

# Industrial energy demand & efficiency:

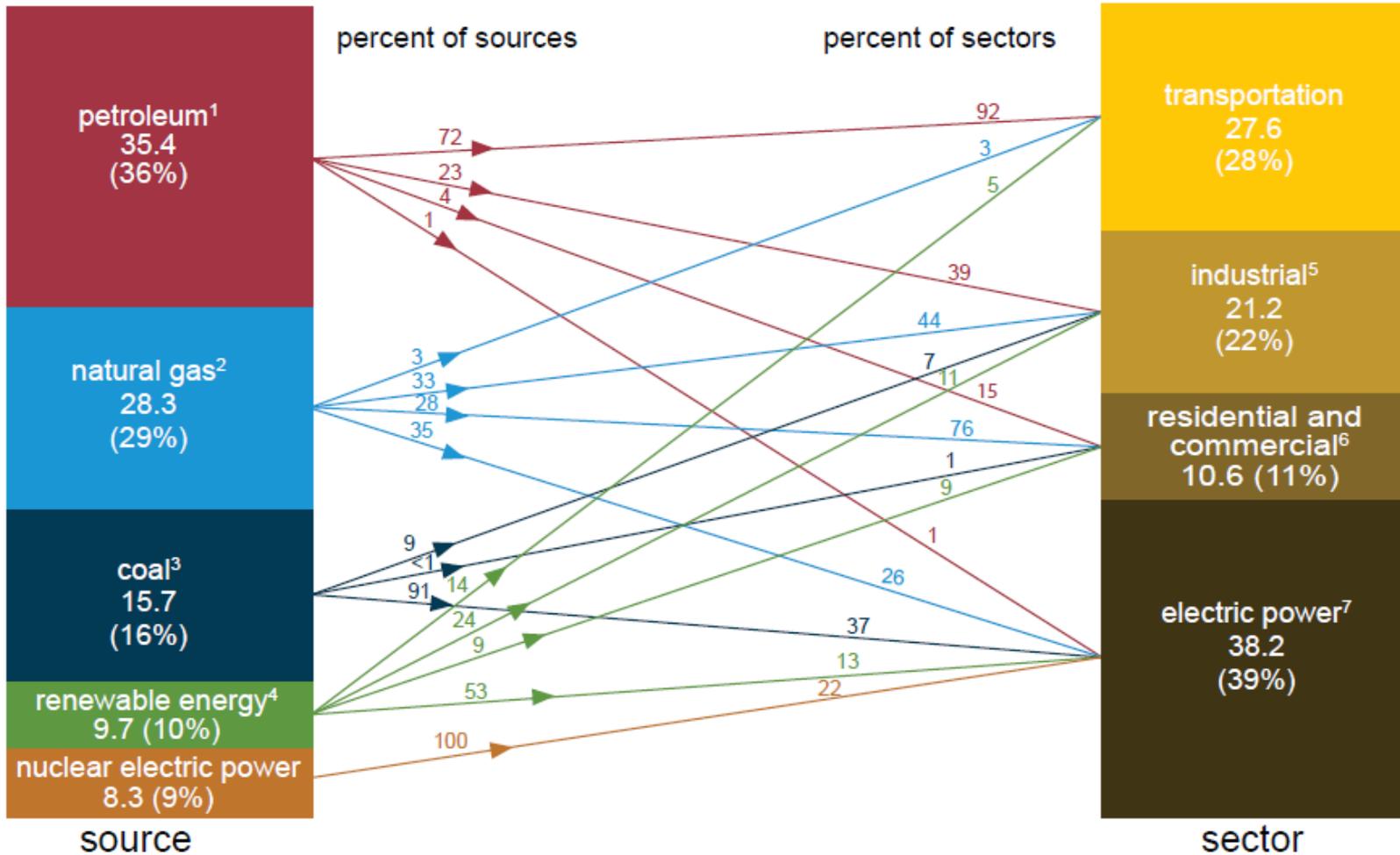
## Secondary processing and waste fuel use in the pulp and paper industry

