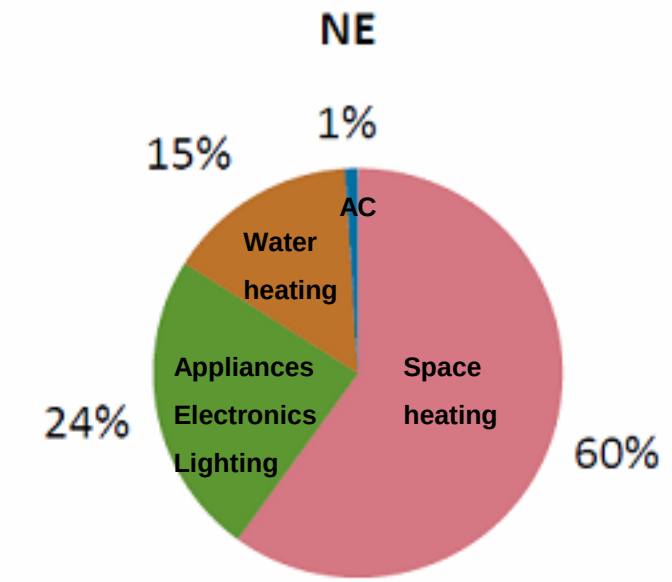
Cold Climate Heat Pumps and EE Programming

October 6, 2015

Northeast “Site” Energy Use

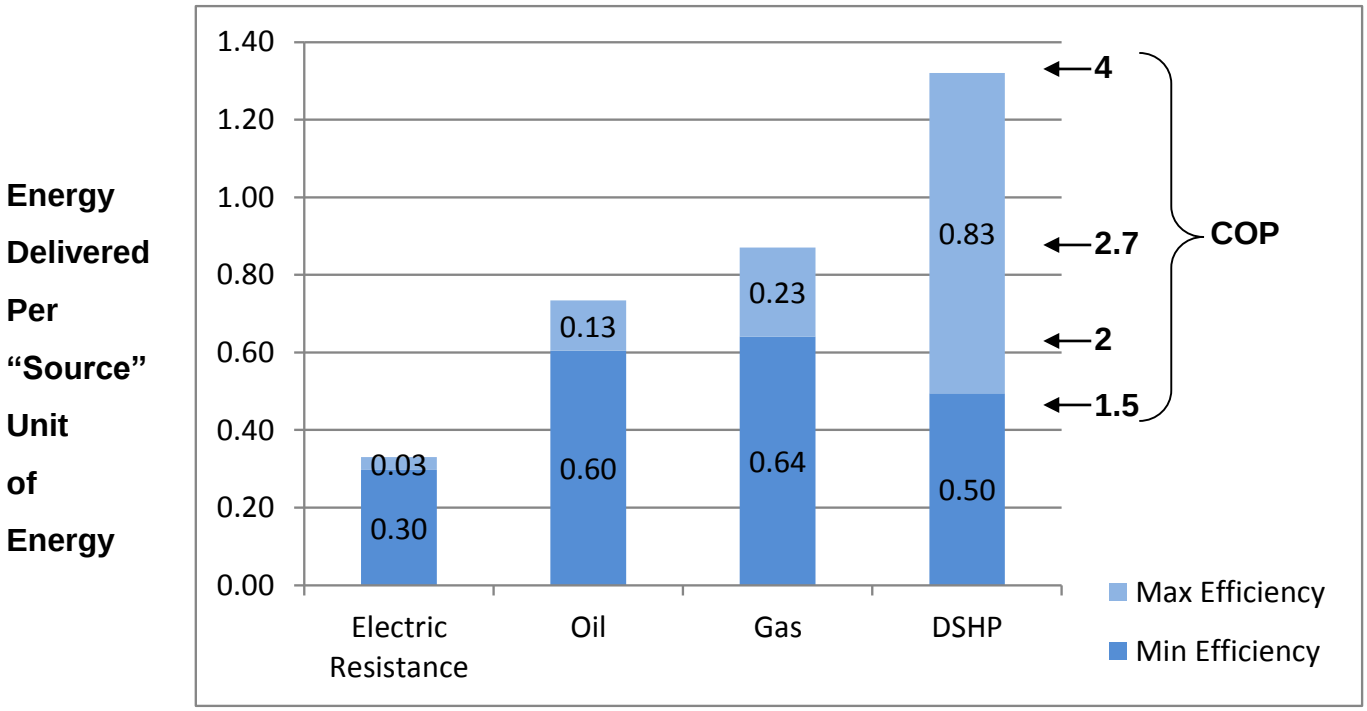
- Space heating dominates residential site energy consumption



EIA’s 2009 Residential Energy Consumption Survey

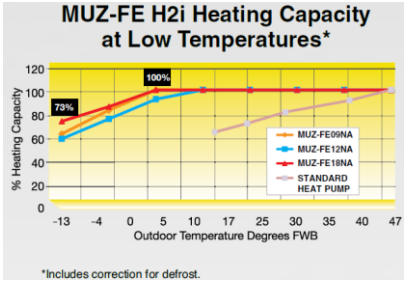
- 6153 Heating Degree Days - 299 Cooling Degree Days

