REopt Lite Tutorial: Financial Outputs

This tutorial explains the financial modeling analysis outputs in the REopt Lite™ web tool. Find additional REopt Lite tutorials.

The following example uses the same input data as provided in the "sample site" option within the web tool.

Results

Technology Recommendations

The first output displayed on the Results page is the recommended size of each technology, based on the inputs that you provided for the evaluation. In this case, a 361-kilowatt (kW) solar photovoltaic (PV) system and a 78-kW, 253-kilowatt-hour (kWh) battery is recommended. If you installed these technologies, they would save $209,419 over their 25-year life cycle (Figure 1).

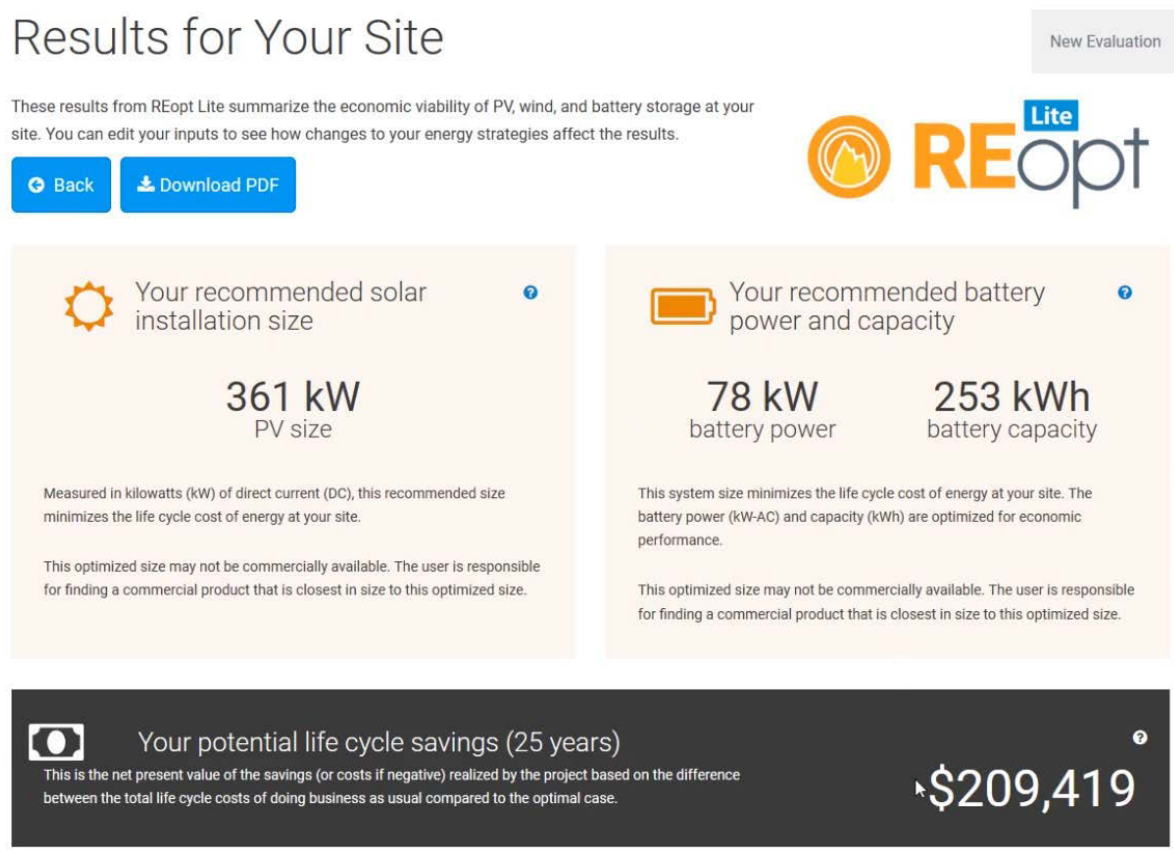

Figure 1. REopt Lite site recommendations for a financial analysis

The REopt Lite model helps find optimized technology sizes to minimize your site's life cycle cost of energy. It identifies the sweet spot by balancing system capital costs with utility cost savings. You could build larger systems at this site, but they would not generate enough additional savings to cover the higher capital costs. Alternatively, you could build smaller systems, but then you would be leaving potential savings on the table that would more than make up for the capital cost investment of building the recommended system.

If you get a "zero size" recommendation, that means the technologies evaluated are not economical based on your modeled assumptions. In other words, it's more cost effective for you to continue purchasing electricity from the grid. You could use the "Back" button to return to the REopt Lite Inputs page and try alternative assumptions, such as lower technology costs or higher incentives.

