

Keeping Emergency Communications Online During Power Outages and Road Closures: Off-Grid Power for a Disaster Radio Relay Station in Itsuki Village, Kumamoto

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Overview

For the digitalization of the municipal disaster-prevention radio broadcast system in Itsuki Village, Kuma District, Kumamoto Prefecture, an integrated off-grid power system was designed for mountainous, unmanned operation under road-closure and blackout conditions: 11.1kW solar generation, a 19.2kWh olivine lithium iron phosphate battery, rated 6kW AC output from hot-swappable inverters, remote monitoring, and protection devices. After installation on June 20, 2020, communications remained operational when the maintenance road was cut by a landslide during the July 2020 heavy rains. This is an implementation case of Personal Energy, an autonomous distributed off-grid power system.

Case Answer

Build autonomous power infrastructure where no power infrastructure exists = off-grid

For critical infrastructure in mountainous areas and remote islands, a stable power supply is a prerequisite for keeping essential equipment operating. These locations can become physically isolated from urban areas, and prolonged outages caused by disasters or accidents can stop community functions such as disaster response and communications, creating risks that may directly affect human life.

In mountainous areas, long overhead power lines are vulnerable to fallen trees and landslides. Remote islands may face risks to submarine cables or may operate on isolated grids that are not connected to the mainland. Severe weather and road closures can also make it difficult to transport and replenish fuel for diesel generators.

For disaster-prevention radio relay stations in particular, communications continuity cannot depend on personnel being able to reach the site and restore equipment after roads are cut.

For this project, the relay equipment and HVAC were supplied by an off-grid power system combining solar as the primary source, a 19.2kWh battery, rated 6kW AC output from hot-swappable inverters, JIZAI charge/discharge control, remote monitoring, a SUS304 IP55 outdoor cabinet, and multiple stages of protective devices.

Kei Communication Technology Inc. has registered the configuration in which the power required at a site is generated, stored, converted, and controlled without dependence on existing power infrastructure under the trademark “ O F F \ G R i D ” (Registration No. 5748120).

Immediately after installation was completed on June 20, 2020, the maintenance road was cut by a landslide during the July 2020 Heavy Rain Disaster, confirming in an actual disaster that onsite access could not be assumed.

Scope

- Power supply for critical-infrastructure communications equipment
- Digital disaster-prevention radio relay stations
- Remote islands and isolated areas
- Aviation obstruction lights

Constraints

- No grid power infrastructure is available
- Communications equipment and HVAC must continue operating during power outages and road closures
- Remote monitoring is required because staffed onsite response cannot be assumed

Evidence / References

<https://www.soumu.go.jp/soutsu/kyushu/ru/prevention.html>

URL: <https://www.soumu.go.jp/soutsu/kyushu/ru/prevention.html>

<https://www.ieee802.co.jp/cases/case-003-ituki.php>

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