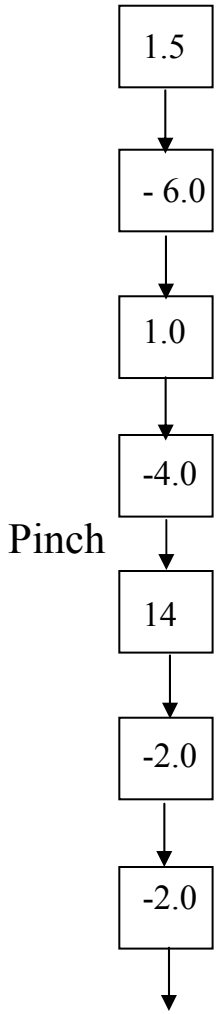
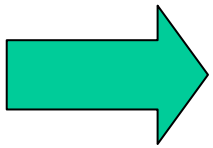
UTILITY PLACEMENT HEAT AND POWER INTEGRATION

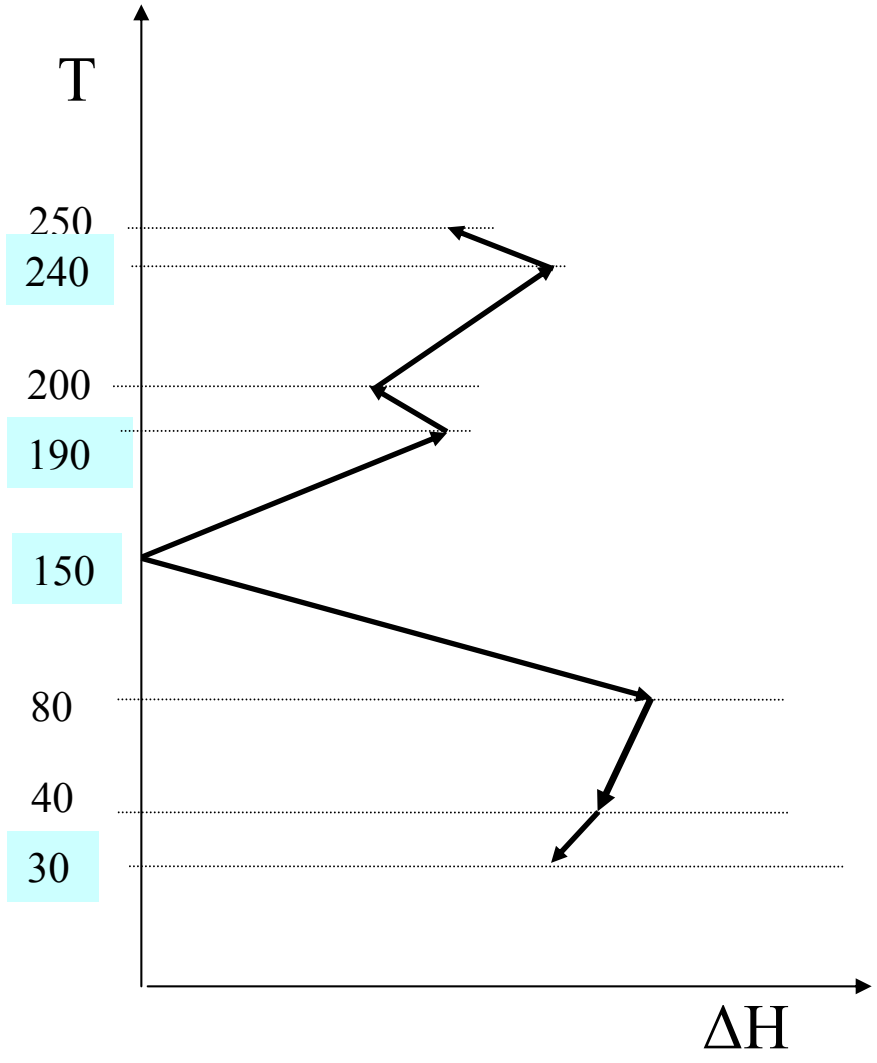
UTILITY PLACEMENT

We now introduce the GRAND COMPOSITE CURVE, which will be useful to analyze the placement of utilities.

