## **TECHNOLOGY OFFER**

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# Secure architecture for smart grid operation

Distributed generation, volatile renewable energy, market attendance, data privacy and cyber security are serious challenges to the hierarchical operation of a power system. A decentralized overall model of power systems (Ilo, A., Energy supply chain net, 2013) created the fundament of the novel architecture. Three major components are designed: "Link", "Producer\_Complex" and "Storage\_Complex". Their interfaces are defined for all power system posturing processes like load-generation balance, n-1 security, demand response (Fig.1). The generic, base element is the "Link". Being a standardized structure, defined by secondary control, the Link can be applied to any partition of the power grid, as a subset of a high, a medium or low voltage grid part, or simply a customer power plant.

## **TECHNOLOGY**

The technical-functional model for the operation of a decentralized smart grid comprises:

- Links are grid parts defined by secondary control area and operating independently
- Links have contractual arrangements with other Links and are communicating through well-defined interfaces, minimizing the number of data to be exchanged

## **ADVANTAGES**

- Security and privacy of data inside the Link
- Low IT costs and enhanced cyber security by minimizing data exchange
- All power system posturing processes (the (n-1) security, the active power balance, angular and voltage stability calculation, demand response, etc.) can be performed for each link

#### MVSO A LVSO-A HVSO Customer -Link LV\_Link O.HMU-123 MV\_Link\_1 -2% new set p an be reached by using CVR. No other actions appro LVSO-B are necessary HV\_Link ۰۵.4% new set poin One line i 0.4 % demand reduction approv by switching off cooling system. No other actions are necessary overloaded It is required 2% and LV\_Link\_1 0.4 % demand reduction reduction in points AF can not be realised and BH respectively approve 4 HM U-945 actions are necessary MV\_Link\_2 Only 5.4% demand LV\_Link\_2 reduction can be reached by using CVR. Other actions are necessary B2<sup>M</sup> oved and reduction A2 -Link can not be realised within the link. Other actions are necessary HMU-1001 B2 Customer

Fig. 1: Demand response process: line overload on high voltage grid

## **KEYWORDS:**

- Decentralized smart grid
- Cyber security
- Load generation balance
- n-1 security
- Demand response

#### IPR:

Patent pending

### **OPTIONS:**

- License agreement
- Pilot projects
- R&D cooperation

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