

312 HEATING PRODUCTION



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Provider

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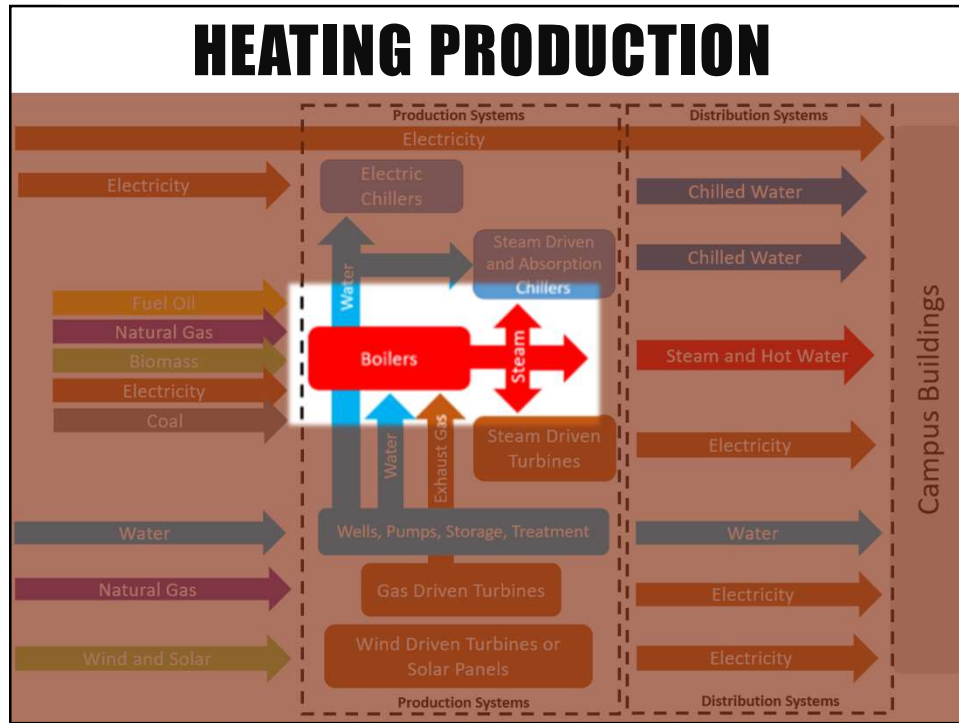
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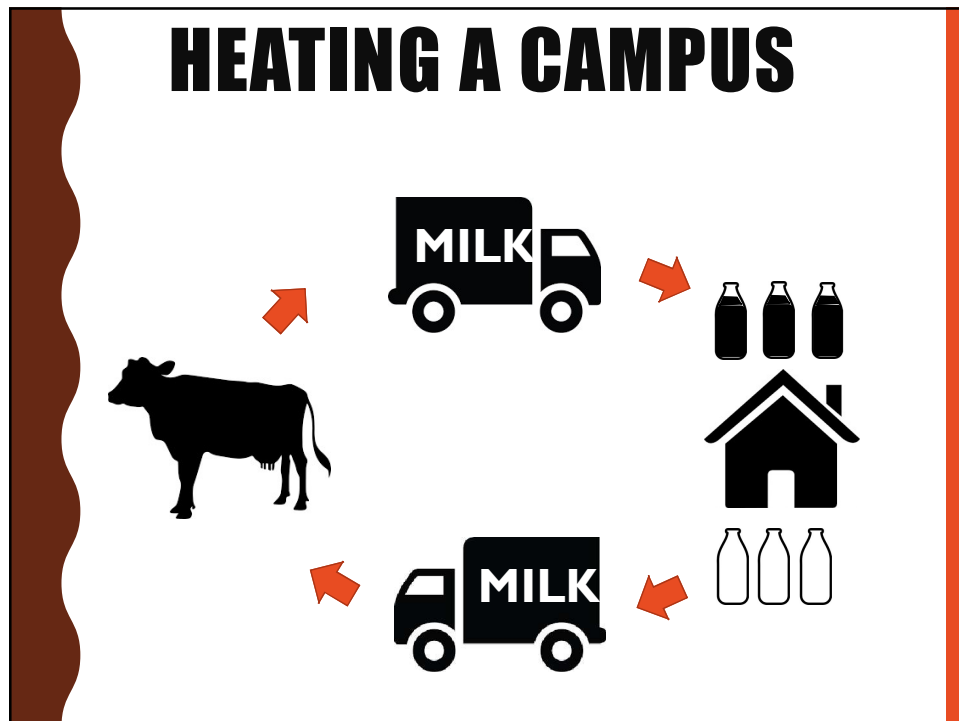
Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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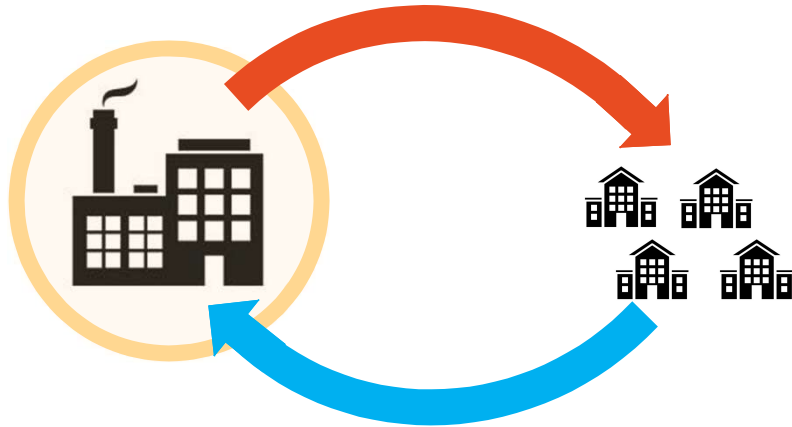