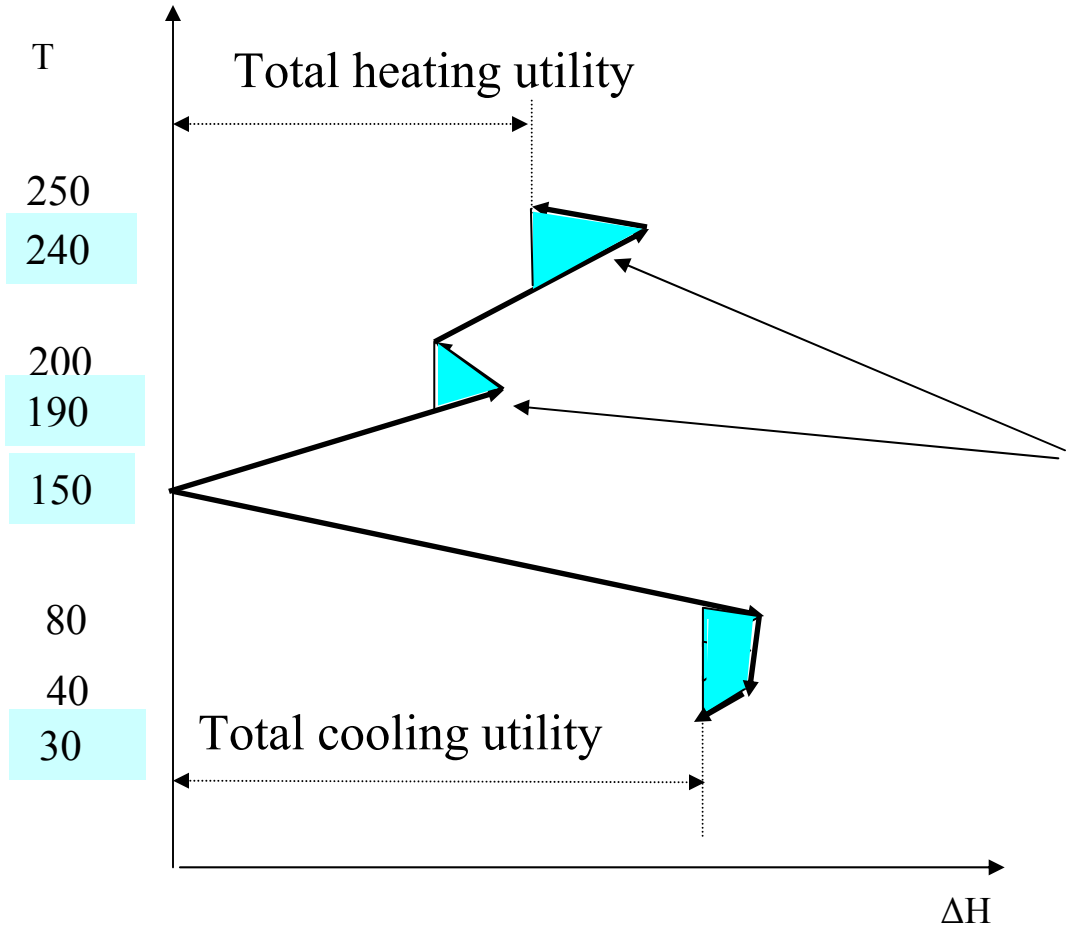


Start at the pinch





GRAND COMPOSITE CURVE

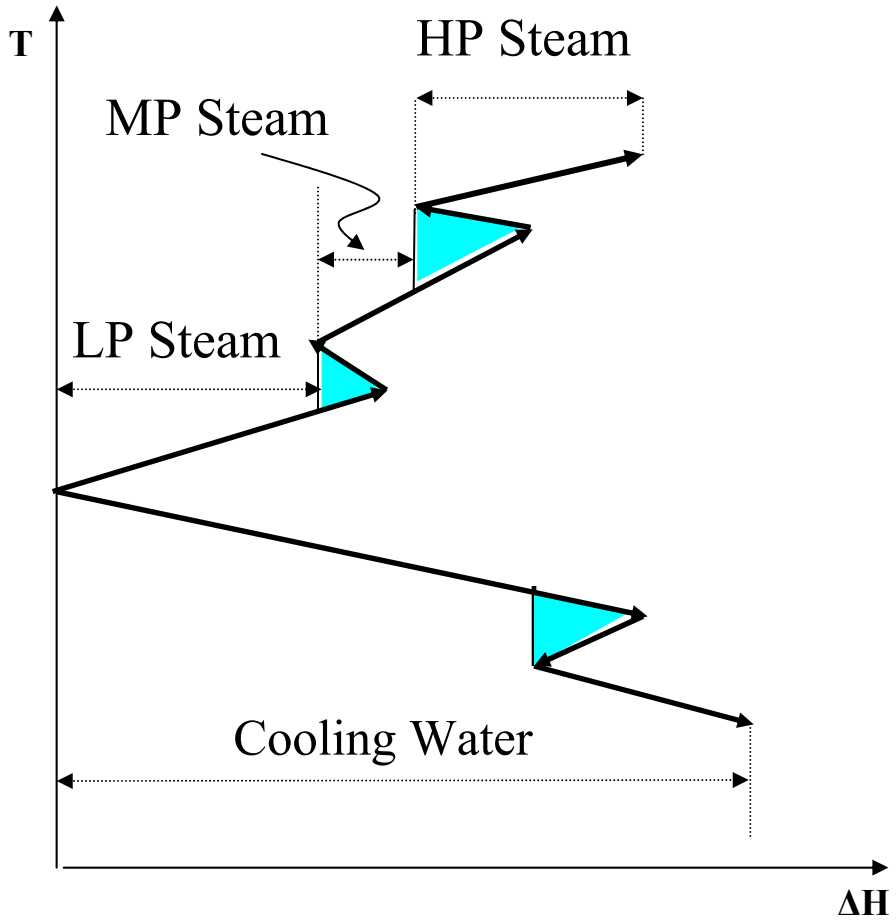


These are called "pockets"

