

Smart Energy Router
main power card

Smart Energy Router

Enhanced SST solution for hybrid grids

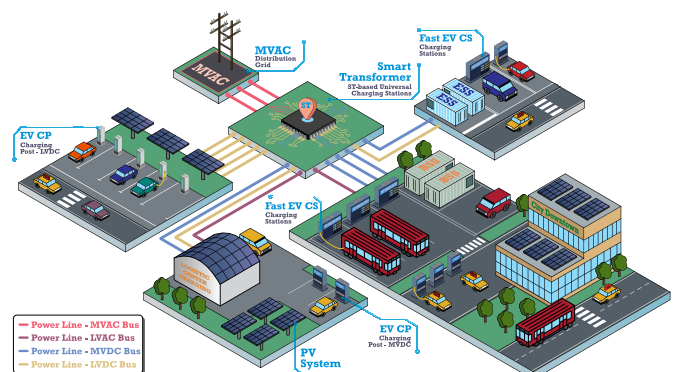
To further drive the transition toward sustainability and efficiency in distribution grids, novel technological solutions that can handle more EV charging stations and decentralized sources of renewable energy are required. These solutions must manage bidirectional power flows, actively adjust to changes in the grid, and be easily reconfigurable with highest performance. This will bring about the innovation needed for modern distribution grids to become smarter, more resilient and better prepared to meet the demands of a rapidly changing energy landscape.

10+ years of accumulated research and development on power-electronics-based systems have provided Fraunhofer ISIT with the capabilities to develop decentralized grid solutions tailored to provide grid services. The Smart Energy Router will become a game changer in hybrid grids by providing:

- Increased flexibility in power flow control
- Enhanced power quality
- Improved grid efficiency
- Reduced maintenance costs

Key features & technical advantages

- High scalability for grid extension
- Enhanced fault-tolerance capability
- Multisource integration: renewable sources (RES) and energy storage
- DC-Transformer feature with voltage control capability
- Enhanced voltage/current controllability for on- and off-grid operation



Smart Energy Router concept

Grid services for hybrid grids

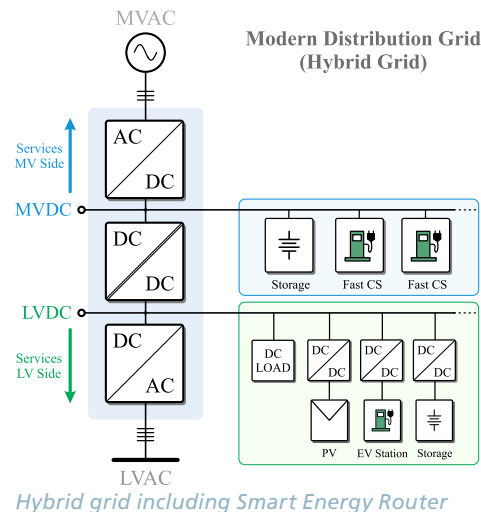
The Smart Energy Router (SER) provides solutions to EV Fast Charging Station integration, as well as the possibility to supply critical MW loads, such as hyperscale data centers. Such systems pose challenges to the grid, which requires support to ensure suitable performance and continuous operation. In this context, SERs feature grid services like reactive power support, MV/LVDC connectivity, and voltage/frequency control.

Offering & technologies developed

- Grid forming for providing virtual inertia
- Control strategies securing the operation in meshed grids
- Multifrequency magnetic coupling for fault-tolerant operation
- Reliability-oriented control
- Design methodology for increasing the efficiency and power density
- Power system level simulation via power-HIL

Multisource integration

Our SER concept offers high connectivity for a convenient Energy Storage Systems (ESS) integration over a wide voltage range. Besides improved charging performance when incorporated into charging stations, ESS can provide essential grid services delivering additional revenue and power system security.



Interested in utilizing our technologies in your hybrid grid?

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More information:



Key feature / main capabilities and ancillary services

Capability	MVAC	MVDC	LVDC	LVAC
Direct grid connection	Direct to MVAC	DC transmission	LV microgrid	AC distribution grid
Integration of RES/ESS/EV	Large PV systems	MW load supply Fast EV charging	PV system, low power charging	kW load supply EV charging points
Grid support/ ancillary service	Reactive power	HVDC interface ESS integration	ESS integration (Battery, fuel cell)	Optional grid connection