

# 312 HEATING PRODUCTION



**JEFF ZUMWALT**  
**LALIT AGARWAL**

**AIA**  
Continuing  
Education  
Provider

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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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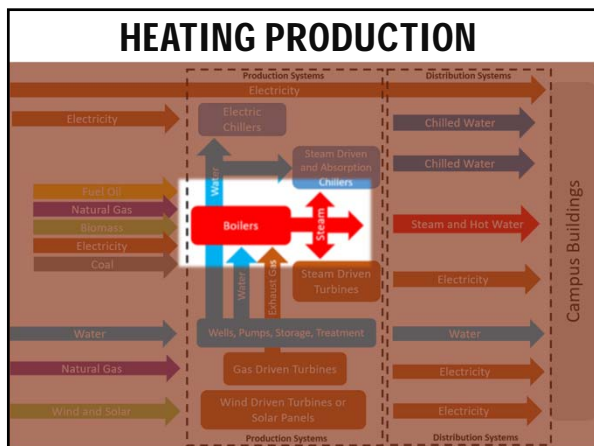
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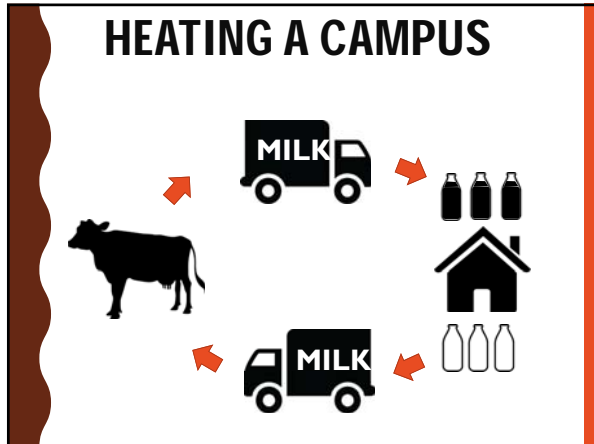
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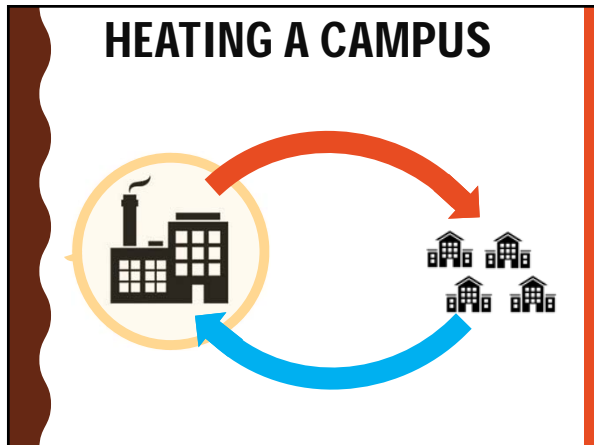
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### OVERVIEW

- Equipment
- Central Boilers
- Distributed Boilers
- Steam
- Hot Water
- Fuels
- Costs

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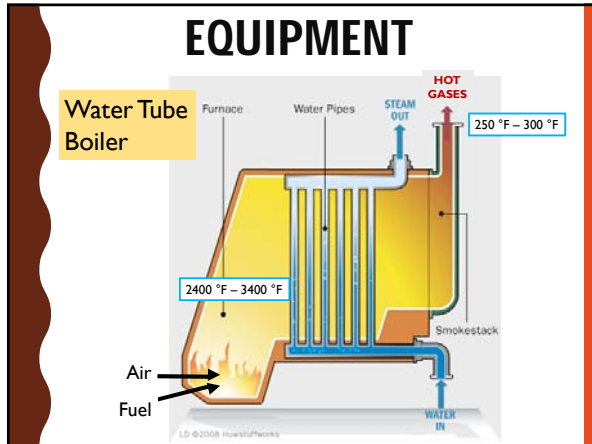
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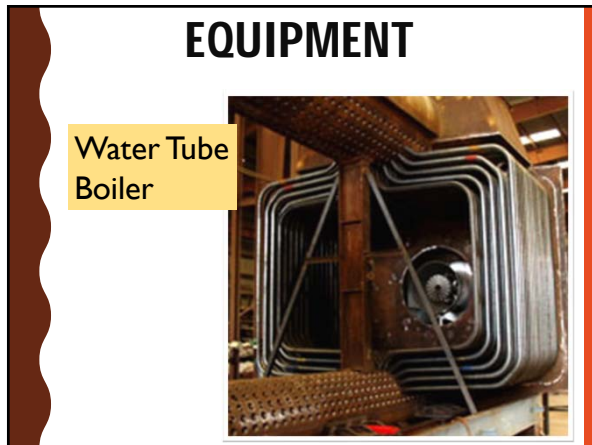
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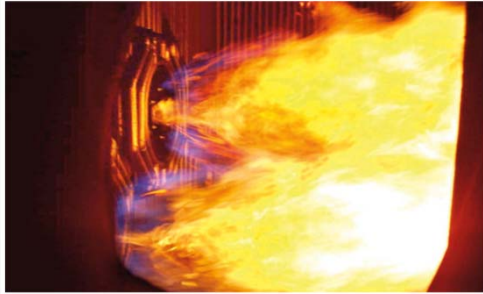
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## EQUIPMENT

