

8.2 Consumption Management, Metering and Accounting

Consumption management

Legally, utilities have to supply customers. This is a social obligation. The only exception is, if the costs are not to justify, e.g. a garden area with a consumption of some kWh per year.

As there are normally no bottlenecks in the networks and the production of electricity, customers can take as much electricity as they want. Limits are the *LV* network house connection fuses and the conductor size. All customers are connected three-phase (four-phase). In the past, one-phase connections have been installed too. From the point of view of today, this has not been very sensible.

Standardised LV house connection get 63 A fuses. This is limiting the maximum power being taken from the network. The customer has to pay a connection price of about thousand Euro. In the house, the different circuits are normally protected with 16 A fuses.

Network load has to be controlled to detect or to prevent not acceptable overloading. By ripple control systems the load curve can be influenced. Load curve and the peak load can be calculated by annual kWh consumption.

Planning has to consider load increase. The coincidence factor from *household - LV line - transformer station - MV line - substation* has to be considered.

If bottlenecks are expected, network extension measures have to be initiated early enough. The realisation of short term measures has to consider the medium term foreseen measures. Feed back can influence the medium planning targets.

Attention: the peak load of some customers have to be considered separately. The time constant of cables and other equipment in the current circuit has to be checked whether it is able to withstand additional thermal stress. Electricity consumers behaviour should be analysed. (e.g.: running water heater without tank; 24 kW or more)

MV customers order the peak power; transformer and fuses are limiting devices. Peak load is measured; customers pay for peak load (kW) and energy (kWh). Load management considered as task of the planning. Connecting cables have to be installed, the supervision of the new customer transformer station has to be integrated into the SCC and meter reading system.

In the "new world" of electricity supply the price is a question of competition. The local utility has to accept the transmission of electricity through the own network: it can claim a fee for this service.

Consumption Management

In LV networks

- households get 63 A fuses for the house connection; this is no power limitation in reality.
- customers pay only an “energy price (€/kWh)” and for metering
- house owners can order a new house connection by internet; normally the installation master, who has a license, transmits the order to the utility
- calculating the load curve as preventive measure to avoid overloading of lines

In MV networks

- customers pay for an definite amount of power (power price)
- transformer station is paid by the customer
- load flow has preventively to be checked
- installation of current limiting relays in case of only small free capacity in the network
- limited power supply in case of an outage via a second line connection; a current limiting relay is obligatory.
- double measured energy
- utility owned devices are sealed
- active and reactive power peak is daily measured; monthly peak is relevant

Consumption control by prepaid meters.

Load shedding is only foreseen in emergency cases, but this is prepared on the central computer.

Meter reading is done by staff, by the customer himself, by internet or by telephone and other communication possibilities.

Annual energy consumption is the base for load curve calculation in meshed LV networks. By this method a good supervision without extensive measuring work is possible and experienced. Only some representative measuring have to be done to actualise the comparable specific data base.

Tariffs

Normal **LV** households have to be supplied by homogeneous tariffs for each utility, that are p
Additionally for the meter and the reading a separate fee has to be paid.

Trade and commerce, small industry and household customers with higher energy need (heating) from the LV network have special tariffs.

Customers, being supplied from the **MV** network, have special prices:

a power price, depending on the peak load and an energy price.

The prices are different if the customer normally would be supplied from the MV network - needed power > 120 kW - however they are connected to the LV network by direct lines to the public transformer station to save costs for the customer owned transformer station. The prices for this group of customers is nearly uniform in the utility; exceptions are the very big industrial customers. Their energy price is a question of negotiation.

Special technical connecting conditions give the orientation for the correct installations.

Meters

Because of its economical importance, meters have to be calibrated at a definite procedure. This belongs to the sovereign tasks.

The accepted tolerances of meters are very small; it depends of the energy quantity which class of accuracy is chosen.

After 16 years in the network a sampling test of each charge of meters has to be made. If tolerance rates are positive, they can stay additional 16 years in the network. If the results are negative, the meters have to be calibrated or replaced by new ones.

There are used a lot of different types of meters: one phase, three phase, two tariff meters, peak load meters,

Time dependent two tariff meters are switched over by a ripple control system. The receiver is electrically connected with the meter.

Load curves can be influenced by ripple control commands, e.g. by load shedding in an emergency situation. Switching on and off of street lighting or other special tasks are solved by the ripple control system too.

