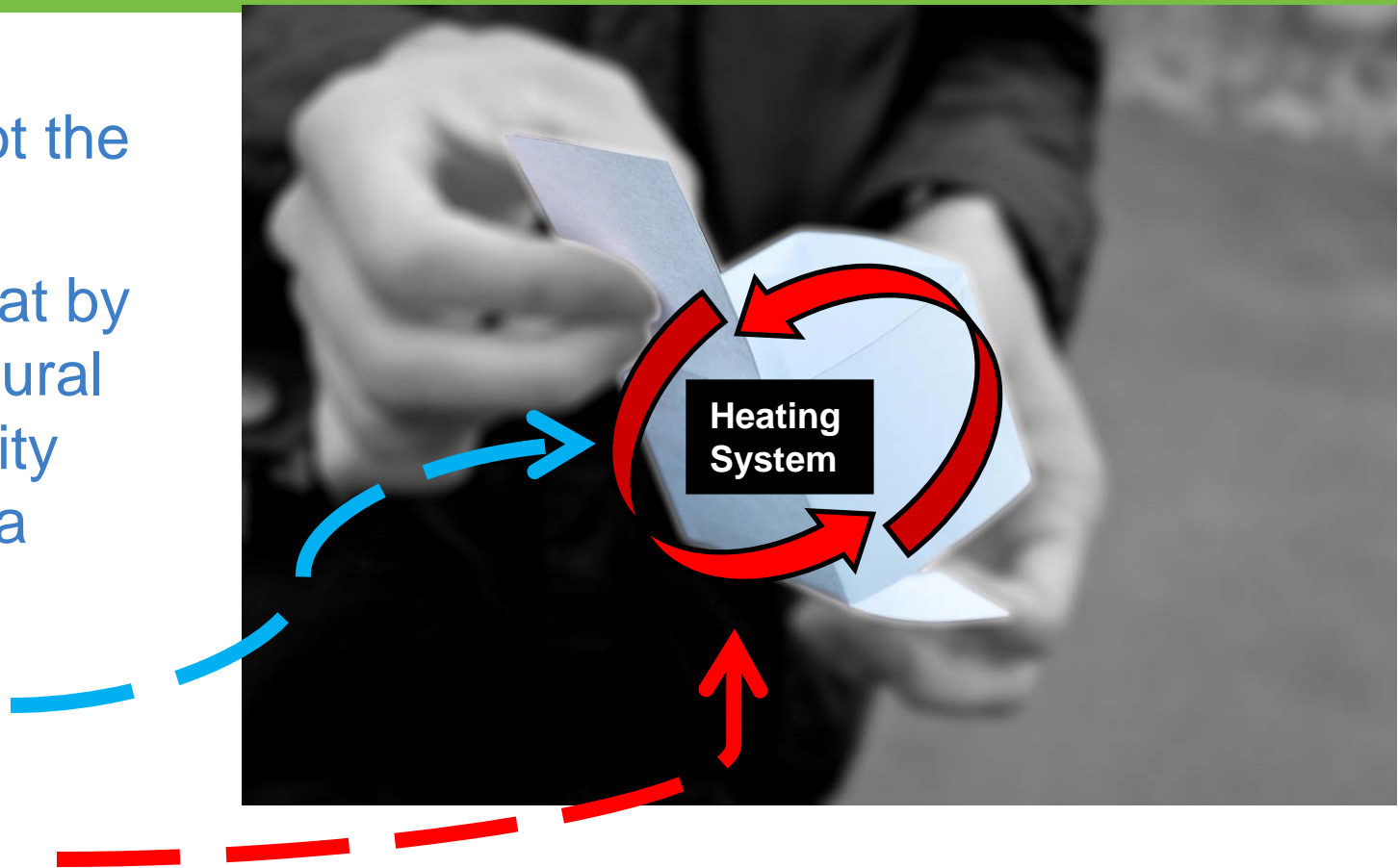
...so the first way
to make the house
more efficient is:
**KEEP THE HEAT
IN AND THE
COLD OUT**



How do you heat your house more efficiently?

