Jwt, 30.01.2009

2009/ Issuepaper

Jun Toutain and Atle Tostensen

Auto-producers of energy
Definition and classification

Issue 5.1: Auto-producers of energy: definition and classification in IRES

The definition and classification of energy-producing activities outside the energy sector, herein auto-production, pose challenges when the boundary of the energy system to be covered by energy statistics is being defined.

In the energy sector, the public energy supply industry's principal product is electricity and heat. However, in several industrial establishments electricity and heat are produced as "secondary products" on a significant scale. Much of the own produced energy is used within the unit where it is produced, but some is also sold to users outside the producing unit.

Sometimes the heat input to an industrial process is itself obtained from the exhaust heat from a higher temperature process in the same establishment, and in this way the total quantity of purchased energy is reduced (ref energy efficiency).

In some industrial production units, both in developed and in developing countries, steam or heat is generated by burning the waste products of the manufacturing process (e.g. wood-waste, bagasse).

Industrial production and energy – Four cases

Industrial production processes are processes where energy and raw materials are transformed into finished goods. Only a small part of the energy is useful in the process. How useful an energy product is depends on the technology employed, the type and quality of the fuel used, the operating conditions and practices. The energy which is not useful is lost to the environment in the form of excess heat. To minimize these losses many industrial production units recover some of the excess heat. This recovery implies reduced need for energy supply and/or increased productivity. It can be seen as increased energy efficiency. The recovered energy is of interest to energy statistics for the recording of energy savings, but the energy does not enter the flows of energy as recorded in energy balances. The simplest treatment is to record as "final energy use" the fuels purchased by the unit concerned, and to regard the uses made of those fuels as wholly internal to the unit. When an establishment recovers more energy than necessary for its own production and sells it to other users it becomes a matter for energy balances. These units should be regarded as auto-producers of energy.

In this paper we present four different cases of industrial production related to energy in order to illustrate what is auto-production and what is not. This clarification is important related to strategies for data collection and also for setups of energy balances.

Case 1 – Standard industrial production

Manufacturing industry where energy and raw material are input to the process and where excess heat is lost to the environment. The manufacturing industry is an end user of energy and no auto-production occur.

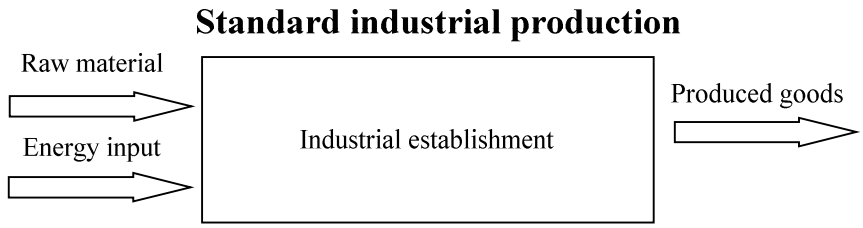

Figure 1 Standard industrial production

Case 2 – Increased energy efficiency

Manufacturing industry where energy and raw material are input to the industrial process and where some of the excess heat is recovered and used within the unit where it is produced. In this case no energy is sold to the public. The extraction of energy from the excess heat is not new production, but it increases the portion of useful energy in the original energy input in the establishment. The energy efficiency of the process is increased, but this is not an auto-producer of energy. The amounts of energy recovered may be of interest to energy statistics as it gives a measure of energy saving efforts.

