

# Fuels and Fuel Supply

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# Biomass Fuels – Thermal

Wood Chips



Wood Pellets



# Biomass Fuels - Thermal

- Wood Chips
  - Readily available, +/-45 moisture content, live floor delivery
  - Made from stems or sawmill residuals
  - Higher specifications than used at biomass electric or paper mill energy
- Semi-Dry Chips
  - Active or passive drying, 25-35% moisture content, multiple delivery options
  - Not currently available in Maine, chicken-and-egg, “bespoke” fuel right now
- Wood Pellets (bulk)
  - Refined wood fuel, manufactured at 4 facilities in Maine (and elsewhere)
  - ~8% moisture, delivery looks like oil tank, easily metered fuel



# Typical Wood Specification

## Community-scale Biomass Unit (e.g., school)

- Clean, 100% wood residues from known sources, free from paint, chemicals, glues, metals, nails, or other non-wood substances. No rotten substances that are evidence of decomposition, no whole-tree chips;
- Moisture content <45%
- Chip size 2.5" x 1.5" x 5/8" maximum
- Delivery via live floor truck, length < = 53 feet, height < = 14 feet



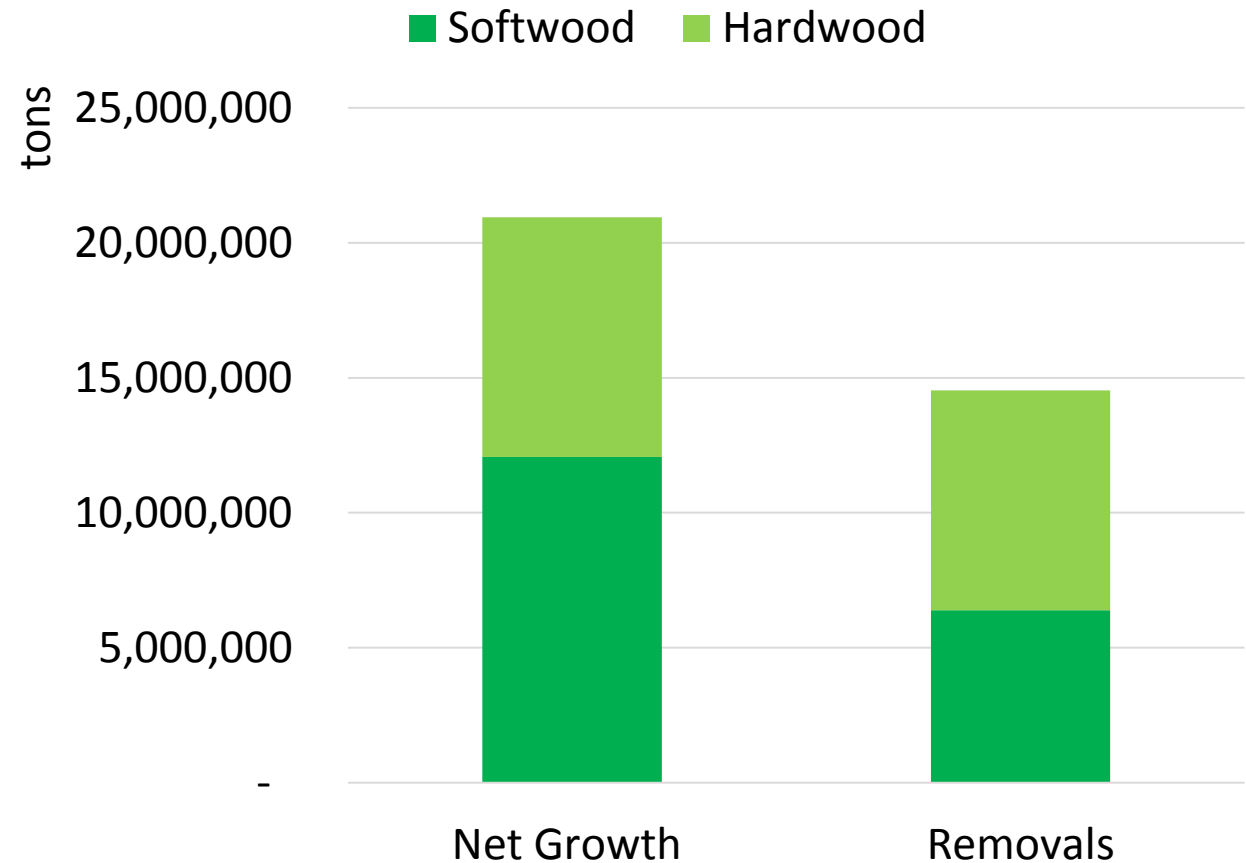
# Chips Vs. Pellets

Parameter	Chips	Semi-Dry Chips	Pellets
Heat Cost (\$/MMBtu)	Lower	Middle	Higher (about 2X chips)
Capital Cost/MMBtu	Higher	Middle	Lower
Fuel supply	Diversity of suppliers	Limited	Fewer suppliers
Applicability	Generally >3MMBTU		Generally <3MMBTU
Fuel Standards to Ensure Consistency of Fuel	Yes	Yes	Yes
Energy Density (MMBtu/ton)	Lower	Middle	Higher (about 2X chips)
Maintenance Cost	Generally higher than pellet system	Middle	Generally lower than chip system
Output efficiency	Generally <75%	Generally 70% - 80%	80-90+%
Particulate Emissions	Higher than pellets w/out emission controls	Middle	Lower than chips



# Maine Forests

- Maine grows 6 million tons more than is harvested annually
- Loss of major markets (pulp and biomass) leaves an opportunity
- Sawmill residue also a source of wood fuel
- *Data Source:* USDA Forest Inventory and Analysis, Maine 2013-2017, conversion to tons by INRS



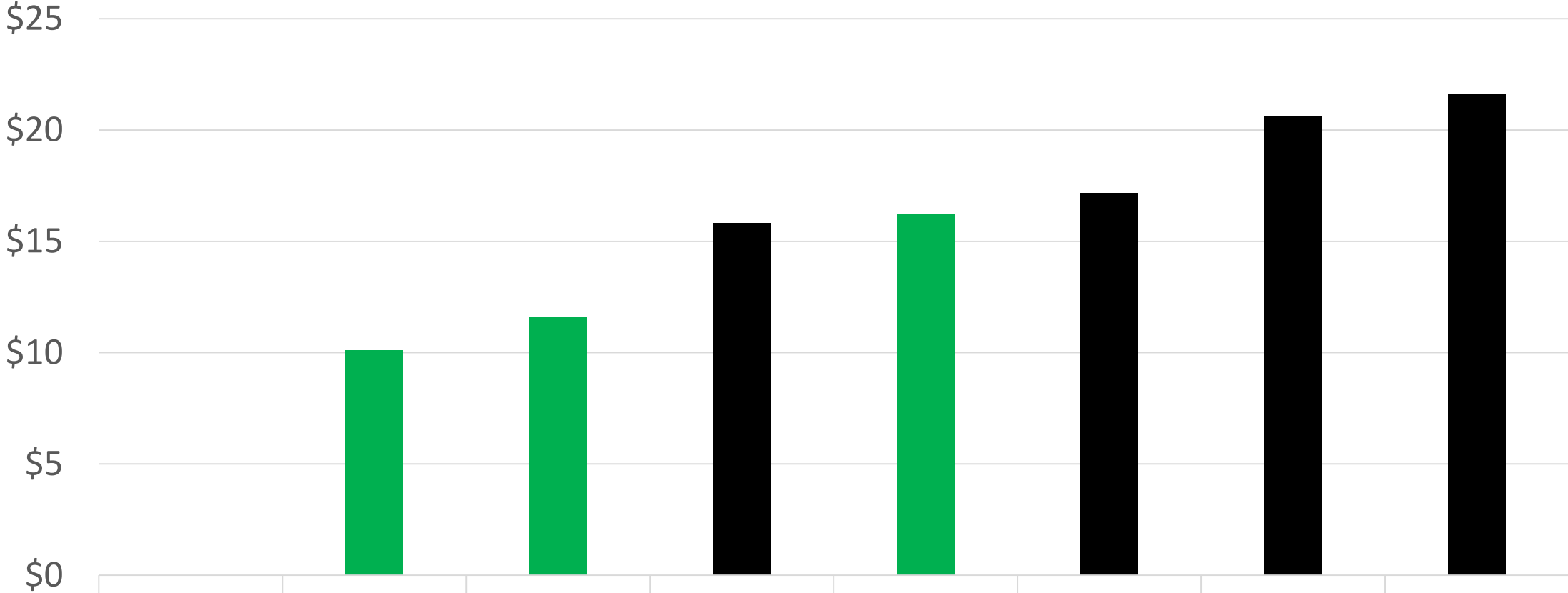
# Comparative Fuel Cost

All data from Maine Energy Office (January 7, 2019), except wood chips and semi-dry chips, which are INRS estimates