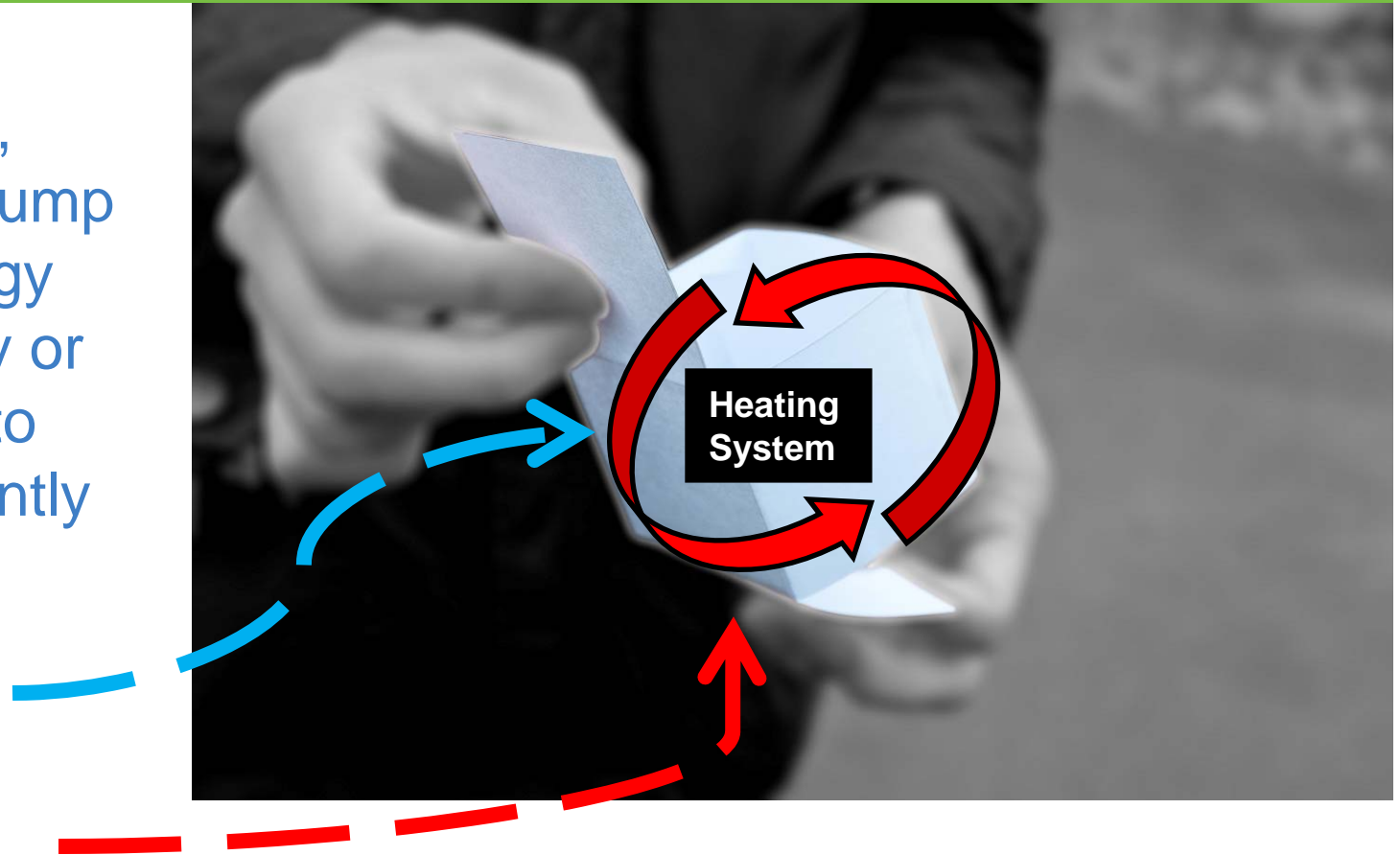
...but that's not the only way!

