For single-input-single-output the “process efficiency” is equal to the output energy per input energy. In fact, it is more often that we use multiple input and multiple output. In this case the “process efficiency” should be a set of input/output ratios, called “process input/output ratios”.

However, this will cause an increase of the degree of freedom. For example: when the input ratio is set to 1, the output ratio will be equal to the process efficiency (*eff*). This can be explained as follows: one unit of process through-put (*tau\_pro*) is imported in the process, then the output electricity will be 1\*process efficiency. Meanwhile the process through-put is related to the total process capacity (*cap\_pro*), which is proportional to the capacity investment costs (*inv\_cost*). Therefore with input ratio = 1, the costs can be represented as: (thermal power plant capacity) or.

As the same to input ratio, the output ratio can also be set to 1. At this time, the corresponding input ratio is , which means: for one unit electrical output, unit input commodity is needed. The electrical power plant capacity can also be calculated as: or.

The input or output ratio can be set to other values as well, but it will change the value of efficiency and arise the mathematical complexity.