A Case Study:

~3,000 Ductless Heat Pumps in Maine

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Learning Objectives

1. Understand range of considerations associated with specifying and installing heat pumps in cold climates.
2. Be able to address concerns frequently shared by occupants of dwelling units served by ductless heat pumps.
3. Understand key factors that affect performance of ductless heat pumps in cold climates.
4. Be better equipped to interpret manufacturers' specifications and to specify appropriate ductless heat pumps for range of cold climate applications.

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Agenda

1. Efficiency Maine Introduction
2. Ductless Heat Pump Introduction
3. All Income Pilot: 1,000 Heat Pumps
4. Low Income Program: ~2,000 Heat Pumps
5. Installation Considerations
6. User Training
7. Efficiency Maine Resources

Efficiency Maine Introduction

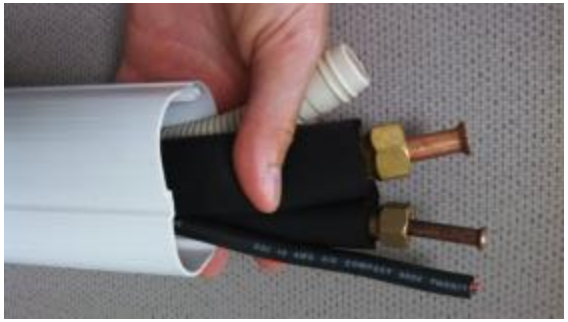
1. **Run Maine's energy efficiency and renewable energy programs**

2. **Funding:**
   a. Maine electricity consumers
   b. The American Reinvestment and Recovery Act (ARRA)
   c. Regional Greenhouse Gas Initiative (RGGI)
   d. Forward Capacity Market (FCM)

Ductless Heat Pumps

1. Indoor unit

2. Outdoor unit



3. Line set

4. Remote control

All Income Pilot: 1,000 Heat Pumps

1. **Program details**
   a. $600 rebate
   b. On-bill financing (7.75% APR)
   c. Discounted electricity (3c/kWh)
   d. HSPF ≥ 10.0

2. **Program results**
   a. 1,000 installations
   b. Average install cost: $3,230
   c. 96% residential
   d. 88% Fujitsu
   e. 21% on-bill financing
   f. 91% will definitely recommend

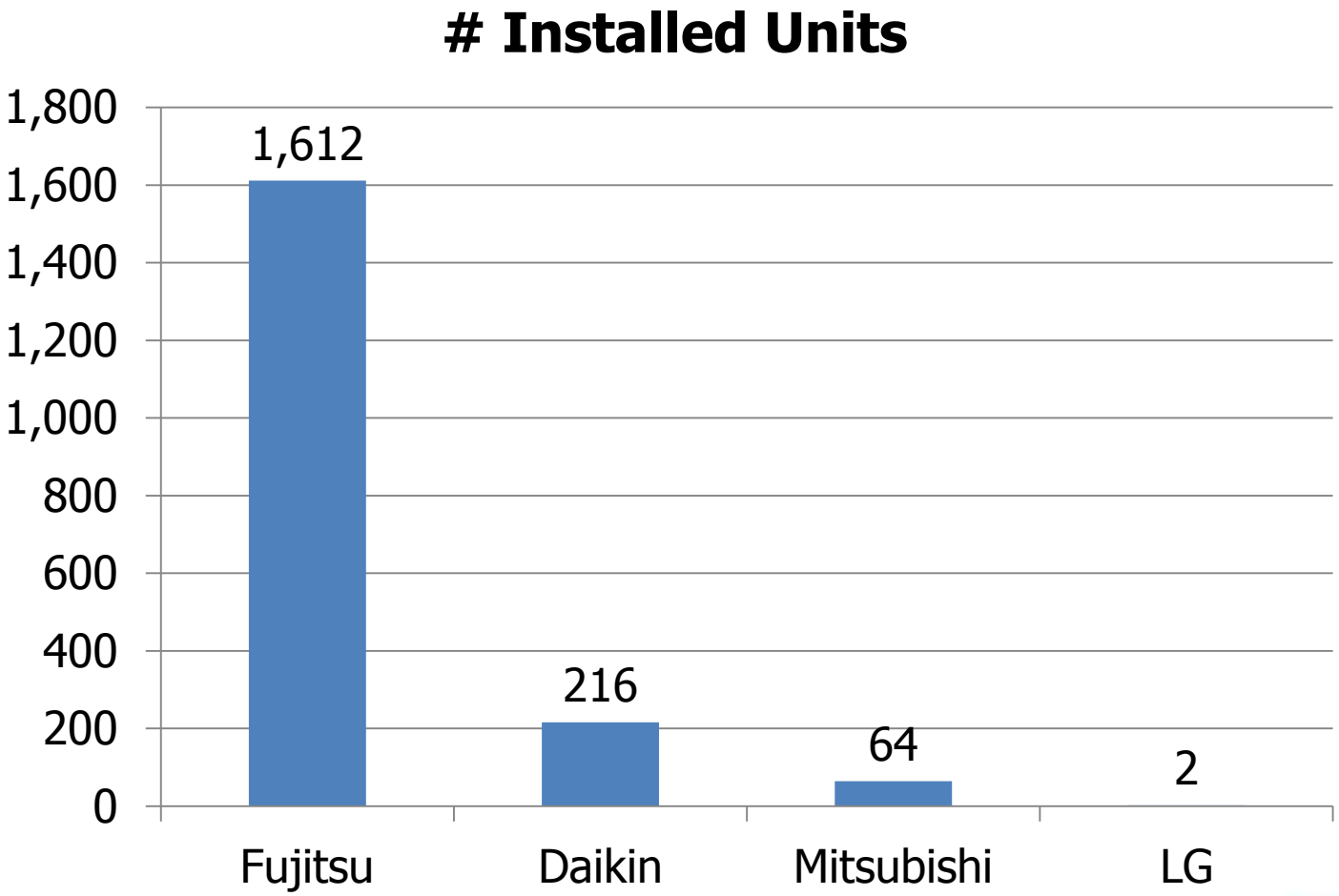
"I'm really pleased with my decision to install a heat pump. The rebates, tax credit and special electric rate all made it affordable. Even on the coldest days my heat pump keeps my home very comfortable.."

