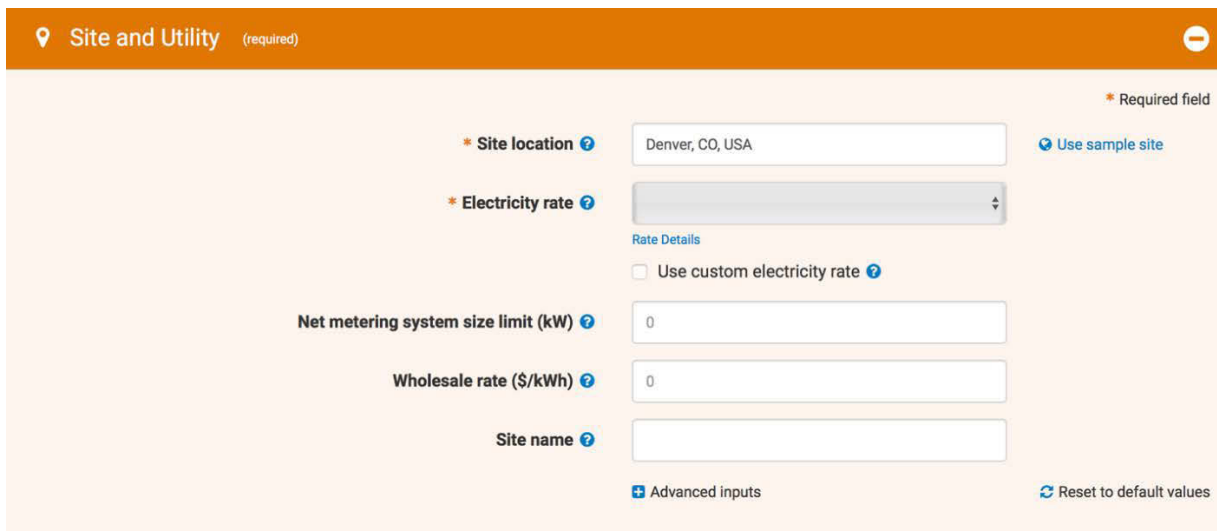




## REopt Lite Tutorial: Advanced Utility Rate Inputs

This tutorial gives an overview of the advanced utility rate inputs in the [REopt Lite™ web tool](#). Find additional REopt Lite [tutorials](#).

Under the Site and Utility section of REopt Lite, you can customize values to best fit your desired outcomes. Review [REopt Lite Tutorial: Entering Site Data](#) for guidance on the required fields in this section (which are marked by asterisks). You may additionally enter more specific optional information (Figure 1).



The screenshot shows the 'Site and Utility' section of the REopt Lite web tool. The section is titled 'Site and Utility (required)' and includes a minus icon in the top right corner. A legend indicates that an asterisk (\*) denotes a 'Required field'. The form contains the following fields and options:

- \* Site location**: A text input field containing 'Denver, CO, USA'. A blue tooltip icon is next to the label. A link 'Use sample site' is located to the right of the field.
- \* Electricity rate**: A dropdown menu. A blue tooltip icon is next to the label. Below the dropdown, there is a link 'Rate Details' and a checkbox labeled 'Use custom electricity rate' with a blue tooltip icon.
- Net metering system size limit (kW)**: A text input field containing '0'. A blue tooltip icon is next to the label.
- Wholesale rate (\$/kWh)**: A text input field containing '0'. A blue tooltip icon is next to the label.
- Site name**: A text input field. A blue tooltip icon is next to the label.

At the bottom of the form, there are two links: '+ Advanced inputs' and 'Reset to default values'.

Figure 1. Site and Utility section inputs

You may enter a net metering system size limit if you choose. The default net metering system size limit of 0 kilowatts (kW) indicates that net metering is not available at the site.

You can also add a wholesale rate for electricity exports that exceed net metering limits, or where net metering is not available. For more information about how REopt Lite models net metering and wholesale rates, click on the blue tooltip icons next to the field headings. The tooltips provide pop-up guidance which links directly to pertinent sections of the user manual (Figure 2).



