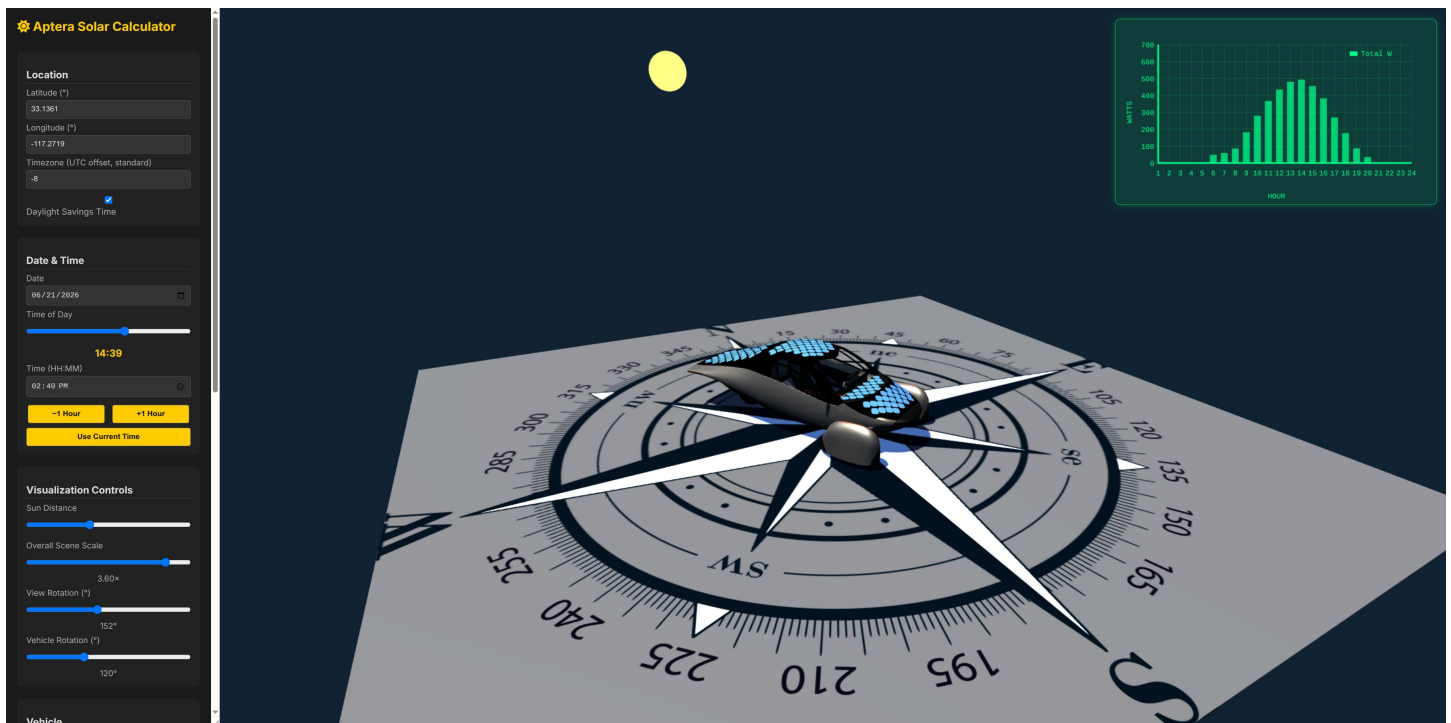


Aptera Solar Calculator – User Guide V3.1

This browser-based tool is a complete, self-contained 3D solar performance simulator for the Aptera vehicle. It uses real solar position data ([SunCalc library](#)) and the actual 3D geometry of the vehicle's solar panels to calculate instantaneous power (kW) and daily energy (kWh) output.

The power and energy values calculated assume only perfect weather conditions with no clouds. It is recommended to visit the [National Solar Radiation Database \(NSRDB\)](#) which is a comprehensive collection of hourly and half-hourly meteorological and solar irradiance data for the United States and select international locations, covering the period from 1998 to the present. This historical data, combined with the output of this calculator, can be used to further model the solar generation capabilities of the Aptera vehicle for a specific location.