Mary Lou W. and Belle

Low Income Program ~2,000 Heat Pumps

1. Electric heat
2. Multifamily
3. No charge to owners
4. Left baseboard as back-up
5. 10 – 20 bidders/property
6. 1,894 units installed
7. Avg installed price: $2,073

Low Income Program Manufacturers



Low Income Program Billing Analysis

1. **Methodology**
   a. First year actual vs. prior year
   b. 249 upgraded units
   c. 58 non-upgraded (controls)
   d. Normalized results for weather and usage

2. **Findings**
   a. Pre-upgrade heat load: 5,399 kWh/year
   b. Net savings: 25 – 54%
   c. Simple payback: ~7 years
      i. $0.14/kWh
      ii. $2,073 install cost

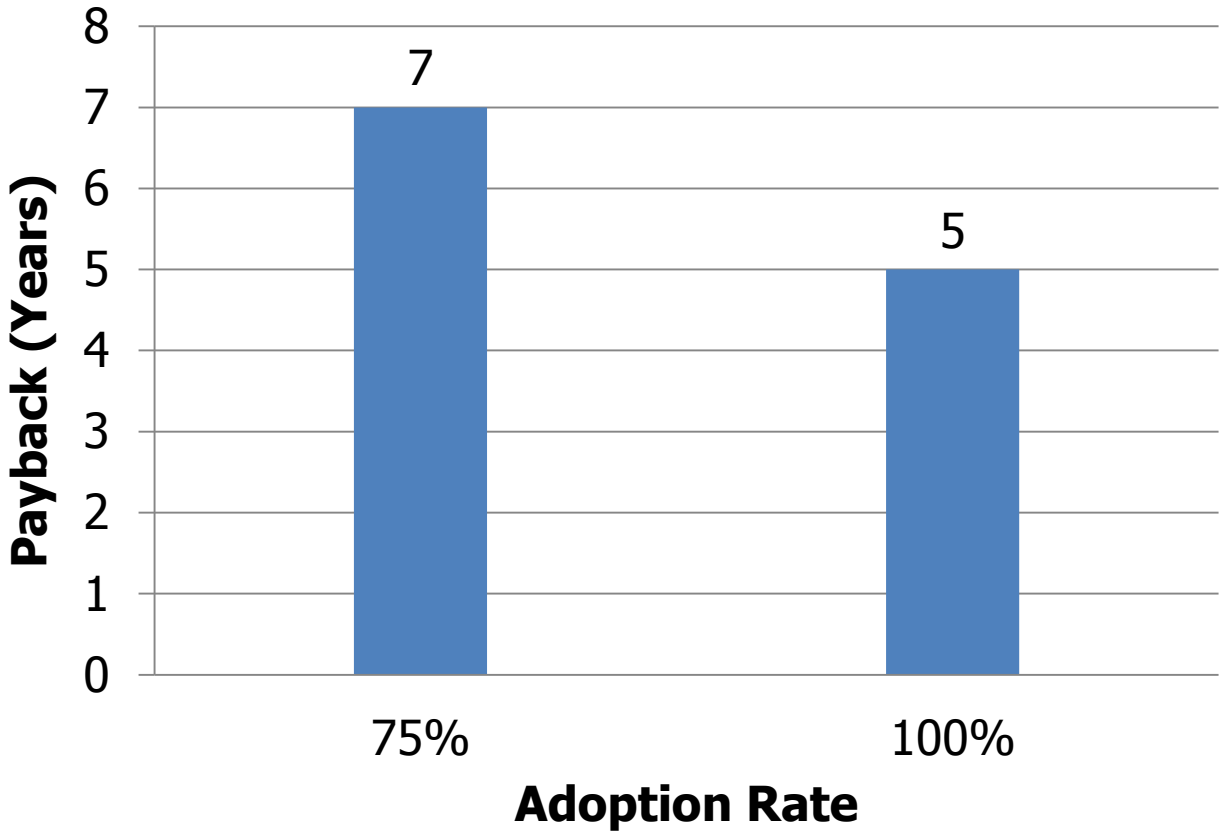
Low Income Tenant Interviews

1. 24 in-home interviews
2. 25% of tenants did not use heat pump at all
3. Only 45% of tenants heated "most of apartment" with heat pump*
4. Behavior influences
   a. Subsidized utilities (open windows, 88 F setpoint, unused units)
   b. Limited training

* Consistent with Bonneville Power 2012 study showing only 43-75% of electric resistance heat offset "*Ductless Heat Pump Retrofits in Multifamily and Small Commercial Buildings*"

5-year, Cold Climate Payback

Assuming only 45% of tenants use DHP to heat "most of apartment"



Assumptions: $0.14/kWh, Pre-upgrade heat = 5,399 kWh/year, Installed cost = $2,073

Key Program Learnings

Based on preliminary review of 249 upgraded units sampled from a program that featured 1,894 installations:

1. Ductless heat pumps have 5 year payback in cold climates, even when heat load is small (5,399 kWh/year = 130 gal of oil/year) and no user incentive.

2. Heat pumps make sense in cold climates as long as:
   a. there's enough heat to go after (>5,000 kWh/year), and
   b. the occupants use them.

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Cold Climate Equipment Specifications

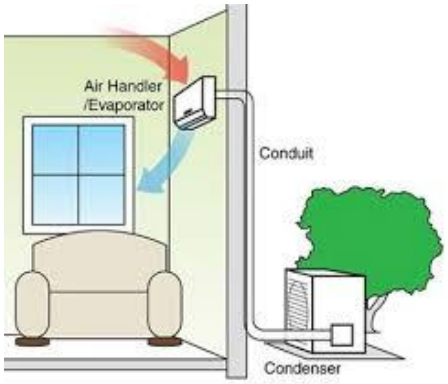
1. ENERGY STAR
2. HSPF ≥ 12
3. Base pan heater not necessary
4. Wall thermostat for rentals

Installation Considerations

1. **Outdoor Unit**
   a. Wall bracket above snow line
   b. Unobstructed location
   c. Rain cap if below dripline
2. **Line Set**
   a. Line hide/termination fittings
   b. Plumb or level
   c. No exposed copper
   d. Seal penetrations with foam
3. **Indoor Unit**
   a. Unobstructed location
   b. Level
   c. Service access
4. **Consider electro-mechanical lockouts with backup heat**

User Training

1. Adjust for comfort, not specific temp
2. Don’t direct airflow at sitting area
3. Minimize use of backup system
4. Maximize the heat zone
5. Avoid “Auto” mode
6. Use “Auto fan” mode
7. Clean filters
8. Keep outdoor unit clear and clean
9. Ignore cycling and gurgling
10. Keep service contact information



