Pain points of solar microgrid

This document summarises the pain points of solar microgrid. The insights are gathered from a few case studies such as the Blue Lake Rancheria Microgrid, UC San Diego Microgrid, and the Hitachi Energy’s facility.

# 1. Load and supply balance

Due to dynamic loads and supply from the solar pv, improper balancing may cause instability in the microgrid.

## Current solutions

1. Energy storage system (ESS)

Almost all microgrids today use some form of energy storage system to act as a shock absorber that provides the microgrid some flexibility in adjusting to dynamic changes in loads and supplies. Some microgrids that utilises ESS technologies include the Blue Lake Rancheria Microgrid, UC San Diego Microgrid, and the Hitachi Energy’s facility.

Hitachi Energy Facility ESS stablise the power system against fluctuations in frequency and voltage by rapidly absorbing and injecting power.

In 2012, the City of Kodiak was planning to install a 2 MW electric crane at its Pier III to replace the older, less efficient diesel-powered crane. The new electric crane would create destabilizing power fluctuations and undesirable battery cycling, so a new flywheel energy storage system

(FESS) was installed to effectively integrate the crane load onto the KEA grid and provide

frequency and voltage regulation.

1. Microgrid communications and controller

With a good enough controller, a microgrid require less energy storage systems which can be costly in land-scare areas like Singapore. The thermal storage and lithium ion battery system of the UC San Diego Microgrid represent a small fraction of the total microgrid loads, but have been effective at continuously balancing energy supply and demand in daily operations.

# 2. Robustness and resilience

A microgrid needs to be resilient and robust in the presence of faults and outages. A resilient microgrid is able to provide power reliably in the event of a fault.

## 2.1 Current solutions

1. ESS

In Hitachi Energy’s facility, ESS allows solar microgrids to transition to islanding mode more smoothly during outages (Reliable, affordable power with substantial energy savings at an industrial facility, Grid Edge Solutions).

1. Communications and control

In Hitachi Energy’s facility, the microgrid uses a motorised circuit breaker to avoid feeding power back into the grid in the event of an outage or power quality issue

# 3. ESS

ESS itself also poses many challenges such as the fire and chemical hazards that comes with various energy storage technologies which was faced by the project team for the UCSD microgrid.