You create heat by converting natural gas or electricity into heat with a machine...



How do you heat your house more efficiently?

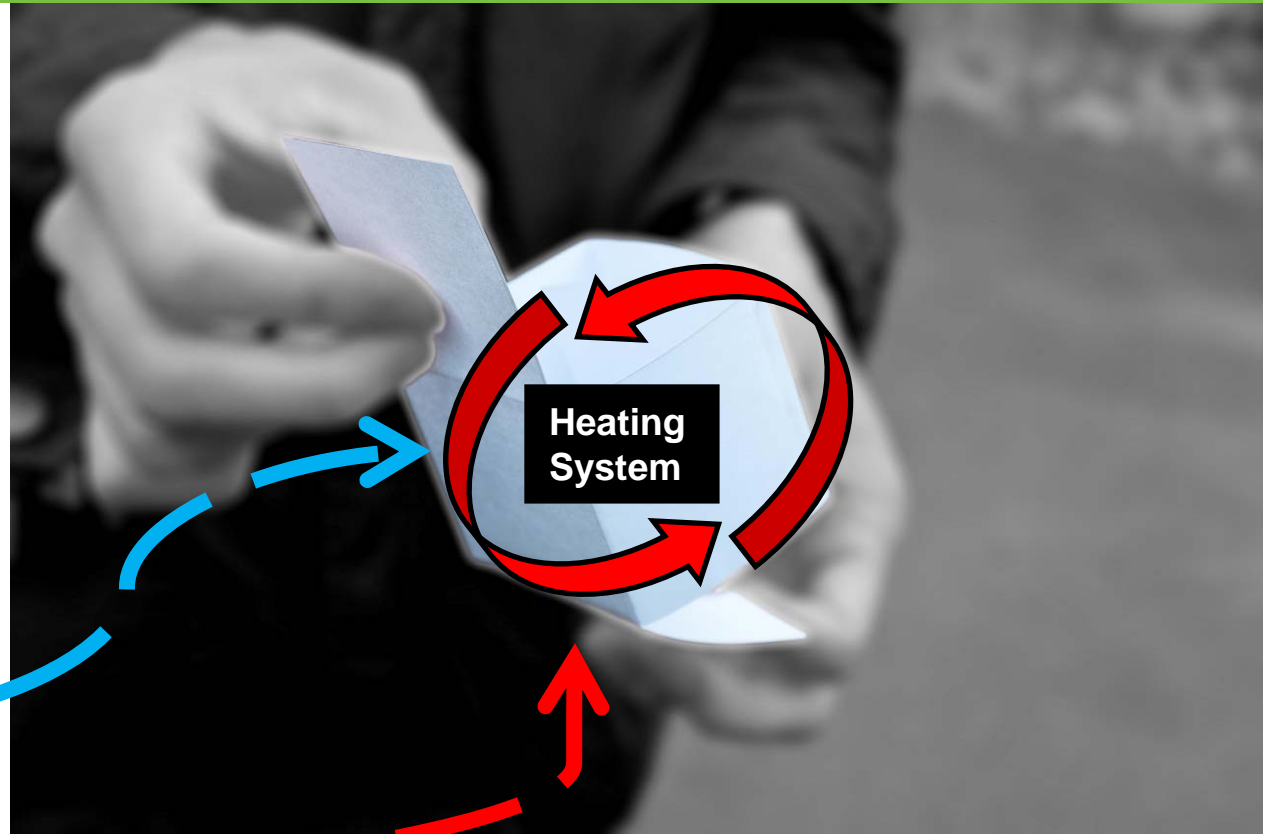
...this furnace, heater, heat pump converts energy from electricity or natural gas into heat as efficiently as possible...



How do you heat your house more efficiently?