Resource #1:
Testimonial Video

1. Canadian border
2. 1 heat pump &
   1 heat pump water heater
3. Worked down to -17 F
4. Saving >$2K/year (~75%)

http://www.efficiencymaine.com/heat-pumps/

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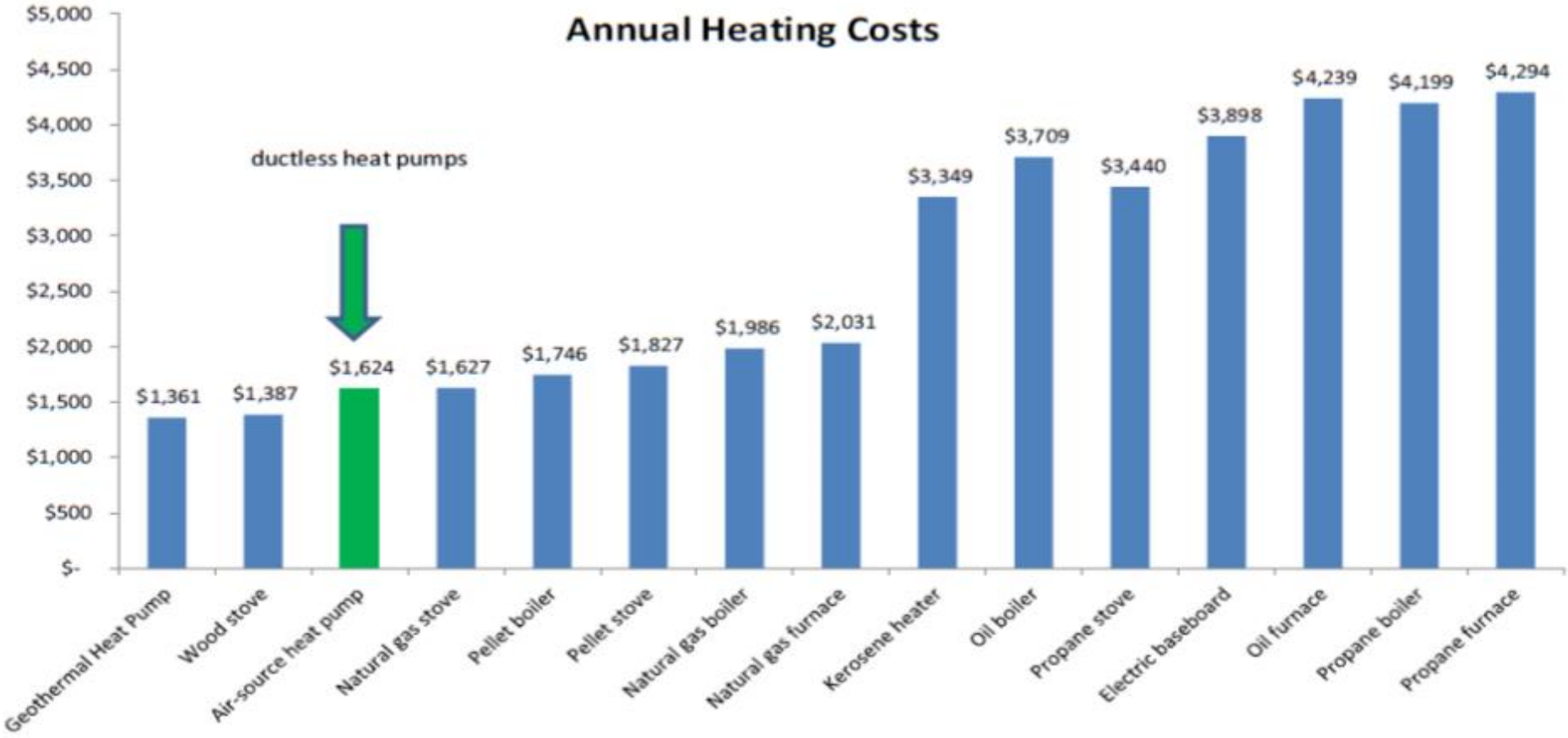
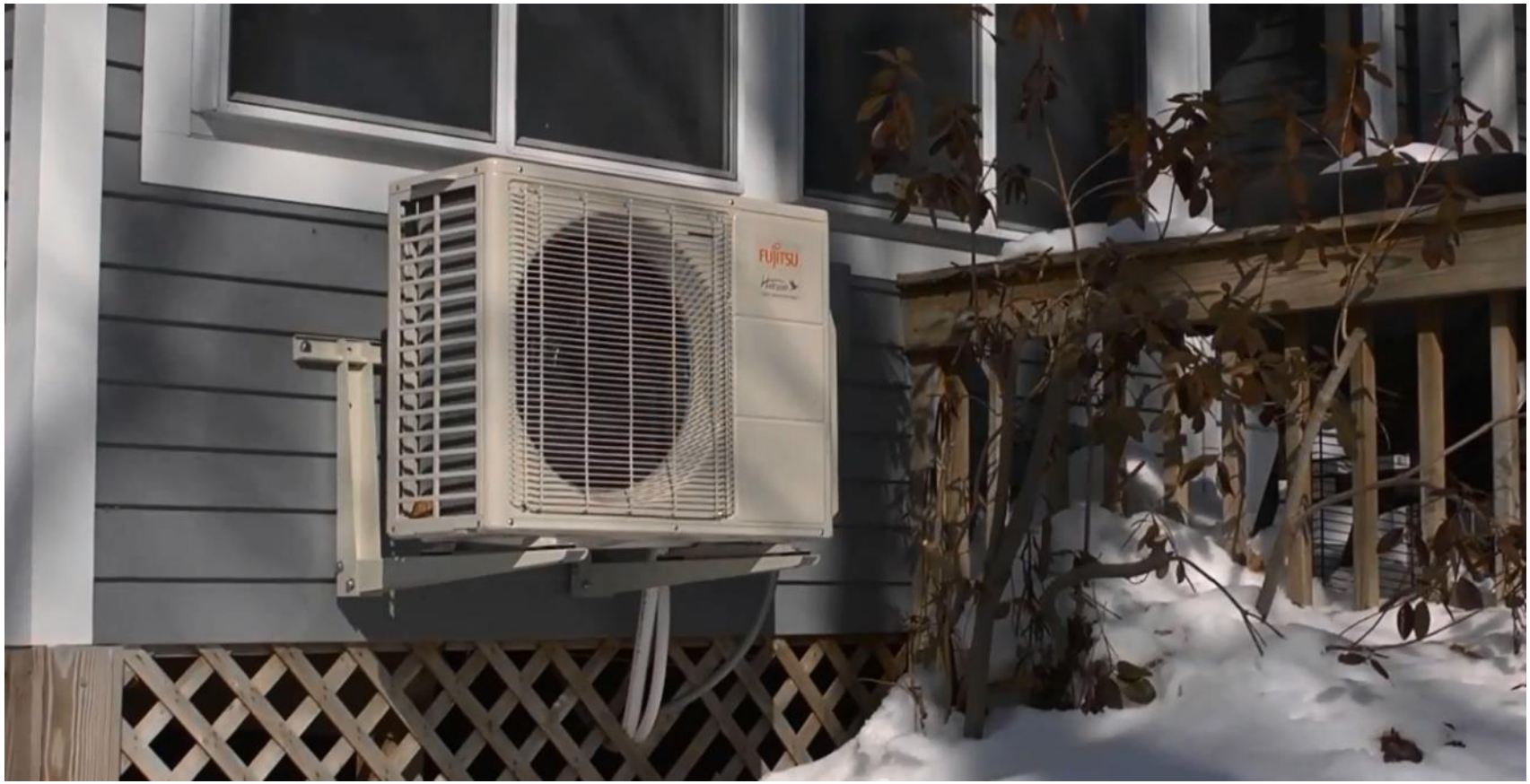
Resource #2:
Cost of Heating Calculator



