

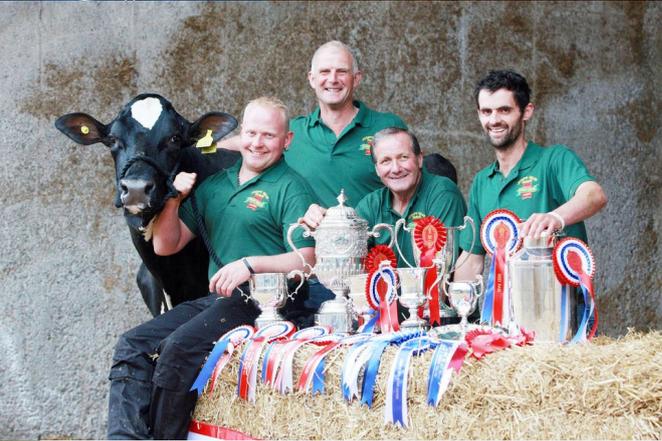


66kV 275kV 33kV 11kV 132kV 400kV

CASE STUDY  
**15940**

# Joseph Heler

## Cheese Factory CHP 11kV



### Joseph Heler Cheese Factory CHP

Powersystems high voltage (HV) power engineering was responsible for the design, installation, testing and commissioning of the electrical infrastructure associated with the construction of the 1.0MW Combined Heat and Power (CHP) Generator Connection at Joseph Heler Cheese Factory Crewe Road, Nantwich, Crewe.

The plant was designed to provide the factory with a more economical alternative supply of electricity, hot water and steam to supplement the systems already in place. The principle of the development and its impact on environmental, social and economic factors was carefully assessed and given the go-ahead.

Joseph Heler Cheese Factory CHP plant is a 1.0MW generation platform that will begin to supply power to the factory in January 2021. The site consists of one 1.0MW generator powered by an MTU 8V4000 GS Engine supplied by 2G Ltd, which is capable of supplying electricity continuously to the factory in parallel to the grid. As a trusted NERS accredited company with over 40 years' experience, Powersystems were appointed to assume the responsibility for the installation of electrical infrastructure.

### Project Facts and Figures:

- ▶ Number of generators: 1
- ▶ Generator capacity: 1.0M
- ▶ Total Installed capacity: 1.0MW
- ▶ Connection Voltage: 11 kV
- ▶ Altitudes of site: 229 ft
- ▶ Length of onsite 11kV cabling: 0.21 km
- ▶ Length of onsite 400V cabling: 0.1 km
- ▶ Length of onsite control & signal cabling: 0.3km
- ▶ Cable containment ladder systems installation 120m
- ▶ Powersystems are a Lloyds registered (NERS) approved independent connection provider (ICP)

### Powersystems partnerships



The site is located on Laurels Farm in Nantwich, Crewe and was constructed in partnership with C.P.M Civil Engineering Ltd and 2G Ltd on behalf of the client, BasePower.

The site connects onto the Joseph Heler Cheese Factory network which is supplied by the factory's private 11 kV network which is a part of Scottish Power Energy Networks (SPEN) larger electricity network. Powersystems have connected countless CHP generator projects to the grid over the years, this project being the ultimate of four CHP projects undertaken this financial year for our client BasePower, which exemplifies our strong and trusting relationship. Our engineers have the much-needed experience of working with every Distribution Network Operator (DNO) across the UK on this type of project, helping customers connect this type of project up and down the country.



**11**  
kV



## CHP development

As UK energy production is changing fast and becoming more expensive, manufacturers who consume large amounts of energy need to find new ways to reduce cost and remain competitive.

The newly installed 1.0MW CHP will allow the end client Joseph Heler to produce their own on-site energy generation at a reduced cost when compared to more conventional sources. This not only helps the manufacturer reduce costs, it also addresses the Governments strategy for a low carbon economy.

CHP technology works by utilising a fuel source to generate electricity, this project utilised a typically used fuel source in natural gas. The electricity produced by the CHP will be utilised by the factory to match the current load consumption at a reduced rate.

The CHP engine will also harness the waste heat produced by the process of generating electricity, this heat will distribute hot water and steam through heating pipework to provide heating and hot water to the factory buildings.

By being able to generate electricity and heat through one fuel source simultaneously, the CHP becomes much more efficient than traditional power generation due to the reduction in wasted energy and has been known to improve energy efficiency by up to 45%.