“Source” Energy Efficiency



Air source heat pump performance varies with outdoor air temperature

Low Temperature Performance

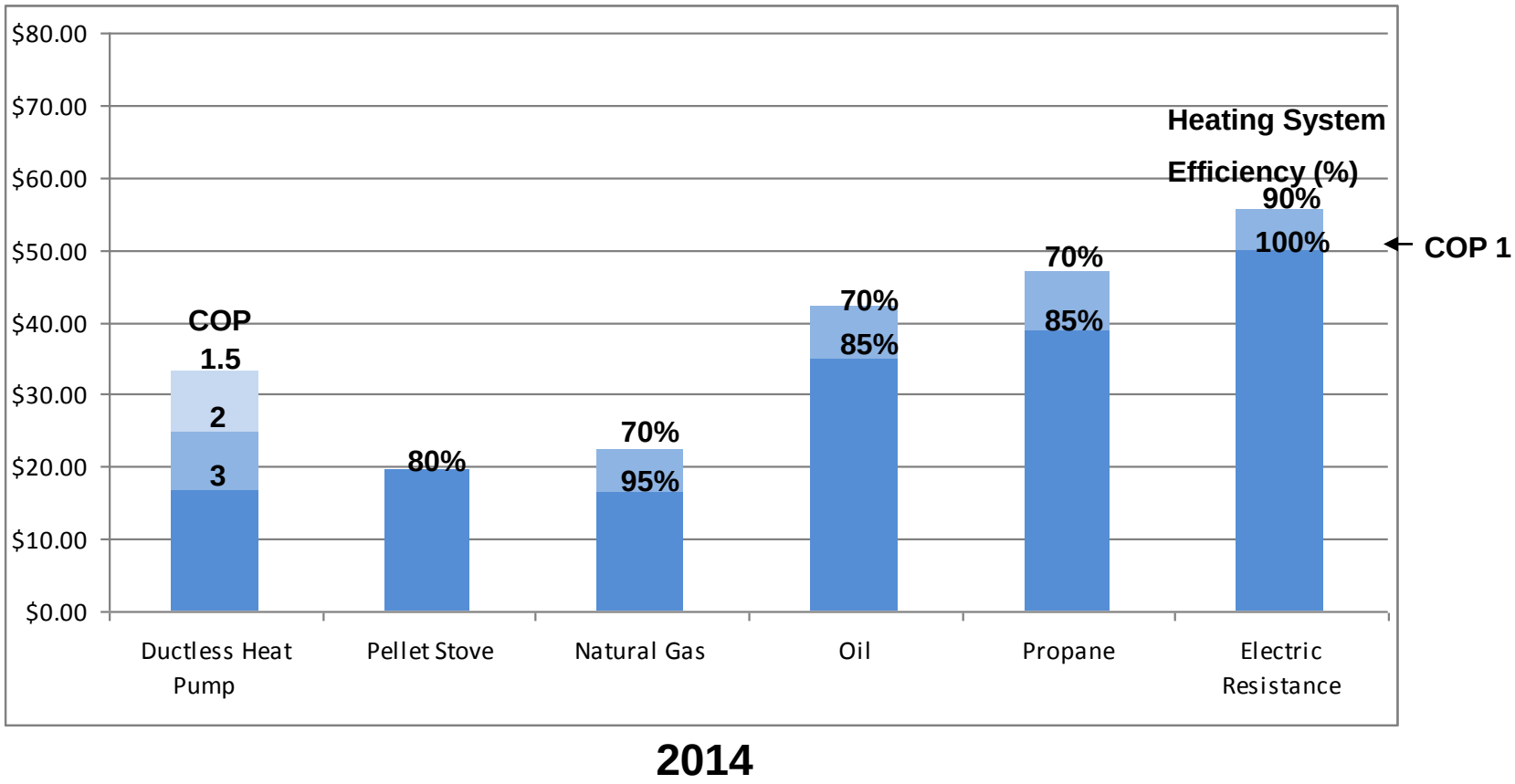


Data for MUZ-FE18NA

Outdoor Temp	Btu Load	Btu Rated	kW Rated	COP Rated	Btu Max	kW Max	COP Max
55	0	25,274	1.65	4.49	36,314	3.51	3.03
45	6,000	22,272	1.58	4.13	33,283	3.43	2.85
35	12,000	15,984	1.45	3.23	30,252	3.35	2.65
25	18,000	14,472	1.28	3.31	27,221	3.26	2.44
15	24,000	12,960	1.10	3.45	24,190	3.18	2.23
5	30,000	10,152	0.89	3.34	21,159	3.10	2.00
0	33,000	8,761	0.77	3.33	19,643	3.06	1.88
-5	36,000	7,260	0.64	3.32	18,128	3.02	1.76
-10	39,000	5,759	0.52	3.24	16,612	2.98	1.63
-15	42,000	4,257	0.40	3.12	15,097	2.94	1.50