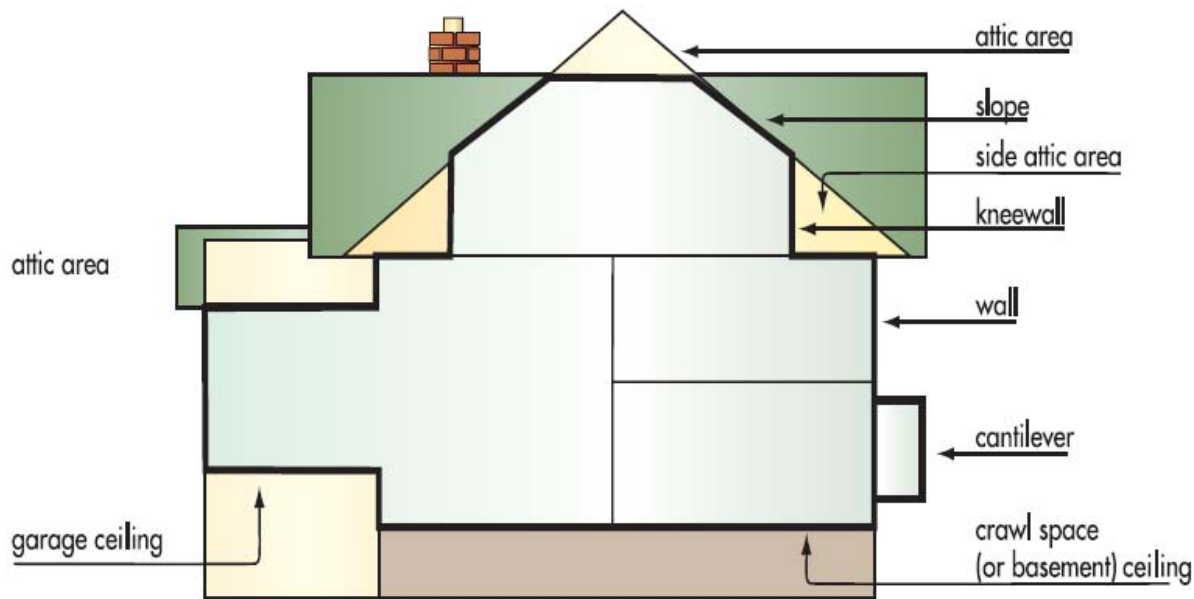
...so the second way to make a house more efficient is:

CONVERT ENERGY INTO HEAT AS EFFICIENTLY AS POSSIBLE!



The Building Enclosure: Air leakage & heat loss

- Visual scan for leaks and cracks
- Watch air movement



Fireplace

- 90% of heat escapes
(10% efficient)
 - Dampers must be sealed
 - Tight-fitting glass doors
- Or
- Permanently sealed



Heating systems

- Space heating
- Programmable thermostats
- Water heating (15-30% of household energy)



Doors & Windows

- Major source of heat loss
- Single or double-pane



Basement/Crawlspace/Attic

- Holes, leaks, cracks
- Insulation
- R-value
- Spray foam and caulking to seal cracks

