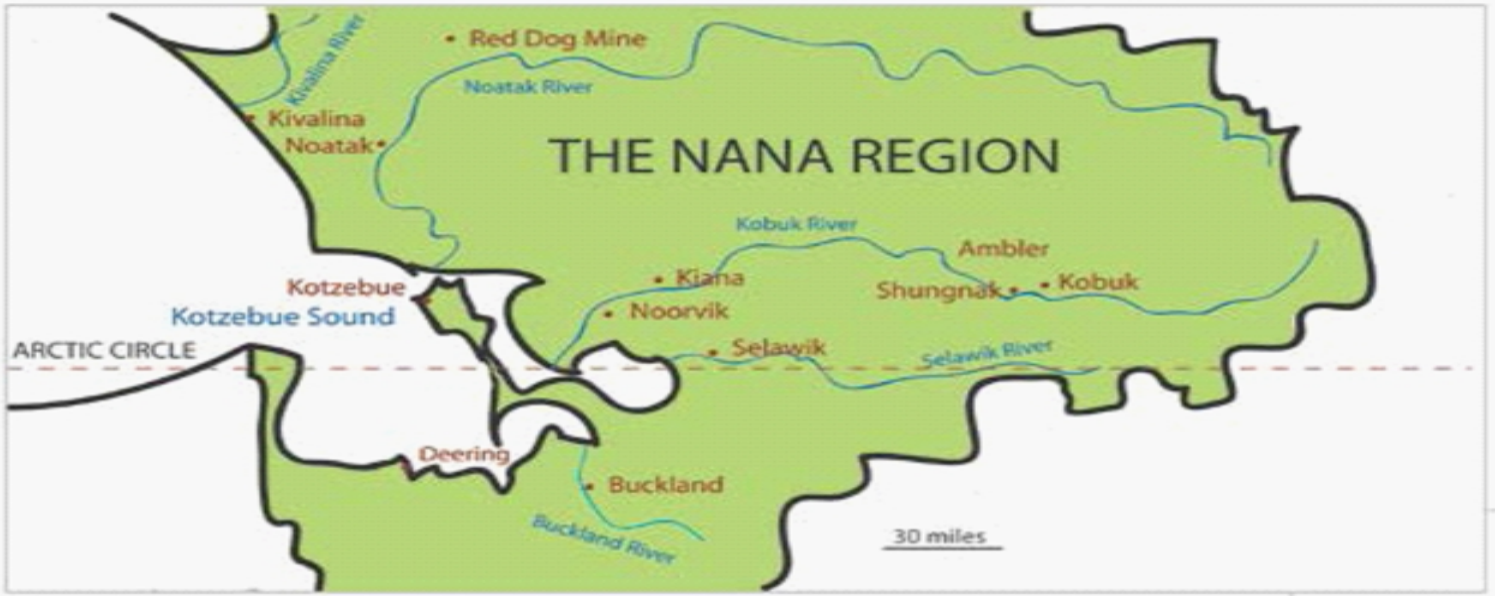
NAB/NANA Region Energy Efficiency Projects 2016-17

