Study Committee D2

JWG D2/C6.47

Advanced Consumer-Side Energy-Resource Management Systems

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Motivation

- Technological maturity and pace of adoption of Distributed Energy Resources (DER), such as renewable and other distributed generation, energy storage and managed demand of consumers (including V2G potential) have outlined new:
  - potential to solve some inherent inefficiencies of traditional power system architecture
  - challenges for maintaining reliability and stability of power systems as well as for their economical viability

DER'S POTENTIAL TO SOLVE EXISTING PROBLEMS

- necessity for costly peak generation and increased amount of spinning reserves
- need to maintain excessive capacity of electrical grids
- retail consumers acceptance of any (high) energy prices dictated by generators
- limitations to receive additional income from participation in ancillary services markets for consumers
- …

NEW CHALLENGES OF MASSIVE DER ADOPTION

- rise of unpredictable power/frequency fluctuations due to renewable or other non-dispatchable generation
- potential income declines for network companies and owners of reserve fuel generation - motivation to uncontrolled reduction of the system capacity reserve
- expected strong increase of loads and their variations due to massive EV introduction
- additional investments for protection modernization in distribution networks
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- To a large extent new challenges can be faced by solving the technical complexity of managing a large number of DERs and by deploying new tools on the consumer-side that would allow DER owners to provide a flexible set of energy services. Recent advances in wireless telecommunications, Industrial Internet of Things, Blockchain and other new information and communication technologies (ICT), as well as methodology and experience gathered e.g. in Transactive Energy (TE) pilot projects, provide a potential platform to deal with massive DER control.
- Thus new ICT can ease the way for evolutionary and controlled transition to new resilient and sustainable power systems.

Approach

- Analyze major DER types and their most frequent mixes for specified world regions
- Analyze risks of uncontrolled DER deployment and benefits of coordinated DER usage both for consumers and EPUs
- Evaluate a list of potential business cases for existing and new ICT solutions and their applicability for representative set of countries
- Analyze current state of new ICT applicable for coordinated or shared control of multiple DER and international experience in deployment of these technologies
- Define the most important interactions between control systems of EPU, generation or load aggregator and consumer, which need to be foreseen to keep reliability of supply and stability of a power system

Objects of investigation

- Advanced systems and technologies for managing energy resources on the consumer side in coordination with EPUs control and management systems

Conclusion

- Development of guidelines for selection and use of ICT for various business cases involving EPUs, aggregators and consumers is proposed