Industrial Scale Cogeneration

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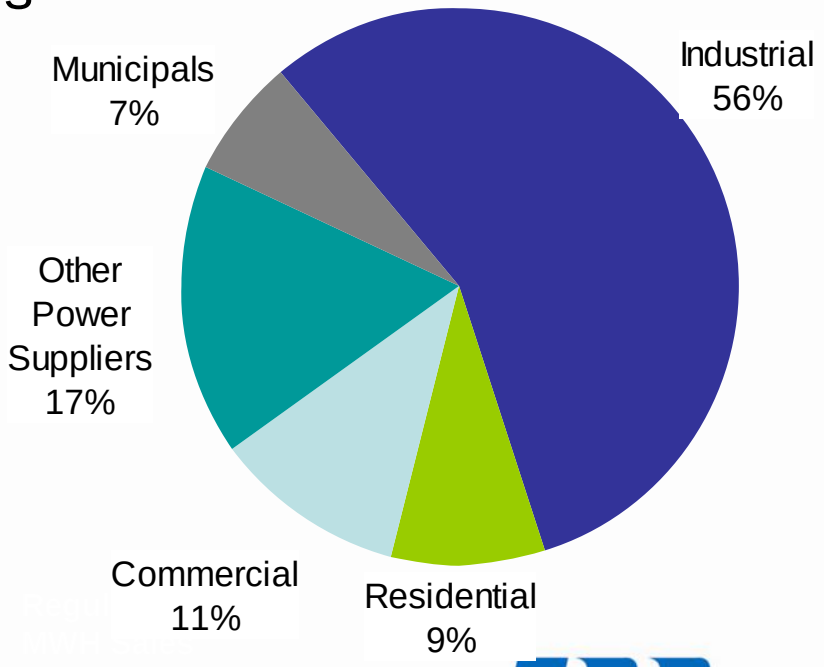
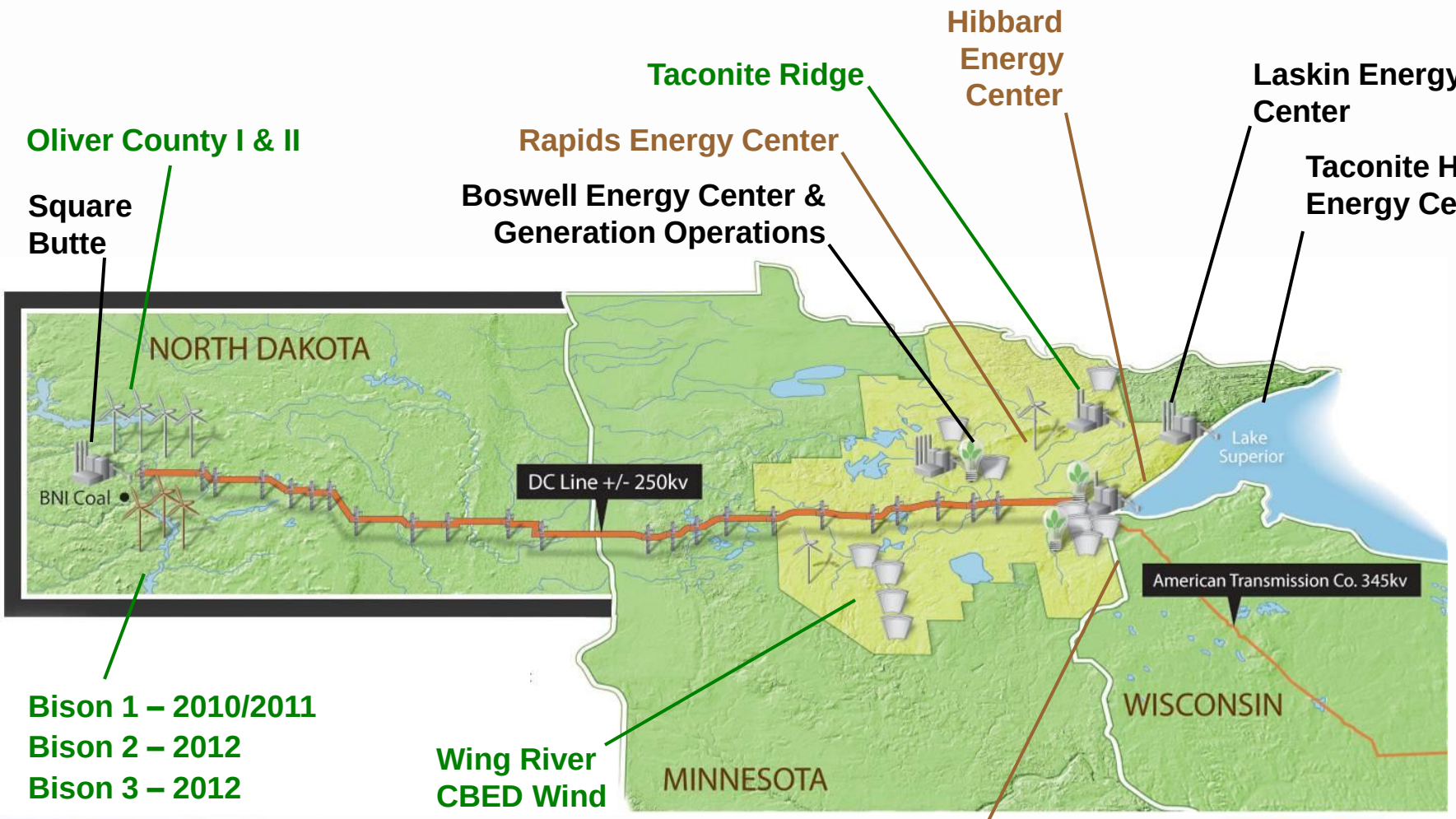
Minnesota Power at-a-Glance

- Large Industrial Customers
- High Load Factor
- 16 Municipal Wholesale Customers
- 144,000 Electric Customers
- 4th lowest rates in the country*



Current Generation Fleet



Hydroelectric Units

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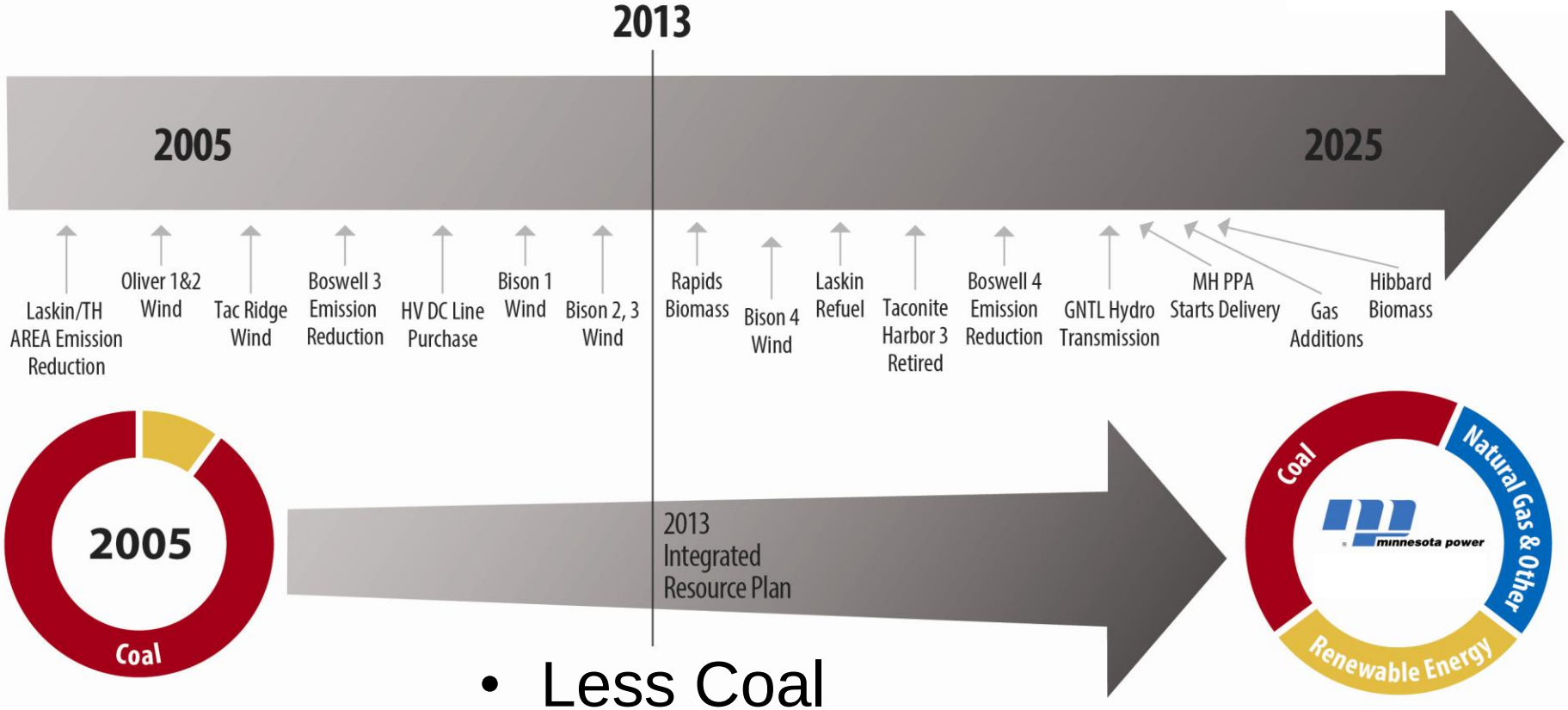
Energy Forward