http://www.efficiencymaine.com/at-home/home-energy-savings-program/compare-heating-options/

Resource #3:
Informational Video



http://www.efficiencymaine.com/heat-pumps/

Resource #4:
User Tips

Heat Pump User Tips

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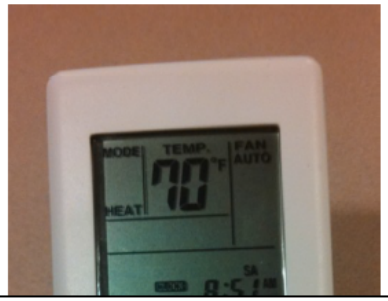
Properly used, heat pumps can save up to 50% compared to heating with oil, kerosene, propane or electric heat. Here are some ways to ensure you get the most from your heat pump:

Use heat pump as primary system - Turn down your old heating system thermostat so it doesn't come on. The more you rely on the heat pump, the more money you'll save.



Avoid "Auto" mode - Set your heat pump mode to "Heat" in the winter and "Cool" in the summer, but avoid using the "Auto" mode. Auto mode could inadvertently turn on heating during a cool summer night or air conditioning on a sunny winter afternoon.

Use "Auto Fan" mode - Set the heat pump fan to "Auto Fan."

http://www.efficiencymaine.com/docs/Heat-Pump-User-Tips.pdf

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Questions?

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