Turn off fossil fuels.
Turn on the power of nature.

• Energy Audits
• Solar Electricity

• Hot Water Solutions
• Heat Pumps
It’s going to get cold outside....
So let’s talk about heat.
Heat Pumps

Ground Source Heat Pumps
(aka “Geothermal”)

Air Source Heat Pumps
(aka “Mini Splits”)
Whole House
Air Source Heat Pumps
How a Heat Pump Works

Uses the electricity to run a refrigerant between the inside and outside units. The refrigerant MOVES heat, it does not create heat.

• **Ground source (geothermal) heat pumps** move energy (heat) from the earth (ground). Use large loops of buried tubing to exchange heat with the ground. Near constant temp of the earth allows them to function in any climate.

• **Air source (mini-splits) heat pumps** (ASHP) move energy (heat) from the air (exterior). Use an above ground fan and heat exchanger assembly similar to that on a whole house air conditioner. Variable speed compressor technology now allows ASHP to not lose efficiency until around 5°F. Many single units are rated to -5°F, with a few to -15°F.
How a Heat Pump Works

**How it Works:**

**During the summer:** A heat pump pulls heat from inside your home and moves it outside to provide air conditioning.

**During the fall and spring:** A heat pump pulls heat from outside and moves it into your home.
Exterior & Interior Unit = Heat Pump

Exterior Unit

Interior Unit(s)

Line hide over exterior refrigeration lines
Mini-split heat pump advantages:

- No combustion in your house: clean air! Helps with Indoor Air Quality
- Electricity is a regulated fuel; level price relative to oil, propane, or pellets
- No chimneys, flues or fuel tanks
- Provides A/C in the summer & heat in the winter
- Great controls: timed, motion sensors, minimum heat settings
- Part of “net zero” homes; can be paired with Solar Electricity
Mini-Split Heat Pumps

Major brands for our climate:

Fujitsu

Mitsubishi Electric
Changes for the Better
Heat Pumps

You already own one; it’s called...a refrigerator
How low do they go?

**Single Units** (one exterior unit matched with one interior unit): -15 °F / -13 °F / -5 °F

**Multi Units** (one exterior unit matched with more than one interior unit):
5 °F

You should always have some kind of backup heat.
Design considerations: Single or Multi?

**Single:** one exterior unit matched to one interior unit
- Single goes to lower temps (-15° or -5° F)
- Most qualify for Efficiency Maine rebate of $500
- More efficient

**Multi:** one exterior unit matched to multiple interior units
- System usually has a lower overall system cost
- Lowest rated temps are 5° to 10° F (depends on size)
- May not qualify for Efficiency Maine rebate
- Takes up less room outside / may be easier to find a location for one unit
Design considerations: Where to put the Exterior Unit?

- Mount 2’ off the ground for snow clearance
- Locate in a place where it won’t get a lot of snow dropped on it from the roof
- If under deck, there needs to be adequate free air circulation above the unit
- Line from exterior unit to interior unit is generally limited to 50’ feet
Design considerations: Interior Units
Which ones and where?

Location and Type of Interior Unit(s):

- Wall mount
  - is the most common, and most cost effective.
  - Ideally mounted on an exterior wall. Interior walls ok but more labor to install.
- Slim duct
  - mounts above ceiling for 2\textsuperscript{nd} floors, or in basement for 1\textsuperscript{st} floors, and ducts down (or up) to the rooms to provide heat/air conditioning. Can supply air to more than one room with short duct runs.
- NEW! Floor mounted unit
Other Design Considerations

• We need a way to connect the refrigerant lines between the exterior and interior units.
• Mini splits don’t scale well.
• You may have some “line hide” on exterior of home.
• You should have some kind of backup heat (electric baseboard, wood stove, current propane or oil boiler, etc.)
Natural gas: don’t be jealous...
Let’s compare heat sources