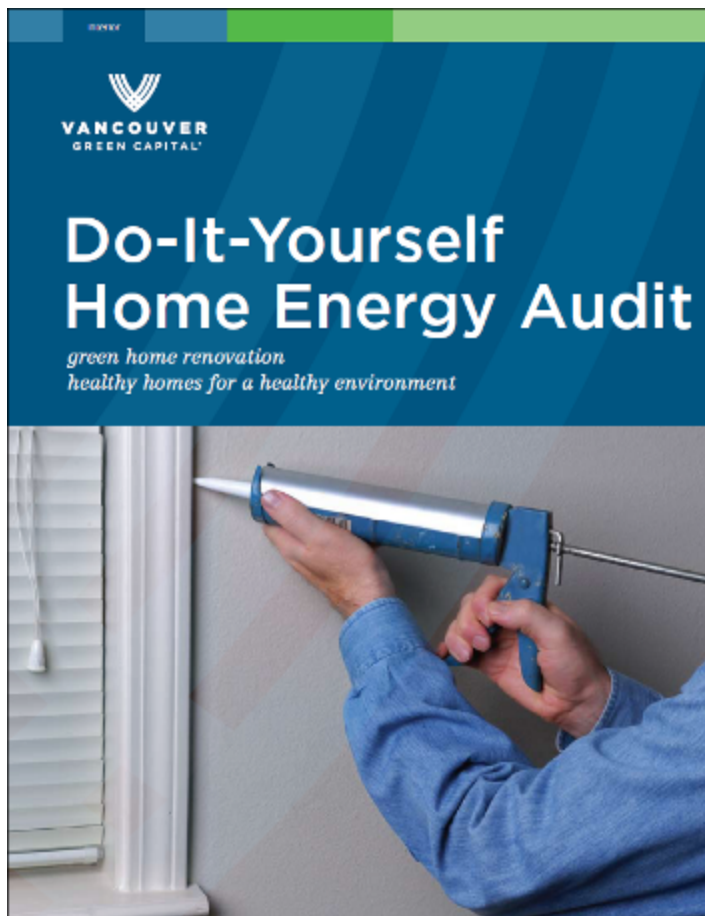


Tips!

Low- or no-cost energy saving measures:

- Keep thermostat low (<20C)
- Turn heat down at night
- Close fireplace damper
- Replace air filters
- Lower water heater temp (60C)
- Low-flow shower heads and faucet aerators
- Weather-stripping

Resources: Green Home Renovation Series



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vancouver.ca/sustainability/RenovationGuides



Financing Tools: Home Energy Loan Program



What is the Home Energy Loan Program?

The pilot program provides small loans to single family homeowners to make energy efficiency improvements to their homes.

The homeowner pays back the loan over time with the money they save from reduced energy costs.



What is the Home Energy Loan Program?

- Offers \$4,000-\$16,000 financing for energy efficiency retrofits to 500 homes
- 10 year terms and preferred, 4.5% fixed interest rate
- All homeowners in good standing on tax payments will qualify.
- Savings on energy offset payments



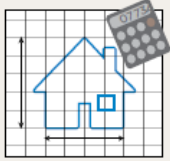



Home Energy Loan Program: Eligible upgrades

| Eligible Retrofit Activities | Max Loan Amount | Energy Cost Savings (over 10 years) * |
|-------------------------------------|------------------------|--|
| EnergyStar Natural Gas Furnace | \$ 5,500 | \$5,400 |
| EnergyStar Natural Gas Boiler | \$ 5,800 | \$5,400 |
| Air Source Heat Pump | \$7,800 | \$7,300 |
| Attic Insulation | \$ 1,400 | \$1,200 |
| Wall Insulation | \$ 4,800 | \$2,000 |
| Basement Insulation | \$ 1,400 | \$1,300 |
| Weatherization | \$1,000 | \$1,400 |