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HEATING A CAMPUS



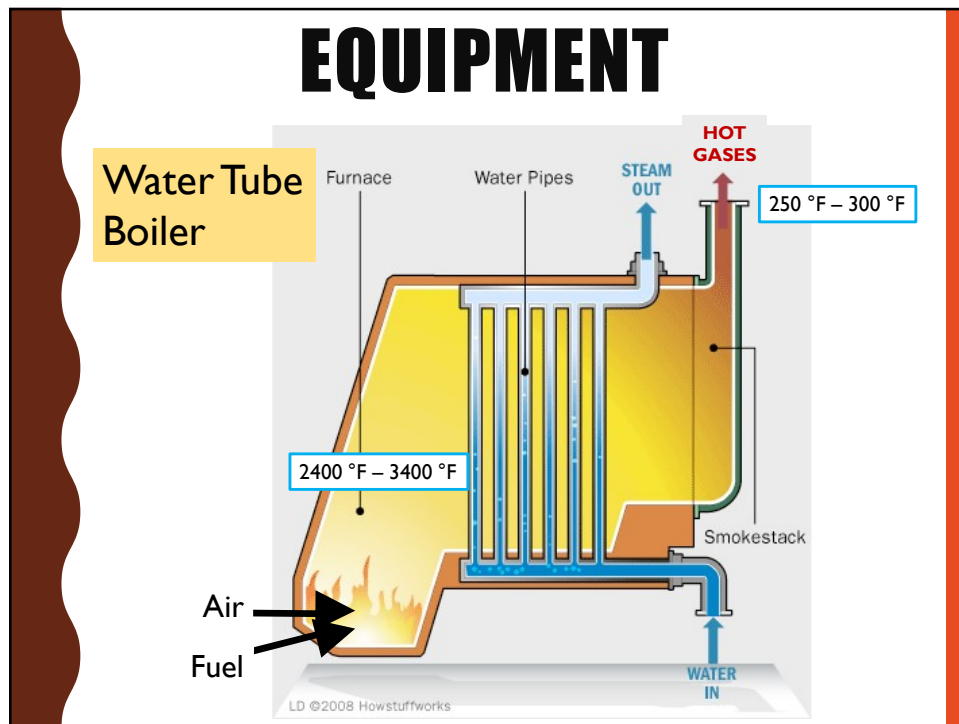
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OVERVIEW

