**BACKGROUND**
The Central Heating Plant (CHP) located at the University of New Brunswick, Fredericton Campus was built in 1970. During renovations in 1984, Boiler #1 was added as the baseload boiler and is now reaching its end of life.

**OBJECTIVE**
The objective of the project is to design a replacement boiler for Boiler #1. The replacement will be required to produce a minimum of 3,600 kJ/hr of saturated steam at 1,480 kPa. Secondary objectives include investigating cogeneration, improving efficiency, and maintaining a low carbon footprint for the boiler.

**PROPOSED DESIGN**
Steam and preheated air enter the circulating fluidized bed (CFB) boiler, where they combust. The hot flue gas enters Steam Generation.

**COMBUSTION**
Steam is produced in the boiler water walls and passes through the superheater before entering the turbines.

**STEAM GENERATION**
Superheated steam enters Power Generation where it splits to feed into a 3,600 kJ/hr and 10,900 kJ/hr turbines.

**HEAT RECOVERY**
Air and boiler feedwater are preheated by passing through the air preheater and economizer, respectively before entering combustion steam generation.

**PARTICULATE REMOVAL**
Flue gas passes through the electrostatic precipitator to remove the particulate matter before exiting the stack to the atmosphere.

**ECONOMICS**
- Overall proposed design was determined to be feasible
- Steam Production Only yield greater economic benefits

**SENSITIVITY ANALYSIS**
- **Internal Rate of Return**
  - Variation in Fuel Cost
  - Variation in Electricity Selling Price

**CONCLUSIONS AND RECOMMENDATIONS**
- The proposed design system efficiency increased by 16% from the current system to a value of 79%
- Hog fuel has allowed the system to have a low carbon footprint
- Electrical production determined to be not feasible

**RECOMMENDATIONS**
- Further investigate alternative boilers types and compare their turndown abilities
- Refrain from implementing a cogeneration system, as only producing steam is more economically viable
- Consider increasing the steam production to the maximum steam demand

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