Note the "Download PDF" button near the top of the Results page. This will open a PDF version of your results in another browser window for you to save or print.

System Performance Year One

Scrolling down, you'll see the System Performance Year One section. The displayed graph shows you what the technologies are doing on an hourly basis. The load is shown as a solid black line, and the PV, battery, and grid combine to meet that load (Figure 2).

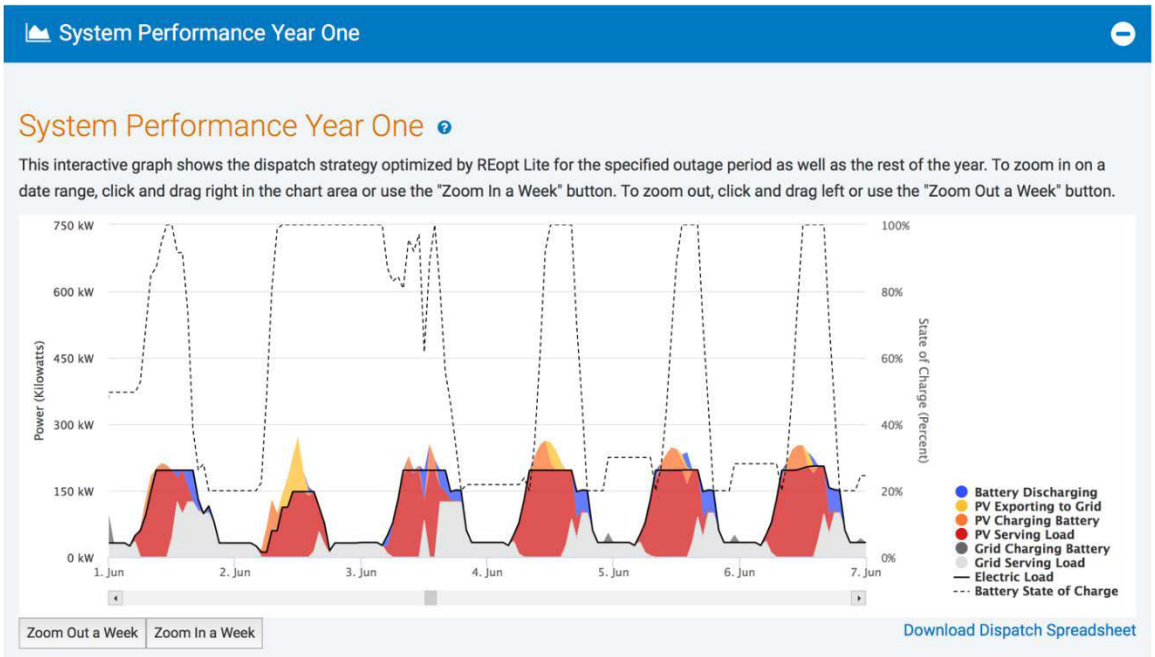

Figure 2. Interactive system performance and dispatch strategy graph

Here, the PV system, in red, is producing electricity during the day. The battery system, in blue, is dispatching in the early morning or late afternoon when the PV system isn't producing electricity, but the time-of-use rate is still fairly high. The excess PV production above the load is charging the battery or exporting back to the grid after the battery is fully charged. The grid electricity—what you're still purchasing from your utility—is shown in gray. You can see a

distinct plateau—that's the model setting your new demand level for the month. You can zoom in and out on this graph or scroll to see different days of the year, by using either the zoom buttons or dragging your mouse over the graph (Figure 3).