Adapting to new Technology



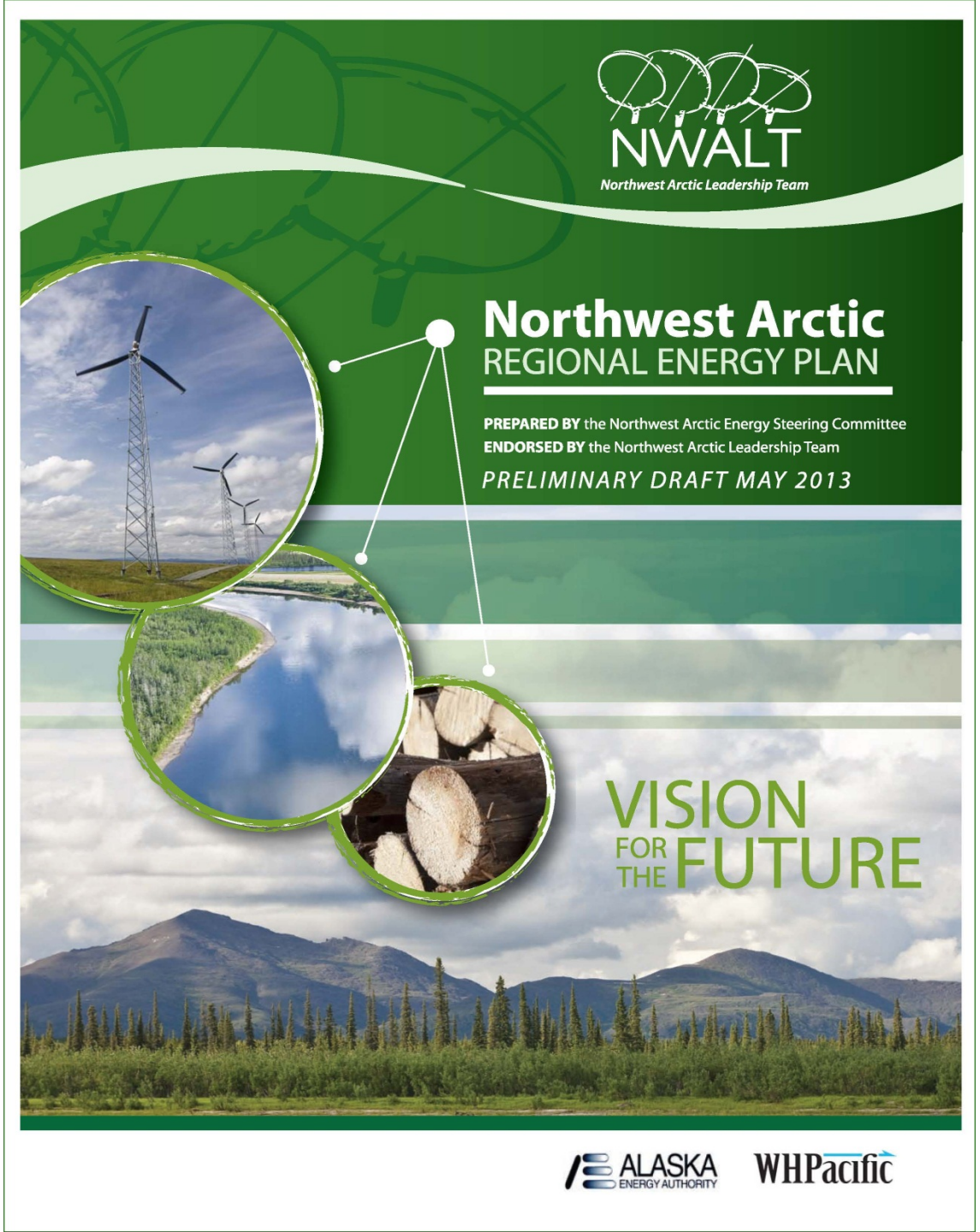
The Case for Heat-pumps

Energy planning background

Started in

2008-2009

Current version
2016
Available
@ Nwabor.org



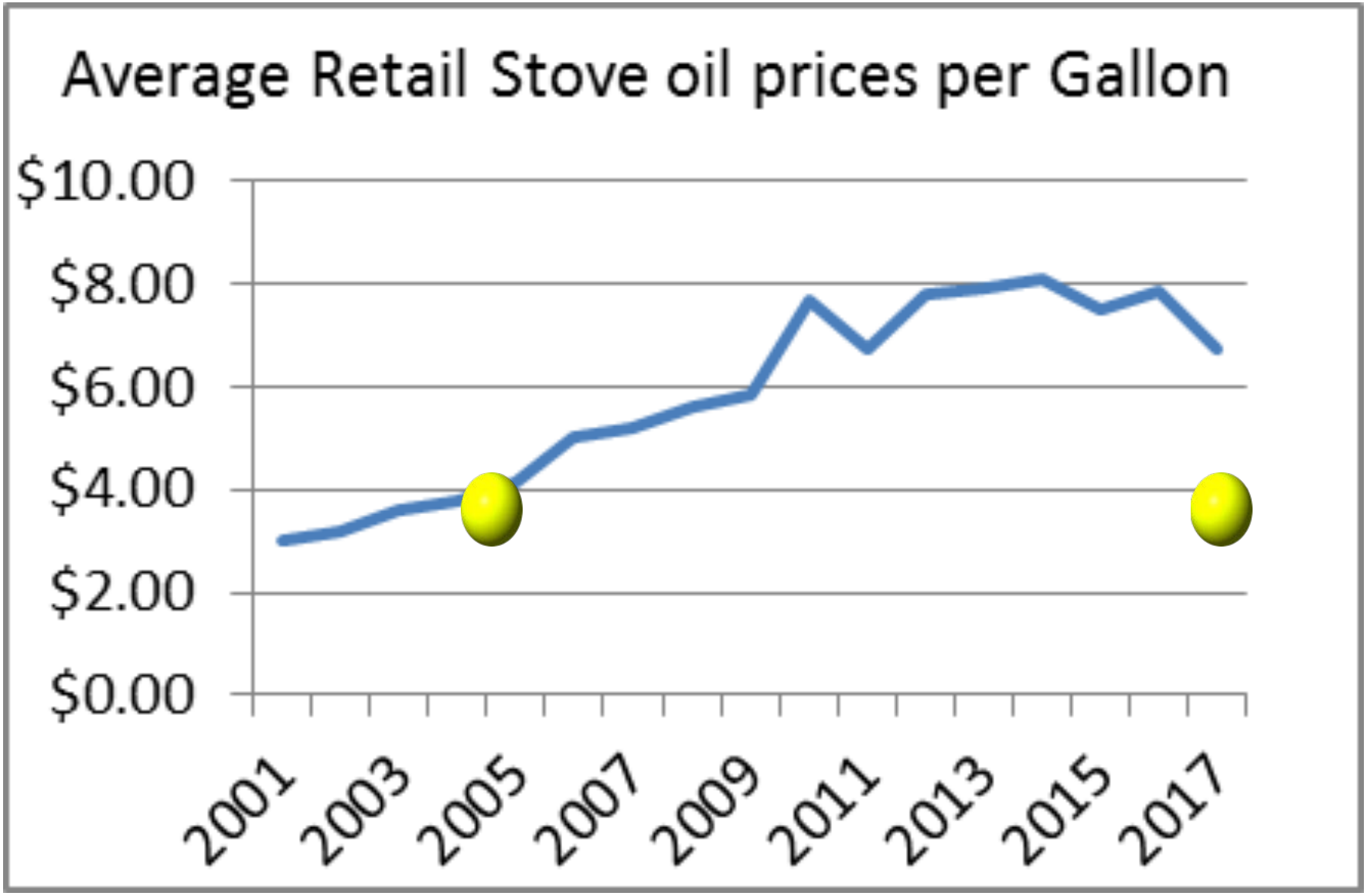
Energy Plan Vision

- **The vision is for the Northwest Arctic region to be 50 percent reliant on regionally available energy sources, both renewable and non-renewable, for heating and generation purposes by the year 2050.**

