### **OPPORTUNITY**

What are the benefits to using Biomass Boilers?

DRIVE USE
OF LOCALLY
SOURCED
RENEWABLE
ENERGY



## TAKE ADVANTAGE OF WASTE WOOD

Pine-beetle infestation has killed 17.7 million acres of U.S. forest<sup>1</sup>

### **TECHNOLOGY**

How do Biomass Boilers work?

### POWER HOT-WATER-HEATING SYSTEMS

with solid wood fuel

85%-90% EFFICIENCY RATING

### M&V

Where did Measurement and Verification occur?

NATIONAL RENEWABLE ENERGY LABORATORY evaluated efficiency, cost-effectiveness, and operational functionality of a 1-million BTU biomass boiler provided by Advanced Climate Technologies at the Federal Building in Ketchikan, Alaska

#### **RESULTS**

How did Biomass Boilers perform in the M&V?

# 85.6% BOILER EFFICIENCY

at 45% partial load<sup>2</sup>; increased load will increase efficiency<sup>3</sup>

## HIGH FUNCTIONALITY

low o&m costs4

# <5 YEARS

Payback operating at75% capacity with average pellet costs<sup>5</sup>

< 10 10+

### **Payback Varies by System Size and Pellet Cost**

Savings are greatest with larger systems and lower fuel costs

Pellet Cost (\$/ton)

		\$400	\$350	\$300	\$250	\$200
		PAYBACK IN YEARS				
System Size (BTUs/hr)	500,000	30.7	10.7	6.5	4.7	3.6
	1,000,000	24.1	8.4	5.1	3.6	2.8
	1,500,000	20.9	7.3	4.4	3.2	2.5
	2,000,000	18.9	6.6	4.0	2.9	2.2
	2,500,000	17.5	6.1	3.7	2.6	2.1
	3,000,000	16.4	5.7	3.5	2.5	1.9
	3,500,000	15.6	5.4	3.3	2.4	1.8
	4,000,000	14.8	5.2	3.1	2.2	1.8

Diesel Price \$3.63/gallon; 75% capacity factor (At a 50% capacity factor, the payback period increases 30%)

### DEPLOYMENT

Where does M&V recommend deploying Biomass Boilers?

# HOT-WATER HEATED FACILITIES USING FUEL OIL

Most cost-effective for buildings in cold northern climates within 50 miles of a biomass pellet mill

1US Forest Service, Western Bark Beetle Strategy, Human Safety, Recovery and Resiliency, 7/11/2011 2Wood-Pellet-Fired Biomass Boiler Project at the Ketchikan Federal Building. Gregg Tomberlin (NREL), June 2014, p3 3lbid, p.12 4lbid, p.23 5lbid, p.29