Process-to Process integration takes place here

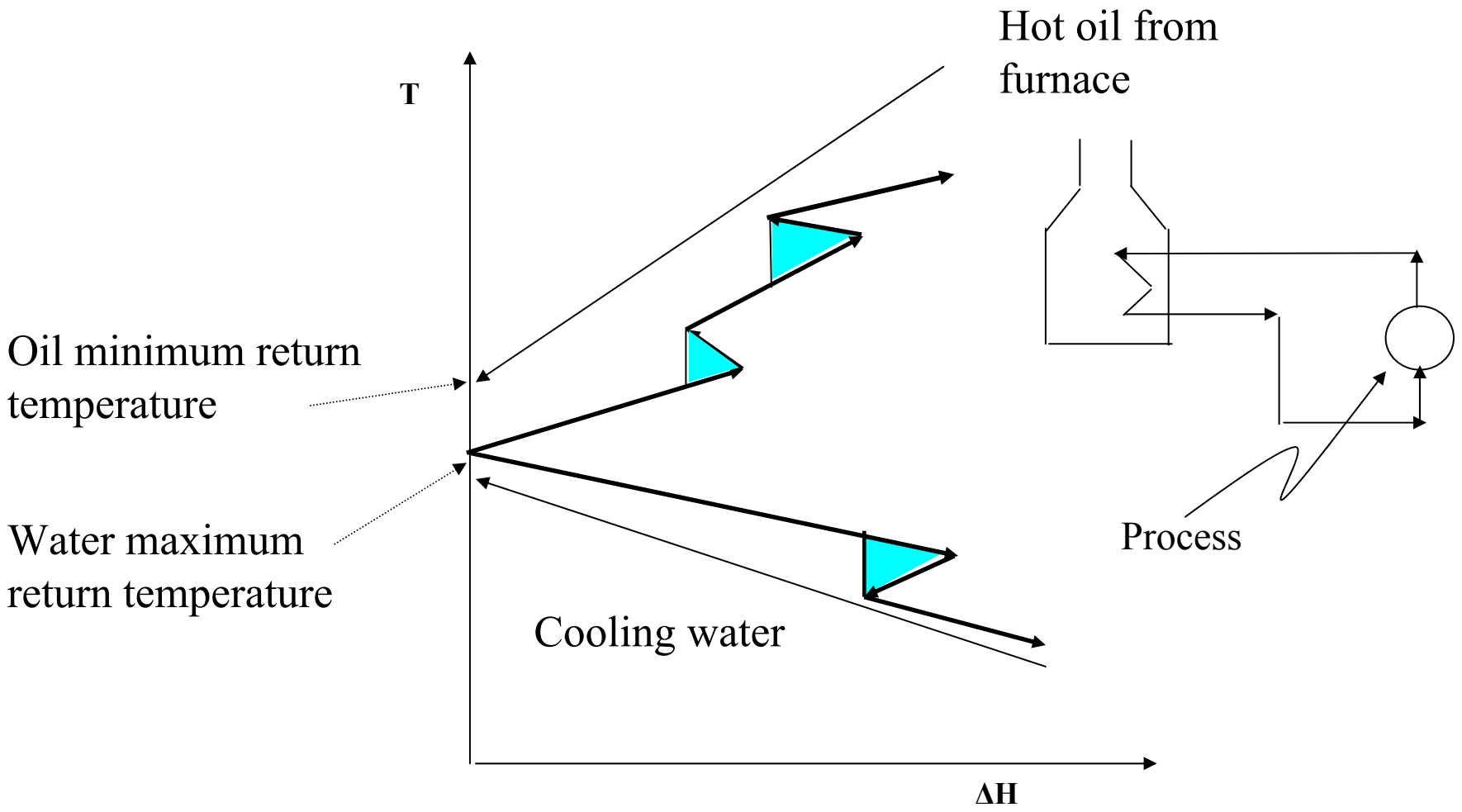
UTILITY PLACEMENT

We now resort to a generic grand composite curve to show how utilities are placed.

