



## The Biomass Solution for District Energy

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### FORWARD-LOOKING STATEMENTS:

This presentation contains “forward-looking statements” within the meaning of the securities laws. Such statements are subject to a number of assumptions, risks, and uncertainties, many of which are beyond the control of Enviva, that may cause actual results to differ materially from those contemplated by the forward-looking statements. These include the risk factors set forth in our Annual Report on Form 10-K for the year ended December 31, 2016 and our other filings with the Securities and Exchange Commission.

### INDUSTRY DATA:

This presentation includes industry data and other statistical information from third-party sources, including industry publications, government publications, and other published sources. Although Enviva believes these third-party sources are reliable as of their respective dates, Enviva has not independently verified the accuracy or completeness of this information. Some data are also based on Enviva’s good faith estimates, which are derived from its review of internal sources as well as the third-party sources described above.



- A maturing industry
- How Enviva fits in
- Unlocking the District Energy Business Case
  - Value proposition
  - Case study
  - The way forward



# **INDUSTRY SNAPSHOT**

Worldwide demand for wood pellets is **expected to grow by 12% in 2017**, to 31.2 million metric tons<sup>1</sup>

Wood biomass accounts for about **44% of all renewable energy in the EU**, by far the largest single source<sup>2</sup>

Wood pellets produce about **5.4% of all electricity in the United Kingdom**<sup>3</sup>



1) Hawkins Wright, "The Outlook for Wood Pellets," 2016 Q4

2) Eurostat, "Electricity Generated from Renewable Sources" 2014

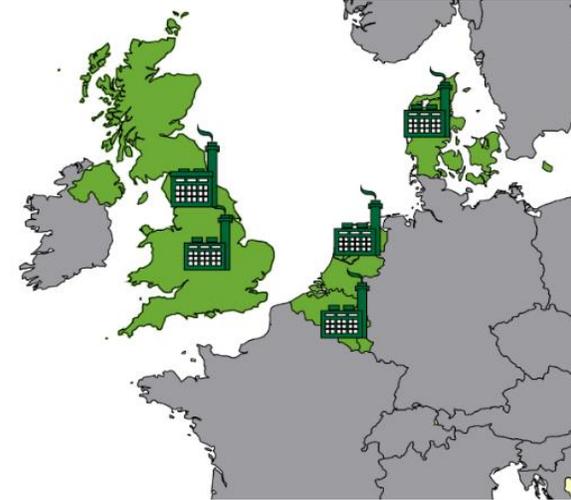
3) Drax Electricity Insights Quarterly, Q1 2017

# Market Characteristics

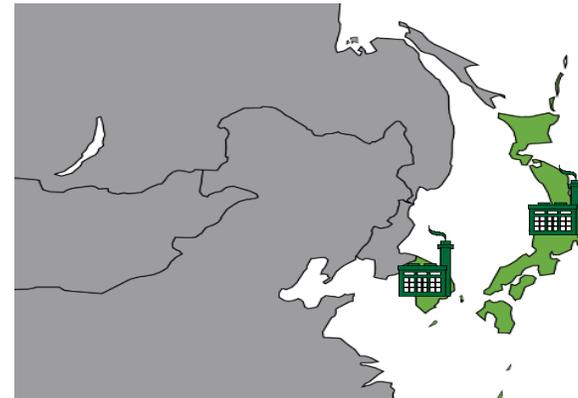
## Policy characteristics for Enviva's target markets

- 1** Biomass energy providing a compelling answer to the energy “trilemma” of cost, decarbonization, and grid stability
- 2** Baseload / dispatchable characteristics of biomass power seen as a major advantage as electricity systems are placed under strain
- 3** Policy-makers focused on improving financial discipline on a “total cost” basis, leading to more competition among renewables, where biomass can prevail
- 4** Asian market maturing towards long-term supply contract structure, and can be cost-competitively supplied from the Southeastern U.S.
- 5** Biomass co-firing of U.S. coal fleet can extend plant lives, preserve jobs, benefit rural economies and help the U.S. meet COP-21 Paris Agreement targets