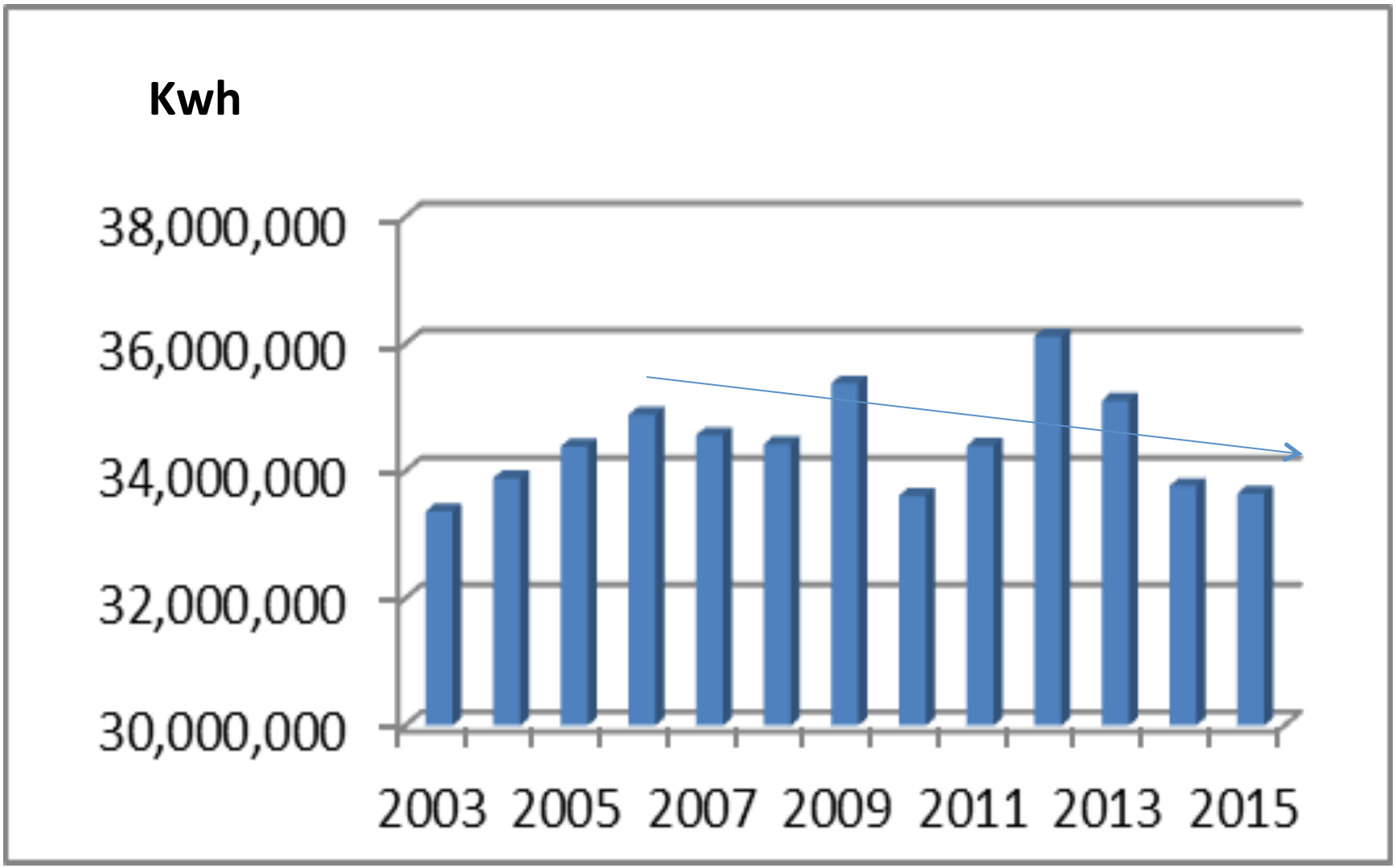
The progression is planned as follows:

- **10 percent decrease of imported diesel fuels by 2020 On track**
- **25 percent decrease of imported diesel fuels by 2030**
- **50 percent decrease of imported diesel fuels by 2050**

Regional Average Retail Stove oil prices over time



Electric usage Region wide



Regional Priorities 2017

- **Bulk Fuel Buying & Logistics & Storage (Regional approach)**
- **Regional funding Strategy (JAA or COOP)**
- **Upgrades of Bulk fuel farms and power plants**
- **Energy Education (Energy Smart)**
- **Heat Pumps**
- **Solar Energy**
- Interties
- Transportation
- Community Efficiency programs
- **Wind energy systems**
- **Biomass/Waste to Heat**
- **Hydro electric**
- **Combined Heat and power**
- **District energy distribution**