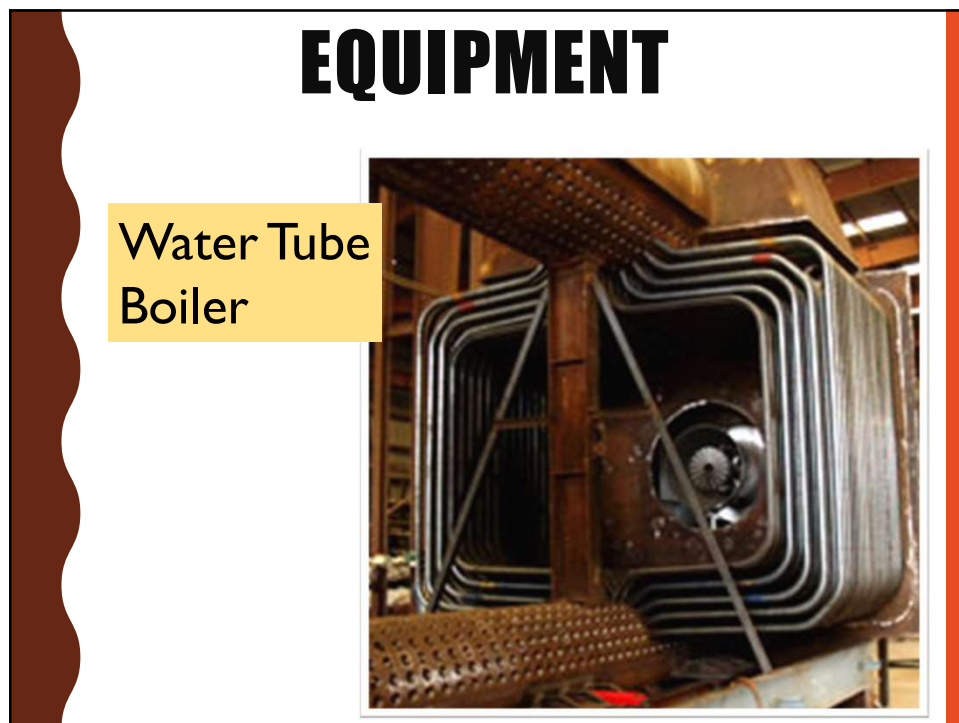


Equipment
Central Boilers
Distributed Boilers
Steam
Hot Water
Fuels
Costs

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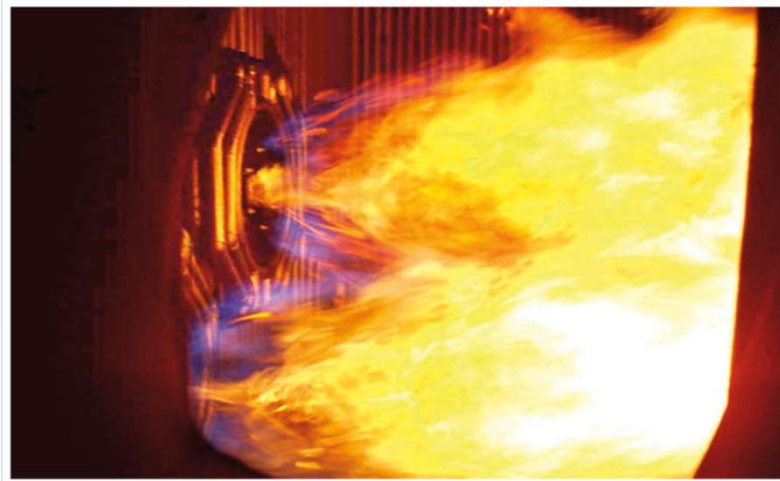
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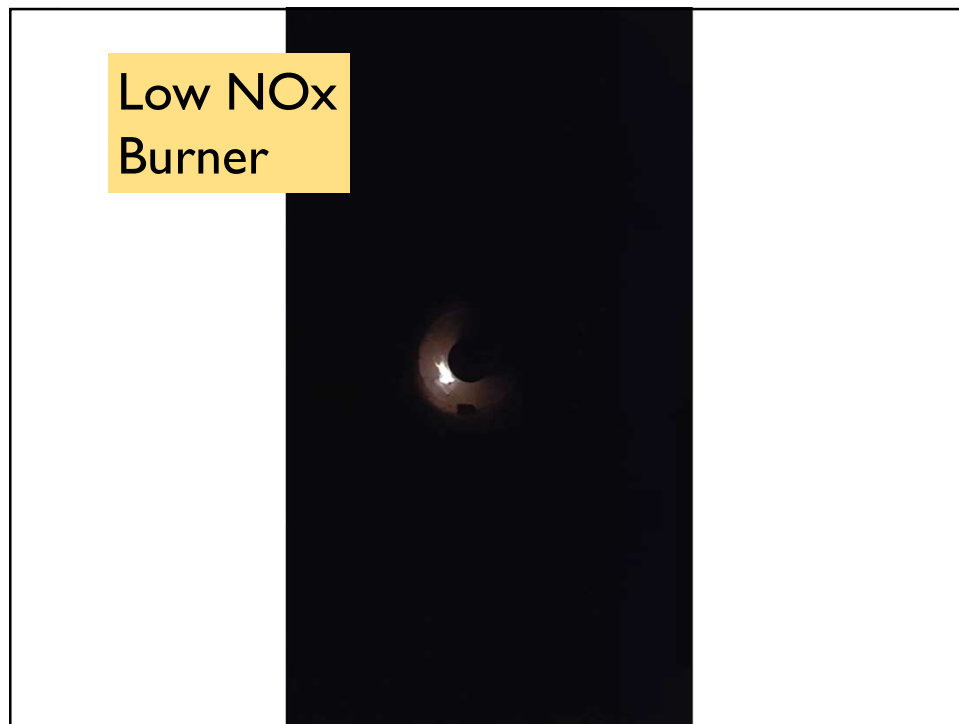
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EQUIPMENT