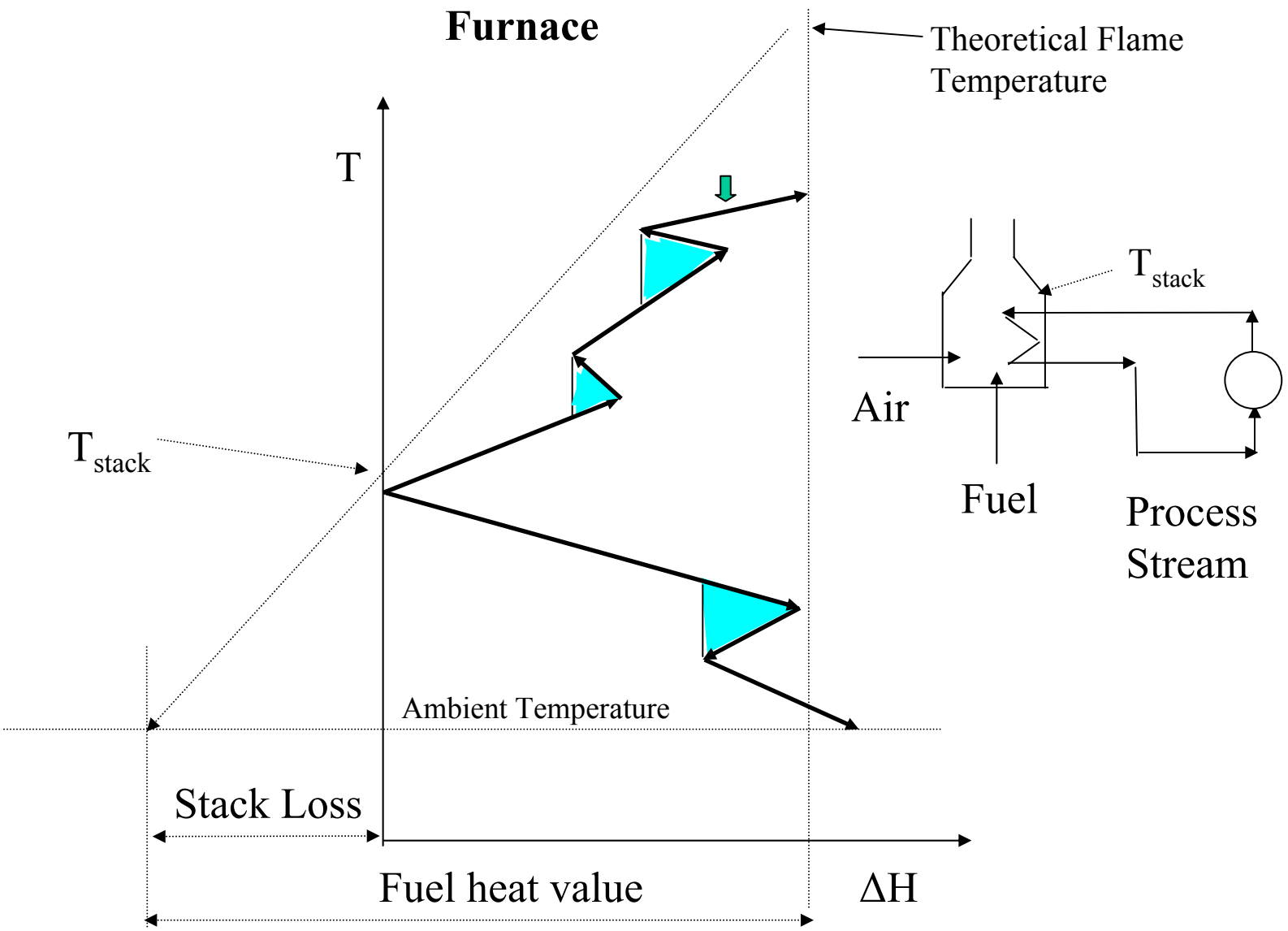


UTILITY PLACEMENT

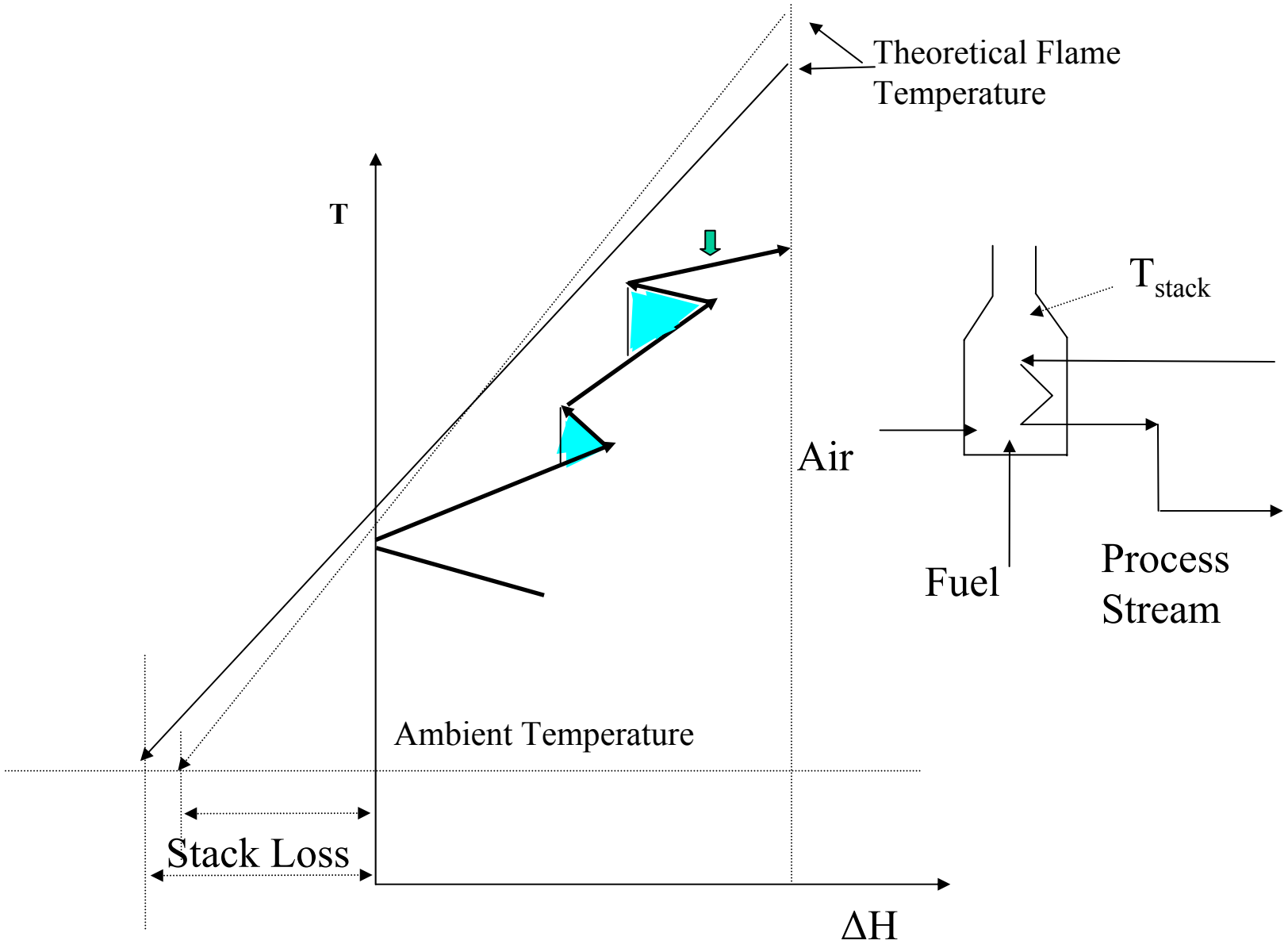
Hot Oil placement and extreme return temperatures