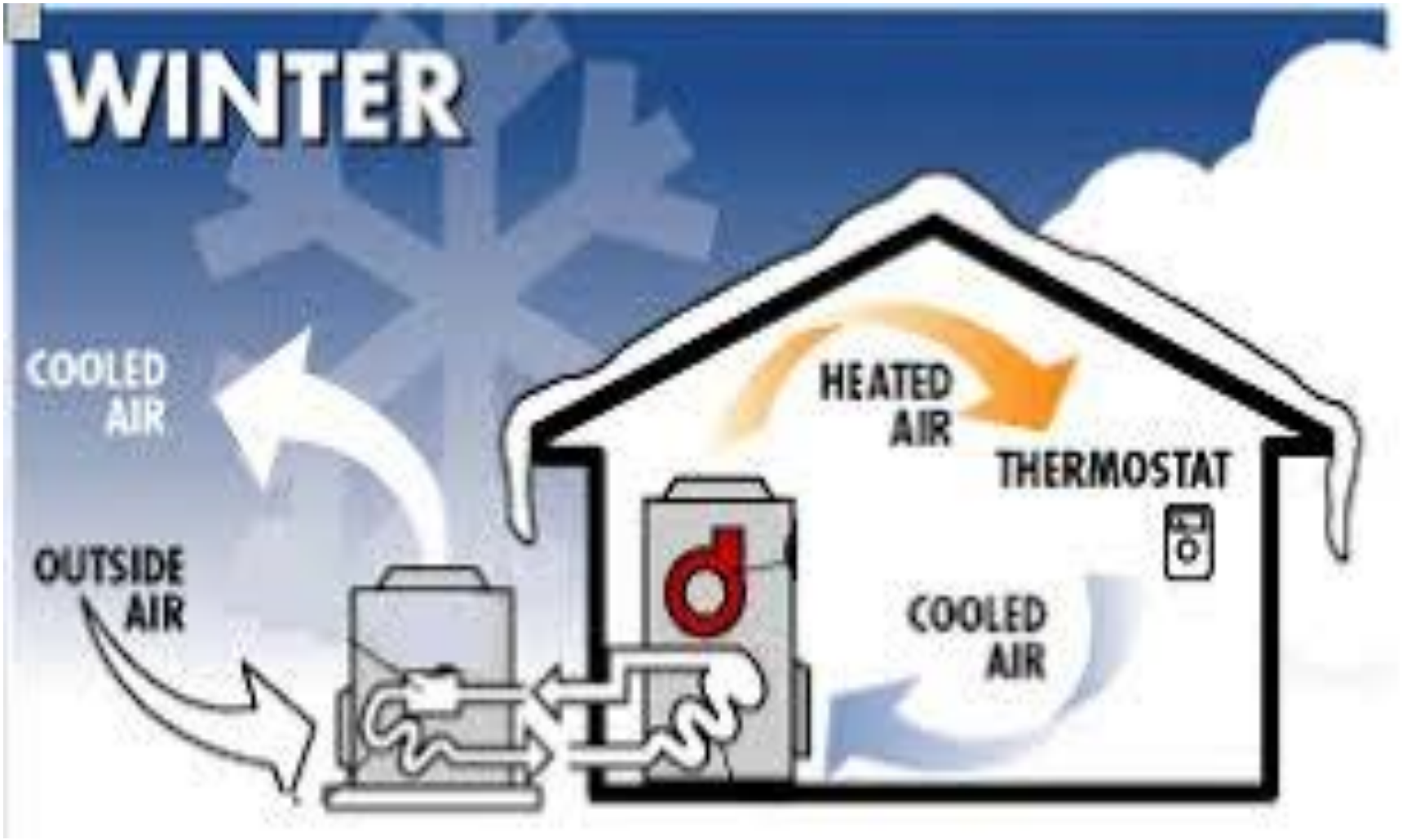
CIAP (Coastal Impact Assistance Program)

