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Decentralized ICT for integrated energy system operation

Dr. Rolf Apel
Siemens AG

Abstract

Traditional network control systems for electrical grids are based on a centralized architecture pattern. Remote terminal units are collecting the information at the substation level and could send out commands to the controlled actuators in the grid. But the major decision logic for the grid control was implemented in the control center system. Only safety critical functionality, like equipment protection or switching interlocking is implemented on substation level.

With Smart Grid and especially the ongoing trend to decentralized energy production, this centralized approach must be enhanced by decentralized control functions too. Examples for such decentralized control functions are customer energy management systems, voltage control for the low voltage grid, etc. To avoid mutual interferences between these decentralized controls or with the still necessary centralized control, system integration is of paramount importance. After the interconnection of the energy transmission system in the last century, Smart Grid imposes now the integration of the information networks along the complete energy conversion chain even beyond the customer's grid connection point.