## Northern European countries where Enviva's long-term contracted customers are based



## Growing Asian Demand Driven by New Feed-In Tariffs, Capacity Needs, and Renewable Energy Standards



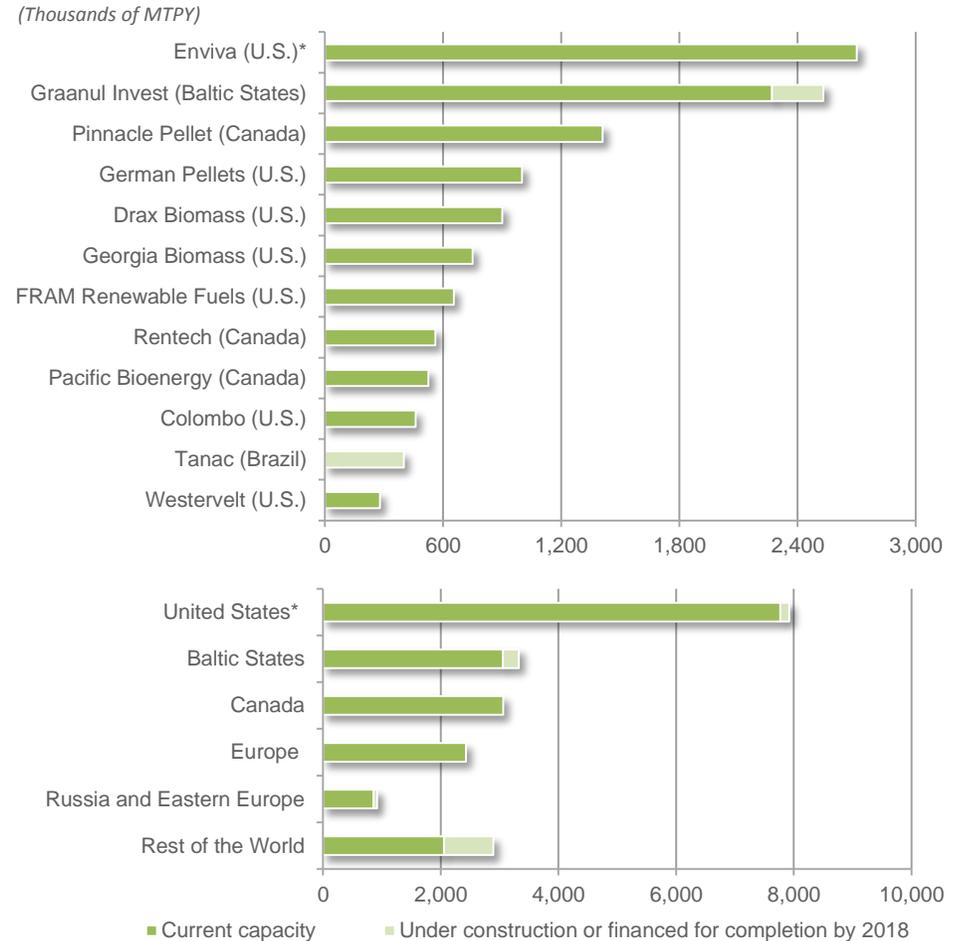
# **HOW ENVIVA FITS IN**

# Enviva Overview

- Enviva is the world’s largest supplier of biomass to global utility industry
- Biomass industry historically characterized by fragmented supply base
- Utility trade almost exclusively one-to-one agreements between standalone plants
- Enviva distinguishes itself with an industrial, enterprise-scale approach
  - Carefully assembled team of foresters, manufacturing experts, logisticians, and engineers
  - Multi-plant profile allows for optimization
  - Years of operational knowledge, employs a “build and copy” approach
  - Conservative balance sheet
  - Multi-billion dollar financial investors experienced in energy and wood products sector

**Bankable and reliable supplies adhering to strict quality standards**

## Worldwide Industrial Pellet Producers and Regional Production



Source: Hawkins Wright: The Outlook for Wood Pellets – Demand, Supply, Costs and Prices; Third quarter 2016  
 \* Includes the Sampson plant, but does not include the Hamlet plant (financed and in detailed design) or other production plants being developed by the Sponsor or the joint venture.



