PV Financing Best Practice: Ketton Cement Works – Industrial Park (UK)

Cement manufacture is an energy and carbon-intensive process. The industry has achieved significant reductions in their CO2 emissions however there has been very few examples of adoption of renewable energy generation. Lark Energy in partnership with Armstrong Energy and Hanson Cement has developed and constructed an innovative best practice project.

Overview of Ketton Cement

The Ketton Cement Solar Farm is an industrial park located in the village of Ketton on a former quarry, in the county of Rutland in the United Kingdom. The Solar Farm is comprised of 2 phases. The first phase is 9MWp located on 20 hectares of former quarry and consists of 38,544 modules. The second phase is 3MWp and is sited on an adjoining field of 7 hectares, consists of 12,100 modules. Overall the project generates enough energy to cover 13% of the Cement work's annual consumption.

The key driver for this project was to reduce the Ketton Cement's CO2 emissions. This project is the first example of where solar has been used by the cement industry to reduce emissions at a significant size.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646554

Business case description and economic parameters

The project was jointly developed by Lark Energy and Armstrong Energy with Downing providing the funding through an innovative PPA arrangement with Hanson. The electricity demand for the project is 87,692,308 kWh, the Solar Farm provides 11,400,000 kWh, 13% of Hanson Cements demand. The project overall provides Hanson with a reduced energy bill over the term of the project in the region of £10 million. The investment costs were around 15 million and the sources of revenue came from a PPA and Renewable Obligation subsidy scheme. Ketton Cement is one of the largest PPA project‘s in the UK. The planning process was very simple as the proposed project was located in the working cement works, and could not be seen from the adjacent village. The council didn’t receive a single objection and it received unanimous approval from Rutland County Council in late July 2013. Construction of a solar farm on a 24/7 operational site requires a very stringent health and safety management. The project experience poor weather conditions with construction beginning in September 2013, one of the wettest autumns on record. However despite these challenges Lark Energy did not miss any construction days and the first phase of the project was completed and connected by December 2013.

Technical project parameters

Grid connection is normally a limiting factor involved in UK solar farms. This project includes a pioneering approach to managing the grid connection. Lark Energy designed the solar farm to enable active and reactive power management and to protect the grid from reverse current. This has a number of advantages, including minimising the need for costly 33kv upgrade work, reducing the energy costs for Hanson and enabling the inverters to be used as capacitor batteries at night. This was the first time inverters had been used in the UK for storage. The power from the solar farm connects into Hanson’s private 11kv network on three separate circuits. This means that individual switchgear and transformer sets are required for each circuit. The 11kv network then connects to Western Power Distribution’s 33kv public grid network via a step up transformer. Various upgrades of the customer and DNO substations had to take place to enable the connections. The project energy is 100% self consumption.

Stakeholders / companies / PPA

The team approached a number of suppliers with a project that would be fully funded by a third party and risk-free for the business. The preferred supplier, Armstrong Energy, provided a bid that would fund a 10MW system based on receiving the Feed in Tariff payments at the time, a Power Purchase Agreement that was acceptable to Hanson, and any benefits from exporting the power if not all used on site. For Hanson, 30% of the generated electricity consumer would be free of charge and all the other energy consumed would be free of the pass-through charges that make up 30% of the electricity bills. The project presented no cost to Hanson and no risk, as Armstrong could export and sell all the electricity generated if the Ketton plant was unable to take it. The stakeholder structure involved Lark Energy as the Developer and EPC, Hanson were the client and land owner. Downing was involved in the financing of the project. The O&M is now run by Lark Energy.

Replicability / Outlook

Ketton Cement is a good example for large scale industries. It helps contribute to carbon emission reductions in a cost effective way. The design of the project is easily replicated in other regions and countries as well as different scales. Mark Cox from Hanson Cement stated in an article that ‘This is the first of what is hoped are much such project the company will be involved in over the coming years as it strives to reduce its CO2 emissions and energy costs.’ The main driver for this project was to reduce CO2 emissions at a low cost. If the project was to be replicated grid connection would need to be considered.

The site has become a local attraction with businesses and schools visiting in the first few months of its operation. The success of this project has inspired Hanson’s renewable energy team and it is expected that more of the same will follow on other company sites. This project would theoretically work in a zero subsidy environment if wholesale prices were higher, installation costs were lower and grid connection was reasonable.