1. How to Use It

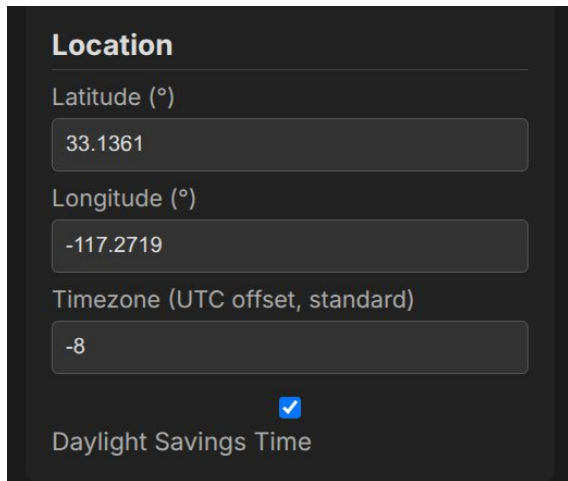
1. **Launch the Website**
Open ExperienceAptera.com in any modern browser (Chrome, Edge, Firefox, Safari). Click the button to launch the **Aptera Solar Calculator**. No installation required.
2. **Main screen layout**
 - Left sidebar: all controls (drag the thin vertical bar on the right edge of the sidebar to make it wider or narrower)
 - Center/right: interactive 3D view of the Aptera on the flat ground
 - Upper-right corner: live power bar chart (Watts per hour)
3. Enter the **Latitude**, **Longitude**, and **Timezone** (UTC offset for standard time) for the location you want to simulate.
4. Select the **Daylight Savings Time** option if it is in effect for the date you will be calculating.
5. Select the **Date and Time** of day for your simulation. Use either a specific time during daylight hours if calculating instantaneous power, or at sunrise if calculating daily energy output.
6. **Arrange the 3D scene** to your preference, including the direction the vehicle is pointing which will have a large influence on the sun power captured.
7. **Choose the Aptera vehicle** for your simulation, either with the rear hatch closed or with the rear hatch open for “solar max’ing”.
8. **Click the Calculate kW button** to simulate the instantaneous power for the current location/date/time (values for the entire vehicle and for the individual solar strings are displayed directly below the button).
9. **Click the Calculate Daily kWh button** to simulate the energy captured during a full day along with the number of miles that energy can be used for (values displayed directly below the button). The time selected will need to start at sunrise and will advance one hour for each press of the button (one hour of instantaneous power = one kWh).
10. Select the option to **Include Dash Solar** only when all of the dash cells are in full sunlight. You will need to manually monitor if any shadow from the vehicle falls onto any cell(s) of the dash. When this option is disabled, the dash output will fall to an ambient light calculation only.
11. **Click the Reset Daily kWh button** to clear all previously calculated values and graph data prior to starting a new simulation.

2. Controls (Sidebar)

Location

- **Latitude & Longitude** (default = Aptera headquarters location in Carlsbad, CA)
- **Timezone** UTC offset in standard time (default = -8 Pacific)
- **Daylight Savings Time** checkbox (default = selected)

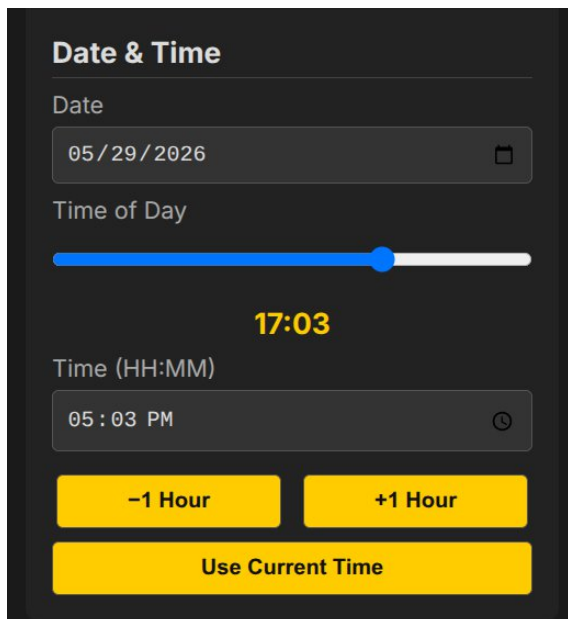
Custom location settings are saved in a client side cookie so they will persist between browser sessions.