Burner



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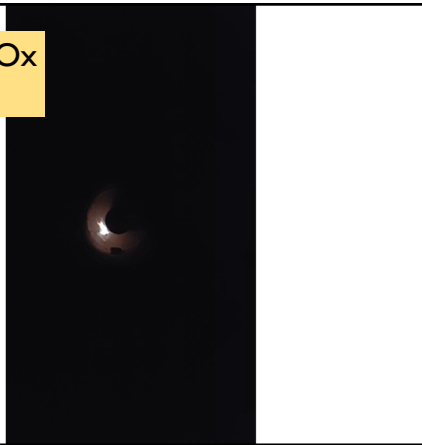
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Low NOx  
Burner



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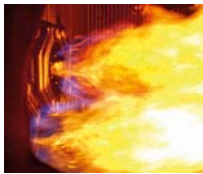
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## BOILER TUBE

Water  
Quality



2400 °F – 3400 °F



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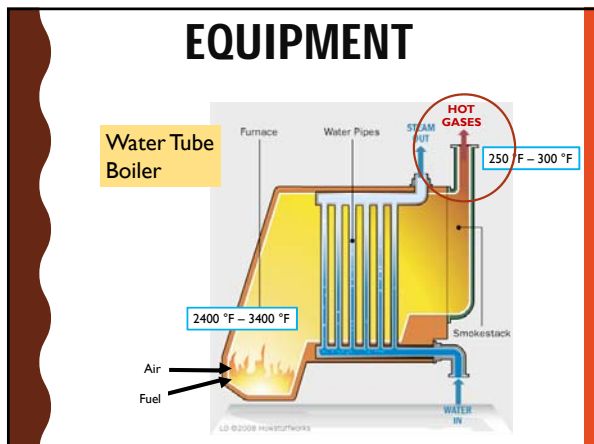
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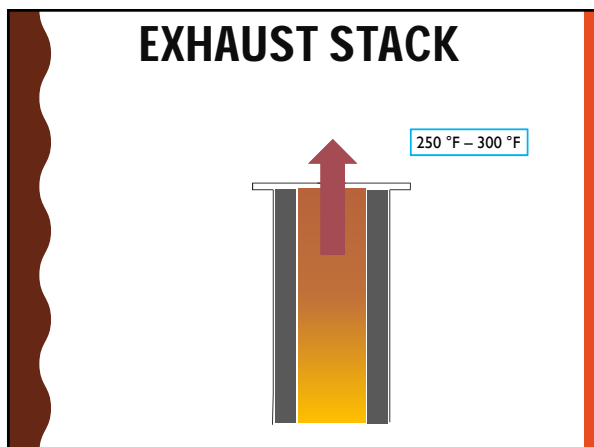
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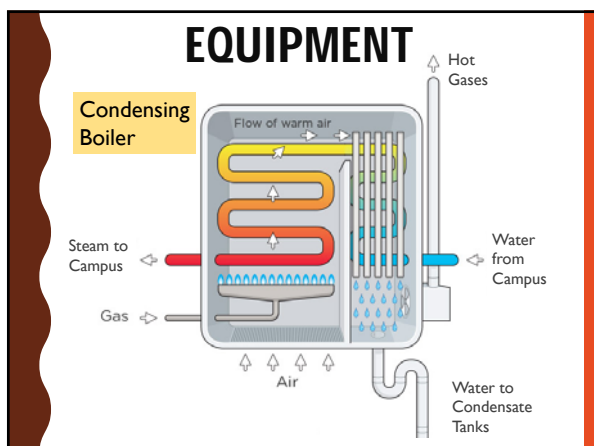
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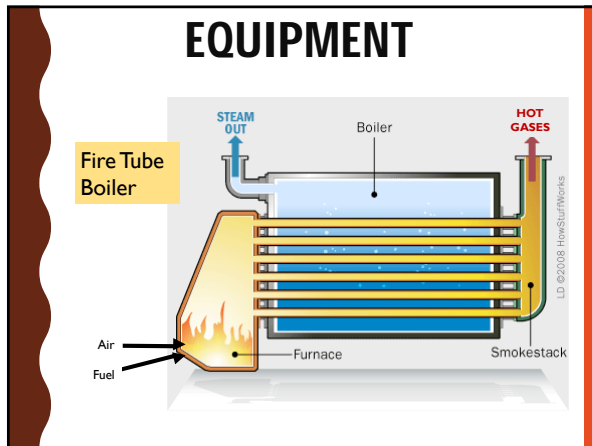
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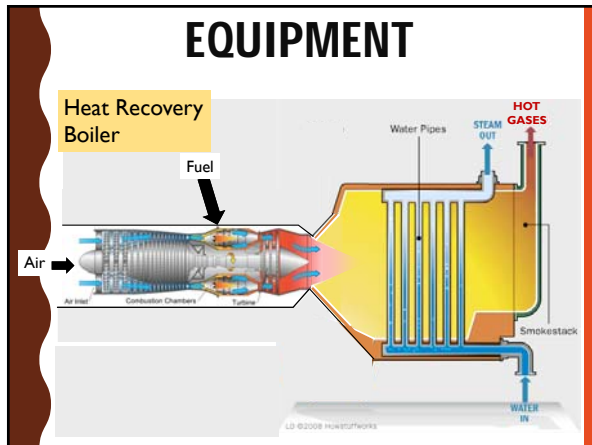
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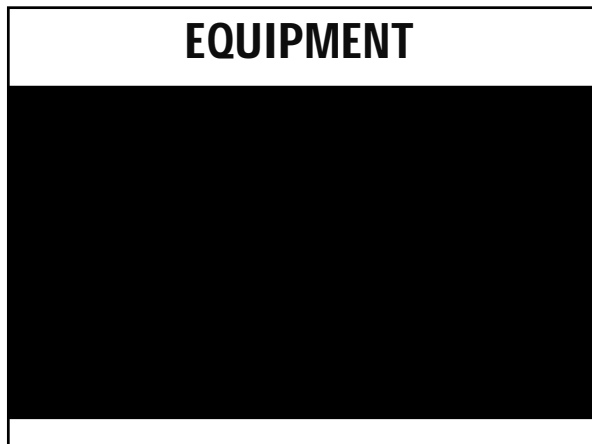
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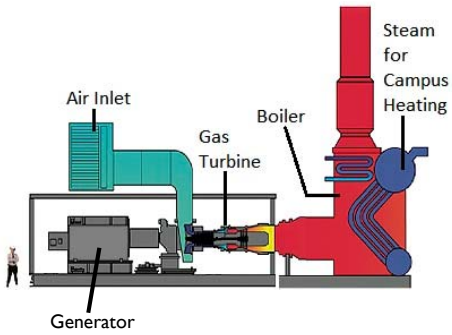
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## EQUIPMENT



