Benefits of Backpressure Turbines

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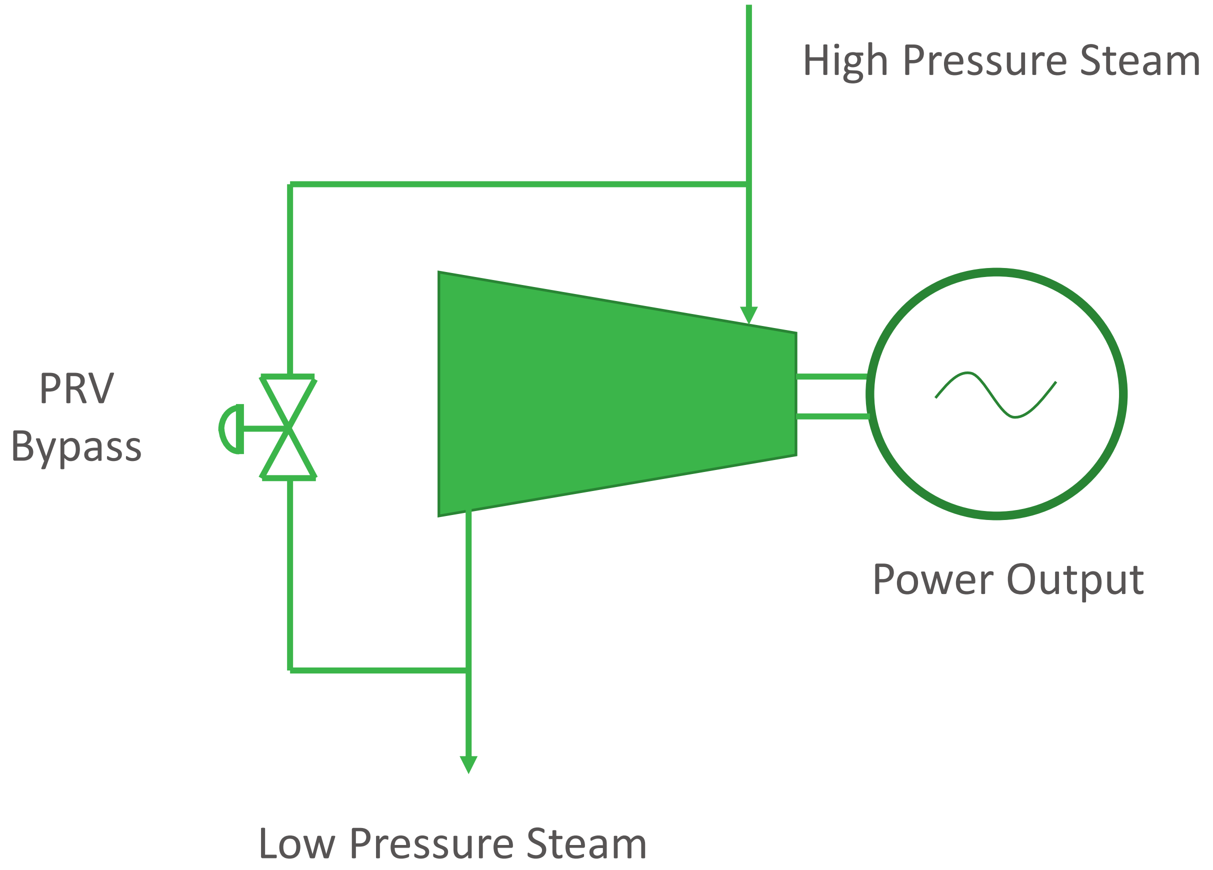


<u>Thermodynamics:</u>

It takes ~ 1,000 Btu/lb to generate steam from liquid. And that doesn't change temperature or pressure. Adding pressure/temperature is incrementally inexpensive and energy efficient. Using that <u>steam twice</u> instead of once increases your steam plant efficiency.

<u>Every steam plant should have a STG</u>.