The screenshot shows a dark-themed sidebar panel titled "Location". It contains three input fields: "Latitude (°)" with the value "33.1361", "Longitude (°)" with the value "-117.2719", and "Timezone (UTC offset, standard)" with the value "-8". Below these fields is a checkbox labeled "Daylight Savings Time" which is checked, indicated by a blue checkmark icon.

Date & Time

- **Date** picker
- **Time** slider + HH:MM input (24 hour clock)
- **±1 Hour** buttons
- **Use Current Time** button – selects the current system time from your device

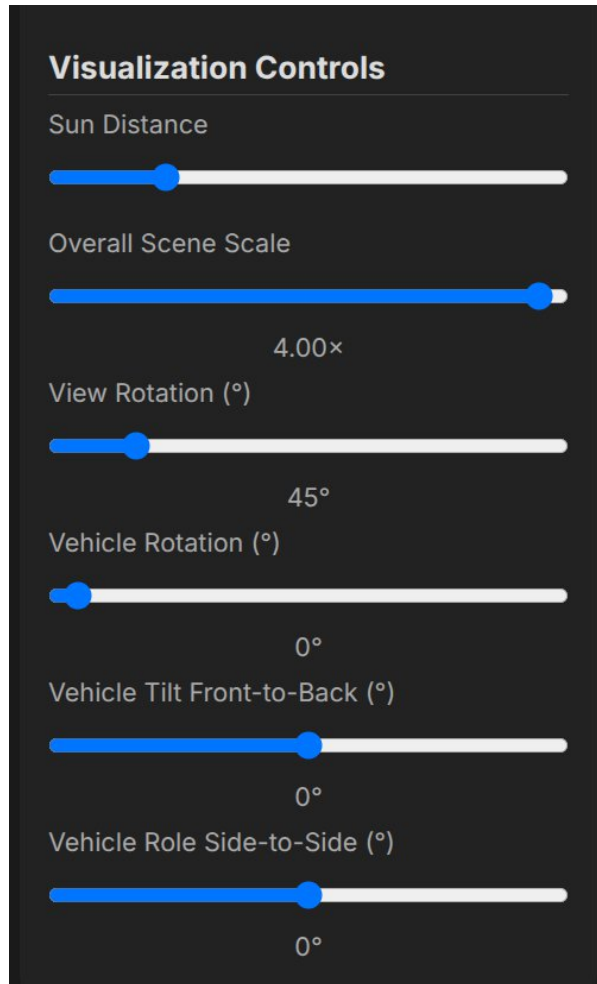


The screenshot shows a dark-themed sidebar panel titled "Date & Time". It features a "Date" picker with the value "05/29/2026" and a calendar icon. Below the date is a "Time of Day" slider with a blue handle, and the time "17:03" is displayed in yellow. Underneath the slider is a "Time (HH:MM)" input field showing "05:03 PM" with a clock icon. At the bottom, there are three yellow buttons: "-1 Hour", "+1 Hour", and "Use Current Time".

Visualization Controls

- **Sun Distance** – moves the sun farther/closer (visual only)
- **Overall Scene Scale** – scales both vehicle and ground together
- **View Rotation** – rotates the camera around the scene
- **Vehicle Rotation** – spins the vehicle on the ground
- **Vehicle Tilt Front-to-Back** – tilts the vehicle forward or backward
- **Vehicle Roll Side-to-Side** – rolls the vehicle on it's side

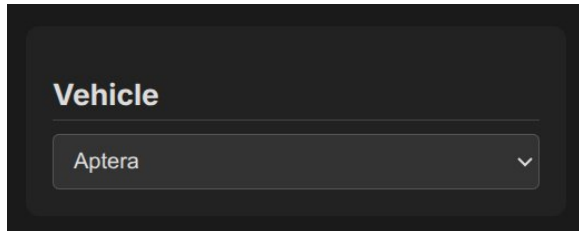
Custom visualization settings are saved in a client side cookie so they will persist between browser sessions.