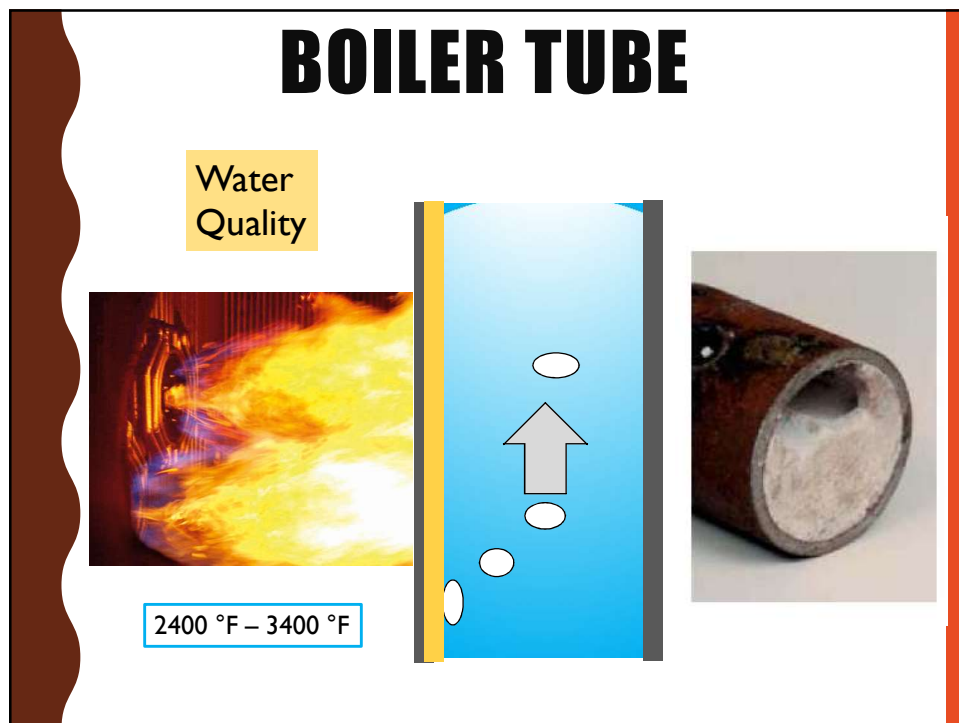
Burner



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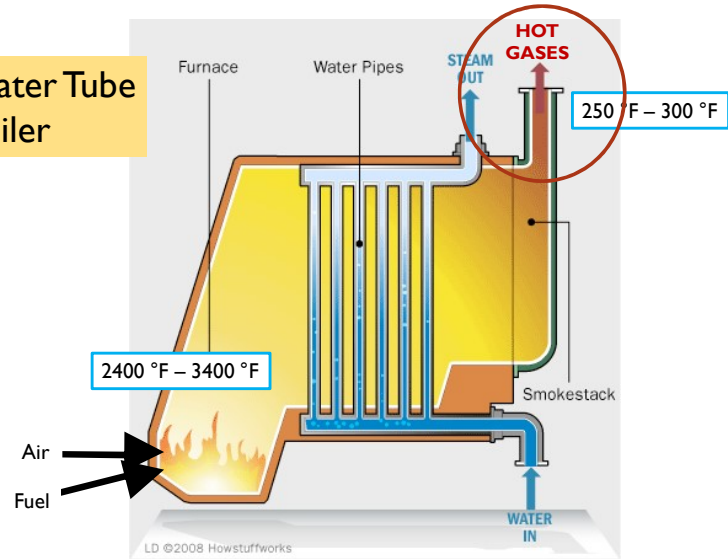
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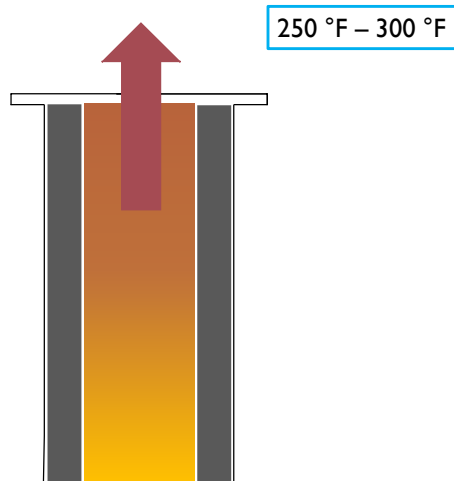
EQUIPMENT

