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# RETAIL MARKET INTEGRATION OF RESIDENTIAL ENERGY RESOURCES

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The integration and application of distributed energy resources (DERs) will impact all actors operating in the electricity infrastructure. DERs comprise three concepts: distributed power generation (DG), distributed electricity storage and electrical load response.
Liberalisation of the electricity sector, environmental concerns and technology development have paved the way for innovative ways of producing and supplying power with DERs at the distributed, retail, level. Furthermore, the expected introduction of intelligent metering and novel ICT arrangements at the distribution level enable smarter power systems, smart grids and active network management. Instead of a 'fit & forget' approach towards DG, 'connect & contribute' control strategies are enabled, creating value webs instead of value chains. Residential customers thereby become so-called energy 'prosumers'.

In our research we focus on the relation and cooperation between households and aggregating bodies (e.g. energy suppliers) in fulfilling domestic energy needs and executing market activities when DERs are applied at the residential level. Residential DERs can provide more benefit to households and external parties when employed in an aggregated way. This paper provides a detailed conceptual model of the system under study (previously published in a simpler form in Houwing et al. (2006)) and gives an overview of possible business models that can be adopted between households and an aggregator. Further, hypothesized operational impacts for clusters of households and aggregators are presented. Impacts for the distribution system operator (DSO), who is also involved in the retail business, are briefly discussed, but the DSO has a more passive role in our research. Impacts on actors are, for example, changing revenues and imbalance volumes for aggregators and different CO2 emisson levels from domestic-level power production.

Selected business models can subsequently be implemented as cases in simulation models to quantify the expected impacts for the actors under these different business arrangements. Business models could focus on stand-alone operation of DERs (with local intelligent control), or more on microgrid and virtual power plant concepts. Our first stand-alone case is described in Houwing and Bouwmans (2006).
We show the modelling space we envisage when modelling our cases. The cases dealt with in our research are presented as well as the way in which they cover this modelling space. The outcomes of interest from the simulations -the impacts on actors- (see Fig.1) can be observed and compared between cases. Fig. 1 shows these outcomes together with the instrument variables and external factors working on the system and the system's internal variables.