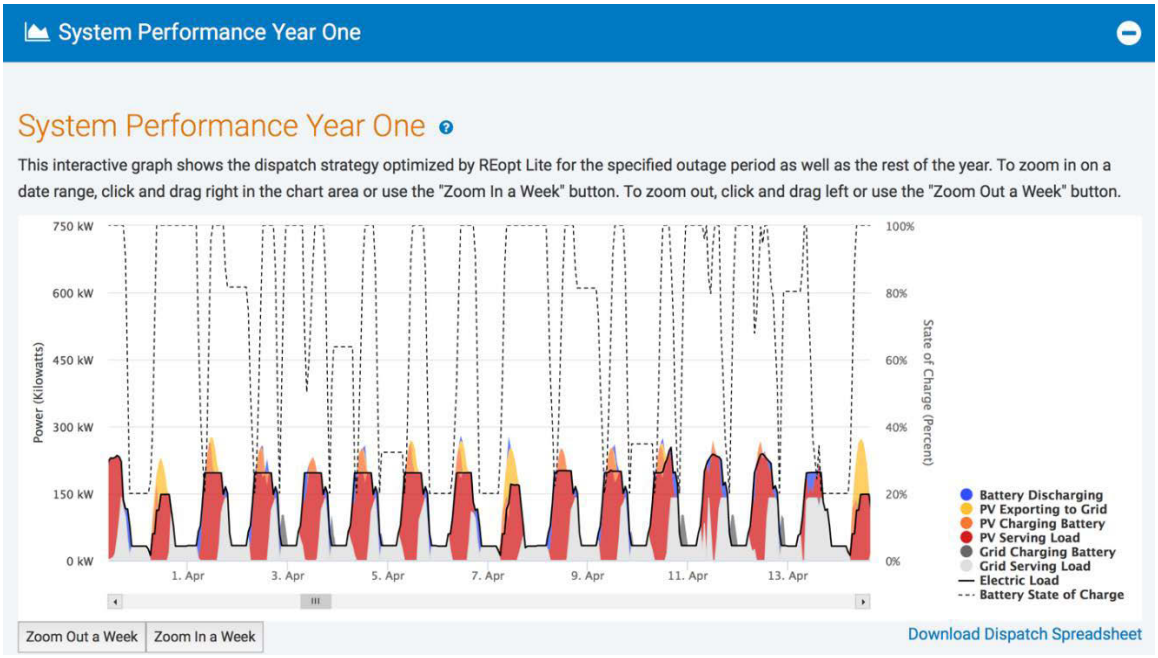

Figure 3. Zooming out on the system performance and dispatch strategy graph

You can also turn different technologies on and off by clicking on the legend. The whole year's dispatch data can be downloaded at the Download Dispatch Spreadsheet link (Figure 4).

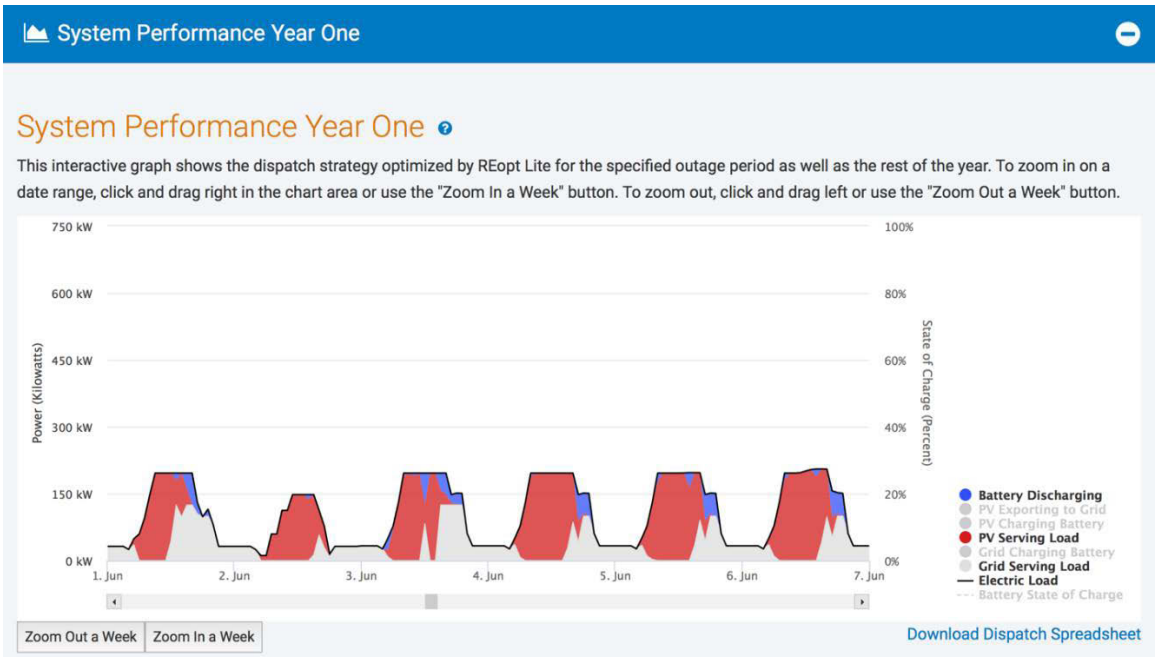

Figure 4. Click the legend to change the graph, or download a dispatch spreadsheet

Results Comparison

Scrolling down, you'll find more detailed information about these results. The Results Comparison table compares the business-as-usual case, which is what you would expect to pay if you didn't install these technologies, to the optimal financial case recommended by the REopt Lite model. In the far right column you can see the difference between these two. You can look at things like your energy costs compared to your demand costs and fixed charges, both in year one and over the life cycle of the analysis (Figure 5).