Vehicle

- Dropdown to choose:
 - **Aptera** (rear hatch closed)
 - **Aptera Solar Max** (rear hatch open)
 - **183 Cell** (early validation vehicle with 83 solar cells on rear hatch, and 183 in total)
 - **199 Cell** (latest validation vehicle with 99 solar cells on rear hatch, and 199 in total)

Switching instantly reloads the new 3D model while keeping all other settings.

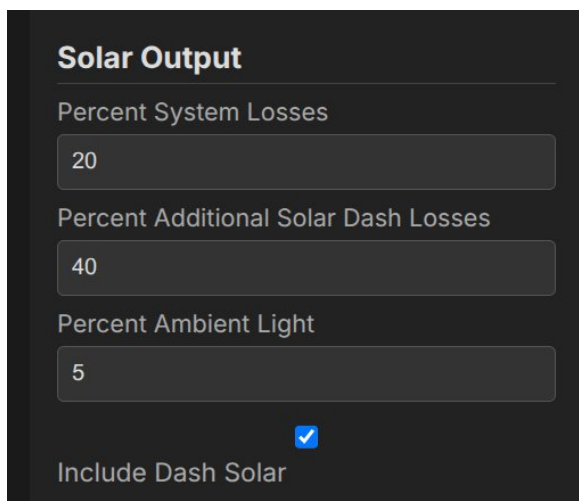


Solar Output

- **Percent System Losses** (default 20.0%)
- **Percent Additional Solar Dash Losses** (default 40%)
- **Percent Ambient Light** (default 5.0%)
- **Include Dash Solar** checkbox (default checked)

The **Percent System Losses**, **Percent Additional Solar Dash Losses**, and **Percent Ambient Light** are key parameters used in the power calculation and different values can be input. The default values have been derived from publicly available, real-world data points although may not be conclusive. When official Aptera validation data is published then these default values may change.

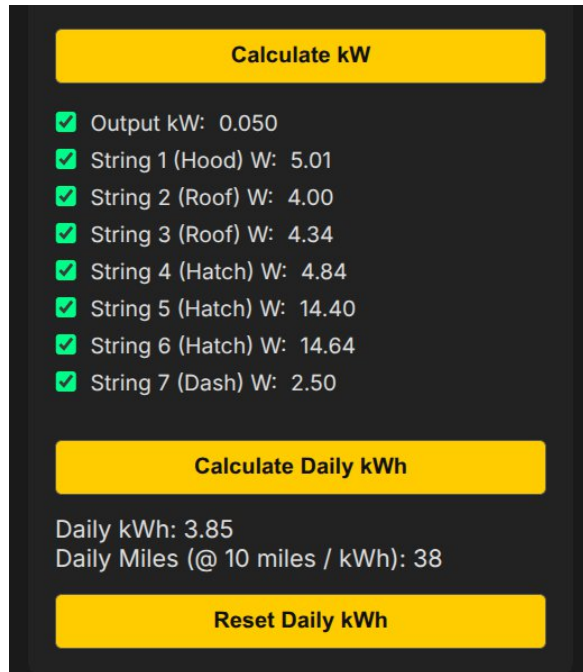
Custom solar output values are saved in a client side cookie so they will persist between browser sessions.



Buttons:

- **Calculate kW** → shows current-hour power and updates the chart with a single bar
- **Calculate Daily kWh** → adds the current hour's power to the daily total **and** advances time by 1 hour (repeat to build the full day)
- **Reset Daily kWh** → clears the daily total and the chart

Checkboxes next to each output value will show/hide this parameter on the power chart.