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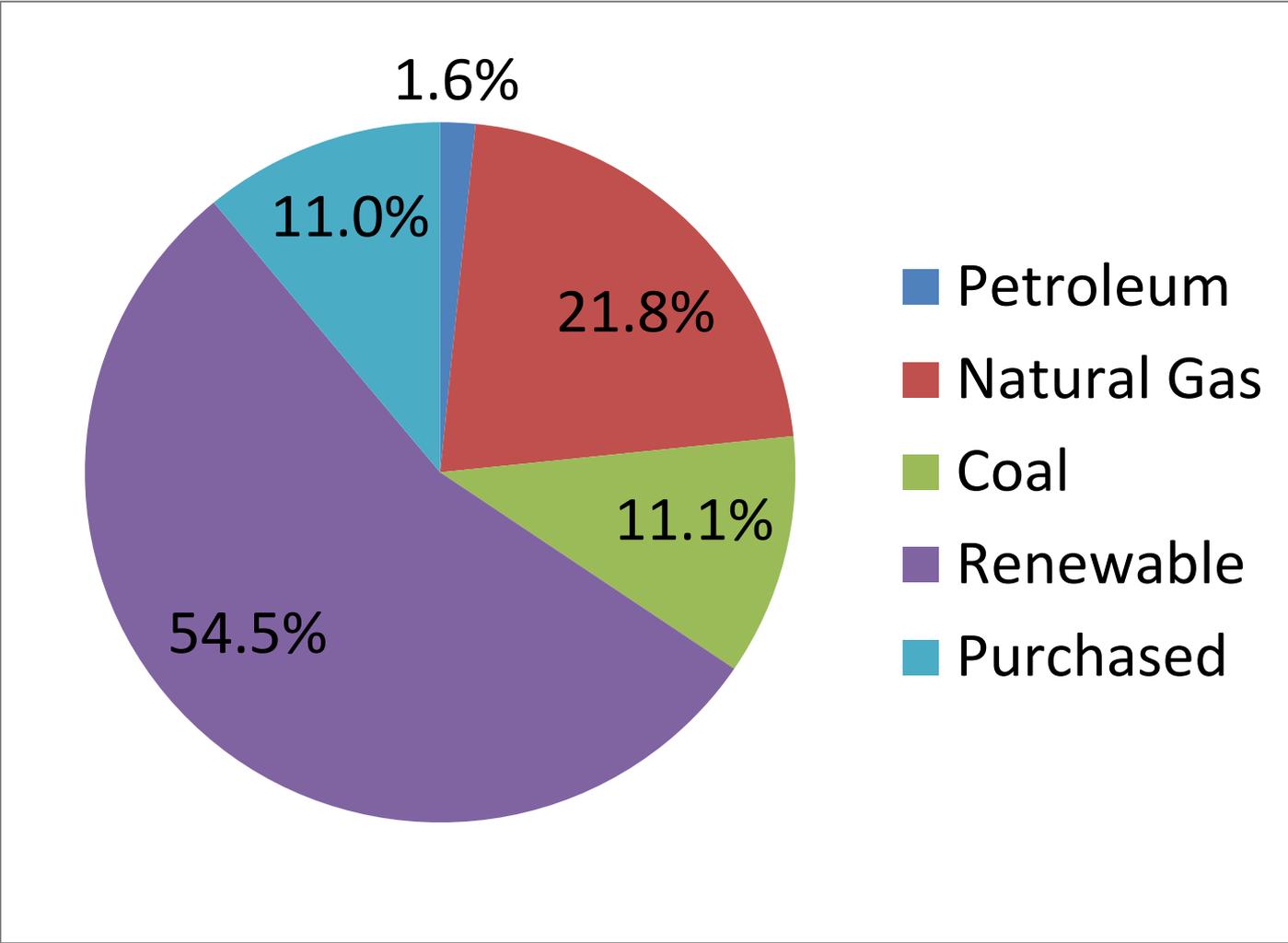


# US energy consumption by source and sector 2015



US industrial sector uses 11% renewable energy

# US paper industry energy consumption (eia 2015)



**US paper industry uses 54.5% renewable energy**

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# US Industry Goal on Energy Efficiency

The American Forest and Paper Association (AF&PA) has established a set of six sustainability goals:

## **Energy Efficiency GHG Emissions**

Sustainable Forestry  
Recovery for Recycling  
Water Reduction  
Waste Reduction



**2020 Goal: Improve energy efficiency in member facilities by at least 10 percent from 2005**

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*AF&PA members improved their purchased energy efficiency by 8.8 percent in 2012. On average, about two-thirds of members' energy needs come from carbon-neutral biomass.*