The wholesale rate for exported energy applies to projects that are not net metered, or projects sized greater than the net metering limit. If a wholesale rate is entered and net metering is not available (i.e. net metering size limit is 0 kW) or if the project is sized greater than the net metering limit, then the project will receive credit for any exported energy at this wholesale rate, up to the annual site load so that the site does not become a net exporter of electricity. **This value is not required.** For more information, please see the [help manual](#).

**Wholesale rate (\$/kWh) ?**

0

Figure 2. Tooltip pop-up text

You may also choose to model a custom utility rate by checking the box next to “Use custom electricity rate,” and then toggling Annual, Monthly, or Detailed, based on the level of detail with which you’d like to model your site’s rate.

For the annual custom rate, you can enter a per-kilowatt-hour (kWh) energy charge that will apply to all electricity purchases throughout the year. The per-kW demand charge will apply to the monthly peak demand each month of the year (Figure 3).

**\* Electricity rate ?**

[Rate Details](#)

☒ Use custom electricity rate ?

☒ Annual ☐ Monthly ☐ Detailed

Energy Cost (\$/kWh)

Demand Cost (\$/kW/month)

0.10

15

Figure 3. Annual custom utility rate inputs

Similarly, for the monthly custom rate, you can enter the per-kWh energy charge and the per-kW demand charge that will apply each month but can vary throughout the year (Figure 4).



**\* Electricity rate ?**

Rate Details

☒ Use custom electricity rate ?

☐ Annual ☒ Monthly ☐ Detailed

	Energy Cost (\$/kWh)	Demand Cost (\$/kW/month)
January	0.10	12
February	0.13	15

Figure 4. Monthly custom utility rate inputs

For a detailed custom rate, you must be logged in to REopt Lite, as custom rates are saved to your account. Note that custom rates should be developed before entering your other site inputs to avoid losing your progress. Access the Custom Rate Builder using the “New Custom Rate” option that appears in the Custom Rates menu in the top right corner when you are logged in (Figure 5).

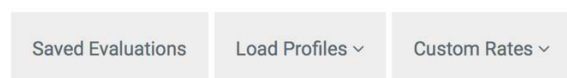


Figure 5. Accessing the detailed custom rate builder

To start building a detailed custom utility rate, choose a name and, optionally, a description for the rate you’re developing (Figure 6). The name that you give the rate will appear in your dropdown “Select custom rate” menu on the Inputs page when you are logged in.



# Custom Rate Builder

[New Evaluation](#)[Saved Evaluations](#)[Load Profiles ▾](#)[Custom Rates ▾](#)

This Custom Electricity Rate Builder allows you to create a detailed custom electricity rate that varies by time period.

- Start by entering a name for the custom rate. Once you have named, created and saved detailed custom rates, these names will show up in the "Select Custom Rate" dropdown menu on the main input page and can be selected to be applied to an optimization. An optional description can also be entered in order to assist in identifying a custom rate.
- Enter each separate rate into the Rate Periods tables for both Energy Charges and Demand Charges. If the rate for a time period includes usage tiers, add tier(s) to that period and enter the maximum energy purchases allowed in the tier(s). The final tier will have unlimited maximum usage.
- After you have defined the Rate Periods, use the Weekday and Weekend Schedule Tables to select the months/times when each period applies. When you have selected a block of time cells, a popover will appear with a dropdown menu so that you can select the relevant period for those cells.



**\* Name**


**Description**


Figure 6. Detailed custom rate builder—name and description fields

Note that there is an option to start with and then modify an existing Utility Rate Database rate by checking “Edit an existing utility’s rate,” entering the existing rate’s location (this does not need to be the same location as your site), selecting the electricity rate from the dropdown, and clicking “Populate form with existing rate” (Figure 7). You can then view and modify the energy charges and demand charges as desired.

☒ Edit an existing utility's rate

 Existing Electricity Rate 

**Rate location** 

**Electricity rate** 

[Populate form with existing rate](#)

Figure 7. Modify an existing Utility Rate Database rate

Start with the simple default custom rate that is already populated in the Custom Rate Builder.

The energy and demand charge structures can incorporate time-of-use and tiered rate components (Figure 8).



