# Logistical & Densification Challenges in Utilizing Cellulosic Biomass
# Torrefaction – A Solution

By

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# Logistical Challenges

Cellulosic biomass, like wood or plant material, is difficult to cost-effectively ship any great distance.

Such biomass is:

- 50% water
- Bulky
- Of low energy value
- Perishable

# Densification: Briquettes & Pellets

In order to overcome some of the logistical challenges, cellulosic biomass is often densified into briquettes and pellets.

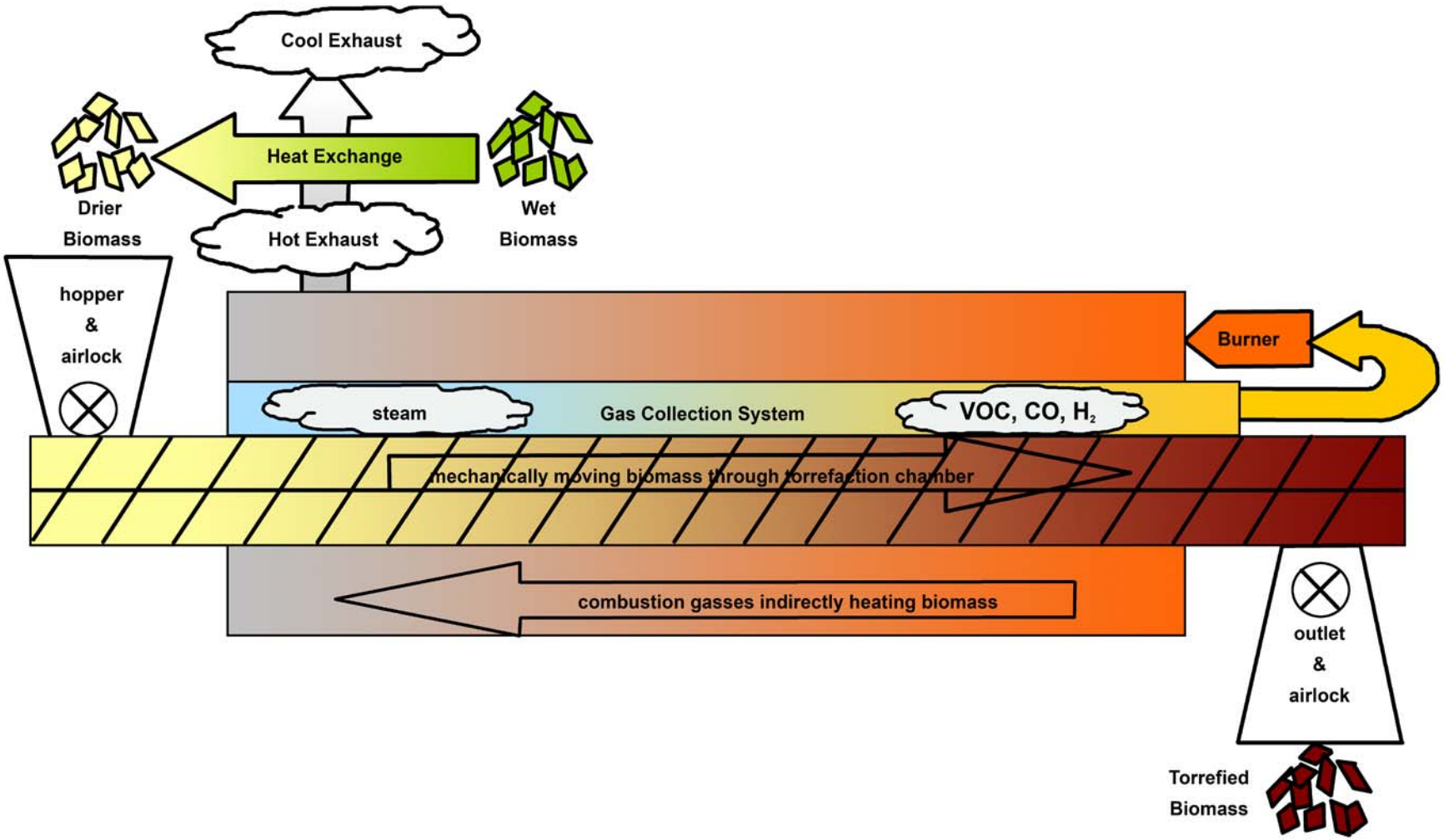
However, that is an expensive process, requiring lots of energy to dry, pulverize and then compress the material.