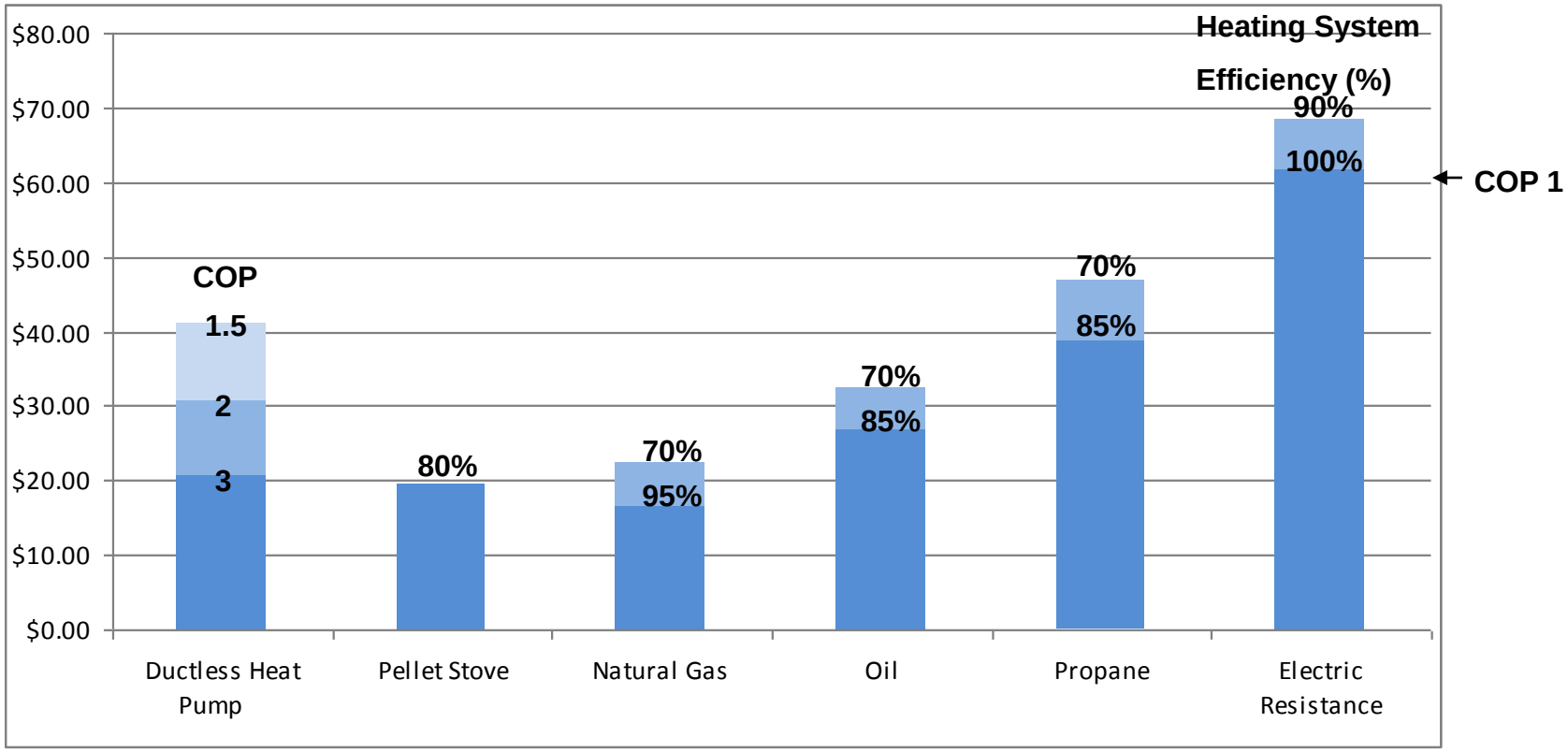
Air source heat pump performance varies with load

Cost Comparison per Delivered MMBtu



Cost effectiveness varies with fuel price

Cost Comparison per Delivered MMBtu



2015

Electric rates increased ($0.17 to $0.21 per kWh)

Oil prices decreased ($4.10 to $3.15 per gallon)

Fit for EE programming

- Verifiable savings = EE programming
  - Savings from defined baseline
  - “Cost effective” per regulatory requirements
  - Influence market
- Reduced variability = better fit for EE
  - Focus on features that improve performance
  - Improve design guidelines for heating dominated climate
    - Primary heating (smaller market opportunity)
    - Supplemental heating (larger market opportunity)

Appendix

2014 Fuel Costs

Electric $0.17 kWh

Natural Gas $1.60 therm

Oil $4.10 gallon

Propane $3.00 gallon

Pellet $250.00 per ton