## Energy Charges



### Energy Charges - **Rate Periods**

	Period	Tier in Period	Max. Energy Purchases (kWh/month)	Energy Charge (\$/kWh)	
	1	1	100.0	0.100	
	1	2	unlimited	0.120	Add Tier to Period 1
	2	1	unlimited	0.080	Add Tier to Period 2
<button>Add Rate Period</button>					

### Energy Charges - **Weekday Schedule**

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Feb	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Apr	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Jun	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Jul	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Aug	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Sep	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

### Energy Charges - **Weekend Schedule**

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Feb	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Apr	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Jun	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Jul	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Aug	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Sep	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 8. View and modify energy charges

First, look at the time-of-use component of energy charges. The Weekday Schedule shows a table containing each month and every hourly increment within a 24-hour period. The table



identifies the period in which each weekday month-hour falls. For example, in January through April and October through December, electricity purchases cost a flat \$/kWh rate throughout all hours of the day, indicated by Period 2.

Looking at the corresponding table of charges, you see that electricity costs \$0.08/kWh during all hours of Period 2. However, in May through September, the cost of electricity increases each day between 10 a.m. and 7 p.m. Note that the hour listed in the schedule indicates the hour starting at that time, so the last hour of this increased electricity charge starts at 6 p.m. and ends at 7 p.m.

Now let's see what electricity costs during this midday period during the summer months. Looking at the table summarizing rates, you see there are two tiers in Period 1. The first 100 kWh each month will be charged at the Period 1, Tier 1 rate of \$0.10/kWh. Any electricity purchased during these hours, beyond 100 kWh, will be charged the Period 1, Tier 2 rate of \$0.12/kWh.

You can modify the energy charges and maximum energy purchases for each period and tier in the table titled "Energy Charges – Rate Periods." You can also add and delete tiers and rate periods.

To change the time-of-use periods on the schedule, highlight a range of month-hours, select the desired period from the dropdown list, and "Add to Schedule" (Figure 9).

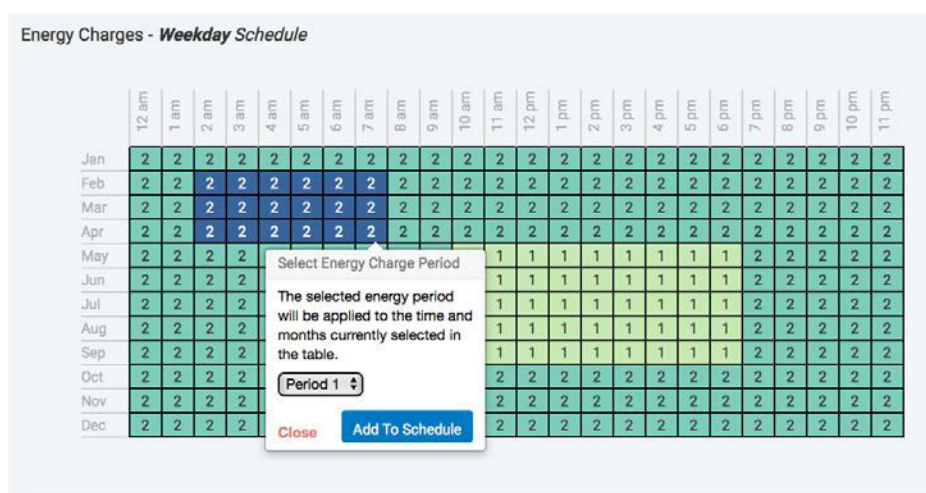


Figure 9. Change the time-of-use periods on the schedule

If you scroll a bit, you'll see there is also a Weekend Schedule for energy charges. The periods listed in this table correspond to the same table, "Energy Charges – Rate Periods," that you've been working from, and the fields can be edited in the same way. This table allows for a different rate schedule on weekdays and weekends. If you continue scrolling, you'll see a very similar table for the Demand Charges schedule. Like energy charges, demand charges can also include time-of-use and tiered structures (Figure 10).