Torrefaction can effectively reduce densification costs and make superior briquettes and pellets.

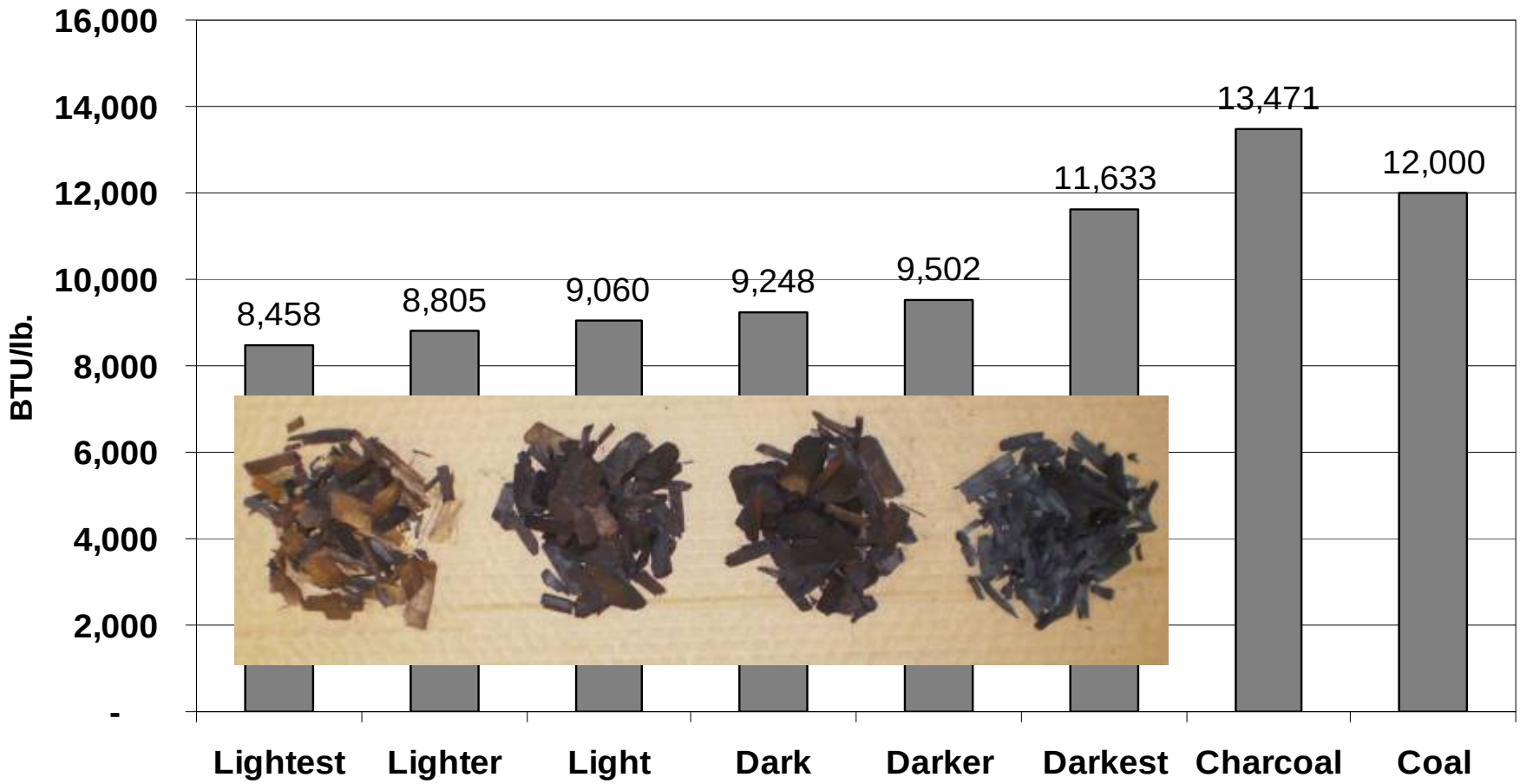
# Torrefaction: A Technology to Enhance & Densify Biomass