Energy Projects

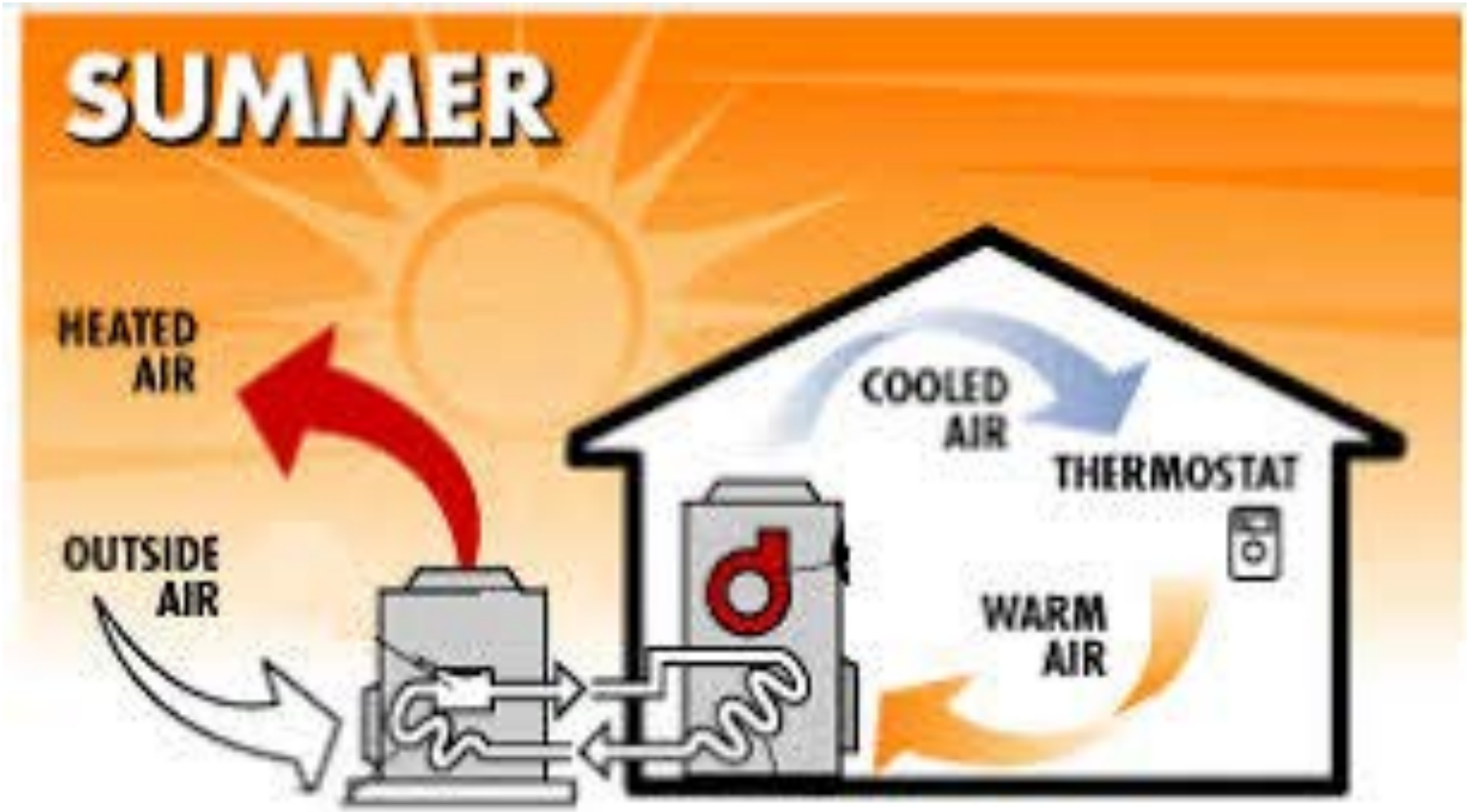
Completed

- 2010-11 TED and ECO Smart meter project
- 2011-16 Solar PV for all water plants
- 2016 Utility size Solar 23kw for Noorvik
- 2016- Air to Air Heat-pump pilot project
- 2016 -17 Hydroponic Van project

Winter cycle for Heating



Summer cooling cycle



Heat pump Advantages

- **Low-cost heat – The cost of heating with a heat pump is similar to heating with natural gas or wood. This is typically half the cost of heating with oil, kerosene, electric baseboard or propane to compare heating costs of different heating systems.**

- **Low-cost air conditioning – Today's best heat pumps are twice as efficient as typical air conditioners.**

- **Comfort – With advances in controls, heat pumps can maintain very constant temperatures.**

- **Safety – Because heat pumps are electrically powered, there is no risk of combustion gas leaks.**

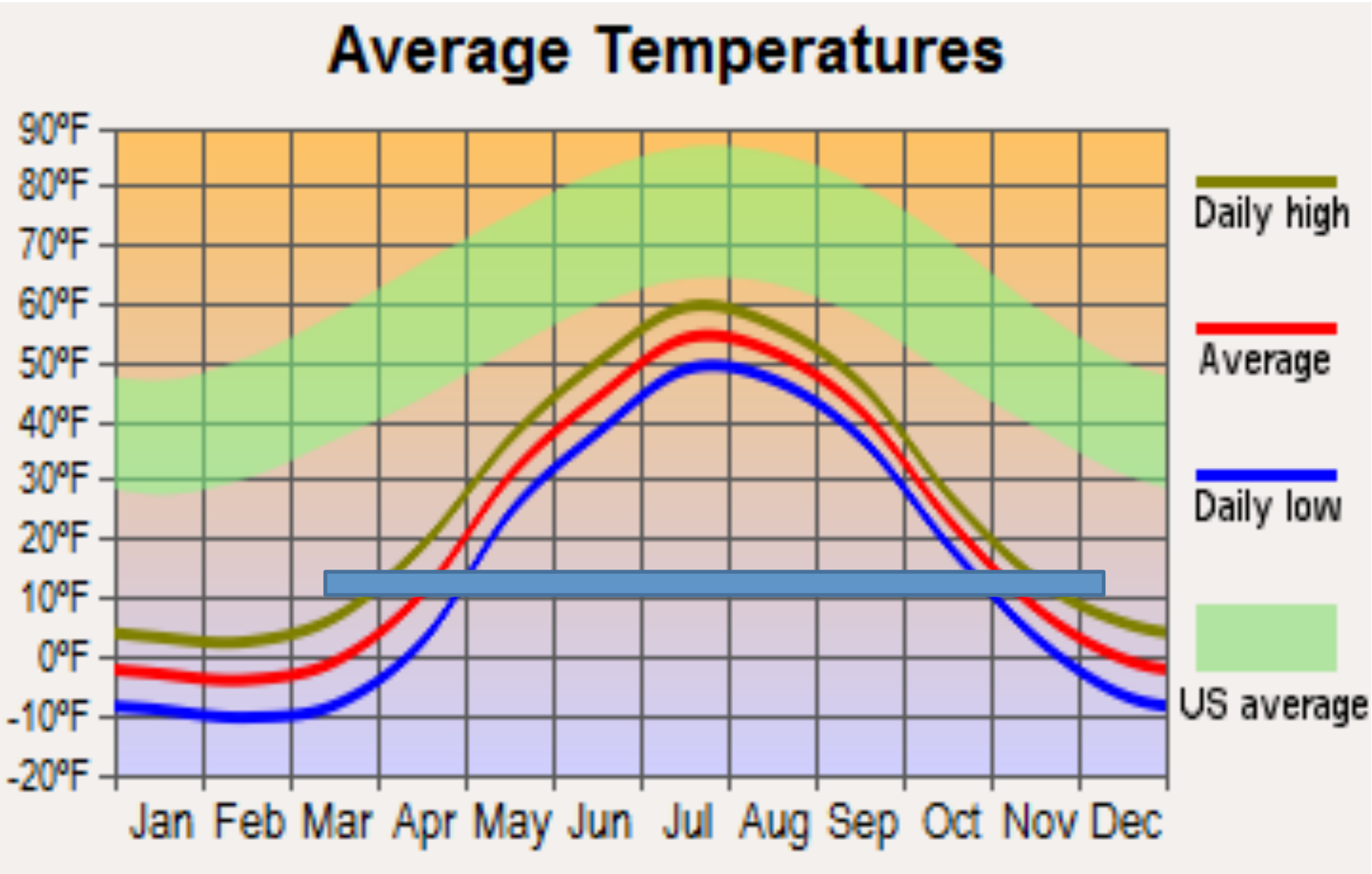
- **Air quality – Heat pumps filter air as they heat/cool/dehumidify it.**