* - Based on 2% annual increase in energy costs

Home Energy Loan Program: How it works

HOME ENERGY LOAN PROGRAM – HOW IT WORKS

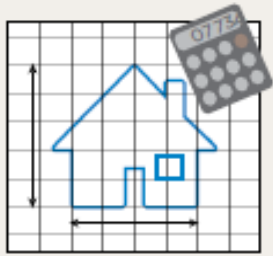
|  |  |  |  |  |  |
|---|--|--|--|--|--|
| 1. HOME ENERGY AUDIT | 2. LOAN APPLICATION & APPROVAL | 3. CONTRACTOR QUOTES & SELECTION | 4. HOME IMPROVEMENT UPGRADES | 5. POST-UPGRADE ENERGY AUDIT | 6. LOAN REPAYMENT & COST SAVINGS |
| Direct Install Option | | | | | |
| <ul style="list-style-type: none"> + Schedule ecoENERGY audit (list available: vancouver.ca/energyloan) + Auditor visits home and conducts energy audit + Auditor provides report on home's energy efficiency, list of recommended upgrades including those covered in Home Energy Loan Program + Select which upgrades to undertake + Complete Home Energy Loan Program Participation Agreement with auditor | <ul style="list-style-type: none"> + Homeowner gathers documents required to apply for loan, see vancouver.ca/energyloan for checklist or call 604.648.5195 + Homeowner begins loan application process with Vancity - Online: www.vancity.com/loans/homeenergy Phone: local 604.648.5195 / toll free 866.648.5195 or in person at any Vancity branch. + Vancity notifies homeowner of loan approval | <ul style="list-style-type: none"> + Request quote(s) from list of pre-approved contractors + Select contractor and sign agreement to proceed with upgrade work | <ul style="list-style-type: none"> + Contractor completes energy efficiency upgrades + Both you and contractor sign Letter of Completion to verify cost and completion of upgrades | <ul style="list-style-type: none"> + Schedule post-upgrade audit with ecoENERGY auditor + Auditor inspects upgrades, and approves them by signing Letter of Completion | <ul style="list-style-type: none"> + Submit Letter of Completion to Vancity + Vancity pays contractor directly on your behalf + Enjoy increased home comfort and save money on your utility bills + Begin repaying loan on quarterly basis |
| Self Serve Option | | | | | |
| <ul style="list-style-type: none"> + Steps as above | <ul style="list-style-type: none"> + Steps as above + Vancity notifies you of loan approval + Visit Vancity branch to sign loan documentation when ready to receive funds | <ul style="list-style-type: none"> + Do work yourself or + Request quote(s) from contractor(s) of your choice + Contractor(s) provides quote(s) + Select contractor to proceed with upgrade work | <ul style="list-style-type: none"> + Contractor completes energy efficiency upgrades + Homeowner pays contractor | <ul style="list-style-type: none"> + Schedule post-upgrade audit with ecoENERGY auditor | <ul style="list-style-type: none"> + Begin repaying loan on quarterly basis - Enjoy increased home comfort and save on electricity and natural gas bills. |

Home Energy Loan Program: How it works



- NRCan ecoENERGY auditor
- EGH Report
- Recommendations
- Application to Vancity
- Approval

