Creating a CSV file for distance and slope

	A	B	C	D	E	F	G	H
1	Distance	Angle	Set Speed	Irradiance PV	Temp PV			
2	0	-0.32	25	1000	33			
3	5	-0.09	25	200	25			
4	10	-0.21	25	300	25			
5	15	-0.14	25	400	25			
6	20	-0.37	25	500	25			
7	25	-0.15	25	600	25			
8	30	-0.44	25	700	25			
9	35	0.61	0	800	25			
10	40	-0.77		900	25			
11	45	-0.88		1000	25			
12	50	-0.6		1100	25			
13	55	0.12		1200	25			
14	60	-0.03		1300	25			
15	65	-0.3		1400	25			
16	70	-0.01	20	1500	25			
17	75	-0.39	20	1600	25			
18	80	0.12	20	1700	25			
19	85	-0.31	20	1600	25			
20	90	-0.7	20	1500	25			
21	95	-0.44	20	1400	25			
22	100	-0.42	40	1300	25			
23	105	-0.73	40	1200	25			
24	110	-0.02	40	1100	25			

Example of the CSV file to be imported

Colmn A: Distance is the length of the route.

Colmn B: Angle is the slope of the road, changing according to the distance.

Colmn C: Set Speed is the desired speed commanded for the vehicle to achieve at each position, changing according to the distance.

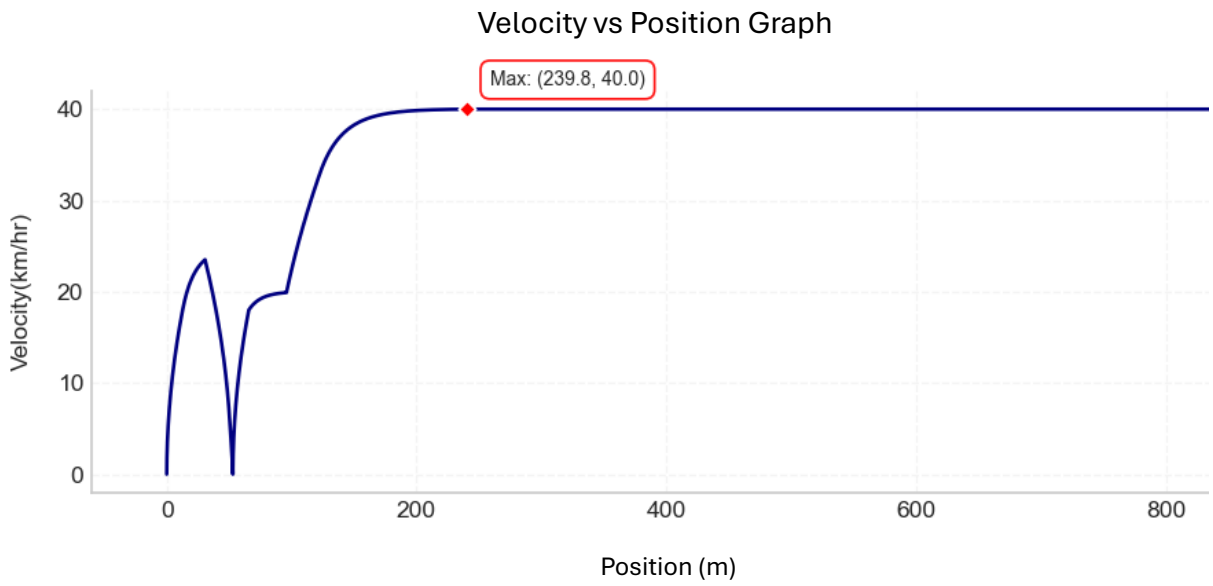
Colmn D: Irradiance PV is the solar radiation that hits the PV while the vehicle is charging with PV, changing every 1 hour.

Colmn E: Temp PV is the ambient air temperature while the vehicle is parked and charging with PV, with values updating every 1 hour.

