Short-term discharge energy storage

Dedicated website – No

Organisation webpage – Yes

Centralised portal – ENA Smarter Networks

Objectives/Success Criteria – Yes

Closedown/final report – Yes

Open-source data – No

Peer-reviewed academic output (Primary Subject / Referenced) - 9 / 0

Brochures/Case Studies/Videos – No

On-line major conference/event presentations - 0

Dissemination Event / Output available – 0 / 0

Follow-on project – No

Consumer Engagement

Consumer Participation – No

Consumer Feedback – No

Output Summary

Progress reports – No

Detailed and objective final report – Yes

Project method detailed – Yes

Performance to objectives detailed – Yes

Lessons learned identified – Yes

Policy/Regulation implications reviewed – No

Outcomes vs. Objectives/Targets

Performance to objectives – All achieved

Key Findings

- **Readiness**: Energy storage is a technically viable smart solution that can operate autonomously.
- **Network location**: Locating the energy storage between two feeders can increase flexibility and utilisation assuming they have complimentary characteristics.
- **Voltage management**: Although both real and reactive power have an impact on the voltage, reactive power has been confirmed as the most effective way to manage voltage.
- **Capacity management**: To manage capacity issues due to thermal constraints, real power exchange is needed. Storage can deliver this capacity but its effectiveness is dependent on the demand profile.
- **Increasing generation output**: Using the Normal Open Point to charge and discharge the ESS allowed up to 50% of energy that would otherwise be curtailed to be exported. An isolated ESS would require a substantial capacity to have much effect in this situation.

Substantial energy storage capacity is required to increase the energy output of a constrained embedded generator without spilling energy if no further control actions such as curtailment or network switching are available.

- **Round trip efficiency**: The auxiliary power consumption and the operating regime of the energy storage have a significant impact on total round trip efficiency; whole life costing is needed to assess the financial relationship between round trip efficiency and benefits achieved. Optimisation of auxiliary support systems could reduce power consumption in future installations.
- **Remote network measurements**: Operating a GPRS/ADSL Ethernet based measurement and control system has shown good general availability, but suffers some data dropouts that would need to be accounted for in an enduring solution.
- **System reliability and protection**: Stability of both ESS and communication network proved a major challenge. Over the course of one year, the site experienced one mis-fire from the fire suppression system, three hardware failures and six trips due to the installation of a G59 relay which was installed as an additional protection whilst experience was gained with the ESS's software protection solution. Now that confidence with the ESS has increased, consideration should be given to a more appropriate protection scheme or more suitable protection settings.
- **Battery operation**: Although the capacity of the ESS was 200 kWh, it was recommended to use only 75% of the battery capacity to preserve battery life. Hemsby was therefore mainly operated with a discharge lower threshold of 25%.