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# SMART METRES AND SMART GRIDS



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## SMART METRES

Smart metres are modern metres, which are usually used for electricity monitoring but they can also be used for gas, water and heat. In this brochure we will concentrate on metres for electricity though as more and more households will be equipped with these devices in the coming years. In contrast to old metres (also called Ferraris-metres), smart metres count your consumption digitally. Smart metres display the current consumption and they can be read remotely as well. This feature enables you or your provider to save and display the history of your energy consumption and the associated costs. The idea behind smart metres is to make your electricity consumption more transparent.



**Fig. 1.** Traditional Ferraris metre  
Image: © Gerd Altmann | PIXELIO

The functionality of smart metres depends on the individual device and on the electricity provider, but they all share some general features. Thanks to the fact that they provide digital data, they offer the possibility to track your energy consumption down to a minute. Some devices just show your current consumption on a display. Other devices and providers offer the possibility to follow your energy consumption on the internet. For this purpose they constantly send the information through the internet to your electricity provider who is collecting and preparing the data for you. Smart metres connect your electricity consumption to your spending for electricity. At the moment, electricity prices are the same throughout the day, but this will change in the future. Electricity will be more expensive in peak-hours and less expensive during the off-peak hours, e.g. at night. Consequently the amount of energy that you use will be directly multiplied with the currently valid tariff and you will see how much you are spending at the very moment.



**Fig. 2.** Modern smart metre  
Source: EVB Energie AG (Wikipedia)

Smart metres allow you to adjust your consumption behaviour more than before and save energy and money. It was shown in pilot projects that this is really the case: Private households where equipped with smart metres and noticeable energy savings were realised in comparison to the time before.

Smart metres offer a range of functions that makes it easier to steer our individual energy consumption. Constant monitoring of the current consumption allows us to see if there is a device with high consumption switch on. It is also possible to notice if the electricity consumption suddenly drops. This could for example be the case if a household appliance that constantly works is broken.

With more flexible tariffing systems, the electricity price will be determined by the demand during the day. It will be cheaper in off-peak times and more expensive when the demand is higher. Smart metres are crucial for offering such flexible tariffs. An old fashioned Ferraris meter is not able to record the consumption by time. For the customer this would also mean receiving monthly bills instead of having pre-payments each months and a final annual energy bill.

The smart metre has not only benefits for the customer but also for the electricity provider. He is able to detect manipulation easier and can cut off the electricity supply remotely if bills are not paid. In case of a problem with electricity supply or a power blackout, certain consumers can be switched off thanks to smart metres. This can prevent at least some damage. Last but not least, the provider or grid operator receives more detailed and accurate data, which makes it easier for him to plan the network expansion or maintenance.

## CONCERNS ABOUT SMART METRES

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Smart metres are also associated with some disadvantages which should be mentioned here as well. The smart metre – in contrast to the old Ferraris metre – is consuming energy itself while measuring and sending data. Additionally some devices need a steady internet connection to transmit the data to the server where the data are collected and stored. Also this constant internet connection requires energy.

When consumption data are transmitted through the internet and stored somewhere, they can be theoretically a target of hackers. The daily energy profile that is recorded through a smart metre tells quite a lot about the individual habits of the person owning the smart metre, e.g. when where electric devices switch on in the morning or if was someone at home during the day. Given the amount of information about our private life that many people already share through phone calls, text messages or social networks, data from smart metres might be of less importance. Nonetheless it is still an issue of which you should be aware.

## FROM SMART METRES TO SMART GRIDS

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In the future our electricity grid will transform from our inert distribution system into a more flexible grid that is able to react better to supply and demand. Most electricity grids work today with a certain number of base load power plants that generate a steady amount of energy, either from water, coal or from nuclear energy. These base load power plants can react to changes in demand only very slowly. Gas and hard coal power plants can be regulated more quickly and serve as mid-load and peak-load power stations, i.e. when the demand increases suddenly. Grids in European countries are centralised, which means that only few power stations serve the whole grid. With a rising number of facilities which generate electricity from renewable energies, the number of feeders to the grid increases. Wind

parks, local co-generation, solar installations or bio mass incineration are spread throughout the entire country making energy generation more and more decentralised.



**Fig. 3.** In centralised grids energy is transmitted through long power lines from few power plants. | Image: © berlin-pics | PIXELIO

Our current electricity grids will become smart grids when the control mechanisms are able to adjust the supply to the demand and thus preventing unnecessary energy generation. In times of high demand additional facilities will be put into operation, serving the peak times. Changing electricity prices during the day – due to the changing demand – can be directly coupled to the electricity consumption in your home via smart metres. In some cases this will really pay-off also for the consumer. Charging your mobile at night or doing your laundry late evening will decrease your energy costs in the future. Smart household devices might be able to automatically switch off during peak-times. Modern refrigerators for examples are so well insulated,

that they could be easily without electricity for some hours without significantly warming up on the inside.

## WHAT DOES THAT ALL MEAN FOR THE CONSUMER?

We will certainly have a bigger influence on our electricity consumption than today. When we shift our energy production to wind and sun and other renewables and decrease our dependency on fossil fuels and our carbon footprint, we need more flexibility on the demand side. Smart metres and smart devices will guarantee such flexibility and allow us to use devices in times where electricity is cheaper. While this might appear inconvenient to some people at first, it will be just a matter of getting used to the “new system”.



**Fig. 4.** In smart grids a lot of local electricity producers feed into the grid, e.g. with the help of wind turbines. | Image: © Frank Raadel | PIXELIO

For your notes

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