

CONSIDERATIONS FOR A NEW COAL-FIRED POWER PLANT ON SVALBARD

AQEEL HUSSAIN, REZA FARZAD, ANDERS LEIRPOLL & KASPER LINNESTAD
 SUPERVISOR: SIGURD SKOGESTAD
 NORWEGIAN UNIVERSITY OF TECHNOLOGY AND SCIENCE
 DEPARTMENT OF CHEMICAL ENGINEERING

Introduction

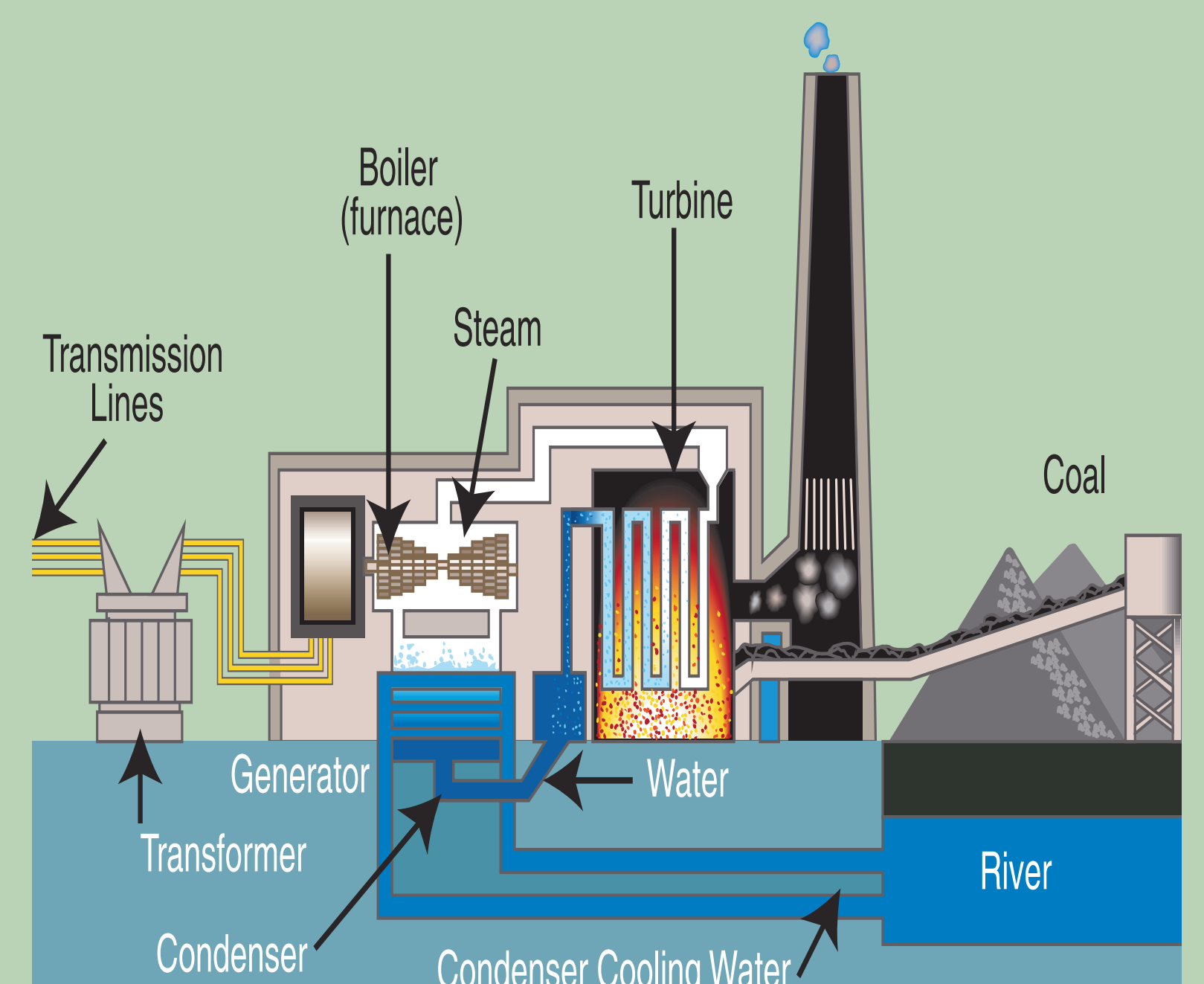
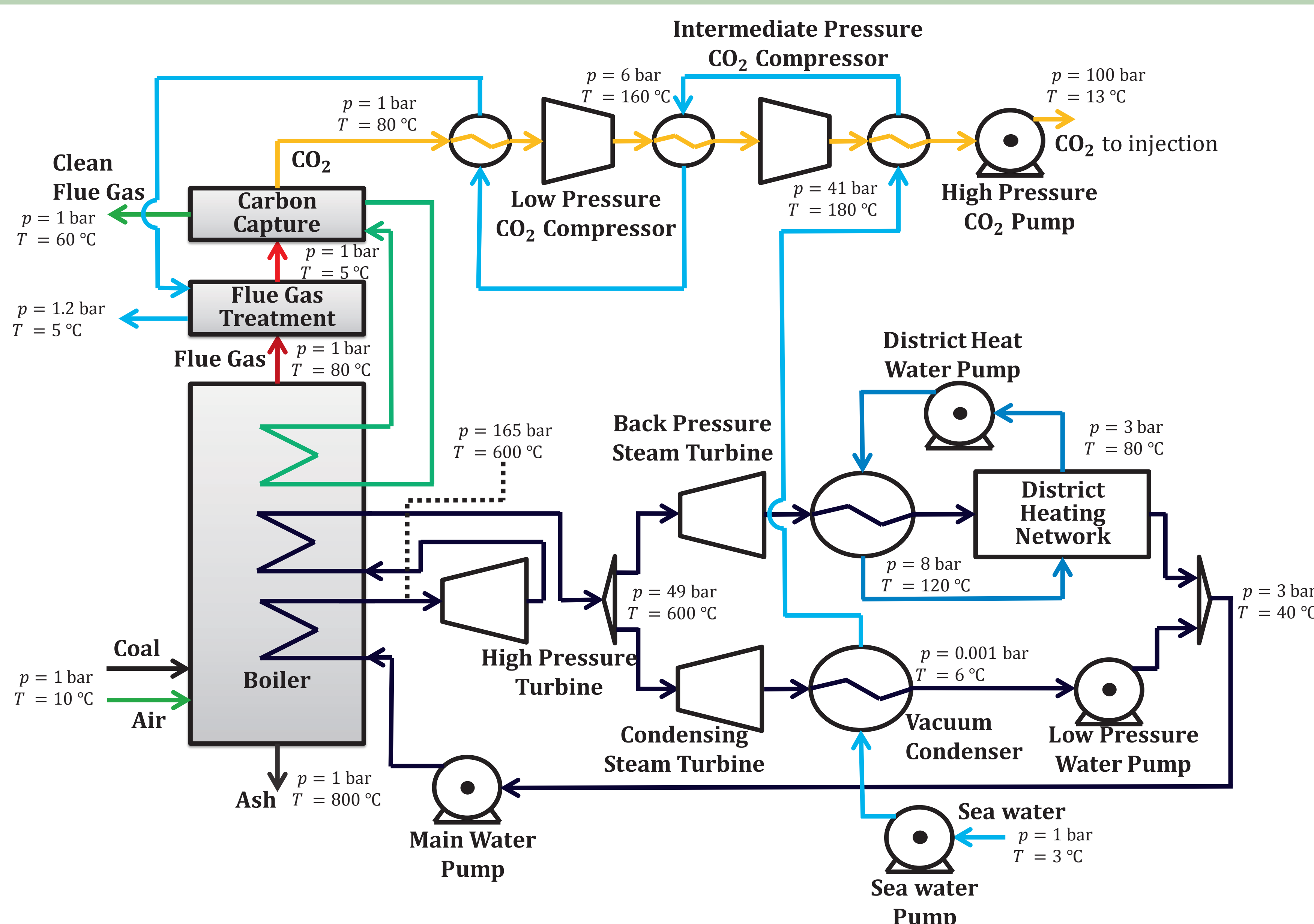
Different types of coal-fired power plants were considered as options for a new power plant at Longyearbyen, Svalbard. Conventional technology was found to be the best fit, and a pulverized coal plant was modeled in detail. As the current plant does not have any flue gas treatment, the new plant was designed to handle CO₂, sulfur, NO_x, dust particle and mercury emissions. After a literature search, a seawater scrubber and carbon capture by amine absorption were found to be suitable for this task.

Key results

Object	Value
District heating power output	12.0 MW
Net electrical power output	9.6 MW
Amount of coal needed	60000 ton/year
Thermal efficiency	34.7%
Heat needed for CO ₂ -removal	22.6 MW

Process Description

The plant was modeled in Aspen HYSYS according to design basis and existing plant data given by Longyearbyen Bydrift. Four cases were considered and studied in detail. The base case generates electric power from three steam levels, and utilizes the existing district heating network in Longyearbyen. In the heat pump case, electric power is generated from two steam levels, with completely condensed steam. It was assumed that the power could be used in a central heat pump or in consumer bought heat pumps, exploiting the power more efficiently. The last two case studies consider how increasing the steam pressure or temperature affects the base case plant's thermal efficiency.



Conclusion

A pulverized coal plant was found to be the best fit for a new power plant on Svalbard. The technology is commercially available, and no research and development is required. A maximum boiler temperature of 800°C was assumed, together with subcritical pressure in the steam cycle. District heating from a backpressure steam turbine was found to be a better option than a central heat pump, both practically and economically.