## Technology Developments – Agenda 2020

### Targeting:

\$1.5B in cost savings

\$5 billion in new products

200 Trillion BTU energy savings

480 Billion gallons water reduction



Next generation pulping – higher yield, lower energy

Black liquor concentration – energy savings

Press technology – drying energy savings

Water reduction – focus on whitewater

Cellulose nanomaterials – commercialization

## Technology Developments – Sappi Focus

Supporting Agenda 2020

R&D on three continents

Ongoing investments in North America  
Over \$350 million in past 4 years  
Pulp mill conversion  
Paper machine rebuilds  
Utilities & recovery infrastructure

Continued emphasis on operating  
efficiency and energy reduction



# Sappi North America Energy Profile (2015)

Type/Mill	Westbrook	Somerset	Cloquet	Sappi NA
Petroleum	0.6%	9.0%	0.4%	4.0%
Natural Gas	0.8%	12.8%	14.3%	13.0%
Coal	37.8%	0	0	2.0%
Renewable	60.8%	61.7%	81.6%	71.0%
Purch. Elect.	0	16.6%	3.8%	10.0%

Westbrook is a small, non-integrated specialty paper mill

Cloquet & Somerset are integrated kraft mills making bleached kraft pulp and coated paper

Cloquet also makes dissolving wood pulp

Numbers reflect consumption (adjusted for REC sales)



## **Cloquet, MN, Integrated mill established in 1915**

**Pulp mill converted to SuperBatch in 1999**

**Modified again in 2013 for dissolving wood pulp**

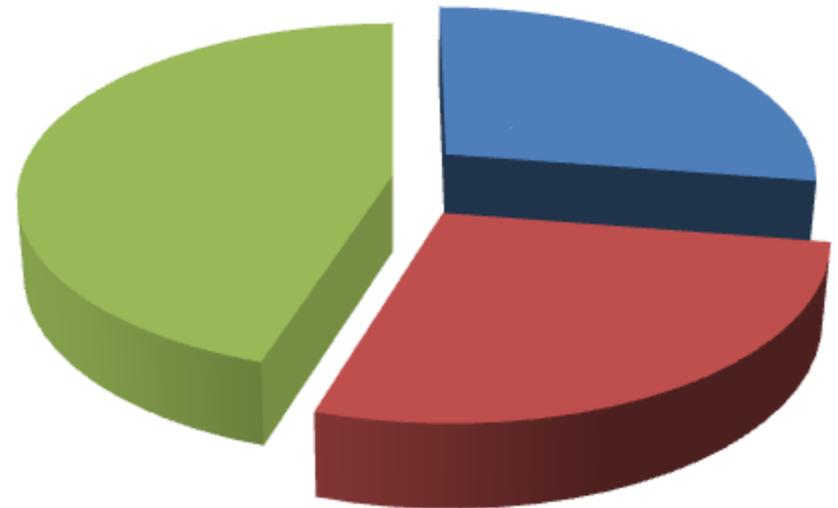
**330,000 mt/yr dissolving wood pulp or 455,000 mt/yr kraft pulp**