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## EQUIPMENT - RISKS



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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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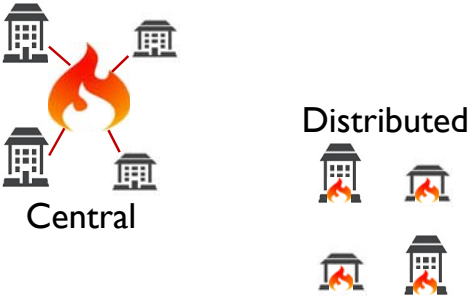
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# CENTRAL OR DISTRIBUTED



Central

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

<u>Central</u>	<u>Distributed</u>
←	→
←	→
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←	→
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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

<u>Steam</u>		<u>Hot Water</u>
←	Efficiency	→
←	Safety	→
←	Maintenance	→
←	Complexity	→
←	Reliability	→
←	Fuel Flexibility	→
←	Process Steam	→
←	Electricity Generation	→

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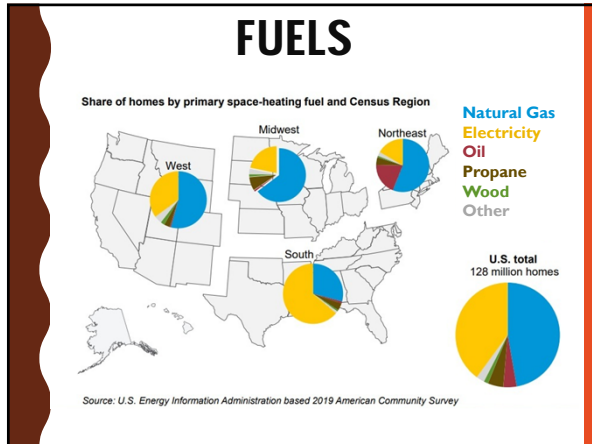
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## HEATING COSTS

	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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THIS CONCLUDES THE  
AMERICAN INSTITUTE OF  
ARCHITECTS CONTINUING  
EDUCATION SYSTEMS  
COURSE



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