Modern meters are equipped with electrical and optical (infra red) interfaces. These allow the reading by handhold computers or the tele-reading by telephone.

Tele-reading of the meters by telephone is done for industrial and other big customers. During night time the utility calls the meter and the stored data are transmitted via a modem and the normal telephone line to the registration computer of the utility.

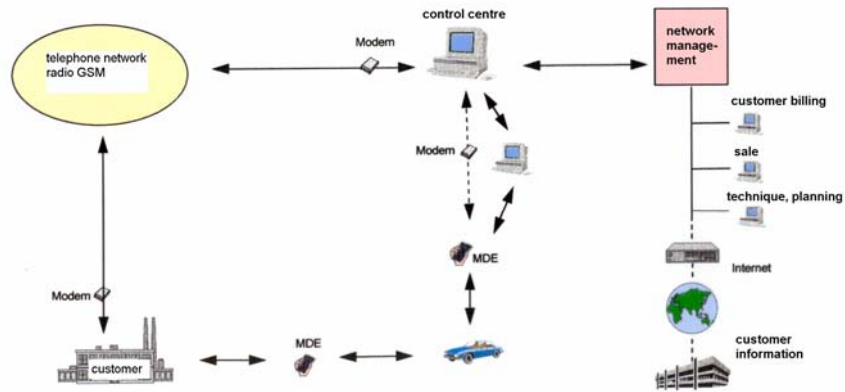
More modern is tele-reading of meters by GSM (Handy-technique). It works in the same way that during night e.g. the meter is called via GSM and the meter data are transmitted to the utility computer by radio.

In the future, meters will be connected to the internet. The customer can use his equipment considering the actual energy prices.

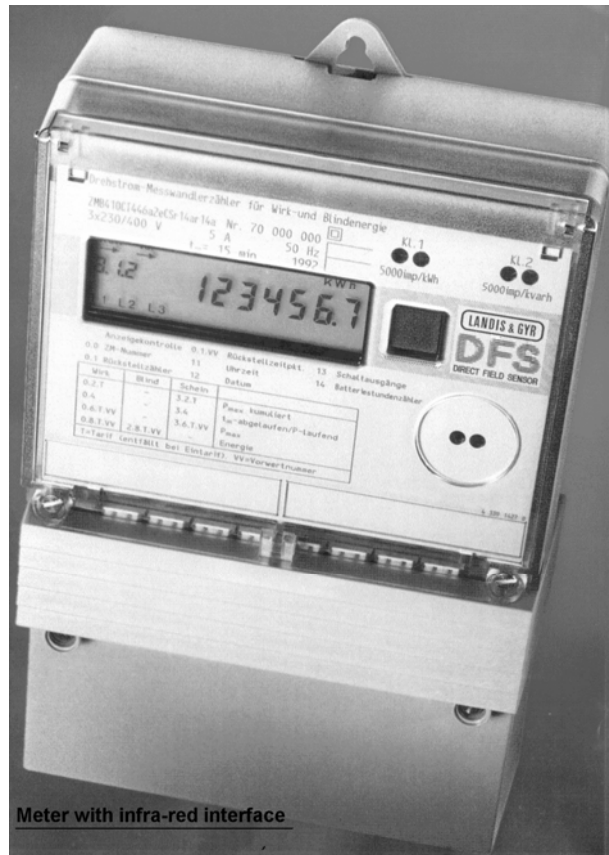
In the future, meters will be connected to the internet. The customer than can look for the cost optimum use of his electrical equipment.



System overview: telereading of meters



Once a year households receive a post card with a back card to write down the meter data. This value is logically checked by a computer program and from this the final annual bill is drawn up. The monthly bills for the part payment for the next year are derived from this value too.



If the consumption vary out of normal tolerances, the meter is checked by staff.

Manipulation of meters are relatively rare; estimated roughly about 0,1 %. There are some typical methods

- the turning disk is slowed down by a thin wire or a hair through a very small drilled whole
- energy is set aside by connections before the meter.
- the meter is destroyed and this is indicated very late; consumption will be estimated.
- by induction under HV lines and injected in the own house installation
- laws allow to punish such clients

- * customers, leaving rented houses without paying the bill; restaurants, small shops,
- * Customers living from social aid; bill will be paid at least from the local authority
- * If customers don't pay the bill, after having been warned the household is disconnected. As soon as the bill is paid, the client has to pay an additional fee for re-connecting the household again. The timing and the allowed amount of the charge for reconnecting are confirmed by legal decisions.