- **No CO_2 emissions – Cleaner environment and resilience to Global Warming.**

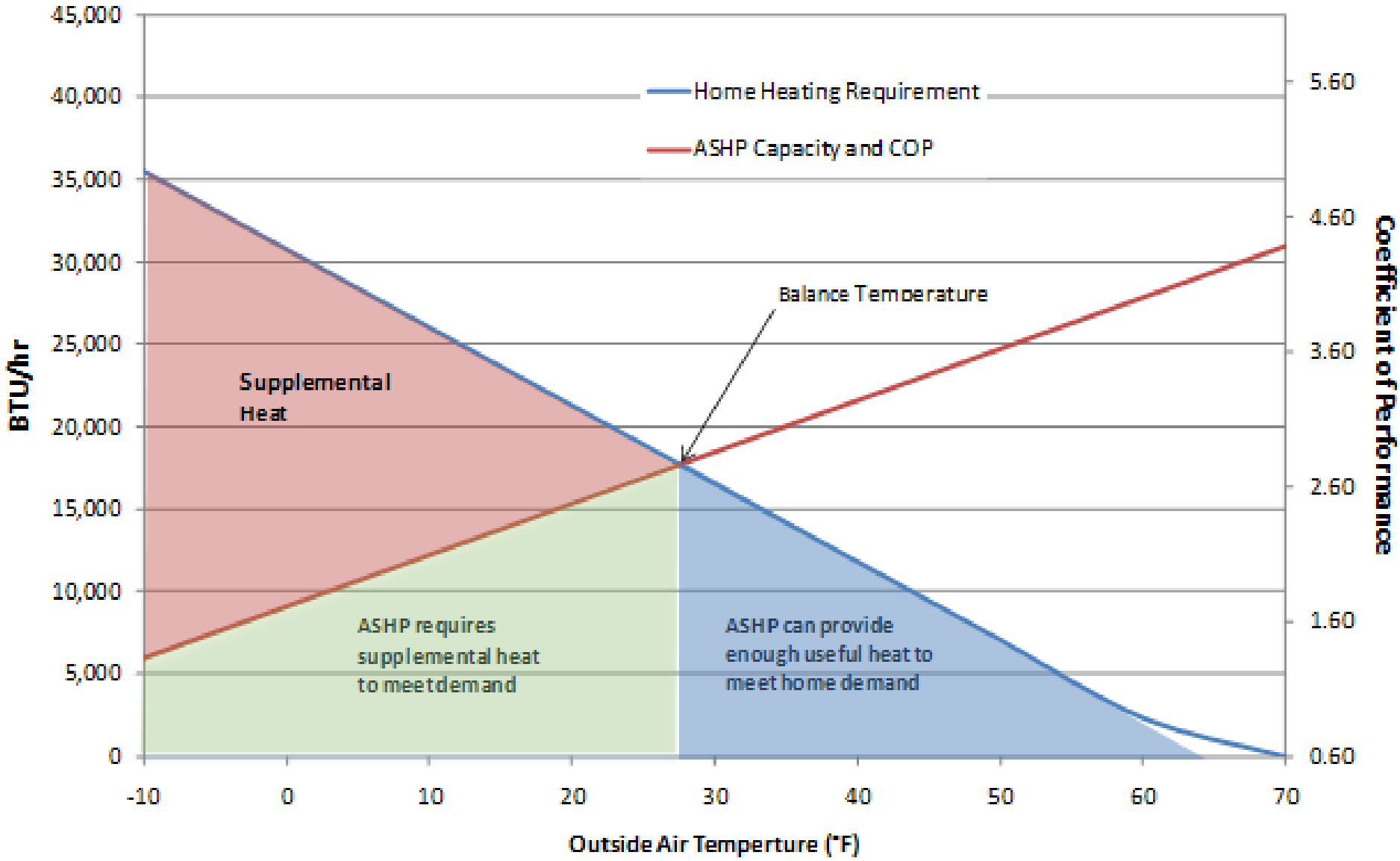
Heatpump disadvantages

- **Cold temperature performance –**
- As outdoor temperatures drop, so does the efficiency of an air-source heat pump.
- COP needs to be utilized above +10 F
- At this time they will not work below -20F.

Kotzebue Yearly Temp.