The image shows a dark-themed control panel with three yellow buttons. The top button is labeled 'Calculate kW'. Below it is a list of seven items, each preceded by a green checkmark: 'Output kW: 0.050', 'String 1 (Hood) W: 5.01', 'String 2 (Roof) W: 4.00', 'String 3 (Roof) W: 4.34', 'String 4 (Hatch) W: 4.84', 'String 5 (Hatch) W: 14.40', and 'String 6 (Hatch) W: 14.64'. Below this list is another yellow button labeled 'Calculate Daily kWh'. Underneath that button, the text 'Daily kWh: 3.85' and 'Daily Miles (@ 10 miles / kWh): 38' is displayed. At the bottom is a third yellow button labeled 'Reset Daily kWh'.

Calculate kW

- ✓ Output kW: 0.050
- ✓ String 1 (Hood) W: 5.01
- ✓ String 2 (Roof) W: 4.00
- ✓ String 3 (Roof) W: 4.34
- ✓ String 4 (Hatch) W: 4.84
- ✓ String 5 (Hatch) W: 14.40
- ✓ String 6 (Hatch) W: 14.64

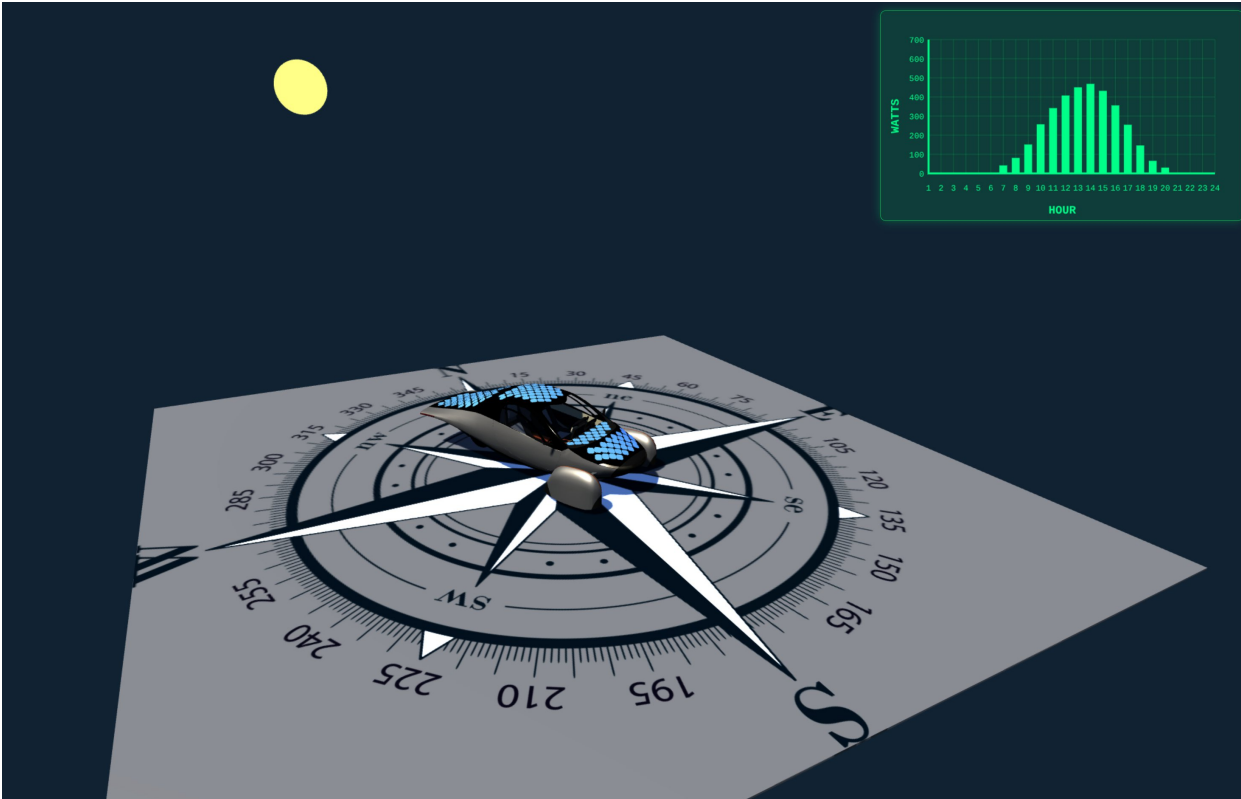
Calculate Daily kWh

Daily kWh: 3.85
Daily Miles (@ 10 miles / kWh): 38

Reset Daily kWh

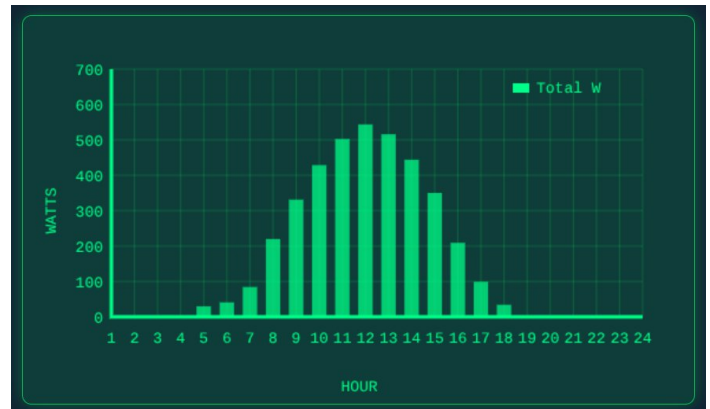
3. The 3D Scene

