

Smart Electricity Meters and Privacy

Close-to-practice Smart Metering Concept Measures Electricity Flows, but Does not Allow Any Conclusions to Be Drawn with Respect to the Habits of Users

Smart meters supply information about the electricity consumption of a household in a quick and detailed manner. However, these data might also reveal how many inhabitants a household has, when they are at home, and which devices they possess. According to the doctoral thesis of the computer scientist Sören Finster of Karlsruhe Institute of Technology (KIT), using the advantages of smart metering and maintaining privacy require a small expenditure only. For this purpose, the measurement data of several households are combined.

Power grids are gaining complexity. An increasing energy share is produced by wind turbines and photovoltaic systems, cogeneration units, and biogas facilities that are distributed over the complete power grid. "Coordination of this multitude of decentralized power producers is a big challenge," says KIT computer scientist Dr. Sören Finster. He thinks that smart metering is an important tool to manage this challenge. Smart electricity meters transmit data on current electricity consumption via the internet, for instance. In this way, utility companies are informed rapidly about when which amount of electricity is needed and they can adapt their production accordingly. As a source of information in a smart power grid, smart meters are very useful for supply security and energy efficiency.

Regular read-out provides a detailed overview of electricity consumption, but also insights into the everyday life of a household. Conclusions may be drawn with respect to private circumstances. "When using smart metering for the implementation of the smart grid, protection of privacy is indispensable," Finster emphasizes. This above all implies protection against unauthorized access of the measured data. "If my power consumption allows the conclusion to be drawn that I do not have any air-conditioning system and I receive a lot of advertising material, no damage is done to me, but I have the uncomfortable feeling of being watched," the scientist says. Moreover, by unauthorized access to the data collected, third parties may obtain information about when certain inhabitants are away from home or when certain devices are operated.

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Finster's doctoral thesis "Protokolle für privatsphärengerechtes Smart Metering" (Protocols for privacy-compliant smart metering) describes how data can be transmitted and used without allowing conclusions to be drawn with respect to private habits. The thesis was written at the Chair of Professor Martina Zitterbart of the KIT Institute of Telematics. Finster designed special communication protocols, by means of which the data can be concealed before they are sent and the measured values are summarized over several households and shifted in the figure space. Randomly generated masking data that do not contain any information about the measurement value are used to disguise the measured data. "By means of these pre-processed measurement values, the data can be transmitted with privacy being ensured," Finster says. The recipient can no longer draw any conclusions with respect to the original measurement data. Still, the sum of the values transmitted corresponds to the sum of the measured values. "They supply valuable information about the current consumption situation, but do no longer put the privacy of individual households at risk," the scientist emphasizes. Finster proves that the idea of peer-to-peer privacy protection by bundling data of several households without any additional infrastructure can be applied in reality with a small expenditure only. The processes used require little computing power of the smart meters and, hence, are associated with a small electricity consumption and low production costs.

According to the KIT scientist, utility companies and manufacturers of smart meters are already interested in the software solution in order to meet their customers' potential needs for confidentiality-compliant smart metering. By 2020, the number of smart electricity meters installed worldwide is expected to total 800 million.

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