Water Tube Boiler

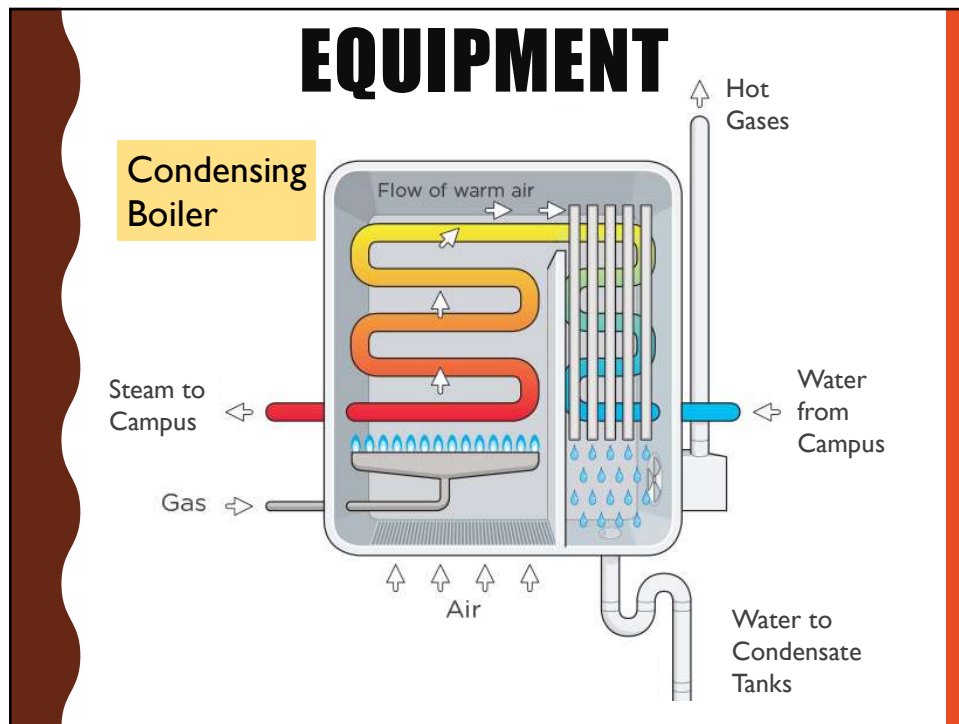


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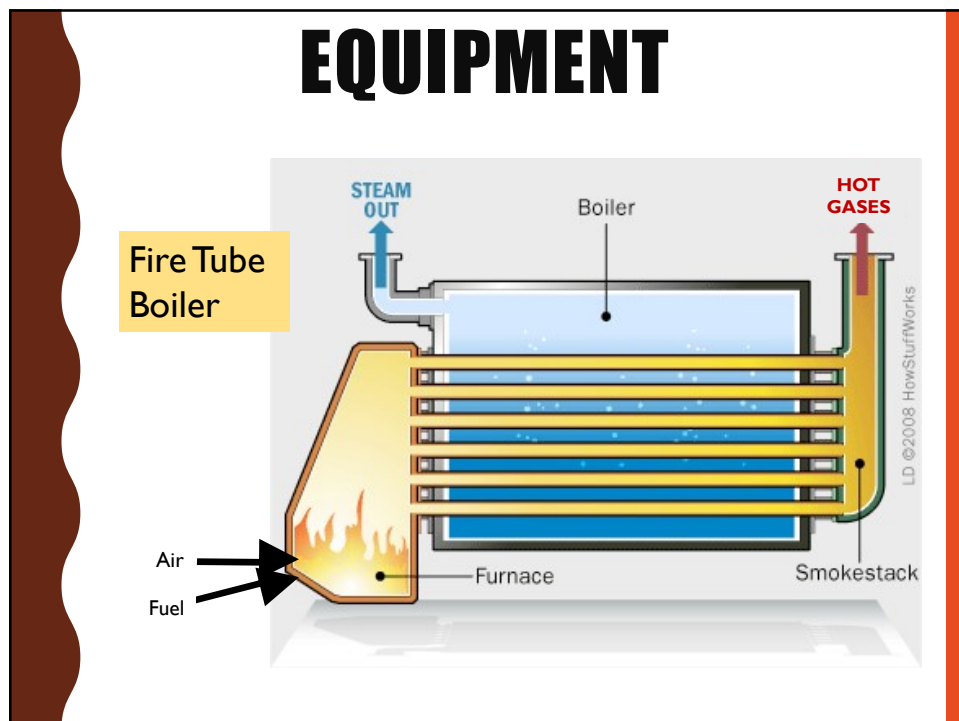
EXHAUST STACK