Performance of a Typical 2 Ton ASHP During the Heating Season



Heat pump Cost and Value (Initial Calculations)

Noatak, Ambler or Shungnak

- **Cost of a 19 Seer/11 HFPS Ductless Heat-pump would be approximately $ 5,000.00**

Comparison to Toyostove Diesel Heat
@ $10.00/G and 60 MBTU

- @ $ 0.20/Kwh savings over **6 months** compared to Diesel could be up to **$ 3,865.00**
- This is using the first 500 Kwh under PCE.

- @ $ 0.70/Kwh savings over **6 months** compared to Diesel could be about **$ 1,136.00**

	Gas/G	Stove Oil/G	Kwh (PCE)	Kwh (501-
Kotzebue	$5.15	$5.04	$0.18	$0.45
Ambler	$9.10	$9.50	$0.21	$0.61
Kobuk	$8.00	$7.50	$0.21	$0.60
Shungnak	$8.25	$8.25	$0.21	$0.60
Kiana	$6.00	$5.50	$0.20	$0.57
Noorvik	$5.83	$5.42	$0.20	$0.57
Selawik	$7.50	$8.28	$0.20	$0.52
Buckland	$6.80	$6.80	$0.20	$0.48
Deering	$4.50	$4.25	$0.32	$0.71
Kivalina	$4.85	$4.40	$0.20	$0.56
Noatak	$9.99	$8.99	$0.21	$0.75

Panasonic CU-4E24RBU - 24,000 BTU

Ductless Heat Pump System - Wall Mounted - 19.2 SEER - 11 HSPF

13 Air to Air Heat-pump installations Pilot Project- CIAP Funded.

Outdoor unit open

Thermal Pics.

A warm room will now
welcome us
when we come to work in the
morning. Thank you!
Janet Mitchell, Administrator
Kivalina City Council

First one is the bedroom and the
next is in the living room.
Thanks .
Went home and the floor was
nice
and warm.
**Daisy Weinard, General
Manager**
Ipnatchiaq Electric Company

Cooling tent for Meat

Results so far

The units was operated
September-October 2016

Keep in mind the savings calculated
are for the Households and City offices

Untapped PCE 2014

Utility	PCE Eligible kWh Region wide 2014 Residential		left over		Community		left over	%	
AVEC	Facilities	used	available	value	Facilities	used	available		value
Ambler	486000	309006	176994	$98,904.25	227640	204139	23501	10.32376	$13,132.36
Kiana	726000	432836	293164	$132,187.65	321720	218384	103336	32.11986	$46,594.20
Kivalina	510000	396682	113318	$50,075.22	337680	118477	219203	64.91442	$96,865.81
Kobuk	210000	147719	62281	$38,346.41	118440	55951	62489	52.76005	$38,474.48
Noatak	702000	606078	95922	$63,711.39	477120	223474	253646	53.16189	$168,471.67
Noorvik	804000	649954	154046	$69,166.65	525840	366173	159667	30.36418	$71,690.48
Selawik	1074000	797514	276486	$113,635.75	719040	550009	169031	23.50787	$69,471.74
Shungnak	378000	290358	87642	$53,961.18	225960	137886	88074	38.9777	$54,227.16
	0		0	$0.00	0		0		$0.00
Buckland	588000	448460	139540	$35,136.17	380520	32283	348237	91.51608	$87,686.08
Deering	282000	152943	129057	$57,559.42	119280	108793	10487	8.791918	$4,677.20
Kotzebue	6276000	3716281	2559719	$692,659.96	2719080	1621262	1097818	40.37461	$297,069.55
		Kwh	4088169			Kwh	2535489		
		Value $		$ 1,405,344.06				value $	$948,360.73

This is 2,044 Kwh and $ 700.00/household that is not claimed

Ambler House Results

- Month Usage Cost/Kwh Total
- August ,, No Heat pump $ 0.247 $ 0
- Sept. 304 Kwh $ 0.286 $ 86.88
- Oct. 342 Kwh $ 0.304 $ 104.10
- Pump operated until 1th November

- Cost per Kwh increases the more the Heat-pump is used.
- Stove oil is $ 9.50/Gallon
- October was heated by an equivalent cost of 11 Gallons But AVEC used 24.4 G to produce the 342 KWh

Noatak House Results

Month	Usage	Cost/Kwh	Total
August	489 Kwh	$ 0.254	$ 22.82
Sept.	765 Kwh	$ 0.453	$ 165.30
Oct.	930 Kwh	$ 0.519	$ 274.93

- Pump operating on and off through winter.

- Cost per Kwh increases the more the Heat-pump is used.
- Stove oil is $ 8.99/Gallon
- October was heated by an equivalent cost of 30.6 Gallons
- But AVEC used 66.4 G to produce the 930 KWh

Kivalina City results

- Month Usage Cost/Kwh Total
- August ,, No Heat pump $ 0.222 $ 0
- Sept. 161 Kwh $ 0.217 $ 35.08
- Oct. 466 Kwh $ 0.210 $ 97.93
- Pump operated until 20th November

- Cost per Kwh decreases the more the Heat-pump is used as long as there is PCE available.
- Stove oil is $ 4.40/Gallon
- October was heated by an equivalent cost of 22 Gallons
- But AVEC used 33.3 G to produce the 466 KWh

Kiana City results

Month	Usage	Cost/Kwh	Total
July	114 Kwh	$ 0.211	$ 24.06
August	170 Kwh	$ 0.222	$ 35.90
Sept.	590 Kwh	$ 0.201	$ 118.51
Oct.	939 Kwh	$ 0.193	$ 181.47

