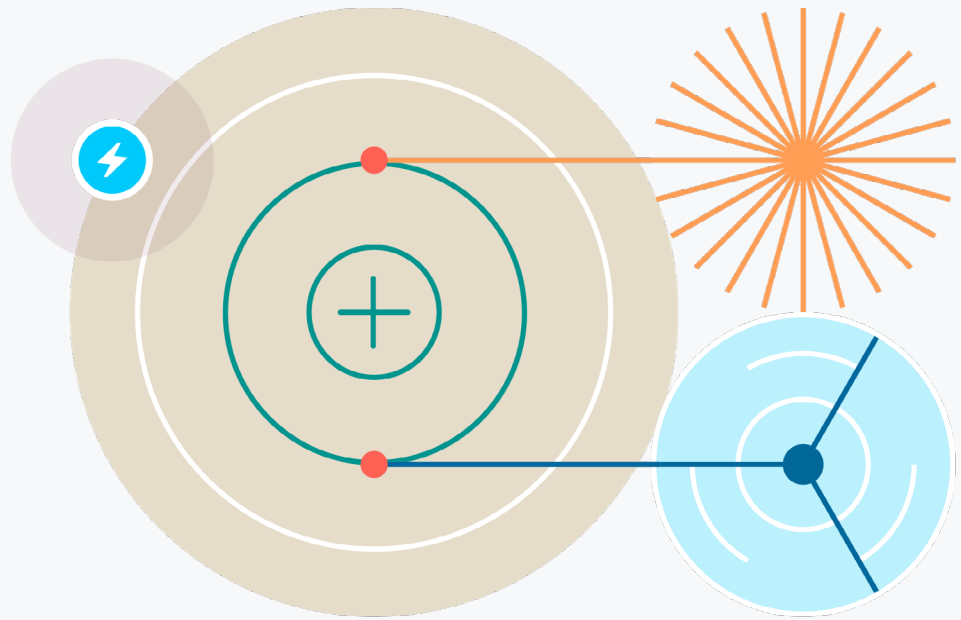
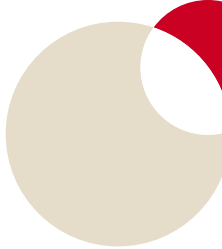


Techno-Economic Analysis for Utility-Scale Hybrid Systems

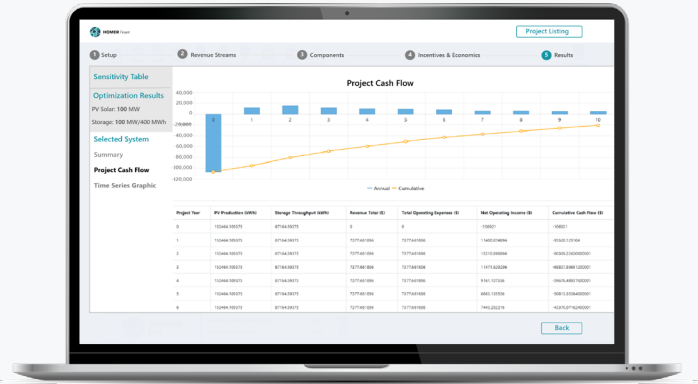




Maximize value for energy storage and hybrid system projects

ULTRUS™ software from UL Solutions provides a powerful web-based platform for rapidly designing, sizing and optimizing utility-scale energy storage and hybrid systems through the HOMER® Front digital offering. Maximize and demonstrate project value, mitigate potential risks and optimize multiple areas, including:

- Variable generation
- Energy markets
- Power purchase agreements
- Battery capacity



ULTRUS for optimizing energy projects

Save hours of analysis time during project development, bid evaluation and due diligence. ULTRUS HOMER Front software models the technical and economic performance of utility-scale energy storage systems — independently or with solar and wind.

You'll get critical, actionable insights into optimal sizing and operational strategies designed to mitigate technical and economic risks while maximizing the potential revenue from multiple streams, including energy and capacity markets, ancillary services and power purchase agreements (PPAs).

By optimizing key aspects of your design with the software's robust computations and simulations, you can determine the winning system faster.



Size your system

Calculate the optimal size of energy storage and other components in utility-scale hybrid systems.



Manage battery augmentation

Model battery lifetime, capacity degradation and augmentation or replacement strategies to minimize ongoing expenses and maximize revenue. Custom storage capability enables you to provide detailed inputs that replicate commercially available batteries.