UTILITY PLACEMENT

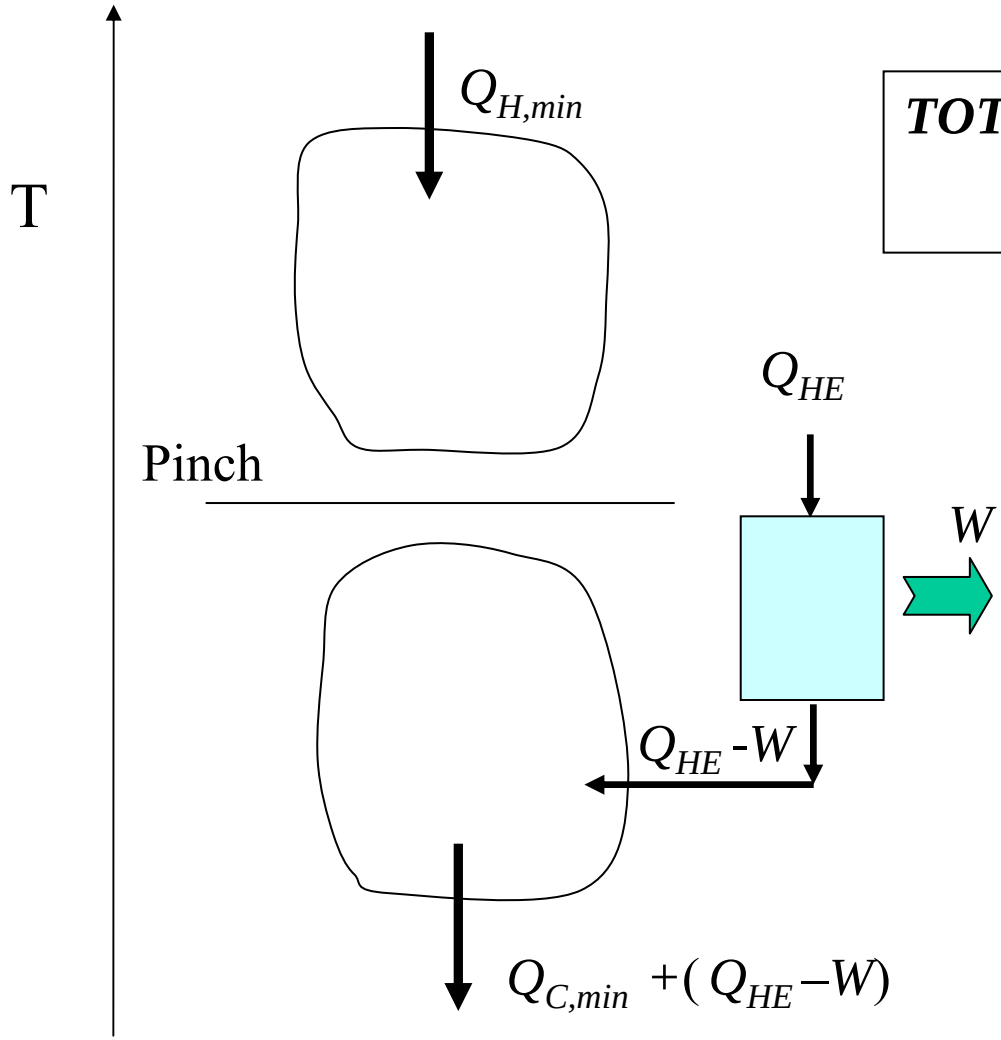


An increase in flame temperature reduces stack loss.



COMBINED HEAT AND POWER

Integration of a Heat Engine Across the Pinch.



