

## CAPTURE WASTED HEAT AND IMPROVE PROCESS EFFICIENCY

**APPLICATION**  
Thermal Energy Storage

**COMMISSIONED**  
2019

**EQUIPMENT**  
FlexEnergy Heat Exchanger

**FUEL**  
Process Heat

### EXTERNAL HEAT SOLUTION FOR POWER GENERATION

Renewable energy promises clean, sustainable and low-carbon power. Solar and wind are the most common renewable energy sources, but stability remains a major barrier to greater adoption. The ability to store energy generated by renewables during low demand periods for use during high demand intervals is key to their increased usage.



### THE SITUATION

An Australian Thermal Energy Storage company developed an innovative energy storage solution for converting energy into heat that can be stored to generate high-quality and reliable electric power. Power that can be used to supplement the grid. Heat, whether it is generated by electric power, natural gas or any other fuel source is used in nearly every industrial process. This company's breakthrough Thermal Energy Storage solution is to generate heat from an efficient source (e.g., biogas, trash, wind, etc.) to melt silicon, which has excellent heat storage characteristics. Once stored in molten silicon, the heat is then used to generate power and to heat facilities. Other benefits include stabilizing batch-like processes or providing a buffer for systems that are unreliable.

At full-field development, the project is designed to supply from 100kW to 100 MW, providing a flexible, reliable and carbon-light energy source. Since the facility does not have any restrictions on where it can be located, a Thermal Energy Storage solution is well-suited to supplement intermittent renewable energy sources, increasing base load reliability.

### POWER OPTIONS

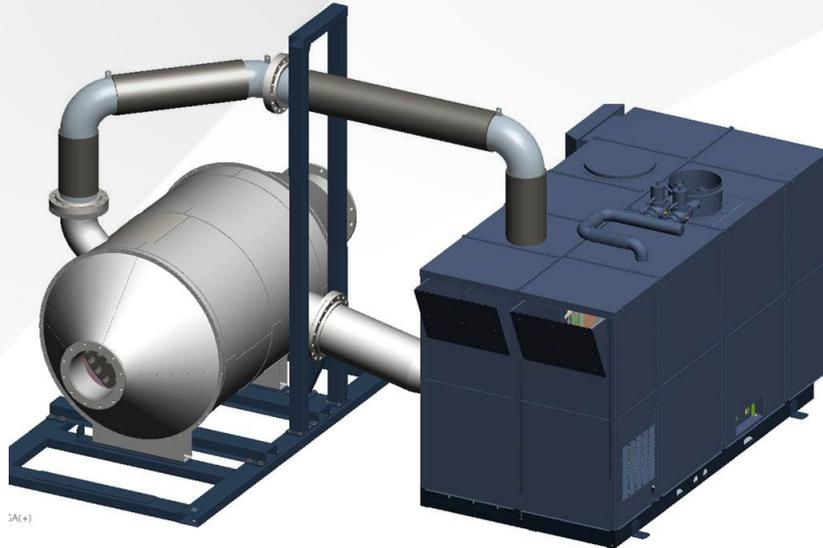
The customer evaluated several options for source power to heat the silicon:

**Solar Power.** Photovoltaic methods provide carbon-free power, but only work when the sun is out and have greatest efficiency on cloud-free days when the sun is directly overhead. Solar sources can be combined with thermal energy storage to give more stable power output.

**Biogas.** Biogas generated from organic waste processes in an anaerobic digester is usually burned on-site in an engine, which is generally inefficient as it is difficult to store so despite demand is usually left running.

**Wind.** Wind power, like solar, provides carbon-free energy, but struggles with real-world demands as when the wind isn't blowing there is no power. Unfortunately, these options for generating power in a carbon-neutral way all struggle to provide reliable power demanded by real-world power consumers.

Supplementing these renewable sources with a clean, thermal storage system provides a reliable base load that industrial, commercial and residential customers expect from the grid.



## THE FLEXENERGY SOLUTION

The company chose to work with FlexEnergy to create an innovative external heat solution for efficiently melting silicon and harnessing the stored heat to generate power. The solution is a Flex Turbine®, which normally runs on gas, paired with an innovative FlexEnergy Heat Exchanger built specifically for high-heat applications. In this closed-loop application, air is circulated through the liquid silicon storage device, heating the air stream which is then routed through the FlexEnergy heat exchanger. Normally, a gas turbine requires a fuel source to supply the heat needed to spin the turbine fast enough to generate electricity. In this case, the heat exchanger heats a second air stream coming into the turbine, which provides all the energy required to power the turbine and supply electricity. Allowing a variable energy source provided to the molten silicon to now become a stable reliable source.

## HEAT EXCHANGER COMPONENT



Essential to the effectiveness of the solution is the purpose-built heat exchanger component, which makes the system possible. FlexEnergy Heat Exchangers are designed to achieve specific system performance goals. The unit developed for this thermal storage solution uses a Fin-Tube design with counter-current flow. Specifically designed for this application, it delivers impressive efficiency with a very low pressure drop and is capable of handling inlet temperatures in excess of 1650F and pressures up to 1000psi.

Importantly, FlexEnergy heat exchangers also have a compact operational footprint which minimizes facility space requirements and lowers weight.

## RESULTS

### The FlexEnergy external heat solution provides the customer:

A reliable source of safe and efficient heat and power for the thermal storage unit.

Flexibility to install the solution “behind the meter,” on or off the grid.

A supplement to base load provided by intermittent, renewable power sources.

Efficiency that approaches 90% overall thermal efficiency.

Ultra-low emissions.

### MORE INFORMATION

is available on the FlexEnergy website at [flexenergy.com/heat-exchanger-technology](http://flexenergy.com/heat-exchanger-technology)