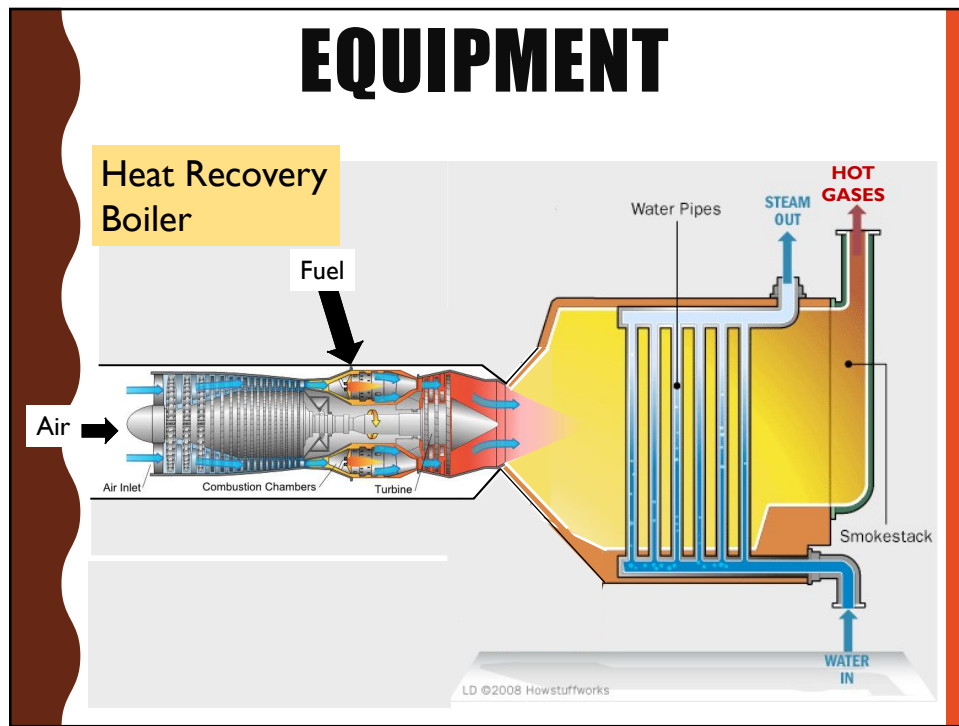
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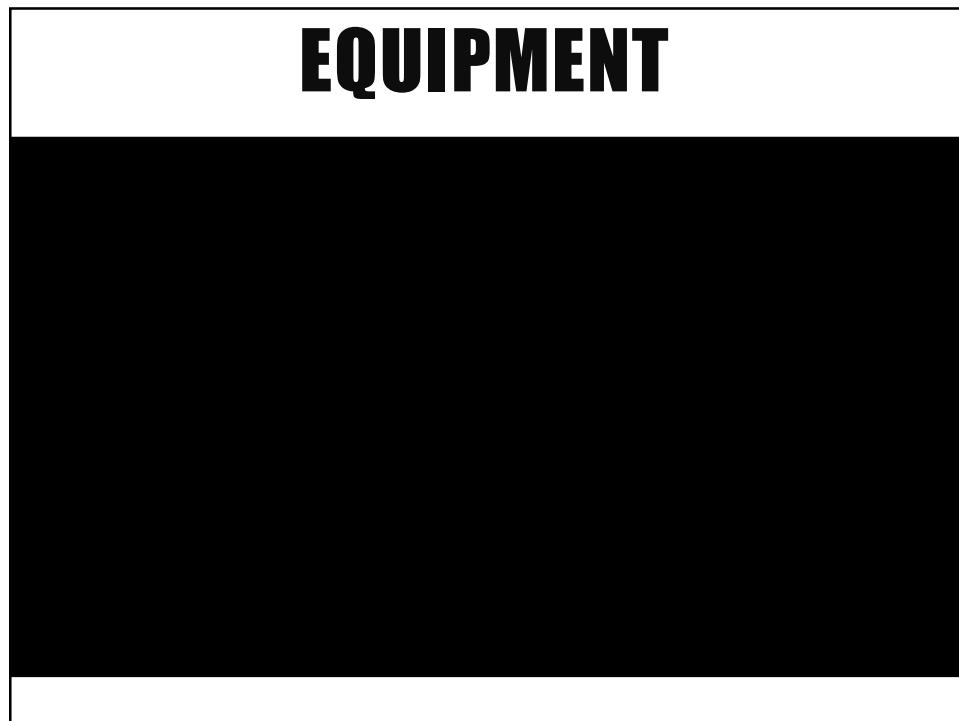
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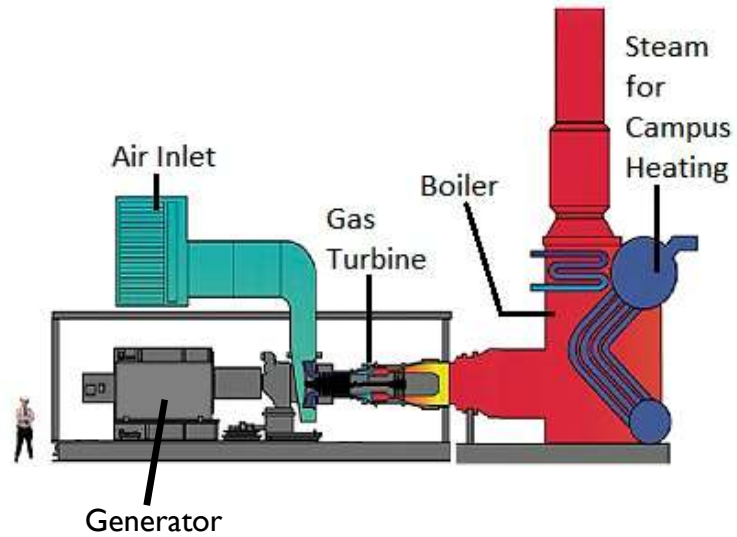