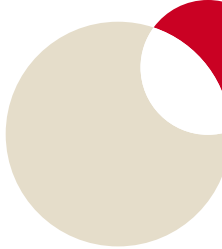
Compare and stack multiple revenue streams

Perform detailed, holistic modeling of most major electricity markets in front-of-the-meter systems worldwide, including PPAs, energy, capacity and ancillary markets.



Utilize robust sensitivity analysis

De-risk your project's performance projections through sensitivity analysis on key parameters that often fluctuate, like solar irradiance, wind speeds or energy market prices. Screen and evaluate project sites and system economic viability.



Evaluate electricity markets worldwide

Compare revenue projections from most major energy markets around the world, including:

- Wholesale energy markets, such as day-ahead and real time
- Capacity markets
- Ancillary services
- Time-of-delivery (ToD) and PPAs

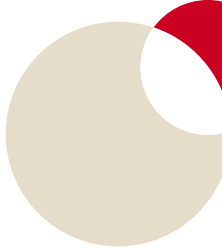
Select from all major monetary currencies globally and customize inputs for a specific country or region. By stacking and comparing multiple revenue streams and dispatch strategies, you can more accurately size and plan system operations to deliver the optimal return on investment while reliably meeting contractual obligations.



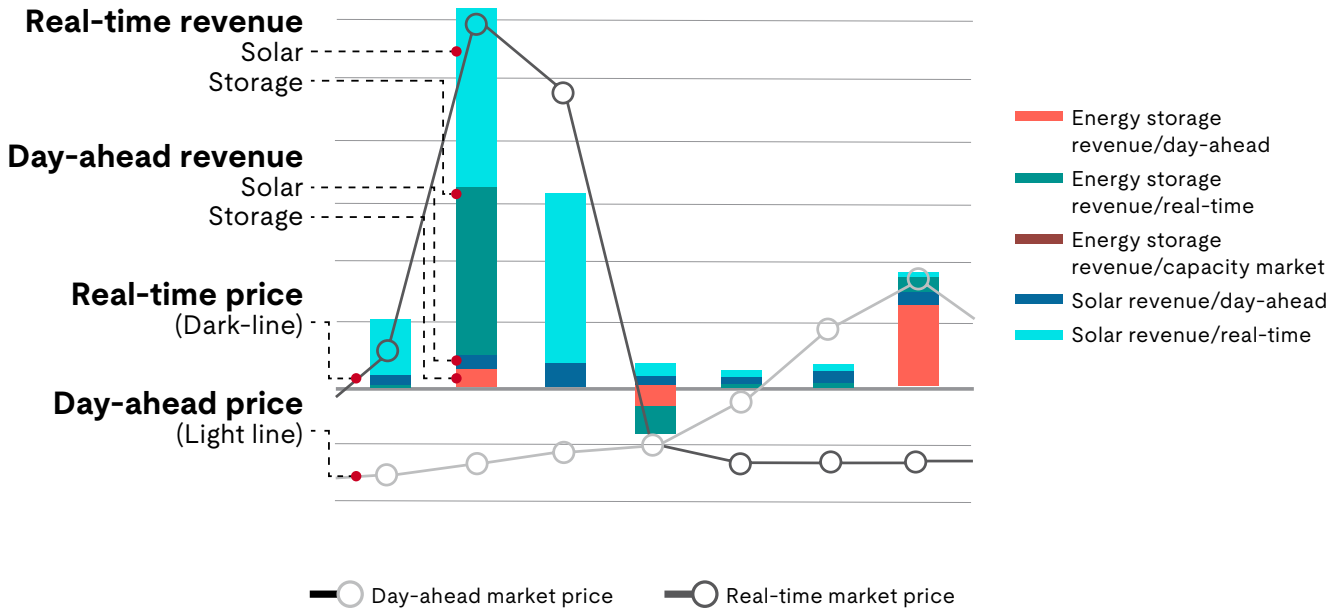
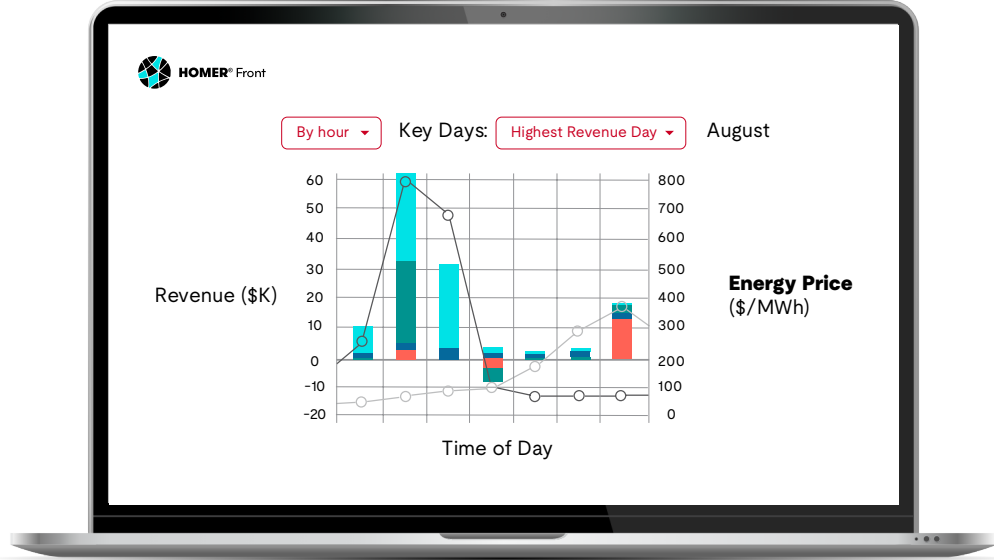
Mitigate risks with advanced energy storage modeling

