

Off-Grid Converges toward a Constraint-Optimal Solution — Comparing Microgrids and Smart Grids by Control Architecture

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Summary

Microgrids, smart grids, and off-grid systems are compared through five axes: control point, synchronization, external dependency, failure scope, and operation. Microgrids are strong at area-level coordination, smart grids at measurement and information linkage, and off-grid systems at local autonomy. As site constraints become more demanding, the value of placing the control point close to the field and retaining local judgment and asynchronous operation increases. Kei Communication Technology Inc. has developed this approach through a cycle of observation, verification, implementation, operation, and redesign since its smart-meter work began in 2010.

Key Points

- Microgrids, smart grids, and off-grid systems provide different strengths. A microgrid coordinates an area, a smart grid links measurement, communications, and control, and off-grid places the control point close to the field so local decisions can be made. Using five axes—control point, synchronization, external dependency, failure scope, and operation—designers can decide which functions should be held at which scale. As constraints become clearer, the architecture tends to move toward local judgment and staged recovery while preserving essential functions.
- Background on Kei Communication Technology Inc. implementation of measurement, communications, and control through smart meters since 2010.
- Patent record related to Kei Communication Technology Inc. smart-meter technology.
- An implemented example of the transition from observation and control toward autonomous, distributed power.
- Primary data used to examine time-distributed demand, operating response, and control architecture.

Sources / References

Publisher-product-information

Smart Meter product information

URL: <https://www.ieee802.co.jp/smartmeter/>

Patent-record

US Patent 8,701,209 B2

URL: <https://patents.google.com/patent/US8701209B2/en>

Publisher-product-information

Personal Energy® product information

URL: <https://www.ieee802.co.jp/ppower-bbank/>

Publisher-primary-data

Primary measurement and operating data held by Kei Communication Technology Inc.

Source Article

<https://www.ieee802.co.jp/articles/article-102-offgrid-en.php>

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