# Chemical Composition of Wood

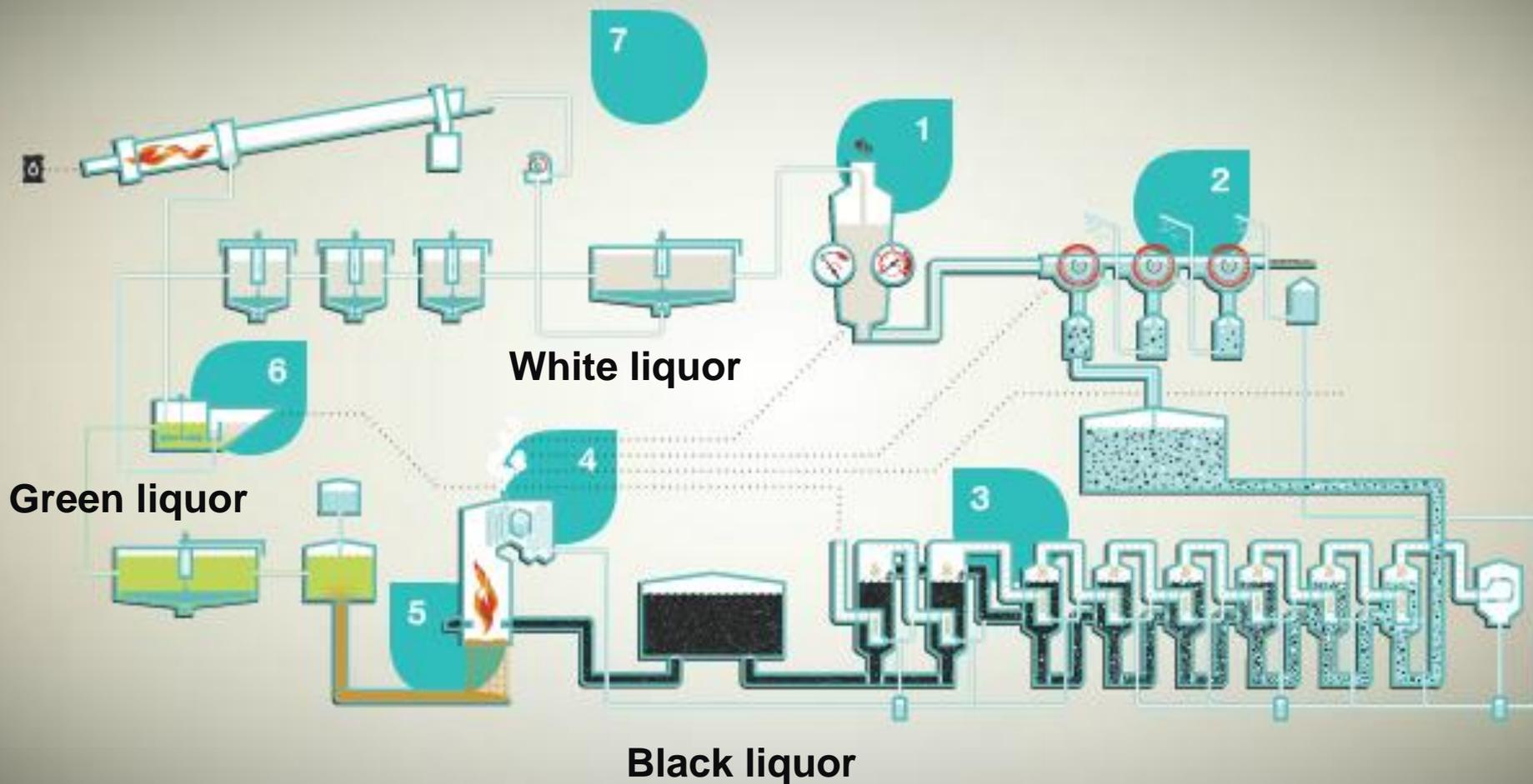
**40-50%**  
**Cellulose**

**15-25%**  
**Lignin**



**25-30%**  
**Hemicellulose**

# The Chemical Recovery Process



# Key Components of the Kraft Pulping Process



Black Liquor

Green Liquor

White Liquor

# Additional Fuel Sources

## Tire Derived Fuel at our Somerset Mill



# Feed to “hogged” fuel Boiler (Somerset)



Includes:

- tire derived fuel
- sludge
- “own make” bark
- purchased biomass

# Construction and Demolition Wood (Westbrook)



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# Beneficial use for additional by-products

Soils in Northern MN have pH of 4.5-6

Crops take up nutrients best at pH 6.3-6.7

We offer land application of:

Lime Mud

“Dregs”

Fly Ash

Bottom Ash

UMN Extension Service

Identifies land owners

Conducts soil testing

Determines application rate

Coordinates with application contractor



See video: [http://www.na.sappi.com/eQ/video\\_ash.html](http://www.na.sappi.com/eQ/video_ash.html)

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**Greenhouse Gas Emissions should be considered from “cradle to grave”**



**Print buyers can have the biggest impact on reducing the footprint of a publication by selecting the paper supplier with the lowest emissions**

### **Greenhouse Gas Emissions Throughout the Life Cycle of a Magazine**



fiber procurement

mill emissions

printing/converting

distribution/use

end of life/storage

**5%**

**44%**

**16%**

**1%**

**34%**

Source: National Council for Air and Stream Improvement, Inc. (NCASI) for American Forest and Paper Association and Forest Products Association of Canada, “Life Cycle Assessment Of North American Printing and Writing Paper Products”, Research Triangle Park, NC, 2010.

# Greenhouse Gas Emissions

Our greenhouse gas emissions are the lowest among our domestic competitors