# Assets at a Glance



## Storage and Terminating Assets

### Port of Mobile

*Location:* Mobile, AL, Cooper Marine & Timberlands ChipCo Terminal  
*Startup:* 3<sup>rd</sup> Party Agreement  
*Storage:* Flex barge storage with 45K+ MT of capacity



### Port of Chesapeake

*Location:* Chesapeake, VA, wholly-owned by Enviva  
*Startup:* November 2011  
*Storage:* Dome storage with 90K MT of capacity



### Port of Panama City

*Location:* Panama City, FL, Port Panama City  
*Startup:* 3<sup>rd</sup> Party Agreement  
*Storage:* Flat warehouse storage with 32K MT of capacity



### Port of Wilmington

*Location:* Wilmington, NC, Enviva Port of Wilmington  
*Startup:* 2016, under agreement with our Sponsor  
*Storage:* Dome storage with 90K MT of capacity



## Current Production Plants

### Amory

*Location:* Amory, MS  
*Startup:* August 2010 (acquired)  
*Annual Production:* 120K MTPY



### Ahoskie

*Location:* Ahoskie, NC  
*Startup:* November 2011  
*Annual Production:* 375K MTPY



### Southampton

*Location:* Southampton, VA  
*Startup:* October 2013  
*Annual Production:* 515K MTPY



### Northampton

*Location:* Northampton, NC  
*Startup:* April 2013  
*Annual Production:* 525K MTPY



### Sampson

*Location:* Sampson, NC  
*Startup:* November 2016  
*Annual Production:* 500K MTPY, expected to increase to 600K MTPY in 2019



### Cottondale

*Location:* Cottondale, FL  
*Startup:* May 2008 (acquired January 2015)  
*Annual Production:* 720K MTPY



## Since Enviva opened its first US mill in 2011

the total amount of forest land in our primary supply area has **increased by 320,842 acres**, with the volume of forest inventory on that land **growing by 10%**.



Harvest removals for all forest products represent **3% of total forest inventory** in the US South.

Removals for pellets make up only **0.1% of total inventory**.

*Inventory is still increasing. Southern forests are growing faster than they are being harvested.*

## Where does Enviva source wood?



**750+**  
individual tracts

**98**  
counties

**07**  
southern states

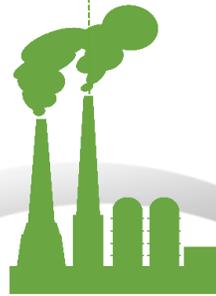
At Enviva, our job is more than making pellets. We work for renewable energy, healthy forests, and strong communities.



# Substantially Lower Greenhouse Gases

**European Union report:** “the vast majority of the biomass used today in the EU for heat and power are considered to provide **significant greenhouse gas savings** compared to fossil fuels”

Source: State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU. European Commission. July 2014.



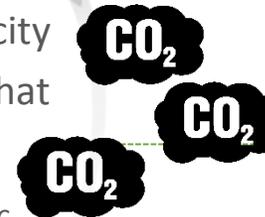
**United Nations report:** “greenhouse gas emissions from coal are **4 times greater** than forest wood bioenergy on a lifecycle basis”

Source: IPCC, 2014: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change

**Carbon Savings:** “The GHG intensity of pellet based electricity is **74% to 85% lower** than that of coal-based electricity”

*Authors include Chair of EPA’s Scientific Advisory Board Panel for Biogenic Carbon*

Source: Khanna et al. Carbon savings with transatlantic trade in pellets: accounting for market-driven effects. 2015.



**Oak Ridge National Laboratory scientists:**

“a robust body of research confirms that forests that are sustainably managed for wood products and energy are associated with **long-term reductions in atmospheric carbon dioxide**”

Source: Dale et al. Ecological objectives can be achieved with wood-derived bioenergy. The Ecological Society of America. 2015.