Results Comparison

These results show how doing business as usual compares to the optimal case.

	Business As Usual	Financial	Difference
System Size, Energy Production, and System Cost			
PV Size	0 kW	361 kW	361 kW
Annualized PV Energy Production	0 kWh	577,409 kWh	577,409 kWh
Battery Power	0 kW	78 kW	78 kW
Battery Capacity	0 kWh	253 kWh	253 kWh
Net CAPEX + Replacement + O&M	$0	$532,744	N/A
Energy Supplied From Grid In Year 1	1,000,000 kWh	448,264 kWh	551,736 kWh
Year 1 Utility Cost – Before Tax			
Utility Energy Cost	$74,602	$31,430	$43,173
Utility Demand Cost	$80,133	$45,853	$34,280
Utility Fixed Cost	$0	$0	$0
Utility Minimum Cost Adder	$0	$0	$0
Life Cycle Utility Cost – After Tax			
Utility Energy Cost	$714,851	$301,165	$413,686
Utility Demand Cost	$767,851	$439,375	$328,476
Utility Fixed Cost	$0	$0	$0
Utility Minimum Cost Adder	$0	$0	$0

Figure 5. Compare the business-as-usual case to the optimal financial case recommended by REopt Lite

At the bottom of the table is the net present value, or the savings over the 25-year analysis period. These values, along with relevant calculations, are also detailed in the pro forma spreadsheet, which you can download (Figure 6).

Total System and Life Cycle Utility Cost — After Tax			
Total Life Cycle Costs	$1,482,702	$1,273,283	$209,419
Net Present Value	$0	$209,419	$209,419

Download ProForma Spreadsheet

Figure 6. Review the potential savings over the 25-year analysis period, or download the pro forma spreadsheet

The Inputs section provides a full record of all the inputs that were entered for the evaluation, and the Caution section highlights some of the model's assumptions and limitations to consider (Figure 7).

Caution

Caution

These results assume perfect prediction of both solar irradiance, wind speed, and electrical load. In practice, actual savings may be lower based on the ability to accurately predict solar irradiance, wind speed, and load, and the battery control strategy used in the system. And, when modeling an outage the results assume perfect foresight of the impending outage, allowing the battery system to charge in the hours leading up the outage.

The results include both expected energy and demand savings. However, the hourly model does not capture inter-hour variability of the PV and wind resource. Because demand is typically determined based on the maximum 15-minute peak, the estimated savings from demand reduction may be exaggerated. The hourly simulation uses one year of load data and one year of solar and wind resource data. Actual demand charges and savings will vary from year to year as load and resource vary.

Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules.

Figure 7. REopt Lite model assumptions and limitations

The Next Steps section recommends actions to take before moving ahead with project development (Figure 8).

Next Steps

Next Steps

This model provides an **estimate** of the techno-economic feasibility of solar, wind, and battery, but investment decisions should not be made based on these results alone. **Before moving ahead with project development, verify:**

- The utility rate tariff is correct.
  - Note that a site may have the option or may be required to switch to a different utility rate tariff when installing a PV, wind, or battery system.
  - Contact your utility for more information.
- Actual load data is used rather than a simulated load profile.
- PV, wind, and battery costs and incentives are accurate for your location.
  - There may be additional value streams not included in this analysis such as ancillary services or capacity payments.
- Financial inputs are accurate, especially discount rate and utility escalation rate.
- Other factors that can inform decision-making, but are not captured in this model, are considered. These may include:
  - roof integrity
  - shading considerations
  - obstacles to wind flow
  - ease of permitting
  - mission compatibility
  - regulatory and zoning ordinances
  - utility interconnection rules
  - availability of funding.
- Multiple systems integrators are consulted and multiple proposals are received. These will help to refine system architecture and projected costs and benefits. REopt results can be used to inform these discussions.

Contact NREL at reopt@nrel.gov for more detailed modeling and project development assistance.

Figure 8. Next steps to take after you run a REopt Lite financial analysis

Learn More

For more information on tool inputs and default values, please see the REopt Lite Web Tool User Manual.

Find additional REopt Lite tutorial documents and videos on reopt.nrel.gov/user-guides.html.

REopt Lite

NREL's REopt Lite web tool helps users evaluate the economic viability of grid-connected PV, wind, and battery storage systems at a site. It identifies system sizes and battery dispatch strategies to minimize energy costs, and estimates how long a system can sustain the site's critical load during a grid outage.

Learn more about REopt Lite at reopt.nrel.gov/tool.

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