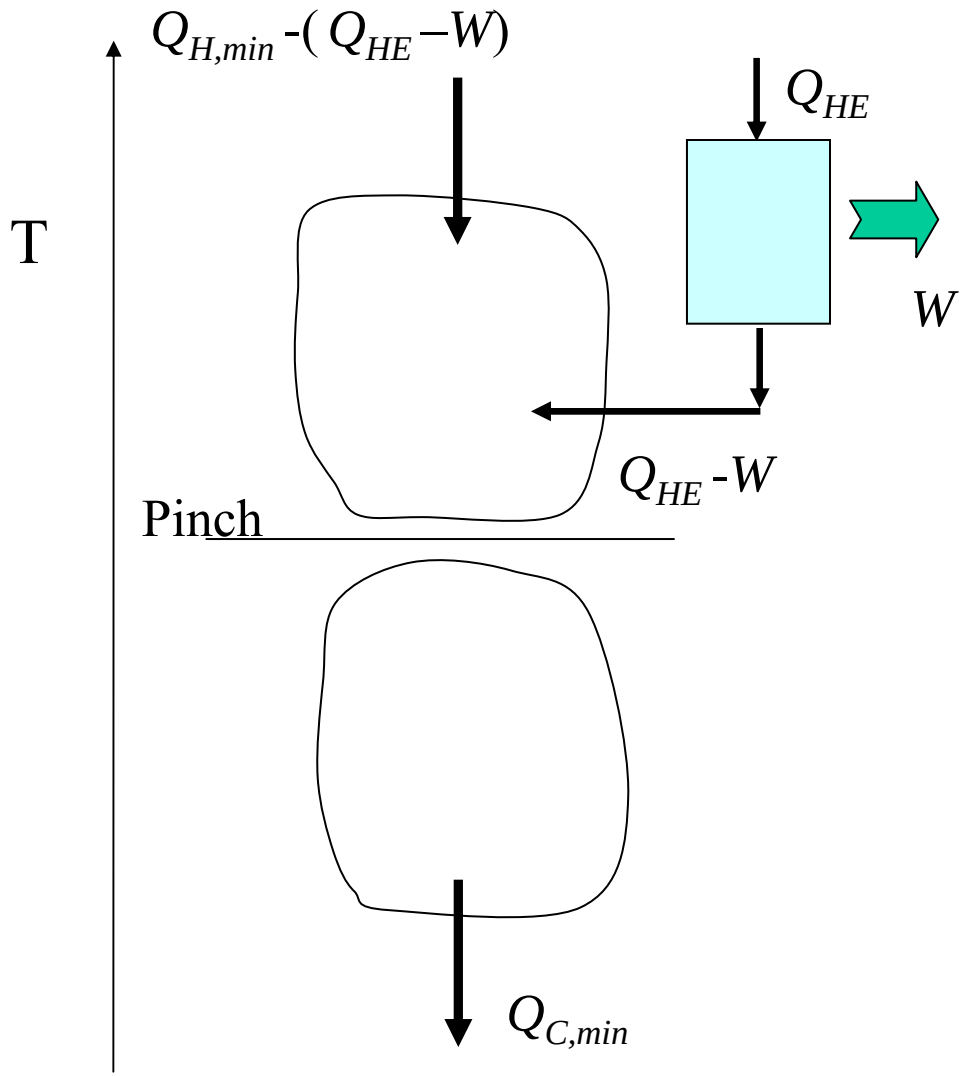
TOTAL ENERGY INTAKE

$Q_{H,,min} + Q_{HE}$

Note that in this case there is no gain. The heat engine can be arranged separately and the utility usage will not change.

COMBINED HEAT AND POWER

Integration of a Heat Engine Across the Pinch.