- Pump operated until 1 th November

- Cost per Kwh decreases the more the Heat-pump is used as long as there is PCE available.
- Stove oil is $ 5.50/Gallon
- October was heated by an equivalent cost of 33 Gallons
- But AVEC used 67 G to produce the 939 KWh

Return on investment @ Ambler

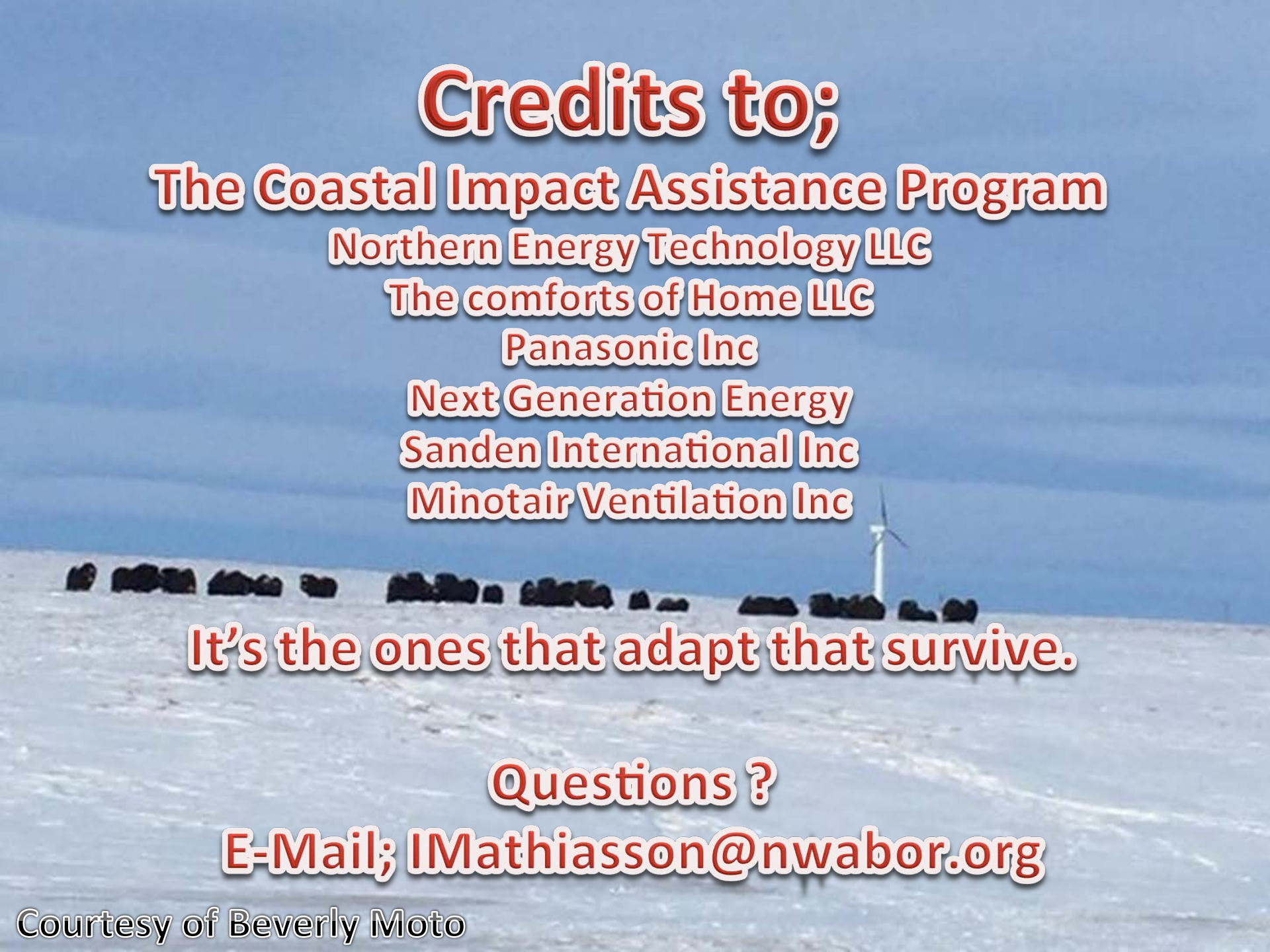
- **2-5 year payback**
- **Benefit to cost ratio of 2 to 6, depending on cost of electricity and Diesel fuel.**
- **$22,500.00 savings/ Household @ $ average $ 1,500.00/year over 15-year lifetime.**
- **150 Gallons of Diesel not needed per Household/year**
- **Total amount of Diesel not needed for 81 Households over 15 Years; 182,250 Gallons**
- **Total savings on project for 81 Households,**

  $ 1,822,500.00

Regional Return on investment

- Assume 2000 Households region wide
- Savings/household and year.
  @ a conservative $ 1,000.00 average
- Payback average 4-5 years
- 15 year lifespan on equipment.
- Total savings for the Region as a whole
- $ 30,000,000
- 4.5 Mil gallons of Diesel not needed for heating.

- And we can also use it for Community buildings


Credits to;
The Coastal Impact Assistance Program
Northern Energy Technology LLC
The comforts of Home LLC
Panasonic Inc
Next Generation Energy
Sanden International Inc
Minotair Ventilation Inc
It's the ones that adapt that survive.
Questions ?
E-Mail; IMathiasson@nwabor.org
Courtesy of Beverly Moto