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EQUIPMENT



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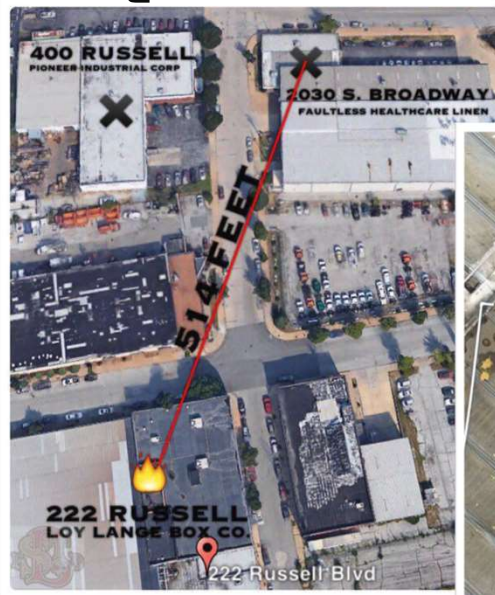
EQUIPMENT - RISKS



BOILER EXPLOSION AT BEAVER MILLS, KEENE, N. H., MAY 22, 1893.

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EQUIPMENT - RISKS



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BOILER REGULATIONS

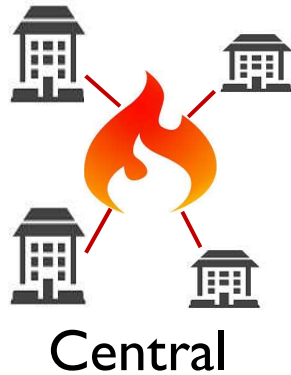


Construction
Repair
Operation

- ASME Boiler and Pressure Vessel Code
- Air Permit
- Operator Licensing
- Insurance Companies

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CENTRAL OR DISTRIBUTED



Distributed



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CENTRAL

Pros

- Fewer but bigger boilers
- Consolidation of operations/maintenance
- Backup fuel capability
- Can last over 50 years
- Option to install Combined Heat & Power

Cons

- Requires pipe distribution
- Complex systems

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DISTRIBUTED

Pros

- Multiple small boilers
- Less complex systems

Cons

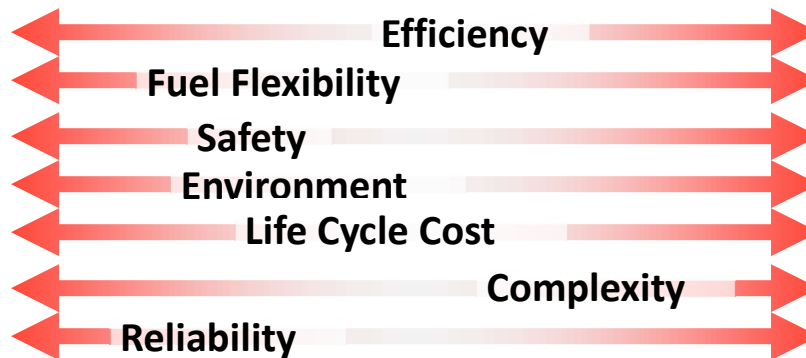
- Less reliable
- Limited backup fuel options
- Limited Combined Heat & Power options

