CASE STUDY

Power Grid Resiliency: Enabled by the Clean Energy Storage System of the Future

Malta Inc. aims to diversify power grids using stored clean energy. Modelon simulation software plays a critical role in design and development.

OVERVIEW

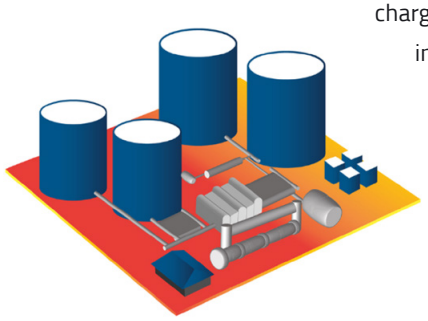
Malta Inc., a renewable energy storage company, incubated at X, Alphabet's Moonshot Factory, is on a mission to bring an advanced renewable energy storage system to market. Developed to support full-scale power grids; Malta's energy storage system is designed to keep energy generated from renewable energy in reserve using conventional components and abundant raw materials like molten salt.

With help from Modelon, Malta is using advanced simulation technologies to design, validate and bring to market what could be the world's most robust energy storage system.

CHALLENGE

The idea of a thermal energy storage facility is not new, but limited life expectancy and high environmental impact of Lithium-ion batteries as well as geographical constraints for compressed air energy storage and pumped hydroelectric energy storage have accentuated the potential of Malta's storage system design – a cost effective and reliable way to store renewable energy on the grid for long periods of time.

How it works: Malta's electro-thermal storage system uses four-tanks that store two fluids, each in two thermal states. The system first captures energy generated from renewable energy sources to drive a heat pump cycle - converting electrical energy into thermal energy by creating a temperature differential. In charge mode, the heat pump cycle results in heating of molten salt and chilling of a coolant, both of which are pumped into their respective hot/cold tanks, in turn. In discharge mode, the system operates as a heat engine - converting the liquids' temperature differential back to electrical energy to be distributed by the grid.



MALTA

OBJECTIVE

Design and validate an advanced clean energy storage system

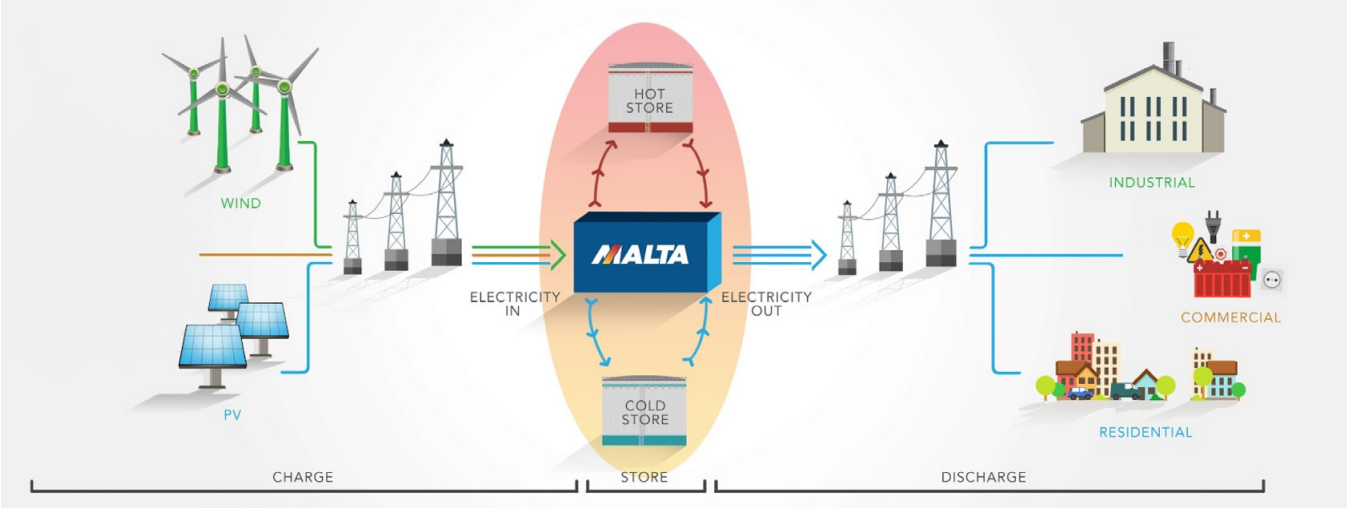
SOLUTIONS

Modelon Thermal Power Library and Project Consulting Services

RESULTS

Malta accelerated their overall design process and go-to-market execution, with the first plant expected to break ground in the near future.

Modelon



"Leveraging Modelon technology and expertise has helped us accelerate on our plan and we value this key partnership."

Ramya Swaminathan
CEO, Malta Inc.

"My role is to ensure that all aspects of the system development life cycle are met, and the support and software from Modelon have been instrumental in streamlining this process with major productivity improvements. Modelon's simulation software and expertise have enabled us to build, test, and validate our design which is critical for executing on our design."

Mert Geveci, Ph.D
Principal Controls Engineer, Malta Inc.

SOLUTION

In order to achieve efficiency in design, testing and operation of this novel system, the need for model-based systems simulation and control engineering is imperative. Leveraging Thermal Power Library, Modelon energy and power industry experts were able to support the design process from ideation, architecture selection, and component sizing to controls development and system verification and validation.

Hardware configuration included:

- Component sizing
- Integration of turbomachinery and heat exchangers
- Development of the flow control scheme for nominal and off-nominal condition
- Performance validation of the selected components including pipes and valves

Basic control algorithm design and validation included the configuration of sequences for:

- Start-up and shutdown
- Emergency trip
- Switching between charge and discharge modes

Meaningful results at each step of the model-based design process have enabled Malta to accelerate their overall design process and go-to-market execution, with the first plant expected to break ground in the near future. Currently, Malta engineers are refining and testing the system models to ensure that the design, including all components, will work for all required transient scenarios.

THE PATH TO COMMISSIONING

Malta will work with Modelon engineers to ensure an advanced and optimized control strategy is developed. Malta's full-scale initial pilot plant will be manufactured with 10MW power and at least 8 hours of storage.