7 Cost Allocation to Cogeneration Products

7.1 Overview of Allocation Methods

In general, cogeneration is the thermodynamic cycle of electricity and heat production in a common generation facility, namely a combined heat and power (CHP) plant. Each of the two cogeneration products, electricity and heat, may consist of different kinds of sub products with regard to their production costs or their thermodynamic grade. A CHP plant may generate cogenerated electricity and non-cogenerated electricity, e.g., in bypass or in condensing operation. Heat may be extracted from a steam turbine at different pressure levels. Thus, in many cases the cogeneration products will be more than two.

One important task in investment appraisal for CHP plants is also the proper allocation of production costs to the different cogeneration products, which will be further allocated to other production goods or commodities of a manufacturing process. There are two main groups of methods as shown in the figure below.

![Cost Allocation Methods for Cogeneration Products](Image)

**Figure 7-1**: Cost allocation methods for cogeneration products
The main difference of the two groups is that commercially based methods do not distinguish production costs differences, e.g., for different steam extraction pressures or between cogenerated and condensing electricity. In contrary, thermodynamics’ methods consider this kind of costs differences.

Besides costs, the methods can also be applied for the allocation of fuel or of emissions to the cogeneration products.

The methods cannot be arbitrarily applied. In general, for each individual application only a single method is the most appropriate, depending on the purpose and the economic philosophy that lies behind.

### 7.2 Proportional Allocation

**Base case:** Heat is produced in a captive, heat only boiler plant (HOB) and electricity purchased from the grid. The costs are charged to the production goods as incurred proportional to the consumption.

**Cogeneration:** In the case of cogeneration in a captive CHP plant, the costs are allocated in the same proportion to the cogeneration products heat & power, as incurred in the base case, and subsequently charged in the same manner to the production goods. In so far, the cost allocation is self-explanatory.

**Philosophy:** The cogeneration benefit is equally shared by cogeneration products. Cogeneration may provide some relative reduction of production costs of goods which have heat or/and power demand. The proportional method is applied for engine CHP or gas turbine CHP plants. It is not applicable for steam- or CCGT CHPs with steam extraction at different pressures.

**Pros and Cons of the method:** The method seems to be just; however, it does neither provide any significant economic advantage to production goods nor an incentive for investment in cogeneration. The cogenerated electricity in a captive CHP, is in most cases, only a relatively small part of the total electricity demand of the factory; thus the cost advantage is marginal referred to the total electricity consumption. Neither does the heat benefit significantly as it has to share with the cogenerated electricity.

### 7.3 The Residual Value Method

The residual value method is very commonly applied in municipal utilities, small scale distribution companies or factories that operate captive engine or gas turbine CHP plants. The approach is shown below: