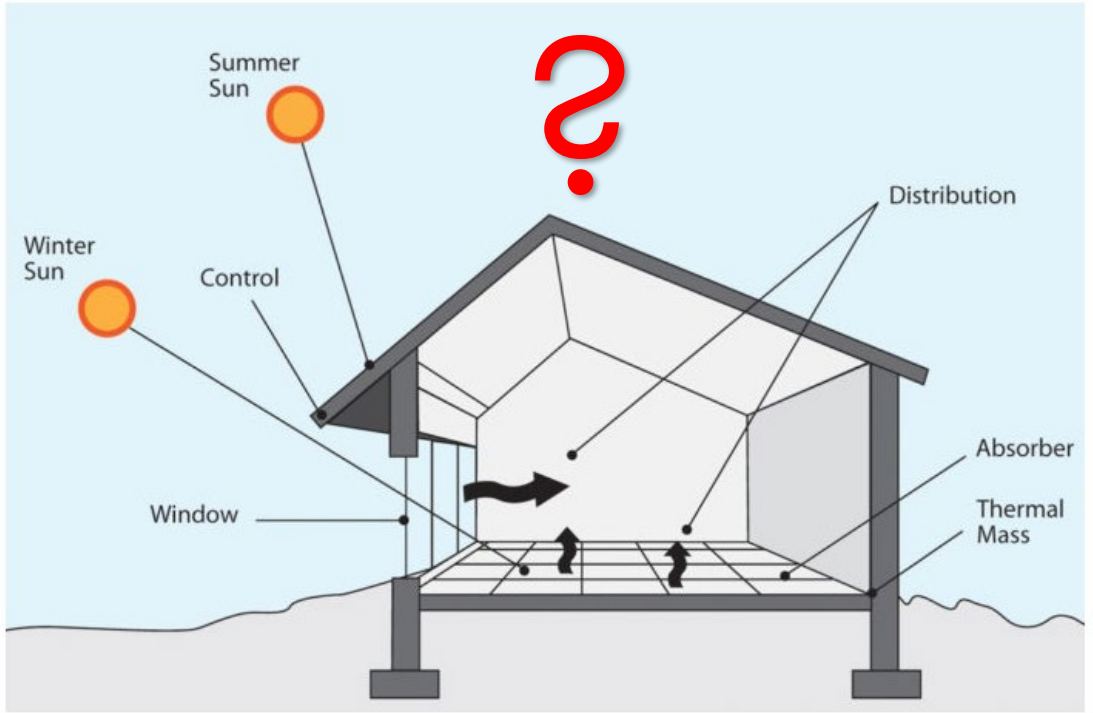
Net Zero Considerations

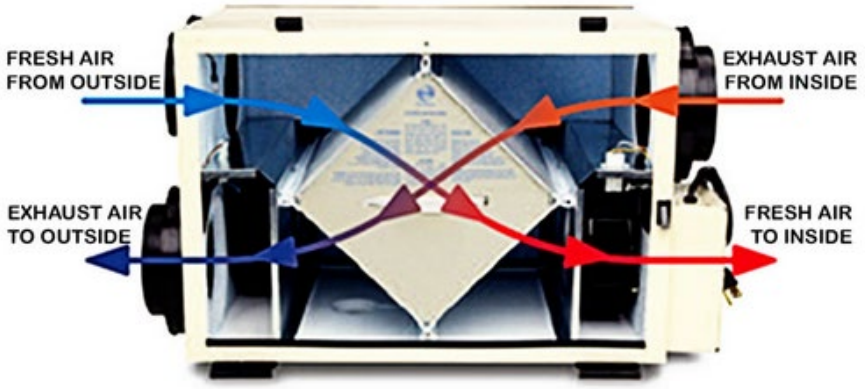
Solar Gain

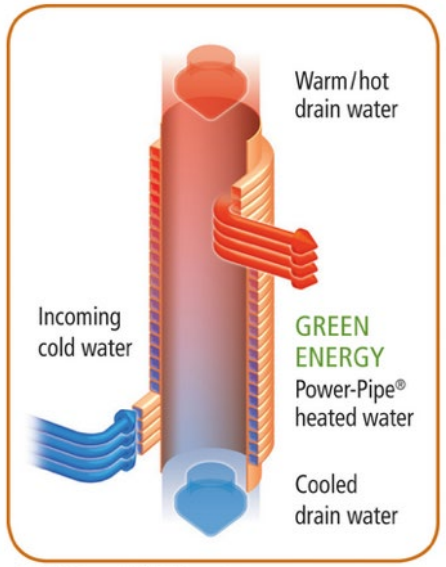
- Can contribute up to 50% of heating
- Too little: heating system consumes more energy
- Too much: summertime overheating (cooling is necessary)
- Good solar design:
    - Strategic window sizing and placement
    - Overhangs for summer shading
    - Film treatment for East and West windows
    - Landscaping and deciduous trees can help
- **Superinsulation** usually better than passive solar
- For well-insulated houses, PV is a better way to collect solar energy



Green Energy Times

Vital Equipment: Heat Exchangers





- Transfer heat energy from one flow to another flow
- The flows do not touch one another
- Used in furnaces, boilers and automobiles (radiators)
- Are the basis of HRV, ERV and DWHR
- HRV/ERV takes heat from exhaust to fresh air (75%)
- DWHR unit: heat from drain to DHW inlet water (60%)

Vital Equipment: Heat Pumps

- "Pump" energy from one place to another
- Both heating and cooling

- **Air-source (ASHP)**: COP of 1.5 to 3.5, cost ~$10K
- 50% energy, 95% less CO2 than natural gas
- Operating costs now similar
- Now effective in colder climates like Ottawa
- **Ground or water source (GSHP, WSHP)**: COP of 3 to 5.5, but cost ~$25K

- **Heat Pump Water Heaters**: heat your water

envirocentre

Residential PV Economics

- Typical available roof is 500 ft²
- 10,000 kWh per year in Ottawa
  https://www.nrcan.gc.ca/18366
- Will support ~35 GJ energy consumption
- about $20,000 retail for this size system
- ARR = 7%