## Demand Charges



### Demand Charges - *Rate Periods*

	Period ?	Tier in Period	Max. Demand (kW)	Demand Charge (\$/kW)	
✖	1	1	unlimited	15,000	Add Tier to Period 1
✖	2	1	unlimited	12,000	Add Tier to Period 2
<button>Add Rate Period</button>					

### Demand Charges - *Weekday Schedule*

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Feb	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Apr	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Jun	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Jul	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Aug	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

[Populate from Energy Weekday Schedule](#)

### Demand Charges - *Weekend Schedule*

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Feb	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Apr	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Jun	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Jul	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Aug	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

[Populate from Energy Weekend Schedule](#)

Figure 10. View and modify demand charges



Time-of-use demand charges are applied to the peak monthly demand that occurs during the defined set of hours that month. As modeled in the default schedules, the monthly demand charge varies by month but does not depend on the timing of the peak.

Let's add a time-of-use demand charge to the hours of 8 a.m. through 6 p.m. for the months of May through September. During this period, set the time-of-use demand charge to \$18/kW. In this situation, the Period 1 demand charge—\$15/kW—would apply to the off-peak demand that occurs between 6 p.m. and 8 a.m. each month of the summer. Period 3's demand charge—\$18/kW—would apply to the peak demand that occurs between the midday hours of 8 a.m. to 6 p.m. during each month of the summer (Figure 11).

#### Demand Charges - *Rate Periods*

	Period ⓘ	Tier in Period	Max. Demand (kW)	Demand Charge (\$/kW)	
✖	1	1	unlimited	15.000 ⓘ	<a href="#">Add Tier to Period 1</a>
✖	2	1	unlimited	12.000 ⓘ	<a href="#">Add Tier to Period 2</a>
✖	3	1	unlimited	18 ⓘ	<a href="#">Add Tier to Period 3</a>
<a href="#">Add Rate Period</a>					

#### Demand Charges - *Weekday Schedule*

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Feb	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Apr	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Jun	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Jul	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Aug	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Sep	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

[Populate from Energy Weekday Schedule](#)

Figure 11. Adding a time-of-use demand charge

If your site has a tiered demand rate, you can add tiers to the “Demand Charges – Rate Periods” table. You can set a Period 2, Tier 1 maximum demand of 100 kW. The first 100 kW of peak demand will be charged at \$12/kW, and any additional peak demand exceeding 100 kW will be charged at \$10/kW. So, if the peak demand for a winter month was 150 kW, that month's





demand charge would be 100 kW multiplied by \$12/kW—plus 50 kW multiplied by \$10/kW (Figure 12).

Demand Charges - **Rate Periods**

	Period ⓘ	Tier in Period	Max. Demand (kW)	Demand Charge (\$/kW)	
✖	1	1	unlimited	15	Add Tier to Period 1
✖	2	1	100	12	
✖	2	2	unlimited	10	Add Tier to Period 2
✖	3	1	unlimited	18	Add Tier to Period 3

[Add Rate Period](#)

Figure 12. Adding tiers to the Demand Charges – Rate Periods table

As with the energy charges, demand charges can have a different weekend schedule than the weekday schedule.

Once you’ve finished setting up your custom rate, click “Create New Custom Rate.” This saves the rate to your custom rate database (Figure 13).

Custom Rate created successfully!

## Custom Rates

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Manage your custom rates

- ⚙ Build a new load
- 📄 Copy, Edit, Delete
- 📊 View charges
- 📈 View rate stats.

Maximum Demand Charge (\$)

- > 30
- 30 - 20
- 10 - 20
- 1 - 10
- 0
- No Data

Maximum demand charge rates by utility service territory.

Show 10 ▾ entries [Build Rate](#)

Last modified	Name	Energy		Demand		Actions ⓘ
		Min. charge (\$/kWh)	Max. charge (\$/kWh)	Min. charge (\$/kW)	Max. charge (\$/kW)	
2020-03-09 1:09 AM	Example Custom Rate	0.08	0.1	12.0	18.0	<a href="#">Copy</a>   <a href="#">Edit</a>   <a href="#">Delete</a>   <a href="#">View charges</a>

[Previous](#) **1** [Next](#)

Figure 13. Saving a new custom rate to your custom rate database



Now, if you go back to the REopt Lite evaluation page, you can select your custom rate from the dropdown list and proceed with your analysis (Figure 14).

Figure 14. Select and use your new custom rate

## 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](https://reopt.nrel.gov/user-guides.html).



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](https://reopt.nrel.gov/tool).

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Operated by the Alliance for Sustainable Energy, LLC