

Abstract

a) Five-line summary (**synopsis**) in **English**

iniGrid innovates the way electric energy is brought to end-use equipment by providing innovative sensor and actuator technology for actively managed and fault-protected distribution grids. Essential future functionalities such as dynamic management of line use as well as fault detection and fast service restoration are only possible with appropriate sensors and actuators in place. These sensors and actuators are missing today on the distribution level of a power grid. Radically new semiconductor-based components that will be developed by iniGrid, alongside the necessary IT and secure networking concepts, will address this shortcoming, and are aimed for commercial and grid applications.

b) Summary in **English**

The aim of the iniGrid project is to develop and validate innovative sensor and actuator components for smart distribution grids. As a consequence of the massive integration of renewables, active capacity management in distribution grids will become necessary in order to avoid high investments in grid reinforcements. Management of line use in congestion situations, as well as fault detection and fast service restoration, are only possible with appropriate sensors and actuators in place. Appropriate cost-effective components that provide advanced functionality such as integrated communication capabilities and can be retrofitted with reasonable effort are missing today at the distribution level. The market is beginning to request such devices on low and medium voltage level. iniGrid targets this window of opportunity right now, so that this key technology for smart grids is made in Austria.

Two radically new sensor and actuator developments, along with the necessary information/automation technology, are in the scope of the project. These items will fill the gaps in the required observability of distribution grids for future grid operation: the first key innovative approach of iniGrid is the integration of the power management *and* grid protection functions within one device, called the Smart Breaker. The challenge is to integrate necessary components in a compact device with reasonable costs. These innovative switching devices are located in the energy customer domain (low voltage, mostly commercial/industrial customers) to provide protection functions, power management, measurement services and communication for individual load or generation branches. The second innovation is an air-insulated medium voltage sensor, integrated into post insulators or other insulating structures for retrofit of the significant number of existing air-insulated medium voltage installations. The challenge here is to provide precise data since these isolators have no earthed cover and therefore suffer from parasitic capacitances to geometrically and electrically (switching state) undefined external structures.

The project deals with the individual technology development and the integration of these novel components (as well as existing ones such as smart metering and other sensors) with future-proof and secure automation architecture and protocols. The challenge addressed in the liberalised market environment is how to technically and conceptually network sensors



and actuators in the smart grid for applications ranging from local energy management to virtual power plants, grid voltage control, fault detection and others.

An increasing number of such networked smart grid applications are emerging. Together with the push for PV and other distributed volatile generators into low voltage networks, a strong pressure for innovative and cost-effective sensor and actuator technologies is developing. iniGrid is expected to innovate the way future electric energy is brought to end-use equipment by providing cost-efficient sensor and actuator technology for actively managed distribution grids. System interaction of novel and existing technology is evaluated in the unique AIT SmartEST laboratory, where interoperability, scalability, and integration can be tested in a hardware-in-the-loop setup.