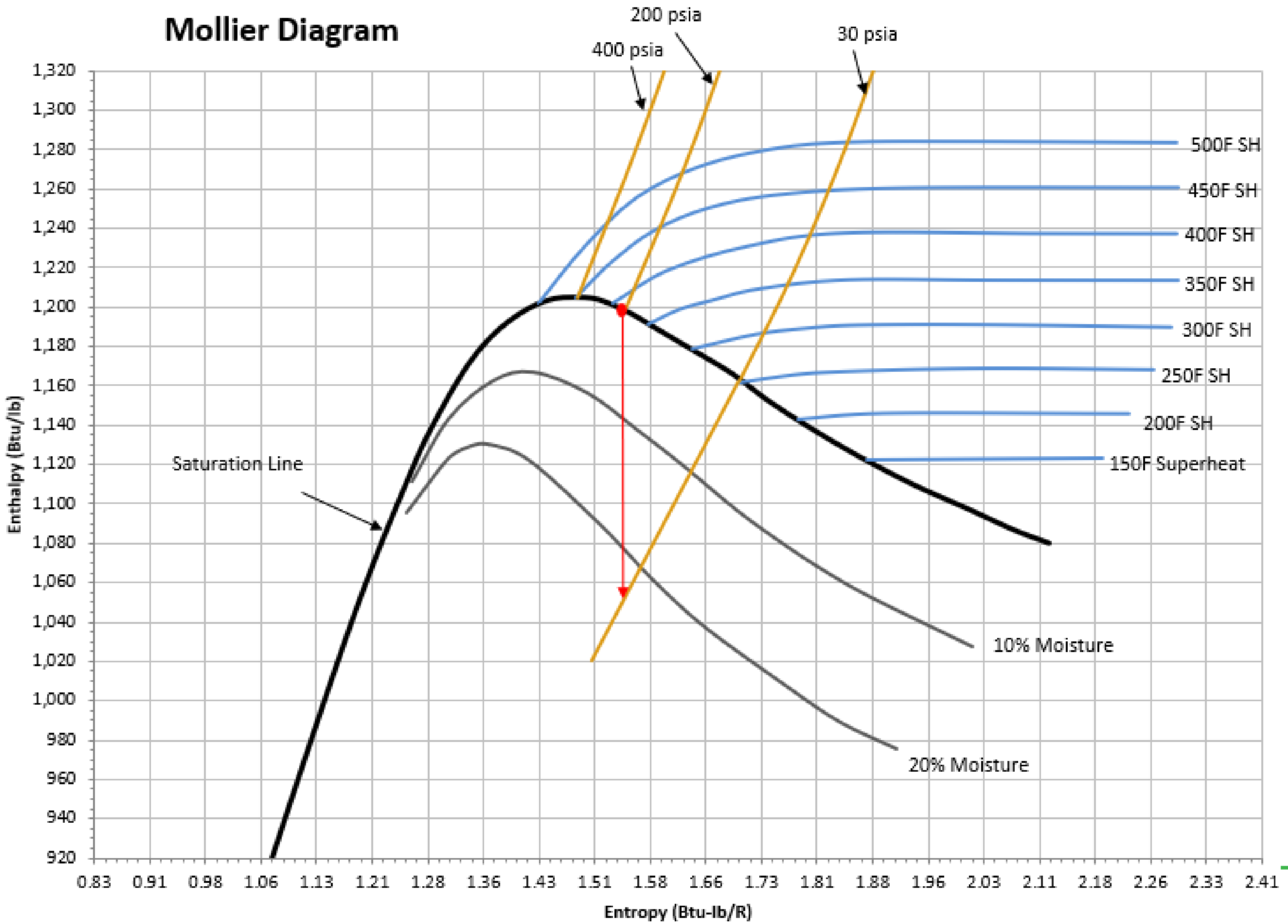
Typical STG Equipment Cost: $1.5 – 2 million

Vaporizing Water

1,000 Btu/lb and its useless.

It needs to be bottled up and pressurized to become useful.