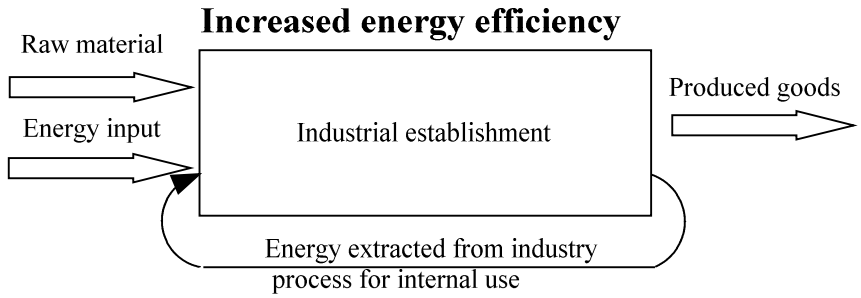

Figure 2 Increased energy efficiency

Case 3 – The typical auto-producer

In case 3 heat is recovered from the industrial process and used to produce a combination of heat and electricity which in part is delivered to users outside the establishment that produces it. This is a typical auto-producer and should be treated as part of the transformation sector. The difference between case 2 and 3 is that in case 2 the increased efficiency is only of relevance to the internal process, but in case 3 an industrial establishment in addition to its core activity also supplies energy to users outside of the establishment. Because of this external delivery, information on the "transformation" in this establishment is relevant to energy statistics.

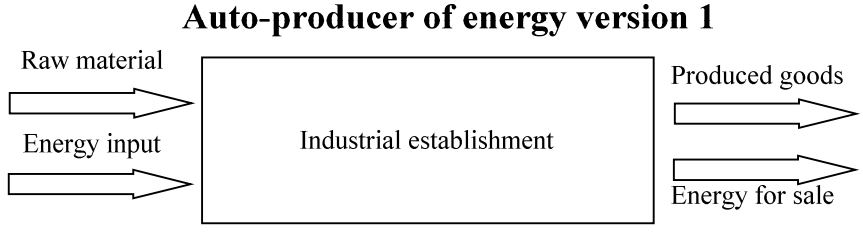

Figure 3 The typical auto-producer

Example case 3: Recovered heat delivered to users outside the unit that produces it
The use of waste materials in the timber and paper industries and the exhaust heat recovered from coke ovens and blast furnaces. Seeing how an energy balance is to record all energy flows it ought, arguably, to include these flows.

Case 4 – Industrial production unit's own power plant

In case 4 the industrial establishment has its own power plant. This case is not uncommon in Norway. We have chosen to handle such cases by making separate statistical units of the energy producing device and the industrial production unit. In this regard the energy production unit reports its energy production, and the industrial production unit is a user of the energy produced. Even if the separation of functions in two units is not made, the production from the energy unit must be recorded in energy statistics, as it is an important part of energy supply.

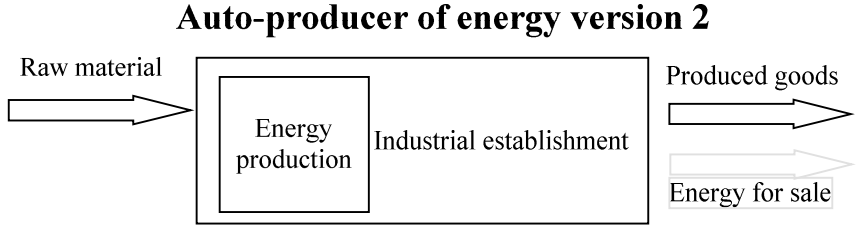

Figure 4 Industrial production unit's own power plant

Example 1 Case 4: Hydroelectricity produced by industrial production unit.
Another example is where large amounts of hydroelectricity are produced by establishments for its own use as its main or only source of energy. If such electricity is not recorded in the balance for a country such as Norway, then the output of some major industries (e.g. aluminium and fertilizers) will appear to have no energy input even though the commodities they produce are, of their nature, energy-intensive.

Example 2 Case 4: Chemical processes. In the manufacture of sulphuric and nitric acid, heat is released by exothermic chemical processes that do not have any heat-input at all. Some of the recovered heat is used to raise steam to produce either shaft motive power for direct use or through electricity generation as a means of distributing motive power elsewhere in the plant, or to supply hot steam as a medium for distributing process or space heat within the plant.

Conclusion

Auto-production is limited to the cases where energy produced or transformation in a unit that does not have energy production or transformation as its main activity is sold out of the unit in question. Regeneration of energy internally in an industrial process, for the units own use, is not auto-production but increased energy efficiency in the unit.

Energy output from auto-producers is an important part of the energy flow in a country. Data collection should hence include data from auto-production as part of energy statistics regardless of the main activity of the unit in question.