- Less Coal
- More Renewables
- Natural Gas

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Hibbard Renewable Energy Center

History

1931 — Original facility dates back to 1931 as Minnesota Power's first large coal fired facility.

1947 — Units #3 and #4 were added in 1947 and 1951.

1982 — Facility shut down in 1982 due to economic downturn and rising production costs.

1987 — Re-missioned as cooperative effort known as Duluth Steam District #2 to serve Lake Superior Paper Industries

2009 — Assets purchased by Minnesota Power in 2009 with goal to optimize renewable energy production.

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Hibbard Renewable Energy Center

Benefits

- Provides a dispatchable source of renewable energy.
- Brings renewable diversity-Wind, Water, Wood.
- Use of existing steam assets more economical than new construction.
- Base load steam usage by the paper mill provides the platform for Minnesota Power's electric generation to run more optimally in the power market; combined retail and steam customer benefits

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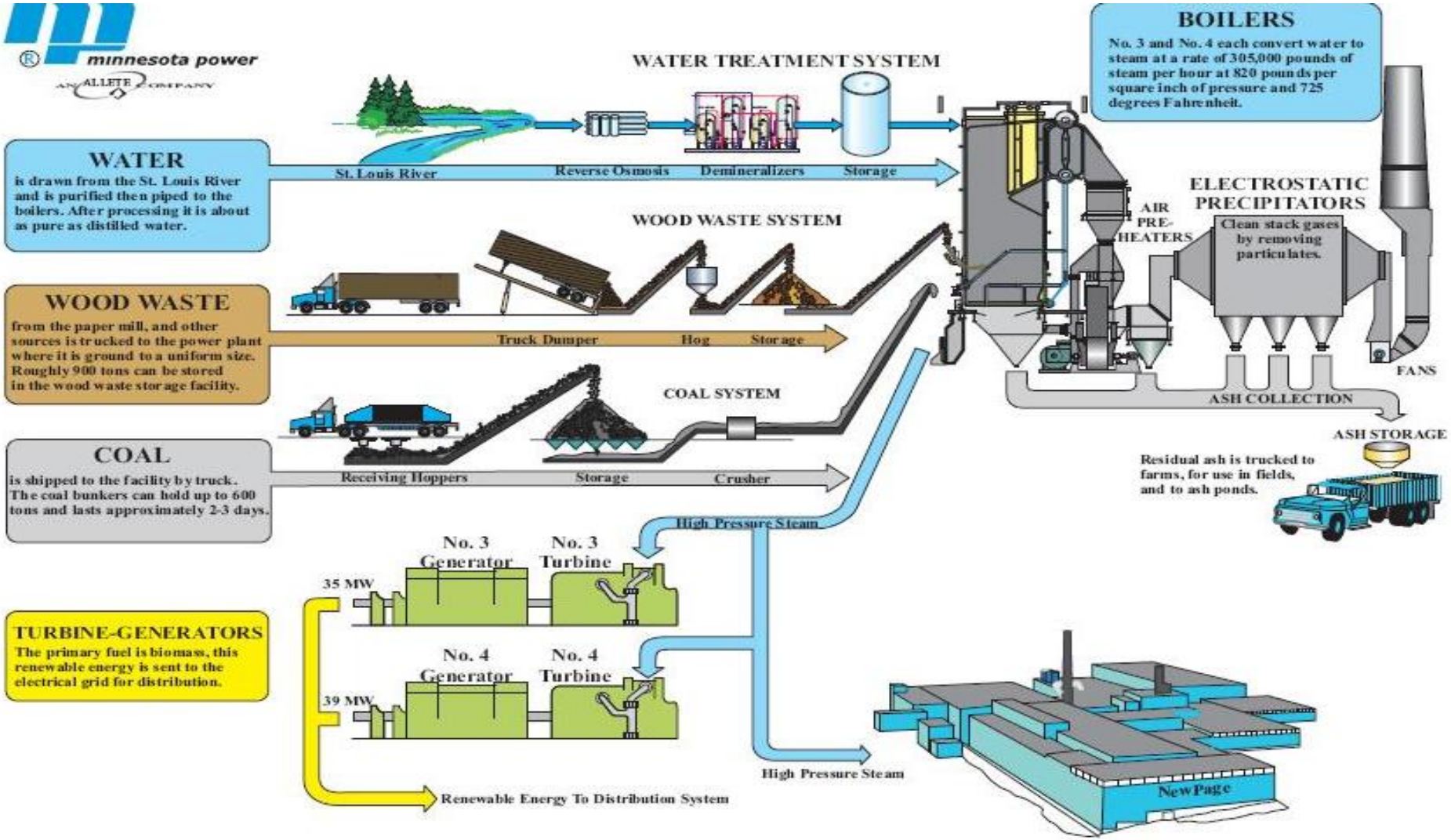
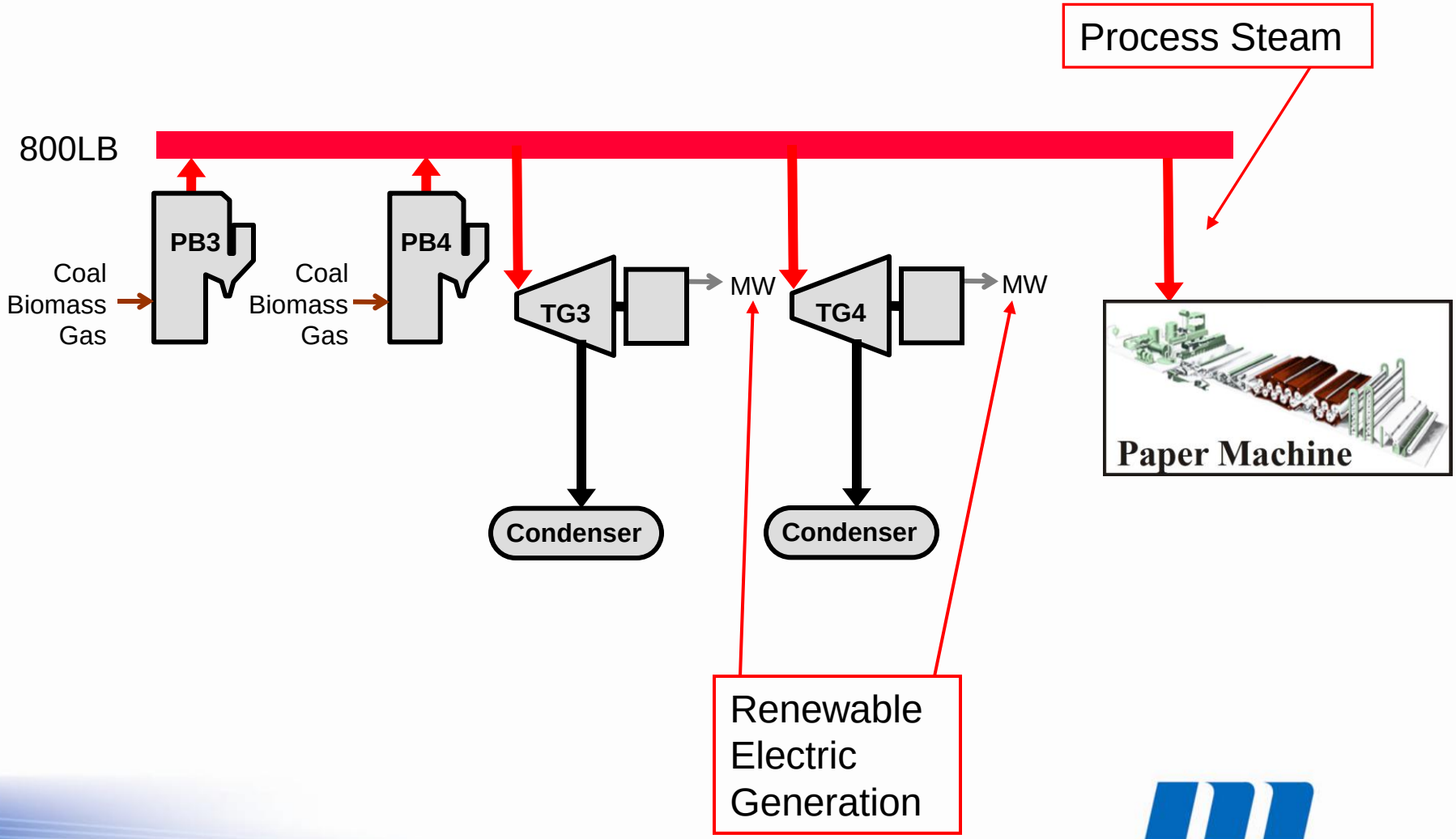
Hibbard Renewable Energy Center