Home Energy Loan Program: How it works



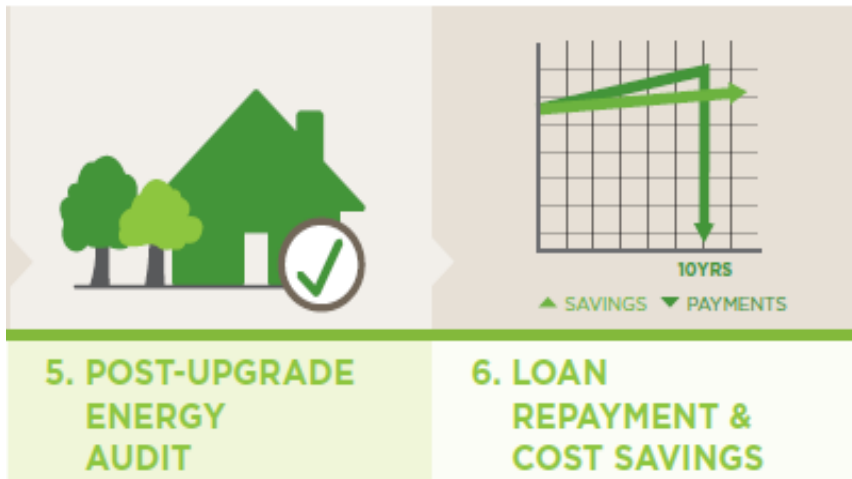
**3. CONTRACTOR
QUOTES &
SELECTION**



**4. HOME
IMPROVEMENT
UPGRADES**

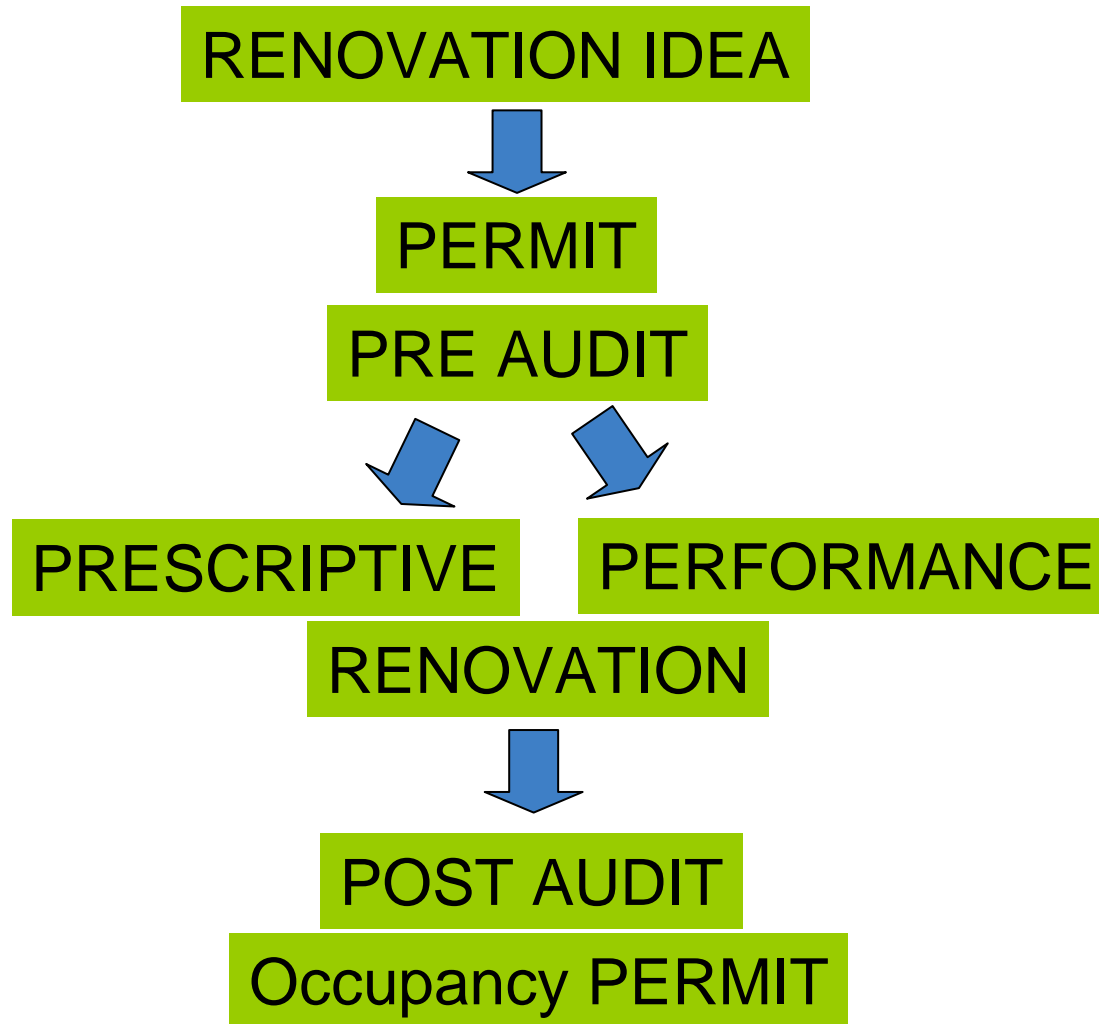
- Choose one:
 - Direct install
 - Self-serve
- Complete upgrades
- Letter of completion

Home Energy Loan Program: How it works



- 2nd energy audit
- Submit letter of completion to Vancity
- Begin repayments
- Save energy & money!