TOTAL ENERGY INTAKE

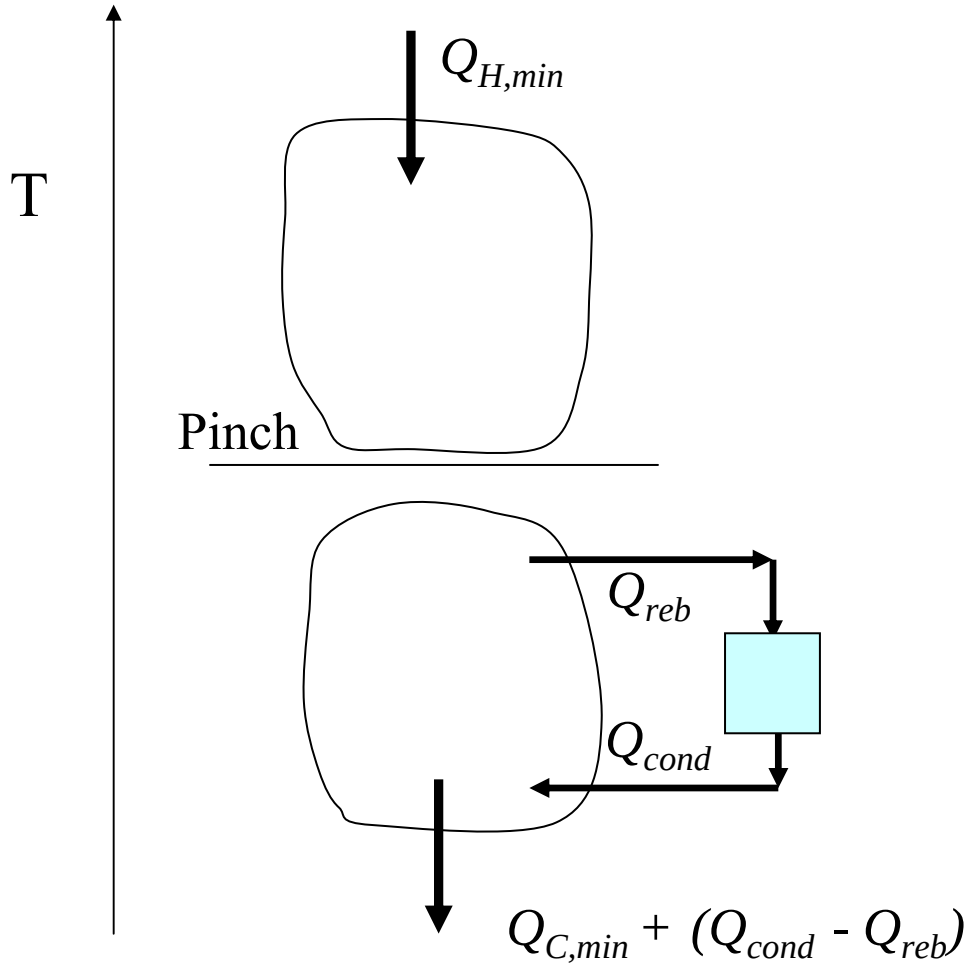
$Q_{H,,min}$ + W

(*smaller*)

Note that in this case there is a gain.

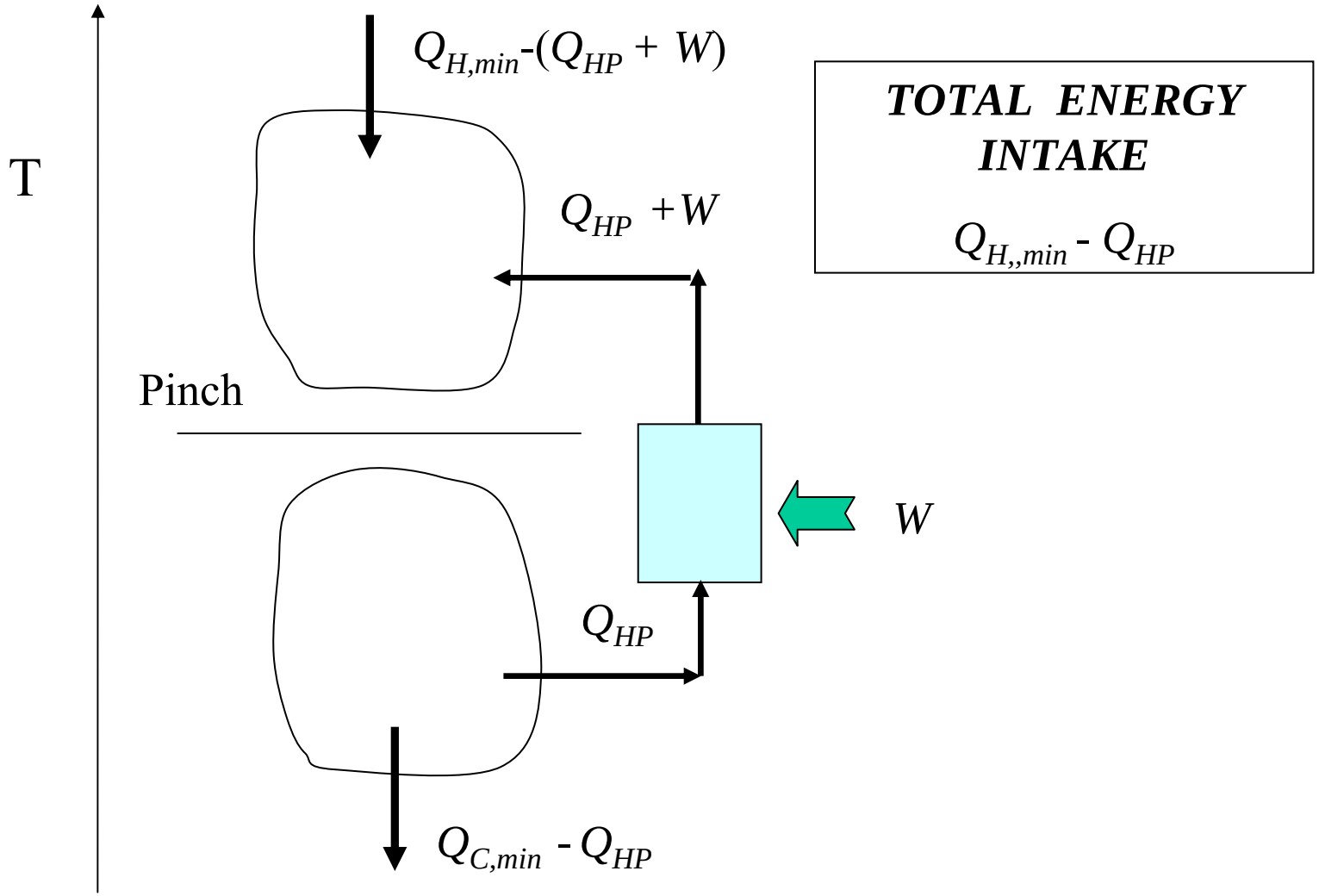
COMBINED HEAT AND POWER

Placement below the pinch.



