



## Basefarm Provides Pivotal Role in Frequency Response Market

Eaton supports Basefarm's progressive attitude to mitigate the environmental impact of its data center and installs its UPS and EnergyAware solution to enable a bi-directional relationship with the grid to transmit power

**Location:**

Oslo, Norway

**Segment:**

Data Center

**Challenge:**

Support Norwegian government and Statnett, the Norwegian grid provider, starting with a pilot project to determine if data centers can participate in Frequency Regulation, which will ultimately enable higher penetration of variable renewable energy source in the Nordic power system.

**Solution:**

Eaton upgraded Basefarm's 93PM and Power Xpert 9395P UPSs with EnergyAware solution.

**Results:**

- Fastest activation to rapid drop in grid frequency.
- Independent load available - 1 MW response to reduce grid demand.
- Proven ability of data centers and UPSs to provide grid flexibility and enable greater levels of renewable energy to be used by the grid.

*"As a major consumer of power, we have a responsibility to contribute towards greener energy. We are proud to have played a major role in this pilot, proving that data centers can contribute to a renewables future and can do so using existing UPS systems and with no impact to critical IT"*

*Ferdinand Mailand,  
Lead Architect, Basefarm*

**Background**

Basefarm is a Norwegian data center operator, running two separate facilities in Oslo, Norway. The company is a leading hosting provider for critical business applications, providing technology solutions, cloud services, application management and colocation for a range of clients, including financial and government organizations, amongst others.

Its data centers are modern, secure and designed to be energy efficient and to lower their environmental impact, both of which reduce operating costs, which can be passed onto customers.

Basefarm's data centers deliver 100 percent uptime Service Level Agreements (SLA) on power. This is done using two independent power supplies fed by two independent diesel generators and two independent UPS (uninterruptible power supply) systems.

**Challenge**

Norway is blessed with renewable energy. 98 percent of the country's energy is generated from renewables, with hydropower being the main source of production.

However, to reduce carbon emissions further and move to 100% renewables, the Norwegian government has committed to the Electricity Certificate Act. The pilot began with an aim to establish the technical and legal framework necessary for Frequency and Dynamic Regulation, essentially the buying and selling of capacity from energy consumers and producers to balance the grid.

Statnett, the Norwegian Transmission System Operator (TSO), runs the balancing market, as part of its tasks. To test its suitability to improve frequency stability, Statnett initiated a trial of Fast Frequency Response (FFR) during normal system operations, working with Fortum, a leading energy provider in the Nordic and Baltic countries.

Fortum lead the careful coordination of major energy consumers (aluminum production plant), a fleet of electric vehicles, and hydropower and pump storage. To complete the project team – Fortum partnered with Eaton on the project to nominate and work alongside a data center for this trial.



Powering Business Worldwide

Eaton approached Basefarm to join the project - as the companies had worked together for over a decade. Basefarm has a progressive attitude to mitigating the environmental impact of its data center and it fulfilled the key technical criteria, such as using a modern UPS which would enable a bidirectional relationship with the grid to transmit power.

The goals for the pilot were to prove that a data center UPS would be capable of supporting the grid in Fast Frequency Response, without impacting its primary function in protecting critical loads.

The key requirements were:

- 2 second response time (full activation)
- Activation of response if the Nordic frequency went under 49.6 Hz
- Maximum FFR support duration of 30 seconds
- 15 minutes rest period

### Solution

Eaton upgraded the control firmware of Basefarm's Eaton 93PM and Power Xpert 9395P UPSs with EnergyAware functionality to enable it to participate in the frequency regulation market

The simple software-only upgrades were carried out via

a site visit from Eaton and no changes were required to the UPS hardware or batteries.

As a result, Basefarm was able to participate in the pilot and instantly reduce the power demand of its data centers in the event of any large disruption occurred in the Nordic power system.

In the Statnett pilot, the activation threshold for reserves to come online was set to 49.6Hz, varying from the normal 50 Hz frequency of the grid. Fast Frequency Response had to provide a full response within two seconds, for a maximum duration of 30 seconds.

The UPSs were programmed to have an activation frequency of 49.65 Hz and to provide full response at 49.60 Hz, resulting in a slight ramp to prevent rapid and high oscillations of power in the local electrical system.

### Results

During the four-week pilot, the UPSs were truly put to the test after two consecutive power plant failures, 13 hours apart, that caused a sudden loss of over 800 MW of capacity and a rapid drop in system frequency.

During the first event the UPS systems measured the grid frequency to be as low as 49.57 Hz, and during the second event the lowest measured frequency value was

49.61 Hz. Steadily lowering the frequency down below the standard of 50 Hz.

Basefarm played a pivotal role in the pilot: the data center reserves were the quickest to activate, providing the desired power impact in far less than the required two seconds, and faster than other reserves connected to the grid, such as pumps, industrial consumption and electric vehicles. A winning and dynamic collaboration was achieved with the split-second action of the UPSs and Basefarm's rapid response in stabilizing the grid - this was a true sign of success.

The UPSs provided approximately 1 MW in response with below 400 kW load thanks to the capabilities of their bi-directional converters. While the pilot project was not operating in true financial market conditions, a data center could potentially earn €50,000 per MW of power allocated to grid support per year, depending on the local market.

Kristin Munthe, Director of System and Market Development in Statnett, said, "The Pilot project was very useful, especially considering the real-world scenario of a power plant failure. It shows that power consumers can contribute flexibility in the system, making the use of renewable power more robust."

Ferdinand Mailand at Basefarm data center explains, "As a major consumer of power, we have a responsibility to contribute towards greener energy. We are proud to have played a major role in this pilot, proving that data centers can contribute to a renewables future and can do so using existing UPS systems and with no impact to critical IT"

### Summary

The pilot is proof that a data center is well suited to provide FFR response. In real world tests, the UPSs are found to be a viable and fast-acting means of power reserve to balance power grids and without impact to the UPS's primary function of securing data center loads.

Following the conclusion of a successful pilot, Basefarm have been fully active since the 2020 season began (typically May - October); participating with 800kW capacity to the FFR market. This has equated to EUR16K/MW for the 2020 season with approximately 2000h procured. Basefarm is on track to receive EUR6.5K in additional revenue after deducting Fortum's share.

Not only is the additional revenue a benefit but participating in FFR will improve their CO<sup>2</sup> footprint as it's an alternative for curtailing CO<sup>2</sup> free production in the power system.



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