**100 U.S. Forest Scientists:**

“The carbon **benefits of sustainable forest biomass** energy are well established”

Source: Letter to Gina McCarthy, Administrator, EPA, from professors affiliated with the National Association of University Forest Resource Programs. November 14, 2014.



The Biomass Solution

# **UNLOCKING THE BUSINESS CASE**

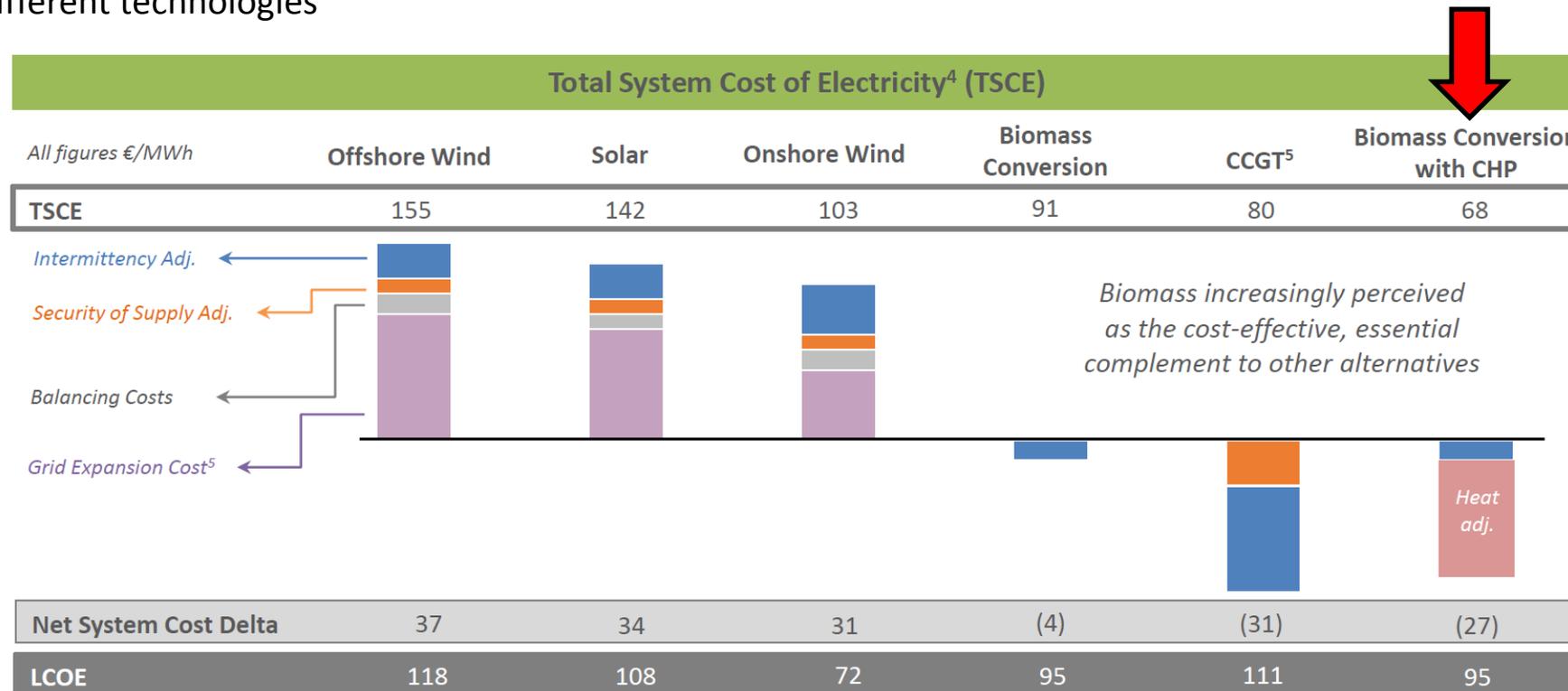
## The Biomass Value Proposition

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- To customers: Enviva has built a world scale biomass fuel supply chain that can uniquely offer:
  - **Supply Security** – enterprise capability ensuring reliability & global deliverability
  - **Quality** – strong track record maintaining consistent adherence to fuel specifications
  - **Predictability** – long-term (15+ year) fixed price supply agreements not tied to fossil fuel markets
  - **Bankability** – world class supply chain enables large project capital investments
  - **Sustainability** – forest product industry leading certification and sourcing practices
- To sourcing regions: Enviva employs more than 600 people with facility investment in excess of \$750 million