Fuel	\$/unit	\$/mmbtu
Wood Chips (HW, 45% MC)	\$70/ton	\$10.10
Semi-Dry Chips (HW, 30% MC)	\$110/ton	\$ 11.59
Natural Gas (low)	\$1.58/therm	\$ 15.83
Wood Pellets	\$268/ton	\$ 16.24
Electricity (Air Source Heat)	\$5.85/kwh	\$ 17.15
No. 2 Oil (HHO)	\$2.68/gallon	\$ 20.62
Natural Gas (high)	\$2.16/therm	\$ 21.61

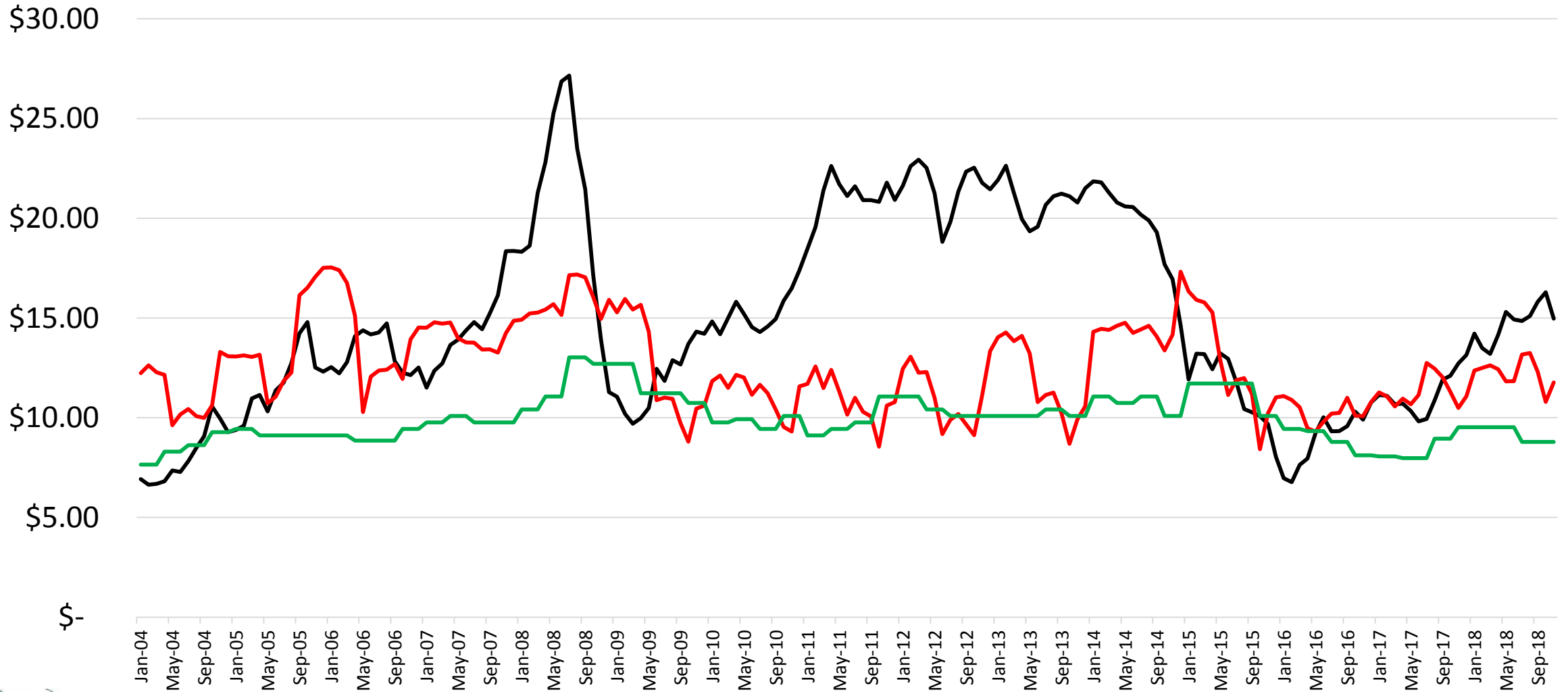


# \$/mmbtu





# \$ per MMBTU



— No 2 Heating Oil (East Coast, Wholesale)

