The Value of IS-Enabled Flexibility in Electricity Consumption

Gilbert Fridgen, University of Bayreuth

Abstract:

As the transition to renewable energy sources progresses, integration of such sources makes electricity production fluctuate increasingly. To contribute to power grid stability, electric utilities must balance volatile supply through shifting demand. This measure of demand side management creates flexibility, which is enabled as the integration of information systems (IS) in the power grid grows. The option to shift electric loads to times of lower demand or higher supply bears an economic value. In the case of electric vehicles drivers might simply provide information about the start of the next trip to the energy supplier, who can then derive the value and optimize the charging strategy for all drivers based on this information. The presenter will describe two approaches on how to quantify this economic potential: 1) By using a quantitative model and a multi-agent simulation for evaluation, we analyze original data from Germany to conclude that advanced metering can enable significant savings on the level of a whole economy. 2) Following a design science research approach, we furthermore illustrate how to quantify this value in order to support decisions on short-term consumer compensation using real options theory. Following the artifact's evaluation based on historical spot price data from the electricity exchange EPEX SPOT, we find that real options analysis is well suited for quantifying IS-enabled flexibility in electricity consumption.