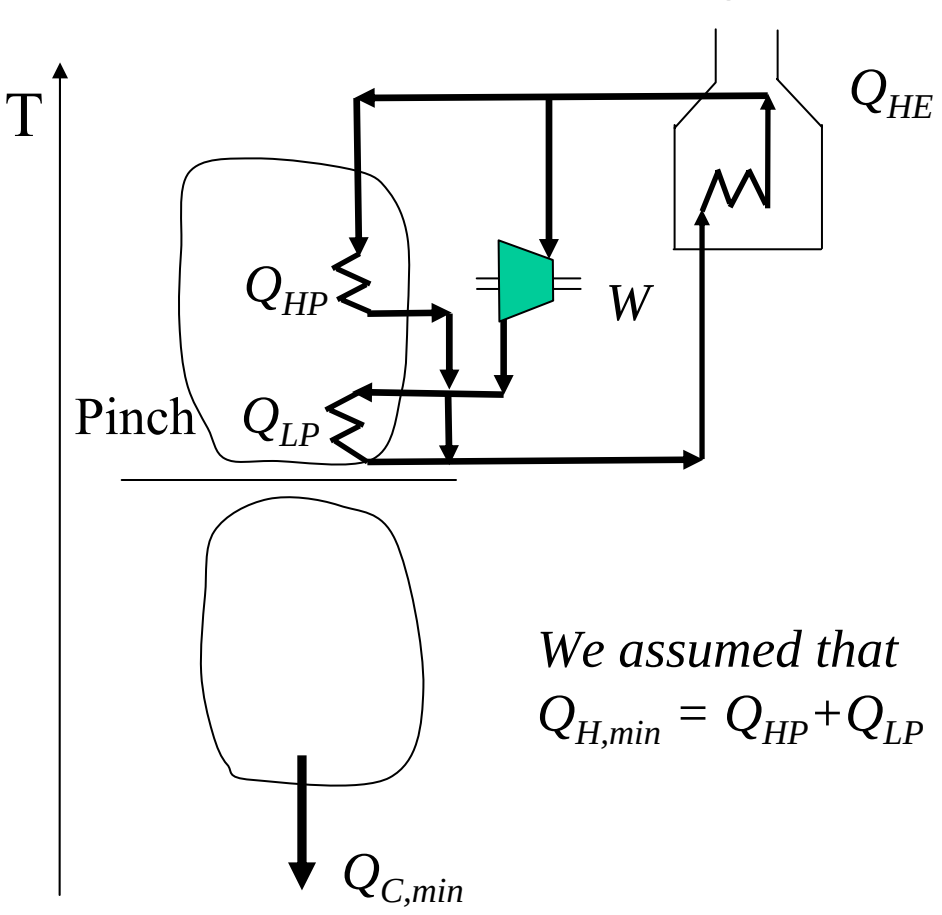
In this case there is a gain of $(Q_{cond} - Q_{reb})$ ***in the cooling utility.***

Placement of Heat Pumps



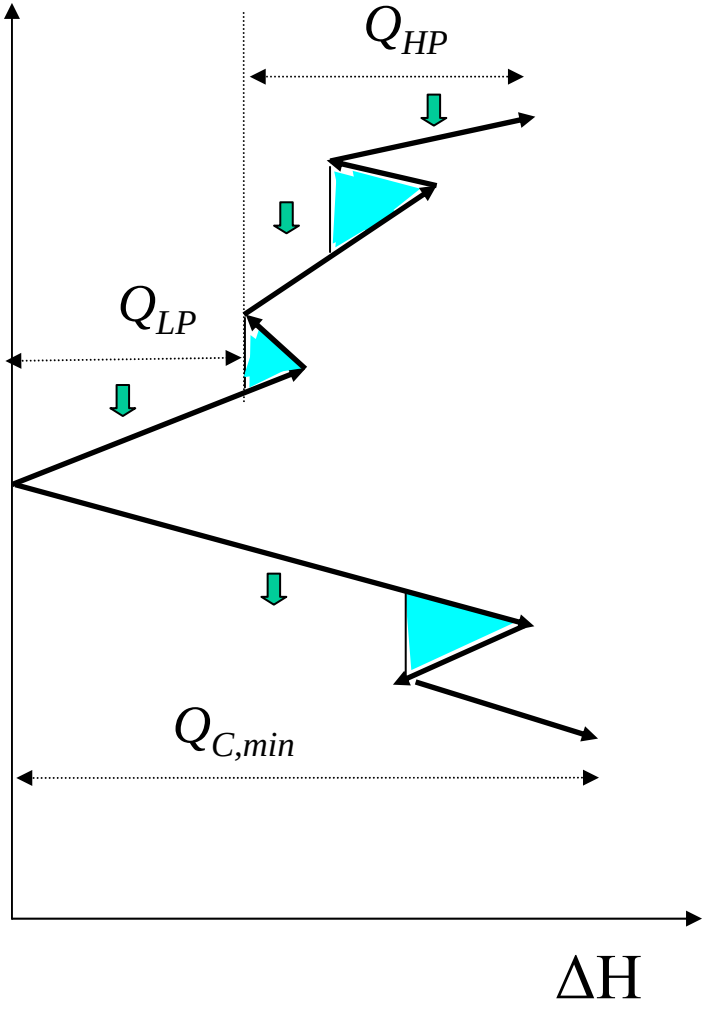
COMBINED HEAT AND POWER

Utility Placement



We assumed that

$Q_{H,min} = Q_{HP} + Q_{LP}$



COMBINED HEAT AND POWER

Gas Turbine Placement

TOTAL ENERGY INTAKE

$Q_{H,min} + W + Q_{LOSS}$