- **Untreated cellulosic biomass may be 50% water, it is bulky and not the most efficient or useable fuel or bio-feedstock. Torrefaction:**
  - Drives off most of the water
  - Reduces the bulk
  - Makes a better co-fire fuel to burn with coal
  - Makes superior briquettes and pellets
- **Torrefaction, applied at or near the point of harvest:**
  - Reduces transportation costs of biomass, per BTU
  - Produces a more valuable biomass shipment

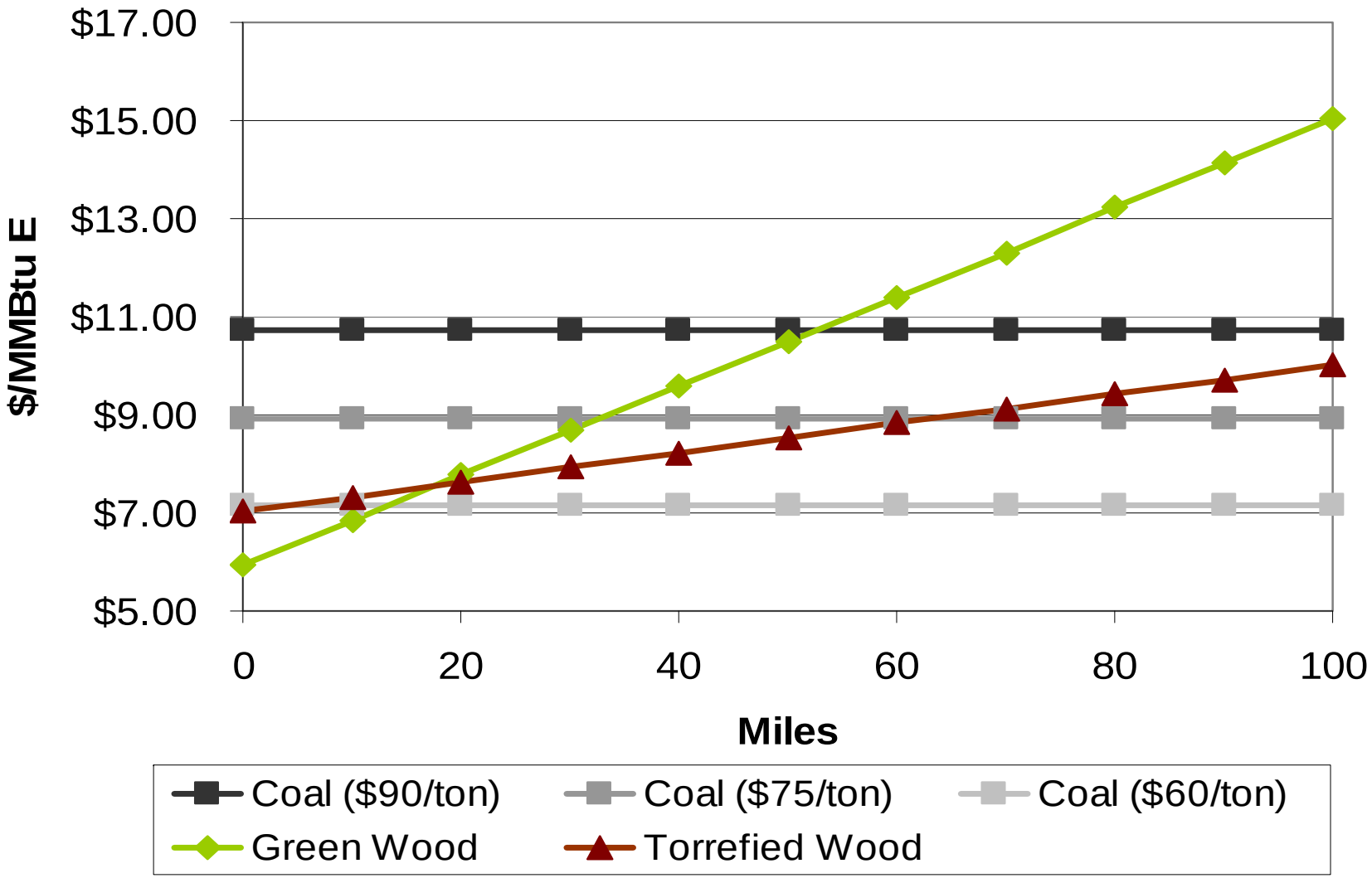
# Schematic of Torrefaction Machine



# Higher Heating Value of Torrefied Wood, Charcoal and Coal



# Delivered Cost per MM BTU



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