



CASE STORY: DC CHARGING +.BATTERY PEAK SHAVING IN WEAK GRIDS

Circle K EV charging station, Norway



INDUSTRY
EV Charging

LOCATION
Ski, Norway

TIMELINE
2022

BACKGROUND

A Circle K petrol station located in the centre of Ski, Norway added a DC charging station for electric vehicles. By choosing a hybrid installation that incorporates a 300 kW battery energy storage system, the station was not only able to utilize its small 64 kW incoming feed, but also to implement peak-shaving to manage costs and guarantee uptime as well as a minimum of 150 kW DC charging capacity for the customer in a way otherwise impossible.



CHALLENGE

A hybrid setup like the one used in Ski is comprised of various technologies including AFE for the battery and a DC rectifier for the charging unit. In this case, the DC rectifier was causing power quality issues, primarily high harmonic distortion. The challenge was to mitigate the influence of both the AFE and the DC rectifier on the grid that may be affecting neighbouring homes or businesses, as well as to comply with the THDi target of <8%.



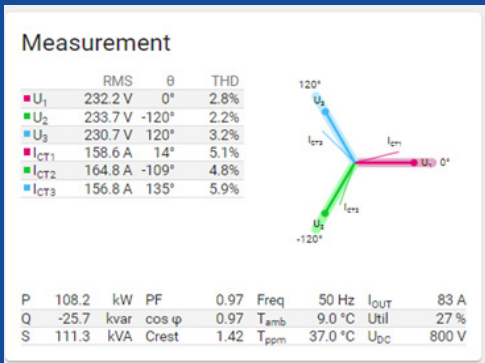
SOLUTION

The future of EV charging will be a small incoming feed combined with a 4-5 times larger backup battery pack for weaker and weaker grids. Uptime requirements will be of essence for the ever-growing EV fleet and drivers demanding fast and efficient charging stations. In order to secure the best results in Ski, we came prepared with various approaches to test. A Comsys ADF P300-300/480 active dynamic filter was installed to mitigate the harmonics and lower the THDi to an acceptable level. Measurements of the AC distortion without the filter showed a THDu level of approximately 15% between the phases and a THDi level of around 82% between the phases, as a baseline for the site. The objective was to lower the THDi value to less than 8%.



RESULT

As a means to optimize the THDi we used the filter's standard CT control option (compensating the load only) and compensated 16 individual even and uneven harmonics. After some fine tuning, we were able to consistently maintain a THDi level of just over 5%. An example of filter measurements done on site are shown below, revealing a good cos phi of 0,97, so no need to do anything there, whilst laying out 83A in total and utilizing 27% of its capacity.



In short, the chosen solution allows DC charging of electric vehicles without disturbing any nearby businesses or homes. The ADF P300-300/480 (300A comp.current at 480V) filter we installed in Ski was a lab filter that we used in order to test and find out appropriate size, and it proved to be oversized. A standard P100-120/480 with IP54 and an external heater in the cabinet to prevent moisture when the filter is not running would be sufficient. This is worth mentioning as hybrid charging stations like the one in Ski, i.e. small power line + large BESS (Battery Energy Storage Systems), may well become the standard as municipalities race to establish more charging stations to handle the growing number of EVs taking to the roads.



Per Ewers, Sales & Business Development Manager



Our installation allowed the customer to comply with local environmental grid codes to prevent interference with nearby homes and businesses. Additionally, the installation of the system is straightforward, scalable and can be performed retroactively as well as in a factory.