- Realistic sun position updates live as you change time/date/location
- Shadows are cast on the ground and vehicle
- Mouse does not orbit — use the “View Rotation” slider instead
- Vehicle can be rotated to a specific compass direction with the “Vehicle Rotation” slider

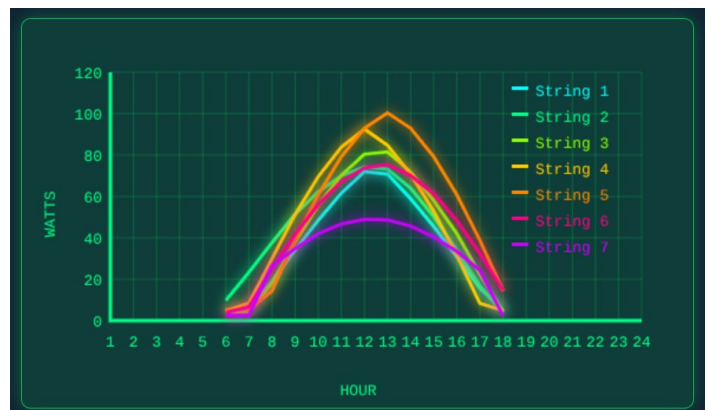


4. The Power Chart (Upper-Right Overlay)

- **X-axis:** Hours 1–24
- **Y-axis:** Watts (0–700)
- **Green bars** show total power output



- **X-axis:** Hours 1–24
- **Y-axis:** Watts (0–120)
- **Colored lines** show string power output



Behavior:

- “Calculate kW” → clears chart and shows one bar at the current hour
- “Calculate Daily kWh” → adds a bar at the current hour and builds the daily curve hour-by-hour
- “Reset Daily kWh” → clears the entire chart

Once a full day has been calculated the power values are stored in memory until reset by clicking the **Reset Daily kWh** or **Calculate kW** button and can be displayed or hidden with the checkbox controls. Solar string values will only display on the chart when calculated with the **Daily kWh** button.