<table>
<thead>
<tr>
<th>Heating System</th>
<th>Cost / Unit</th>
<th>Quantity</th>
<th>Units</th>
<th>Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ground source (geothermal) heat pump (energy star)</td>
<td>$0.14</td>
<td>9,722</td>
<td>kWh</td>
<td>$1,361</td>
</tr>
<tr>
<td>2. Wood stove (EPA certified)</td>
<td>$230</td>
<td>6.03</td>
<td>tons</td>
<td>$1,387</td>
</tr>
<tr>
<td>3. Air Source/Mini split ductless heat pumps</td>
<td>$0.14</td>
<td>11,601</td>
<td>kWh</td>
<td>$1,624</td>
</tr>
<tr>
<td>4. Natural gas furnace (Energy Star)-Summit</td>
<td>$1.20</td>
<td>1,429</td>
<td>therms</td>
<td>$1,708</td>
</tr>
<tr>
<td>5. Wood pellet boiler</td>
<td>$200</td>
<td>8.73</td>
<td>tons</td>
<td>$1,746</td>
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<tr>
<td>6. Wood pellet stove</td>
<td>$240</td>
<td>7.61</td>
<td>tons</td>
<td>$1,827</td>
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<tr>
<td>7. Kerosene space heater</td>
<td>$4.14</td>
<td>809</td>
<td>gallons</td>
<td>$3,349</td>
</tr>
<tr>
<td>8. Oil boiler (Energy Star)</td>
<td>$3.69</td>
<td>1,005</td>
<td>gallons</td>
<td>$3,709</td>
</tr>
<tr>
<td>9. Electric resistance baseboard</td>
<td>$0.14</td>
<td>27,843</td>
<td>kWh</td>
<td>$3,898</td>
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<tr>
<td>10. Propane boiler (Energy Star)</td>
<td>$2.75</td>
<td>1,527</td>
<td>gallons</td>
<td>$4,199</td>
</tr>
</tbody>
</table>
Sorted by emissions...

<table>
<thead>
<tr>
<th>Heating System</th>
<th>Cost / Unit</th>
<th>Quantity</th>
<th>Units</th>
<th>Annual Cost</th>
<th>CO2</th>
<th>Lbs of CO2</th>
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</thead>
<tbody>
<tr>
<td>1 Ground source (geothermal) heat pump (energy star)</td>
<td>$0.14</td>
<td>9,722</td>
<td>kWh</td>
<td>$1,361</td>
<td>0.68292</td>
<td>6,639</td>
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<tr>
<td>2 Air Source/Mini split ductless heat pumps</td>
<td>$0.14</td>
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<td>kWh</td>
<td>$1,624</td>
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<tr>
<td>3 Natural gas furnace (Energy Star)-Summit</td>
<td>$1.20</td>
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<td>therms</td>
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<tr>
<td>4 Kerosene space heater</td>
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<td>$3,349</td>
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<td>5 Oil boiler (Energy Star)</td>
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<tr>
<td>6 Electric resistance baseboard</td>
<td>$0.14</td>
<td>27,843</td>
<td>kWh</td>
<td>$3,898</td>
<td>0.68292</td>
<td>19,014</td>
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<tr>
<td>7 Propane boiler (Energy Star)</td>
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<td>1,527</td>
<td>gallons</td>
<td>$4,199</td>
<td>12.805</td>
<td>19,551</td>
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</tbody>
</table>
Mini-Split Heat Pumps

• Use for heating or cooling
• Use for individual rooms or the whole house
• Replace your oil or propane system with electric
• Efficient in temperatures as low as -15°F
• Cost-effective & comfortable
$500 Rebate for Heat Pumps

• Maine residents qualify for $500 back on the purchase and installation of a heat pump system
• Funded through Efficiency Maine
• Speak with Goggin Energy about how to get started
Heat Pumps on Islands

- If you have reasonably priced electricity (CMP or Emera Rates)
- Generally oil and propane prices are higher on islands because the fuel needs to be sent over on a barge
Heat Pumps on Islands

• Helps Vendor to have multiple customers so that we combine site visits, understand logistics of delivering materials, organize our electrician.
• Helpful to have an organizer on the island who can organize a meeting for property owners to understand heat pumps, and choices available.
• If not easy to get a van over there, we can hand truck materials and installation team, but we need help with transportation on the island.
Economics

• “Single” heat pump costs $3,500 - $4,000 on island.
• $500 rebate will only last until heat pumps become mainstream.
• Payback at $.145 / kWh is about 3.5 years, if electricity goes up to $.18 payback is about 5 years.
• That is comparing to oil at ~ $3.50 / gallon.
• “Single” heat pumps work efficiently to -5 degrees.
• “Multi” heat pumps coming in the next 4-8 weeks that will work efficiently to -5 degrees, and are rated to -13 degrees.
• Heat Pumps will be used for whole house heating, rather than “space” heating. Oil low (relatively) now, and electricity may go up in March but oil will catch back up and return to its upward trend.
• Prediction: Within 5 years, all new homes will have a heat pump.
Solar Electricity (PV)

• Never pay an electric bill again
• Own – don’t rent – your power
• Generate electricity in the summer to use in the winter
• Eligible for 30% federal tax credit & Maine state rebate