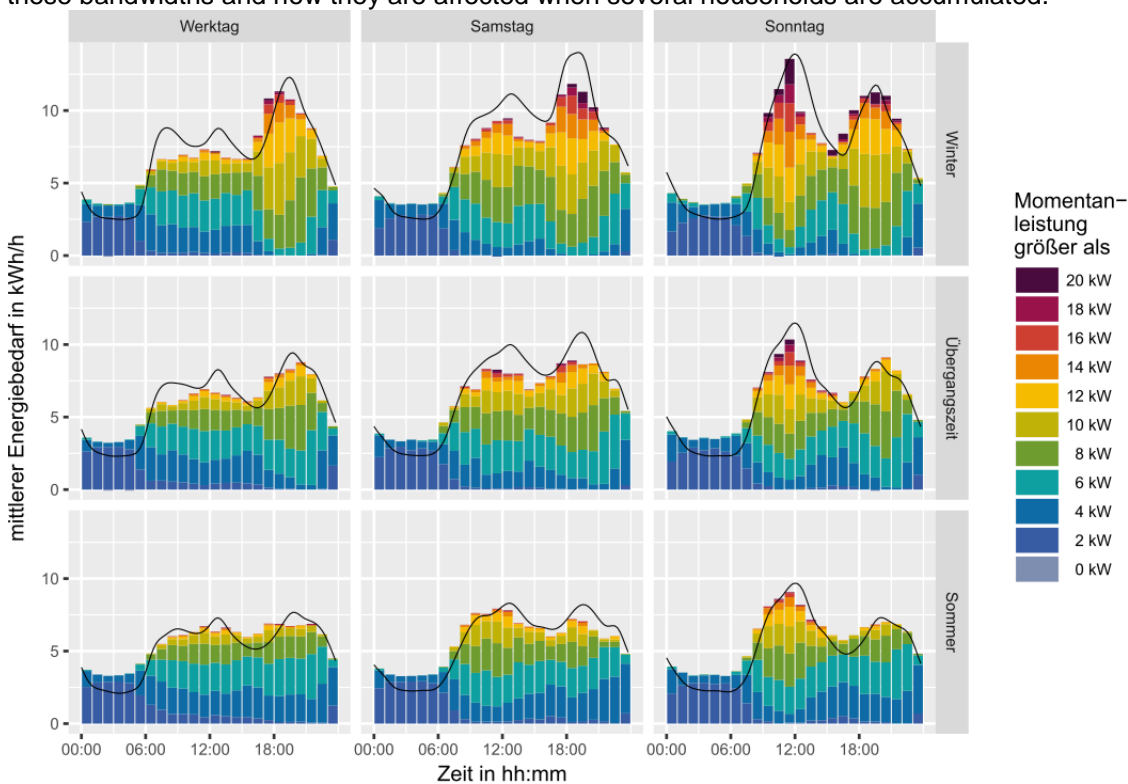


SE-24.4 Comparing residential power demand with standard load profiles (S)

C. Stegner¹, P. Luchscheider¹

¹ZAE Bayern, Hof

Standard load profiles (SLPs) are still state of the art for the classification of residential power demand, despite having been introduced several decades ago. And they robustly fulfil their purpose, i. e., helping to balance power generation and consumption, when they are used to forecast consumer behaviour on large scales which is then matched through the schedules of big, centralised power plants. But it is the prospect of a future power system based on highly volatile and decentral, renewable energy sources (RES) that is pushing SLPs to their limit. Modern applications require smaller scales and additional information, like the level of fluctuation inside a grid. In the research project “Smart Grid Solar” a thorough measurement of power (voltage, current, phase angle) in 15 seconds interval was conducted in 18 households of a rural village [1]. This corresponds to a temporal resolution that is 60 times higher than SLPs. The village has a high penetration of photovoltaics. Within the measured households, the ratio of annual energy generation to consumption is roughly 3 : 1 [2]. The values for both directions were metered separately in the months 01/2015 to 08/2016 and using a local persistence, the measurement loss was reduced to about 2 %. In the proposed paper, we apply the categories for days as used in SLPs. They consist of the two variables *type* (working day, Saturday or Sunday/holiday) and *season* (winter, interim or summer) resulting in nine different day classes. The classification of the measured load profiles is done according to these days by calculating average energy consumptions per hour as well as weighted power histograms. The latter displays some peculiar characteristics with regard to frequent power values while the hourly averages allow for a comparison with SLPs. The results show that individual households deviate strongly from SLPs. If the same analysis is done with the accumulated loads of all households a great consistency with SLPs is already visible despite the low number of units (= 17, one household was discarded), which is shown in the figure below. Important information that hourly averages or the 15 minute values of SLPs do not contain is the fluctuation within that interval. With the metered data we give insight on these bandwidths and how they are affected when several households are accumulated.



[1] C. Stegner, et al., Wirtschaftlichkeitsbetrachtung von Haushaltsspeichern und realdatengestützte Untersuchung des elektrischen Eigenverbrauchs von PV-Strom, in Nachhaltige Energieversorgung und Integration von Speichern, D. Schulz, Wiesbaden, 2015, ISBN 978-3-658-10957-8.

[2] C. Stegner, et al., Solving the Community Storage Dilemma – Higher Utilization by Multiple Usage, 6th SIW in Vienna, Austria: proceedings, Darmstadt, 2016, ISBN 978-3-9816549-3-6.