5. How the Calculations Work (High-Level)

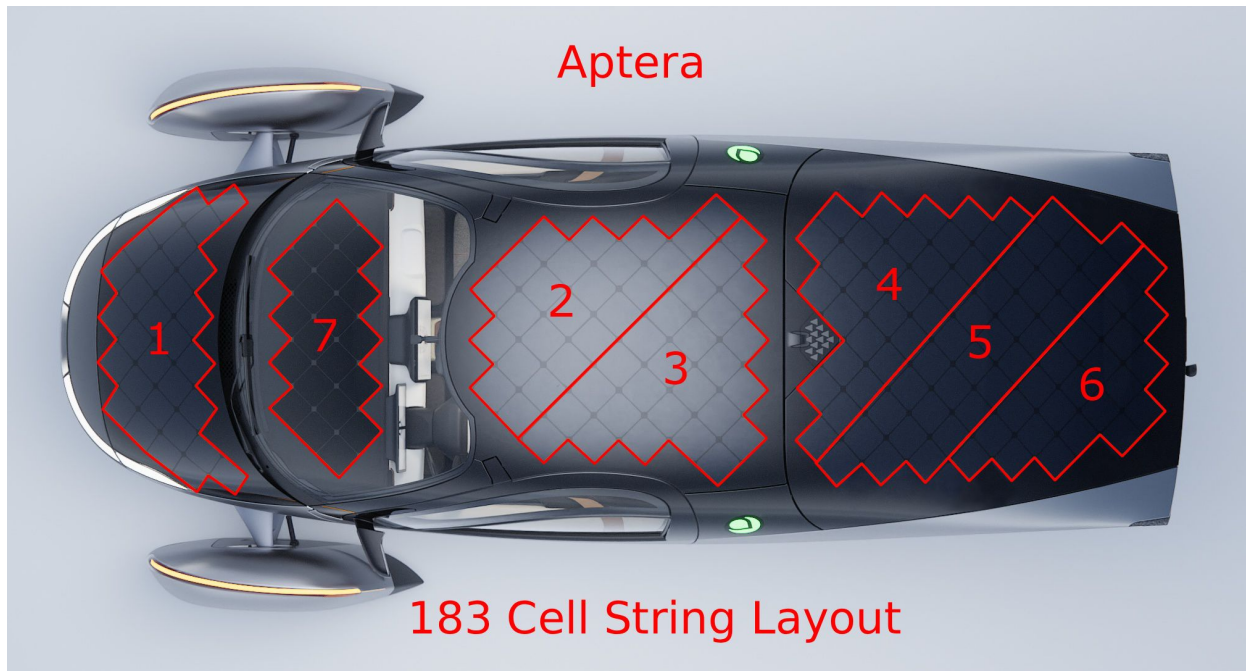
- **Sun position** is calculated with the industry-standard SunCalc library using your exact date, time, latitude, and longitude.
- **Incidence angle** for each solar cell is computed using the real 3D normal vector of every cell compared to the vector of the sun.
- **Efficiency** is determined (for our purposes) for each solar string although is evaluated at the cell level using each cell's incidence angle, and then by applying two rules. First is that a string of cells is limited by its worst performing cell within that string. Second is that the minimum amount of light hitting a cell has a bottom threshold of ambient light.
- **Power** = (number of cells in string) × 3.88 W × (1 – system losses) × (efficiency / 100), with ambient-light floor and optional dash string. Note that the 3.88 W is the cell output of the Maxeon Gen 7 at standard test conditions.
- **Daily kWh** is accumulated manually by clicking “Calculate Daily kWh” repeatedly. Each click of the button advances the clock one hour and the sun moves forward accordingly. When using this button, start the process by adjusting the time to the sunrise value, then clicking the button until sunset.

6. Solar Calculator Limitations

- **Minimum of one hour resolution.** The calculator evaluates a single data point in time and assumes that the same amount of power applies for the next hour, resulting in a stair effect to the output chart. This means that energy is slightly understated during the morning hours when solar gain is increasing over time, while being slightly overstated during the afternoon hours when solar gain is decreasing over time.
- **Ambient light is assumed constant over the day.** The calculator uses a single value for ambient light which is estimated for best case, standard test conditions. In reality the ambient light value changes throughout the day, ramping up from zero during the morning hours and ramping down to zero during the afternoon hours.
- **System losses are estimates.** The losses introduced by the laminate stack, electronics, age, etc. are estimates only and not validated by Aptera Motors.
- **Clear skies and no shading.** The calculator outputs values for clear sky conditions and no shading due to trees, building, etc. so the numbers generated are best case conditions only. To get real world estimates, the calculated values should be analyzed further using solar irradiance data like that found in the National Solar Radiation Database (NSRDB) - <https://nsrdb.nrl.gov/>

7. Aptera Solar String Layout

- Early validation vehicle with 183 solar cells.



- Latest validation vehicle with 199 solar cells.