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CENTRAL OR DISTRIBUTED

Central

Distributed



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STEAM OR HOT WATER



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STEAM OR HOT WATER

Steam has “two phase flow” - mix of gas and liquid

Hot Water is liquid only



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WATER HAMMER

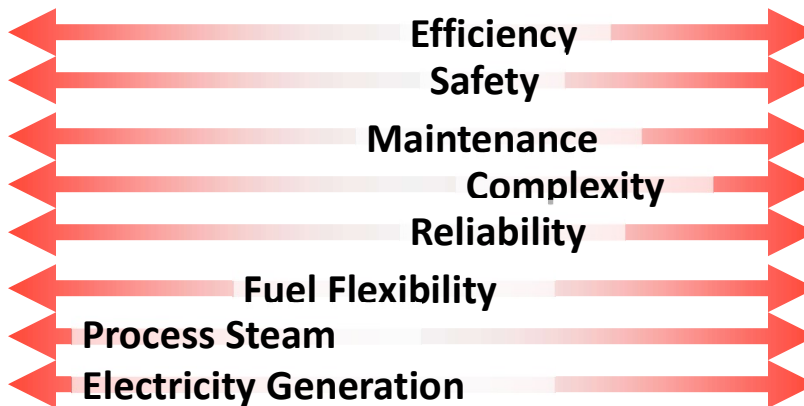


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STEAM OR HOT WATER

Steam

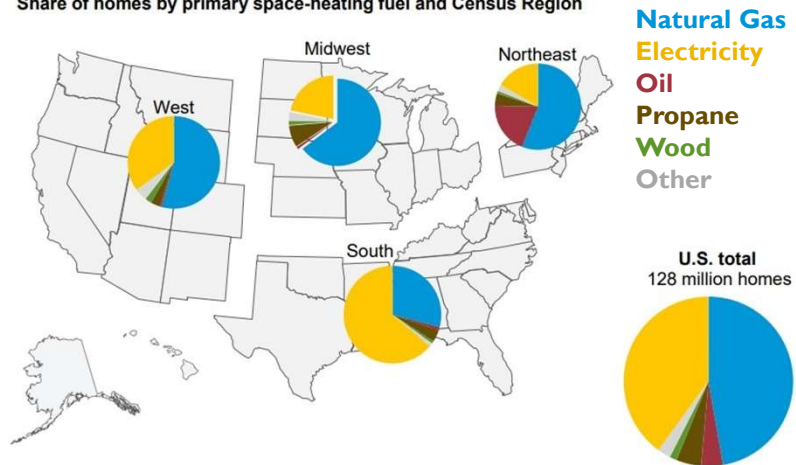
Hot Water



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FUELS

Share of homes by primary space-heating fuel and Census Region



Source: U.S. Energy Information Administration based 2019 American Community Survey

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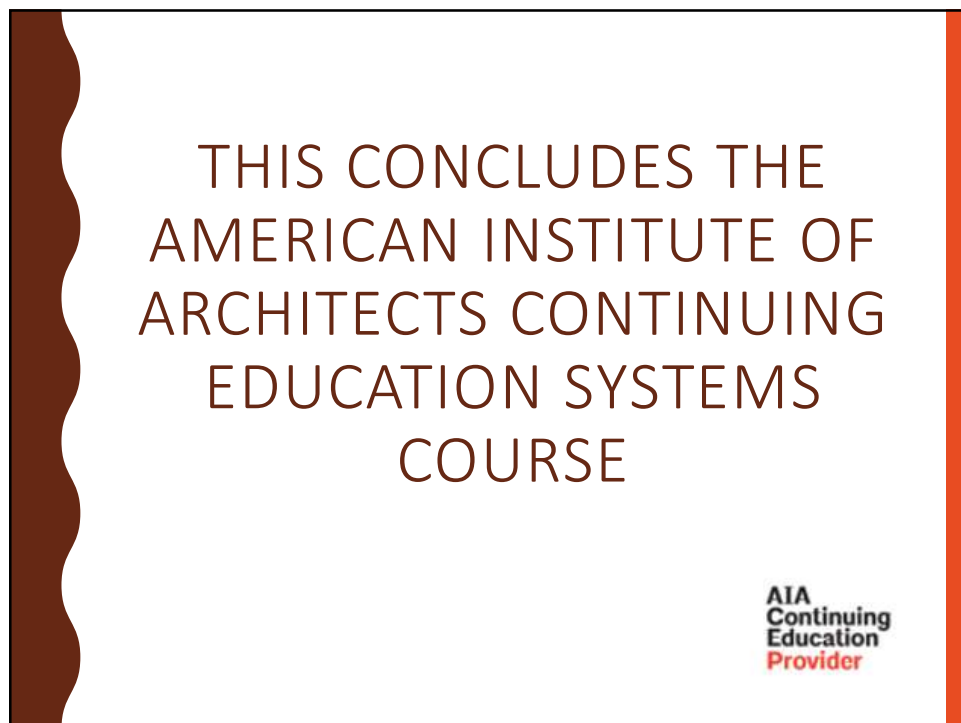
HEATING COSTS

	Kentucky	New Mexico
Fuel	48%	55%
Labor & Maintenance	29%	34%
Chemicals	6%	2%
Electricity	4%	5%
Water	3%	1%
Other	10%	3%

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