Mollier Diagram



Mollier Diagram

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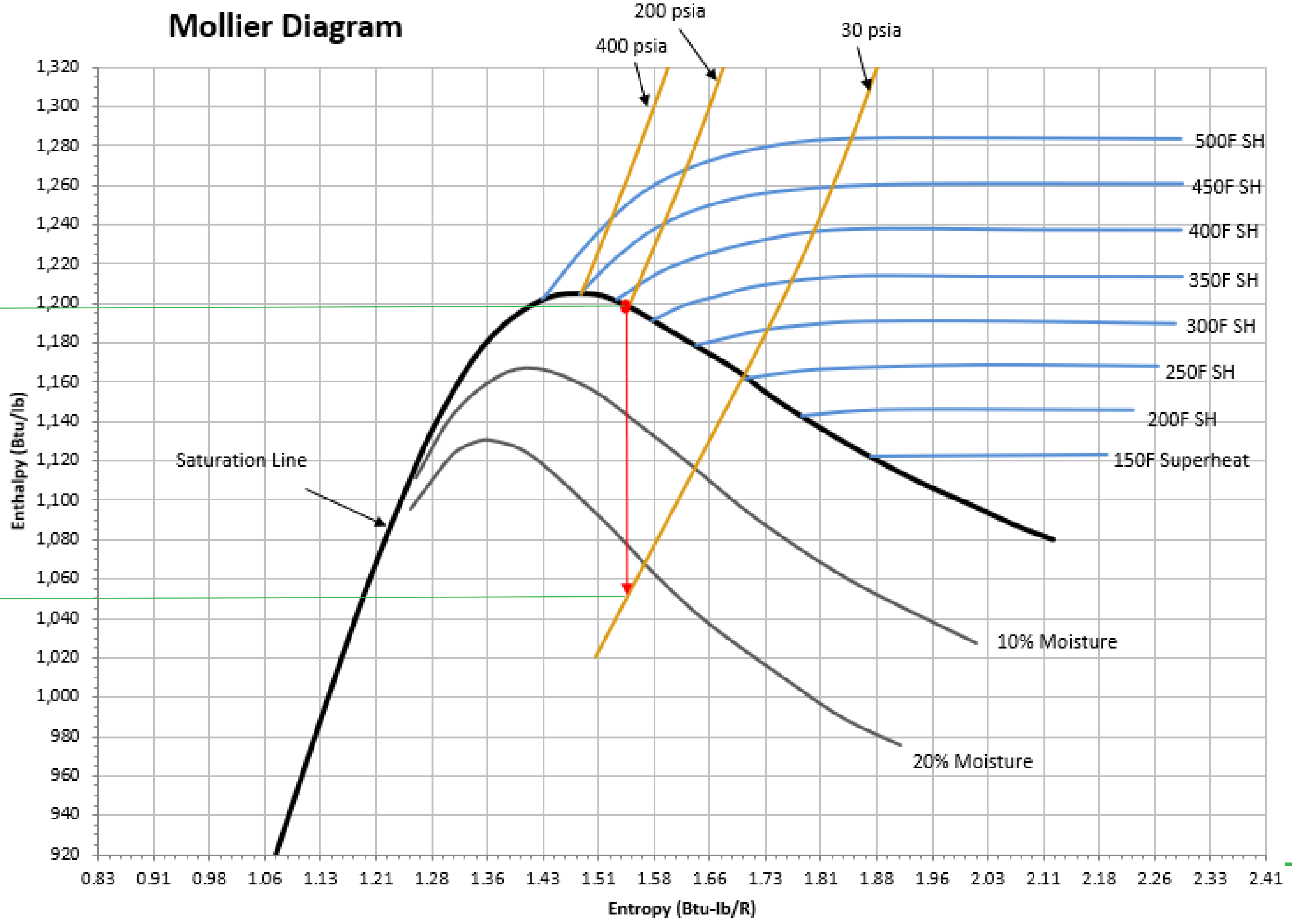
~1200