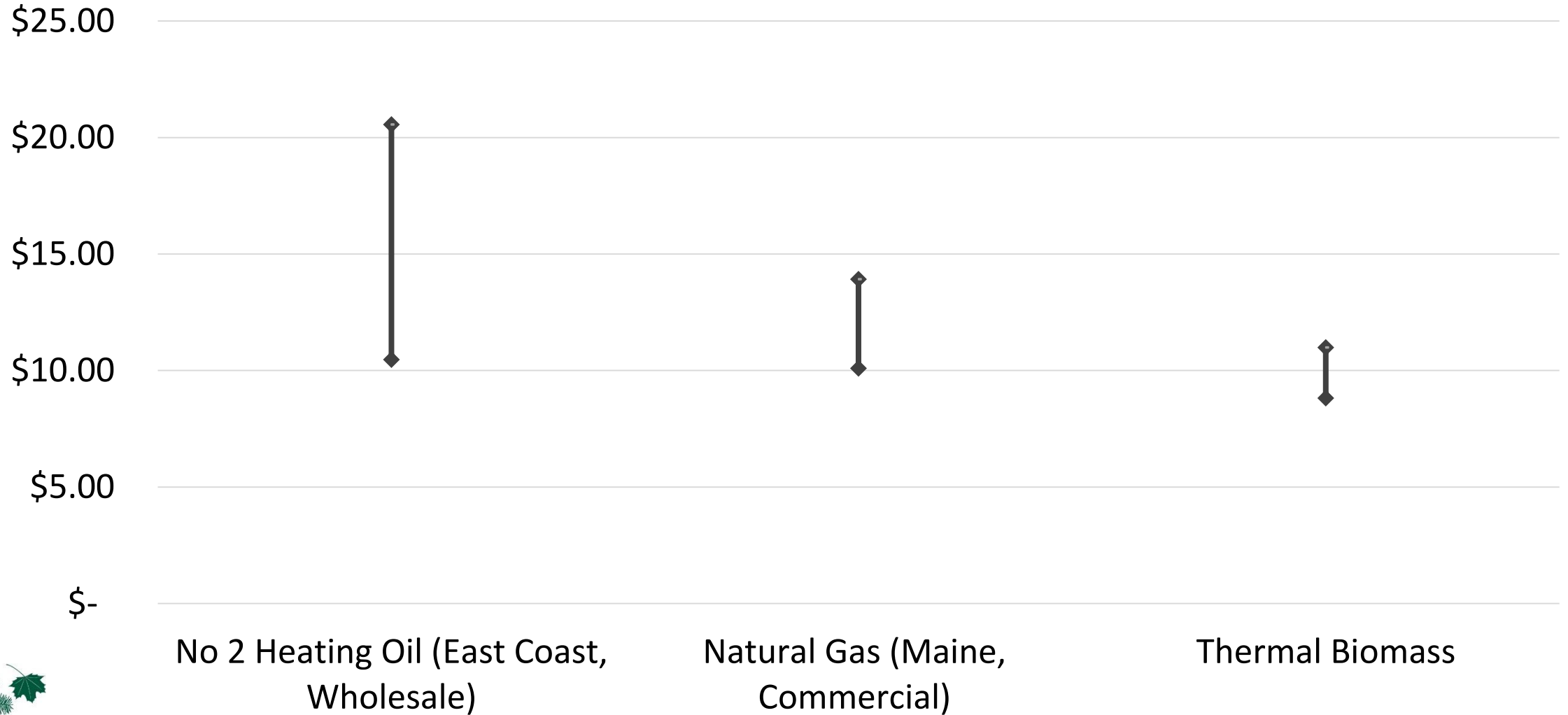
— Natural Gas (Maine, Commercial)

— Biomass Thermal



# Monthly Fuel Prices, 2012 -2018

## \$ Per MMBTU, Mean and 1 Standard Deviation



# Biomass Fuels In Maine

- Multiple options to meet your project's needs
- Abundant and local
- A track record of success across New England
- Low-cost when compared to the options (particularly oil)
- Very price stable



# QUESTIONS?

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