Heat Pumps 101:
An Informational Workshop

BROUGHT TO YOU BY RENEWABLE JUNEAU
WHAT IS A HEAT PUMP?

A **heat pump** is a mechanical device that moves heat energy from one place to another using mechanical energy.

For the home, a heat pump moves heat from the outdoor air to the indoor air. Contrary to other common heating technologies, instead of **using energy to create heat**, heat pumps **use energy to move heat**.

To put it simply, a heat pump is a refrigerator in reverse.
TYPES OF HEAT PUMPS

There are 3 types of heat pumps:

1) Ground Source Heat Pump (geothermal) - transfers heat to or from the ground
2) Water Source Heat Pump - extracts heat from a water source and delivers it indoors
3) Air Source Heat Pump - extracts heat from the outside air and delivers it indoors
This presentation will focus on #3, **Air Source Heat Pumps (ASHP’s)**, specifically those referred to as mini-split ductless systems.

These are typically the simplest and least expensive systems to install, and can be used in many situations.
Mini-splits are heating and cooling systems that allow you to control the temperatures in individual rooms or spaces without the use of air conduits or ducts.

Mini-split systems have TWO main components - (1) an outdoor compressor/condenser and (2) an indoor air-handling unit(s)/evaporator.

The outdoor condenser unit pushes heated refrigerant through narrow piping to localized indoor units where heating (or cooling) is delivered directly to the space.

If desired, one outdoor unit can power multiple indoor units known as a “multi-split” system. These excel in Juneau’s climate and units can work efficiently to temperatures of -5°C to -15°F.
They are **3 times as efficient** as electric baseboard resistance heaters.

Cost savings can be as much as \( \frac{1}{3} \) to \( \frac{2}{3} \) of your present oil or electric heating bill.

**Reduce greenhouse gas emissions** (lower carbon footprint) via the elimination of oil.

Free your home from the burden of fluctuating oil prices and the risk of fuel leaks.

ASHP technology has improved immensely over the last 20 years, resulting in increased heating output and air discharge temperatures, elimination of most compressor failures, and increased temperature range of efficient operation.
Annual Cost
to heat an average Juneau home

- Propane: $3,500
- Electric Boiler: $3,000
- Electric Baseboard: $2,500
- Fuel Oil #2: $2,000
- Wood Pellets: $1,500
- Wood - Cord: $1,000
- Air Source Heat Pump: $500
- Ground Source Hp: $500
- Sea Water Source Hp: $500
**Costs: Preparation, Installation and Maintenance**

**Weatherization:** If not already done, costs are highly variable, measured in $1000’s.

**Building Permit:** cost = several $100, scaled to cost of installation.

**Electric Power Supply:** 240 volt supply to the outdoor unit, not necessarily part of the HP installation. Cost varies depending on existing electrical service.

**Parts and Labor:** depends on number and type of outdoor and indoor units. Costs vary from about $3200 to $5000 for a 1:1 ductless system as a retrofit.

**Maintenance:** low cost, mostly cleaning the filters; warranties are now in the 10 year range, some including parts and labor.

**Payback Period:** varies, but typically within 5 to 9 years
1 IS MY HOME WEATHERIZED?

YES

NO

BEFORE INSTALLING A HEAT PUMP, WEATHERIZING YOUR HOME CAN GREATLY IMPACT YOUR HEAT PUMP SYSTEM AND AFFECT THE OVERALL EFFICIENCY.

2 WHAT HEATING SYSTEM DO I CURRENTLY HAVE?

ELECTRIC RESISTANCE

OIL BOILER/FURNACE

OTHER

YES

YES

YES

3 WHAT ARE MY HEAT PUMP OPTIONS?

A SWITCH TO A FULL CONVERSION OF AN AIR SOURCE HEAT PUMP AS YOUR MAIN HEATING SYSTEM

B USE AN AIR SOURCE HEAT PUMP TO OPERATE IN THE MAIN SPACE(S) OF YOUR HOME TO OFFSET EXISTING HEATING SYSTEM (=>Backup)

C USE AN AIR SOURCE HEAT PUMP TO OPERATE IN A NEWLY BUILT ADDITION (IE. APARTMENT) TO YOUR HOME

Retrofit Decision Tree
Other Heat Pump Options

● Ducted Mini-Splits
  ○ Amenable for new construction
  ○ Allows hiding the indoor appliance

● Air to Water Systems
  ○ Radiant floor heat
  ○ Hot water baseboards

● Domestic Hot Water
CO$_2$ Domestic Hot Water Heat Pump
Sanden system