- To energy consumers: Enviva enables reliable, dispatchable, low-carbon renewable energy



- Total System Cost of Energy (TSCE) is a framework developed to compare intermittent and dispatchable energy technologies more effectively than Levelized Cost of Energy (LCOE)
- In many regions pursuing carbon reductions, such as in Europe, regulators have been increasingly recognizing the additional costs that must be considered when setting low-carbon generation regimes
- The chart below reflects recent work sponsored by Enviva in Germany and can inform relative costs & value of different technologies



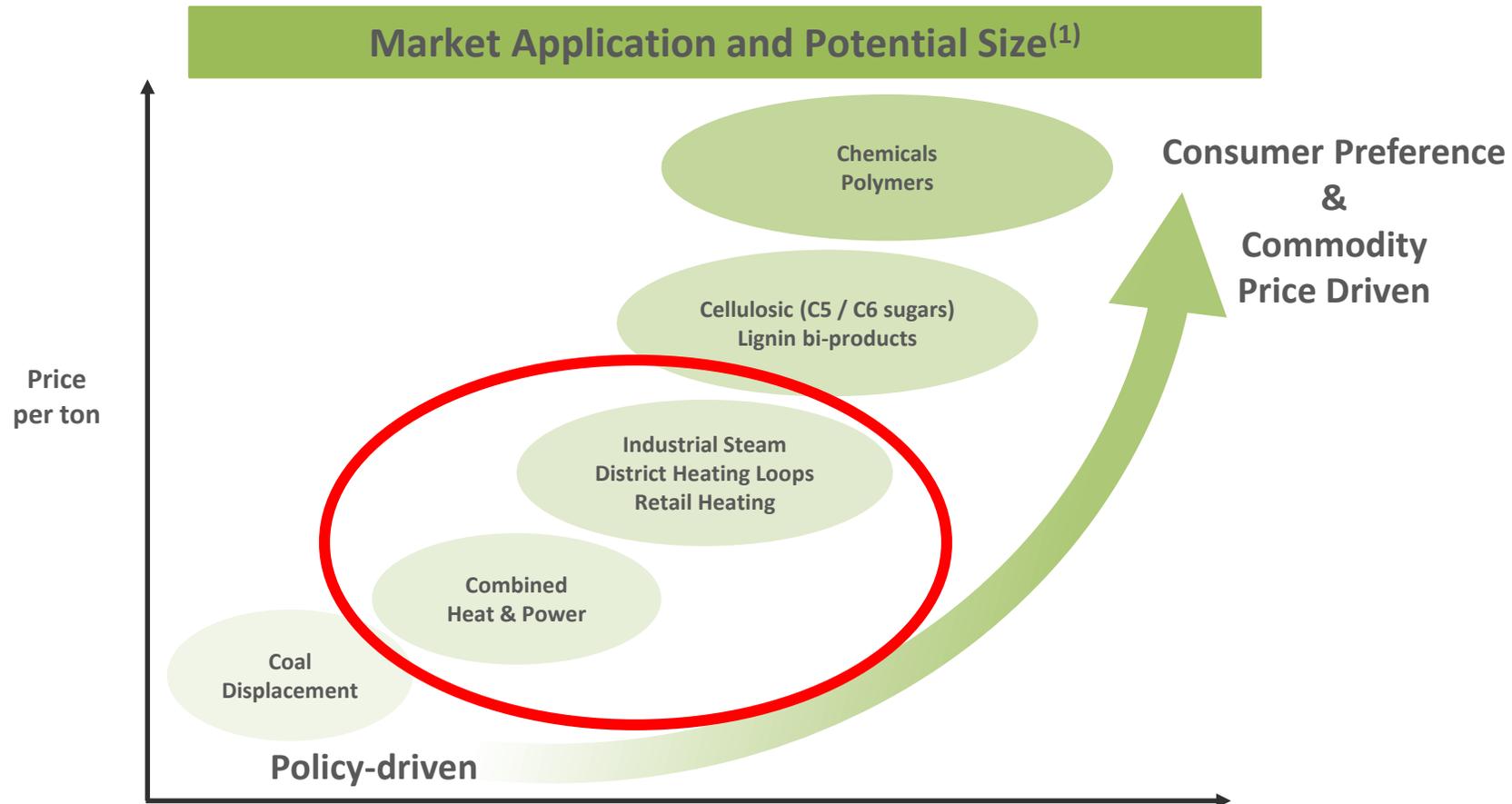
(4) Aurora Energy Research – Biomass conversions & the system cost of renewables (November 2016). Total System Cost of Electricity (TSCE) is the per-megawatthour cost of building and operating a generating plant over an assumed financial life including intermittency, security of supply, balancing, grid expansion, and heat adjustment (applicable for CHP only). Data is for Germany and may not be representative of all the markets in which we or our customers operate. CHP is Combined Heat & Power.