## Scope of works and major design considerations

The major items of electrical infrastructure that Powersystems designed, supplied, installed, and commissioned were for the design, supply, installation, testing and commissioning of the 11 kV grid connection consisting of:

- ▶ Installation of HV CT's to the site incomer cable box including SAP attendance and a controlled site shutdown
- ▶ Civil works for the client - Included breaking out, trenching, ducting and reinstatement works throughout the factory grounds
- ▶ Civil works for the DNO - Find and expose SPEN existing cables, create two joint bays to allow SPEN to joint onto their existing network. Break out and trenching works from the joint bays to SPEN's new substation
- ▶ Installation of SPEN's supply network cables
- ▶ Installation of the CHP 95mm<sup>2</sup> 3 core 11 kV feeder cable and the new 185mm<sup>2</sup> 1core Triplex site incomer cable
- ▶ Design and installation of the cable containment systems.
- ▶ Installation of an Argand System, to provide site import/export signals to the BMS to enable control of the generator output
- ▶ Earthing design and installation
- ▶ Within the CHP site, the installation of low voltage, control, signal and communications cabling works
- ▶ Carry out a lightning Risk Assessment for the new CHP installation

## Joseph Heler Cheese Factory Project timings

Construction of the Joseph Heler Cheese Factory CHP generator initially began in October 2020. Unfortunately, this was during a critical stage of the UK lock down due to the Coronavirus pandemic but, despite the necessary restrictions and with the right health and safety approach and procedures implemented, the project continued at a steady and efficient pace. Powersystems mobilised on site in October 2020 which involved preparing the ground for construction activity. Plant and material deliveries such as tower scaffolding, cherry pickers and ladder system components commenced, with key dates such as Energisation and G99 Testing on 1st February 2021 and 12th February respectively.



### What the client wanted

As UK energy production is changing fast and becoming more expensive, manufacturers who consume large amounts of energy need to find new ways to reduce cost and remain competitive.

BasePower offer a solution to manufacturers via their award-winning business model, that would see manufacturers develop and operate on-site energy generation schemes. This not only helps the manufacturer reduce cost, it also addresses the Governments strategy for a low carbon economy. Powersystems being an Independent Connection Provider (ICP) would be charged with becoming a conduit for the grid connection to allow these types of schemes become reality.



### Design works

Design work is a vitally important part of any Powersystems project, at this stage we ensure the project will meet the clients regulatory, economic and, most importantly, safety requirements. The design works included in this project are listed below;

- ▶ Design of the measurement HV CT's installation
- ▶ Design of the trench sections
- ▶ Design of the HV cable containment system
- ▶ HV earthing design - this included the general arrangements and conductor calculations for cable sizing adequate enough to carry the relevant fault currents in the event of an earth fault
- ▶ HV/LV cable calculations and cable sizing appropriate to the project loads
- ▶ HV cable route design, including full site layout highlighting the fully ducted route from the existing network to the CHP
- ▶ Lightning Risk Assessment study and full report
- ▶ Control & signal cable - this included the design of all small power and equipment control wiring

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## Installation works

Following the design stage, the installation work listed below was undertaken and completed;

- ▶ Complete trenching and duct work across the factory yard and around the substations, which was complicated as the route crossed a very busy delivery route that was key to the factory's processes
- ▶ Installation of HV CT's to the site incomer cable box including SAP attendance and a controlled site shutdown
- ▶ Cable containment installation routing through the factory
- ▶ 11 kV cable installation - 1 No off 95 mm<sup>2</sup> aluminium SWA/XLPE/PVC cable at roughly 210 m was installed partly in ducts and partly on to a cable ladder system routing between the clients existing switch room through to the CHP
- ▶ Small power, control and signal cables were installed for various LV equipment such as, the Argand load monitoring system
- ▶ Earthing - this included the HV earth mat and Circuit Protective Conductor (CPC) and all other relevant supplementary bonding
- ▶ Argand System Panels - these panels were designed to provide the site load reference which was communicated to the CHP control panel via a fibre optic communication connection and allow generator modulation. The panels also provide for a G99 Constraint scheme

## Commissioning works

- ▶ Pressure testing of newly installed HV cables
- ▶ Electrical installation certificate completed on newly installed LV circuits
- ▶ Insulation resistance testing of all control and signal cables
- ▶ Functional testing of all newly installed equipment

## Energisation works

- ▶ Provision of an 11 kV SAP to take control of the client's 11 kV network
- ▶ Provision of an 11 kV SAP to attend site to provide supervision and to undertake pre-energisation checks and issue safety documents to Powersystems operatives.



## Environmental benefits

- ▶ Due to the fact that less fuel is burned to produce a given energy output and the bakery is avoiding the use of power from the grid which mitigates transmission and distribution losses therefore, the CHP reduces emissions of greenhouse gases and other air pollutants such as carbon dioxide, nitrogen oxide and sulphur dioxide.

## Economic benefits

- ▶ The CHP will save the factory considerable amounts of money on their energy bills due to its high efficiency
- ▶ Protection of revenue through onsite generation and improved reliability, the CHP can allow the factory to continue to operate in the event of an interruption of the grid supplied electricity, providing the connection agreement allows for this
- ▶ Less exposure to electricity rate increases, due to the fact less electricity is being purchased from the grid, the bakery will have less exposure to any rate increases.

## The results:

The Joseph Heler Cheese Factory CHP connection work was completed in line with the client programme against constricted timescales and within budget. This project, the closing of the four BasePower CHP projects undertaken this financial year, exemplifies a long-term working partnership with Powersystems.