Hibbard Steam System



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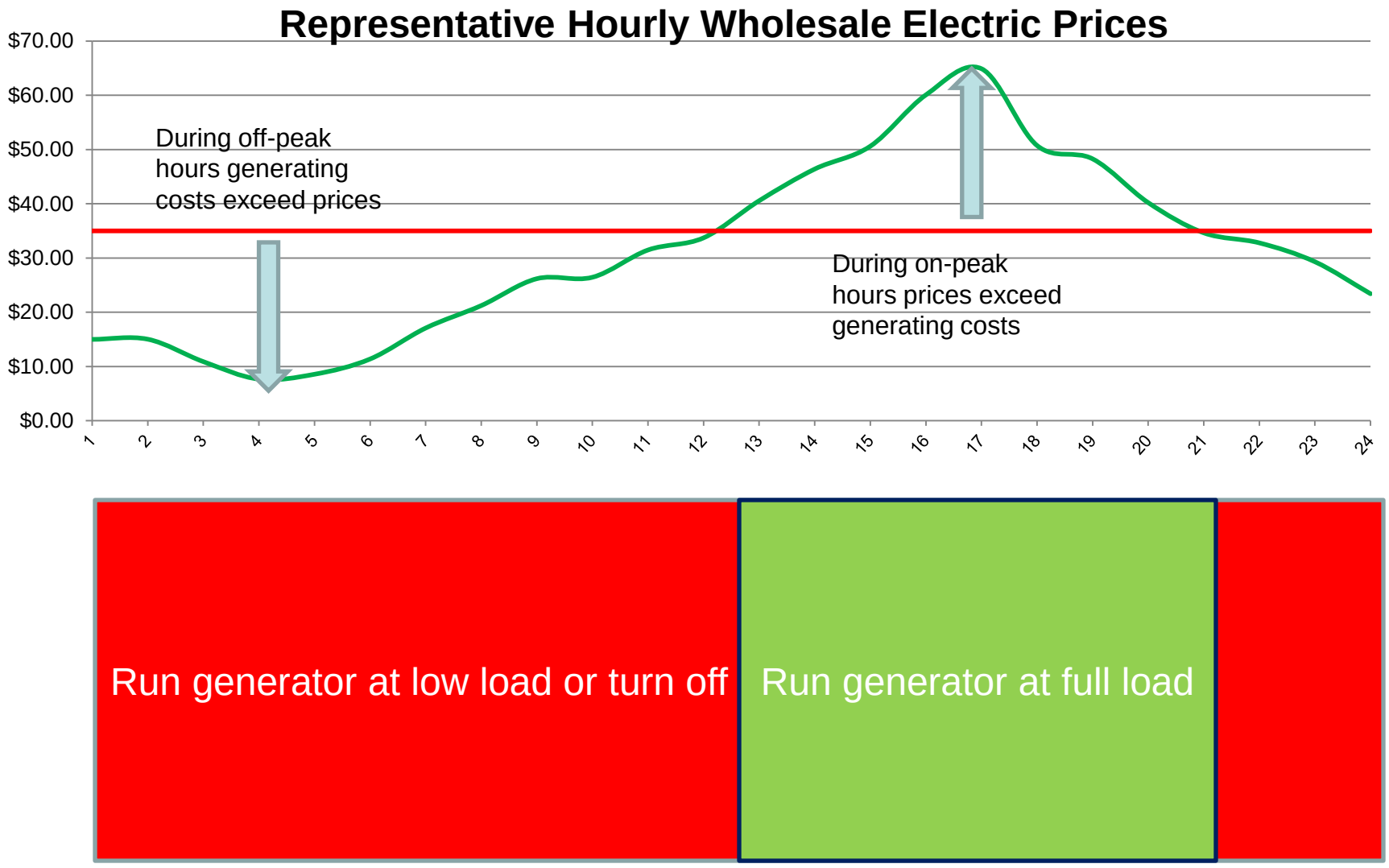
Benefit to MP Customers



Rapids Energy Center

History

- Co-Located with UPM-Blandin Paper company in downtown Grand Rapids, MN.
- Original paper mill dates back to 1901 with Rapids Energy Center (REC) facilities constructed in 1979.
- In 2000, Minnesota Power purchased and began operating REC under a steam agreement.
- In 2012, Minnesota Power petitioned for optimization projects approval with Minnesota Public Utilities Commission.

Benefits

- Combined Heat and Power (CHP) arrangement is an extremely efficient conversion of energy.
- Generates biomass based electricity in support of renewable energy standards.
- Creates market for unusable wood such as bark, small limbs and harvest waste.