(5) Expansion costs are related to the electricity grid only. New build CCGT could require gas grid expansions, and the cost is not included here



## Market Growing Due to Application Diversity

- Long-term contracted demand for wood pellet displacement of coal has enabled substantial infrastructure investment in processing and logistics assets
- Resulting global distribution capability for low-cost fiber creates emerging demand from other applications for wood pellets



(1) Graph illustrative only



### **Biomass Power, CHP, and Green District Heating –**

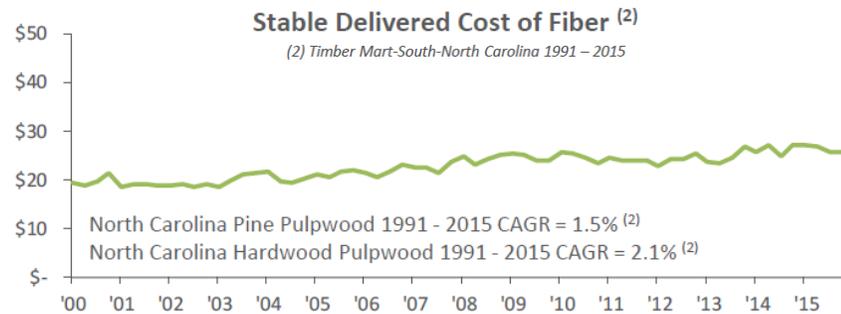
- Dong, the Danish Utility, is phasing out coal and shifting toward sustainable biomass
  - Stopping coal consumption entirely by 2023
  - Focusing on power generation in combination with district heating for greatest efficiency (89%)
  - >50% CO<sub>2</sub> reduction since 2006, target of 96% reduction by 2023



Avedøre Power Station, Denmark

# The Emerging Biomass Power Business Case

Wood Pellet vs. Coal Attributes			
	Wood Pellets <sup>(1)</sup>	NYMEX CAPP Coal <sup>(2)</sup>	Southern PRB Coal <sup>(3)</sup>
Median Heat Content (BTU/lb)	8,000	12,000	8,600
Moisture	4 – 10%	< 10%	26 – 30%
Ash	0 – 2%	< 13.5%	4.6 – 5.7%
Sulfur	0 – 0.15%	< 1.0%	< 1.0%



- Wood pellets are a drop-in replacement for coal and can accelerate energy decarbonization
- Biomass is a low-carbon, scalable, and proven fuel for industrial thermal needs, such as
  - Consumer facing brands with process heat demand
  - District energy applications with sustainability goals
  - Campus energy opportunities



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