~ Δ150 Btu/lb

~1050



Mollier Diagram

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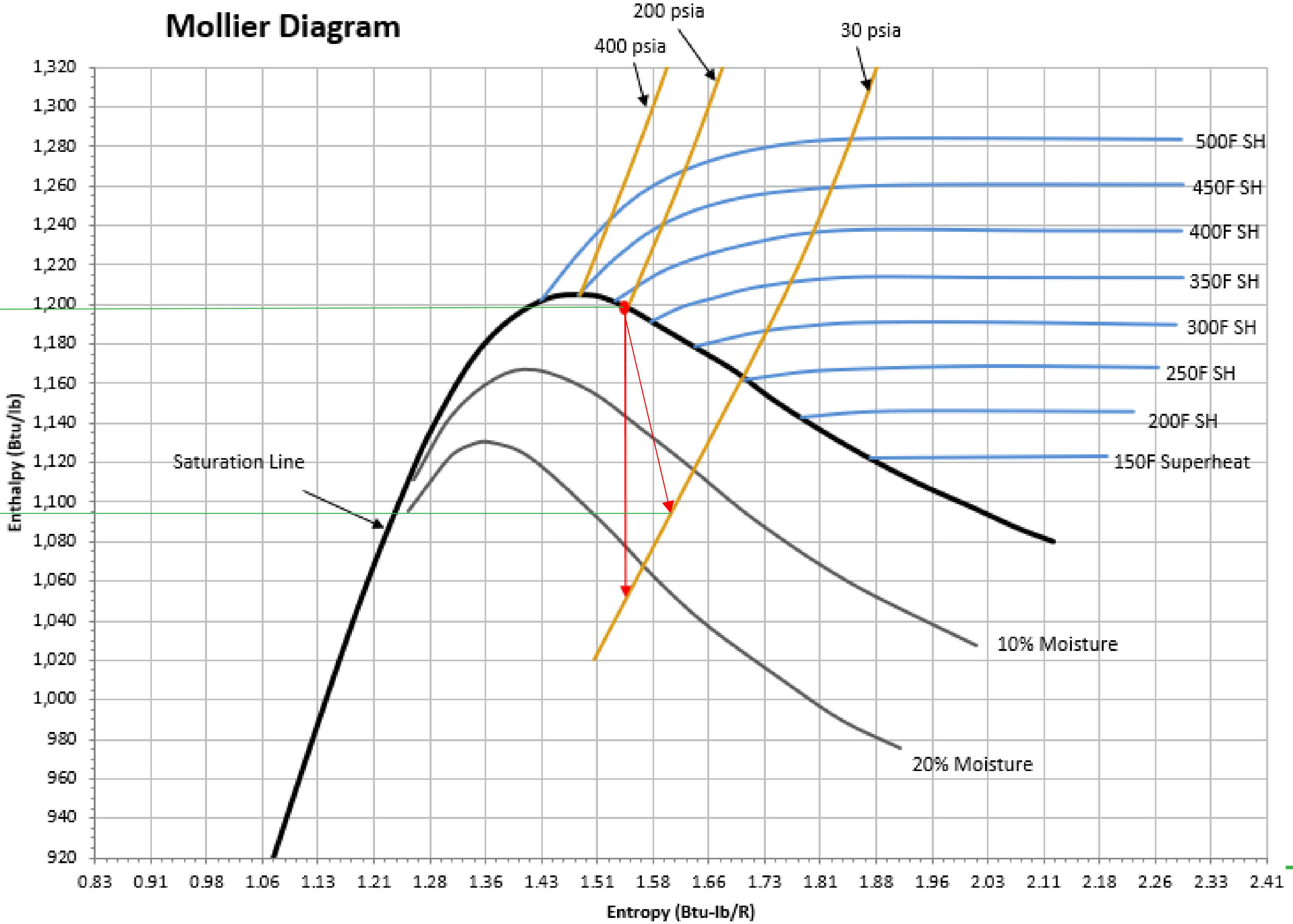
@70% Efficient Turbine:

~1200

~ Δ105 Btu/lb



Output Calculation

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Steam Flow:	50,000 lb/hr
Enthalpy Diff:	105 Btu/lb
Output:	50,000 lb/hr * 105 Btu/lb = 5,250,000 Btu/hr

Conversion: 3412 Btu/kWh

5,250,000 Btu/hr ÷ 3412 Btu/kWh = 1,539 kW

1,539 kW * $.08/kWh * 8,000 hrs/year
= $985,000/year

What about the fuel cost?

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Fuel Cost Calculation:

105 Btu/lb * 50,000 lb/hr =	5.25 mmBtu/hr
5.25 mmBtu/hr * $4/mmBtu =	$21/hr
$21/hr * 8,000 hrs/yr =	$168,000/yr

Net Benefit:

$985,000 - $168,000 = $817,000/year

Unless you have excess wood fuel and its free.
Then the benefit is $985,000

Heat Rate Comparison & CO_2 Savings

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Energy Information Agency:

- Combined Cycle Heat Rate: 7,146 Btu/kWh
- Backpressure Turbines: 3,600 Btu/kWh
- * Saves ½ lb CO_2 per kWh

*Compared to conventional power generation

Example:

- 1,539 kW Generator
- 8,000 hrs/yr operation
- 12,312,000 kWh/yr
- Saves: 6,156,000 lbs/yr CO_2

1/2

Contact Info

Questions?

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