



Figure 3: The heat flows illustrated for biomass and utilities.

Approximately 73 MW of additional biomass is needed shown in Figure 4 to supply the power and steam demand of the process. Due to small LP steam demand only HP and MP pressure steam is supplied to the process. Here only one high pressure level is assumed. The high pressure steam is feed through the back pressure turbine generating needed amount of MP steam with a power output/ heat output ratio of 0.20 and rest of the is feed to a condensing turbine with a power output to heat output ratio of 0.45. About 65 % of the energy content in the biomass and additional biomass 74 MW used for power and energy production can be found in the products ethanol, biogas and pellets.

Table 1: The heat and Power production calculated based on data by (Gulichen and Fogelholm 2000) for a typical Northern European Kraft Pulp Mill producing annually 600000 ton of air dried pulp with an annual operation of 8000 h. The plant is integrated to paper mill.

	Black Liq. Boiler	Bark Boiler	Pulp Mills Cons.	Paper Mill cons	Back Pressure Power	Cond. Power Production	Sold to Outside
GJ/Adt	18.0	4.2	9.0	6.5	4.4	2.3	
MW	375.0	87.5	187.5	135.4	91.7	47.9	0.0
KWh/Adt			550.0	650.0	1200.0	225.0	
MW			41.3	48.8	90.0	16.9	16.9

In Table 1 it can be concluded that normally there is no excess of LP steam in the pulp mill. About 17 MW of electricity is normally sold to outside. The amount of electricity produce could be increased if condensing turbine would be employed or a lower back pressure in the power generation. This could be done if MP and LP pressure steam produced in the biofuel process could replace steam made in the pulp mill process.