ULTRUS software provides comprehensive battery modeling and sensitivity analysis through our HOMER Front platform to assess the impact of energy storage degradation and varying dispatch and augmentation strategies. Easy-to-understand time series graphics empower you to:

- Optimize augmentation strategies and cycling limits
- Model warranted battery values and storage usage
- Determine the most efficient dispatch strategies with charging and discharging rules
- Assess the system's ability to meet off-take agreement requirements consistently



Revenue stacking and wholesale energy price





Make hybrid power system decisions with confidence

Rely on accurate, confirmable analysis of multiple inputs of energy resources, markets, and dispatch and augmentation strategies.

Easily export data and share across companies without exposing intellectual property related to the project.

A trusted third-party model helps partnering companies, financiers and customers feel confident.

Save time with data integration through Helioscope's application programming interface (API); import PvSyst and wind production data, resource data for solar and temperature, and multiple formats of price data.



Get the clear advantage of HOMER Front software

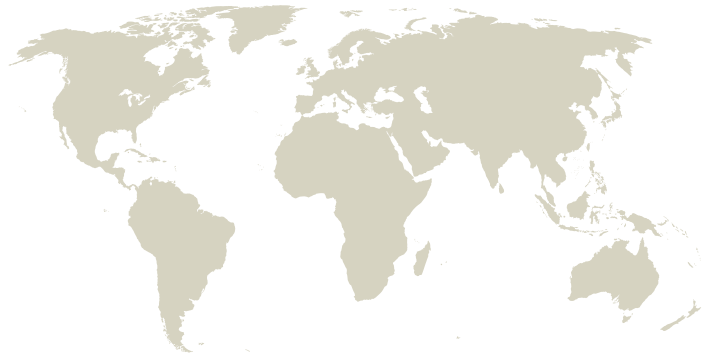
Model your projects more accurately with a license for HOMER Front web-based software, or work with our respected team of renewable energy experts. Rely on UL Solutions to help accelerate your project's design-to-build timeline with a feasibility study or complete project evaluation.

Put ULTRUS software to work for you

Originally developed at the National Renewable Energy Laboratory, HOMER modeling software optimizes the value of your hybrid power systems and energy storage – whether your system is standalone, connected to the grid, behind-the-meter or utility-scale.

We offer complete project support, including market and regulatory assessment, project and site evaluation, technical design and analysis.

Gain unmatched advanced energy storage modeling along with our 25 years of experience in modeling hybrid power systems.



HOMER software has enabled more than 250,000 users in 190+ countries to model and optimize hybrid power systems.

Learn more at [ULTRUS™ | HOMER® Front](#)



HOMER Front and ULTRUS software

HOMER Front and other components of HOMER software are part of the ULTRUS portfolio, which includes digital offerings from UL Solutions to help customers manage regulatory, supply chain and sustainability challenges.