Policy: Proposed Renovation By-Law



Policy: Proposed Renovation By-Law

PERFORMANCE

- EGH +5 Points
- EGH +10 Point
- EGH +15 Points
- EGH +20 Points

Maximum EGH80

PRESCRIPTIVE

- EGH Audit Pre/Post
- Low Flow Devices
- Reduce Air Leakage
- Improve Insulation
- Dual Flush Toilets
- Improve Lighting

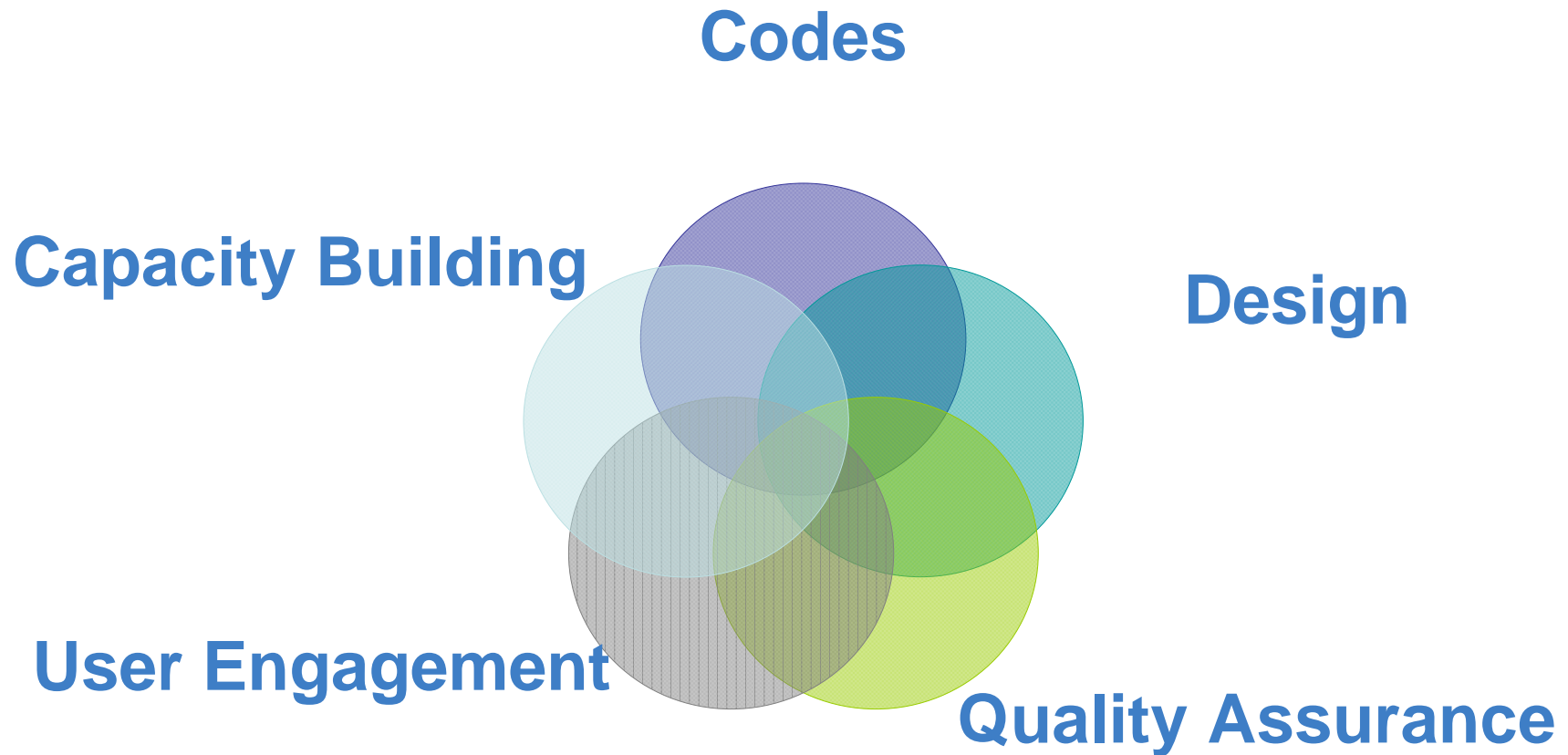
Capacity Building: Weatherization Training & Social Enterprise



- Weatherization Pilot 2010
- 4 people trained
- 50 homes
- 20% improvement (air leakage reduction)
- Grant \$\$ to EMBERS Green Renovations (with Vancity)



Energy efficiency → Holistic approach



Questions?