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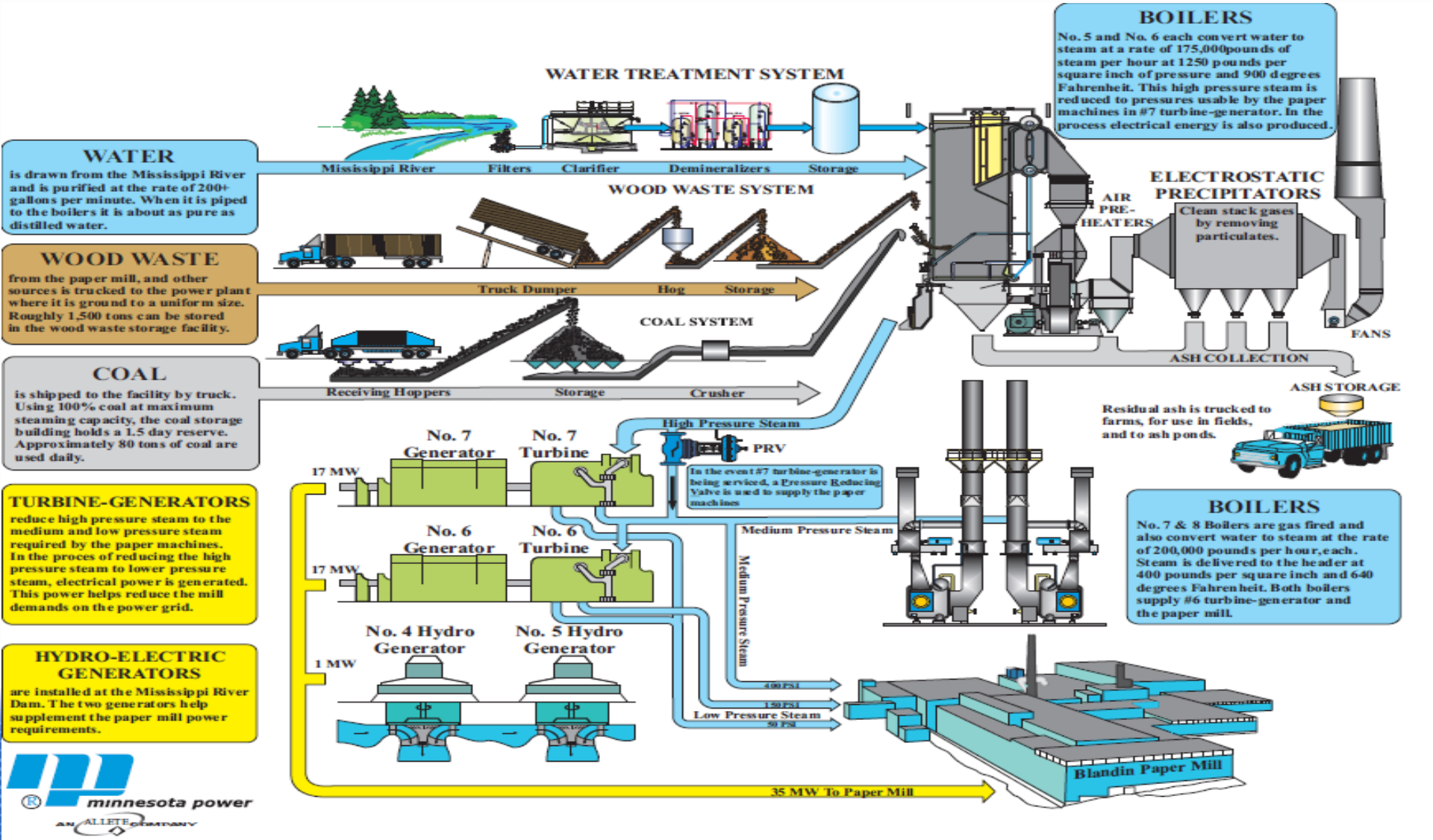
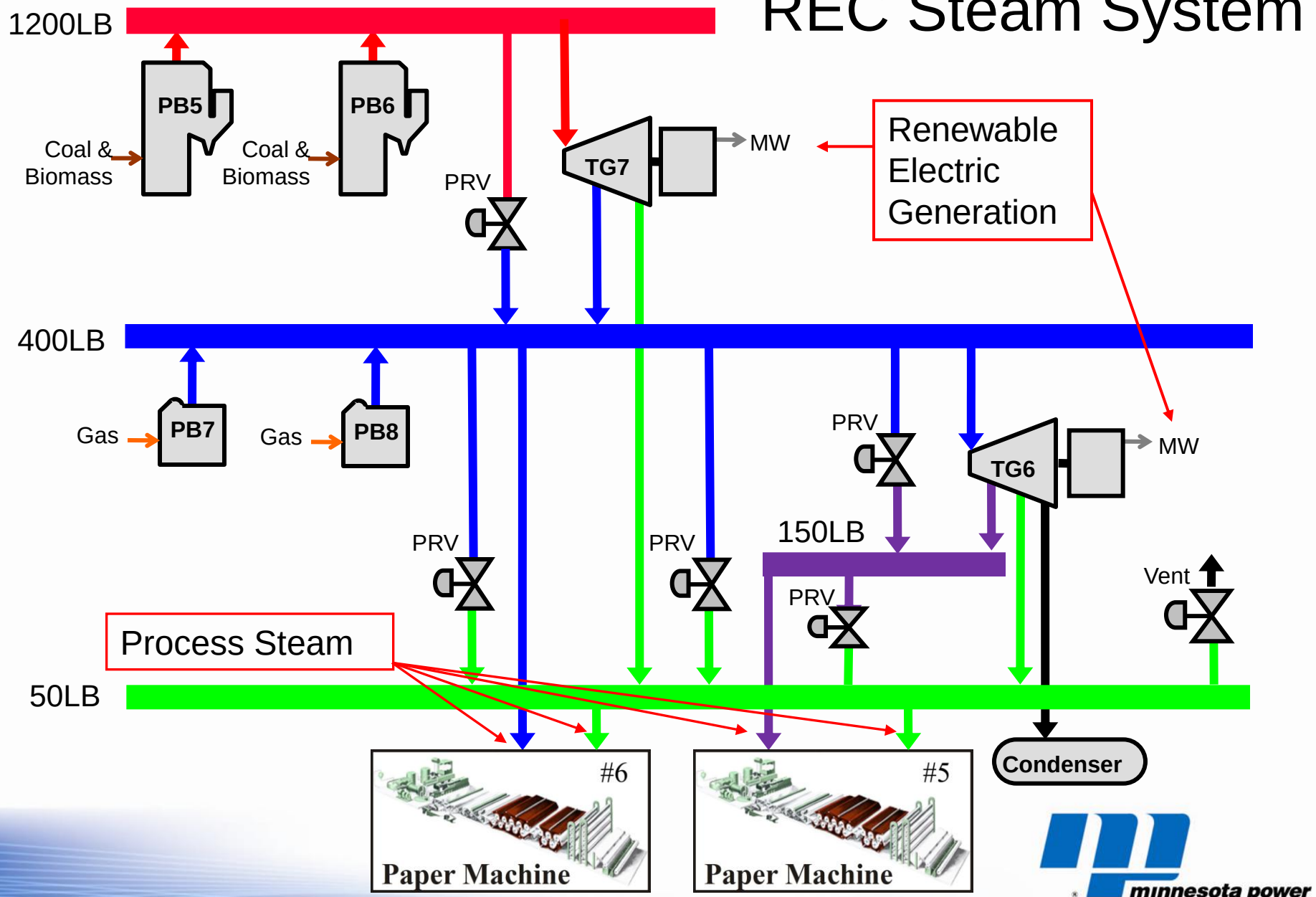
Rapids Energy Center



REC Steam System



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Key Points

- Biomass energy is an important piece of Minnesota Power's renewable energy portfolio.
- Minnesota Power's renewable energy strategy is to utilize the renewable resources that are the most affordable and reliable for our customers within our region and includes Wood, Wind and Water.
- Biomass fuel is abundant in our region and affordable to our customers because we utilize the least desirable parts of the tree for fuel.
- We are focused on optimizing existing assets to increase efficiency and output.
- Industrial scale cogeneration offer the best value for biomass generation.
- We will continue to assess all biomass opportunities in and adjacent to our region to provide value to our customers.

Challenges for Biomass

Carbon neutrality questions.

High cost position of biomass.

Historically low natural gas pricing.

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Questions?

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