(*Note: "PV" refers to "Photovoltaic," which relates to solar panels converting sunlight into electricity.*)

Method for stopping at a sign: Set the speed to 0 when the vehicle receives the command. The vehicle will attempt to brake until it comes to a complete stop and will remain stationary for the duration of the Station Stop Time. Once the set time has elapsed, the vehicle will be instructed to resume moving at the maximum speed defined in the Set Speed, unless a different speed has been specified for that particular position.

! Caution: Do not set the speed to 0 continuously, because if the vehicle's speed is 0 and it is commanded to continue at a speed of 0 until the next point, the vehicle will not be able to move to the next point to receive a new speed value, causing an infinite loop.



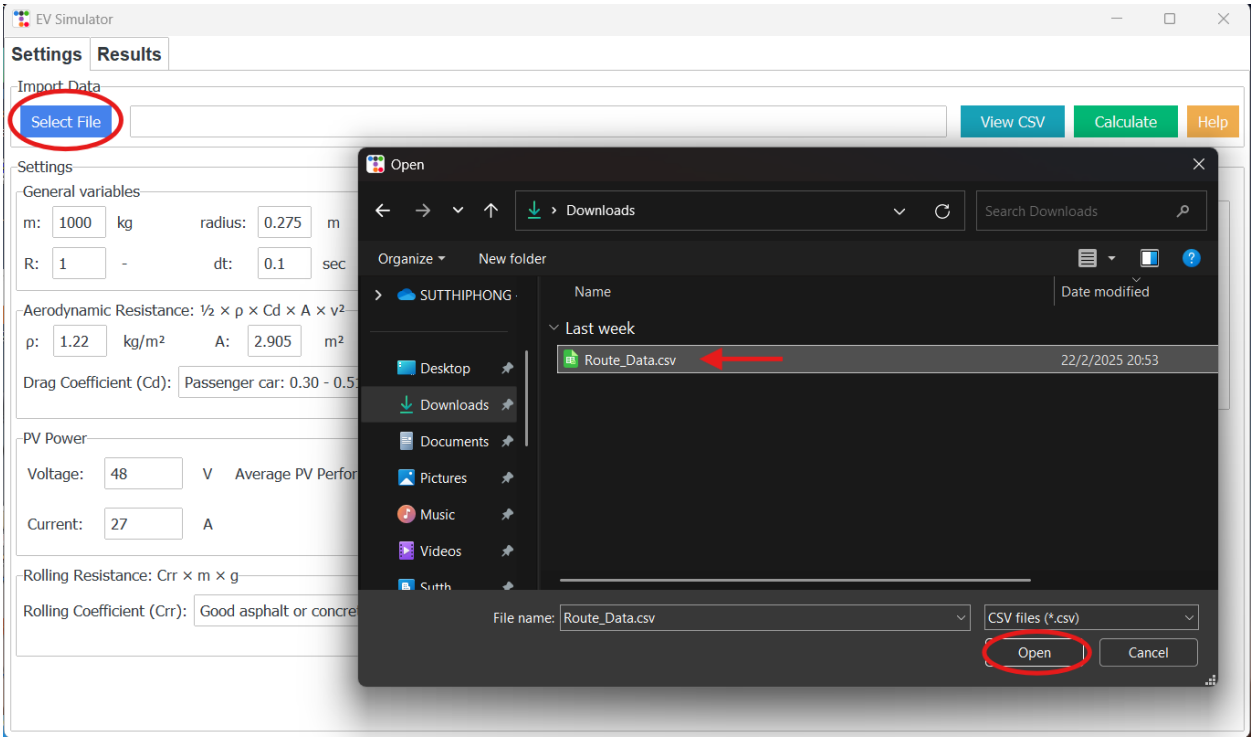
Speed control results from the previous CSV file

From the image, it can be observed that the vehicle does not reach the commanded speed but instead attempts to achieve the speed according to the set parameters. If you want the vehicle to accelerate or decelerate, you can increase the **start-acc** (acceleration) or **break-acc** (deceleration) values, respectively.

Basic Program Usage

1. Import the distance and slope data as a CSV file.

To select the desired CSV file, click the "Select File" button. Choose the file you want and click "Open" to import the data.

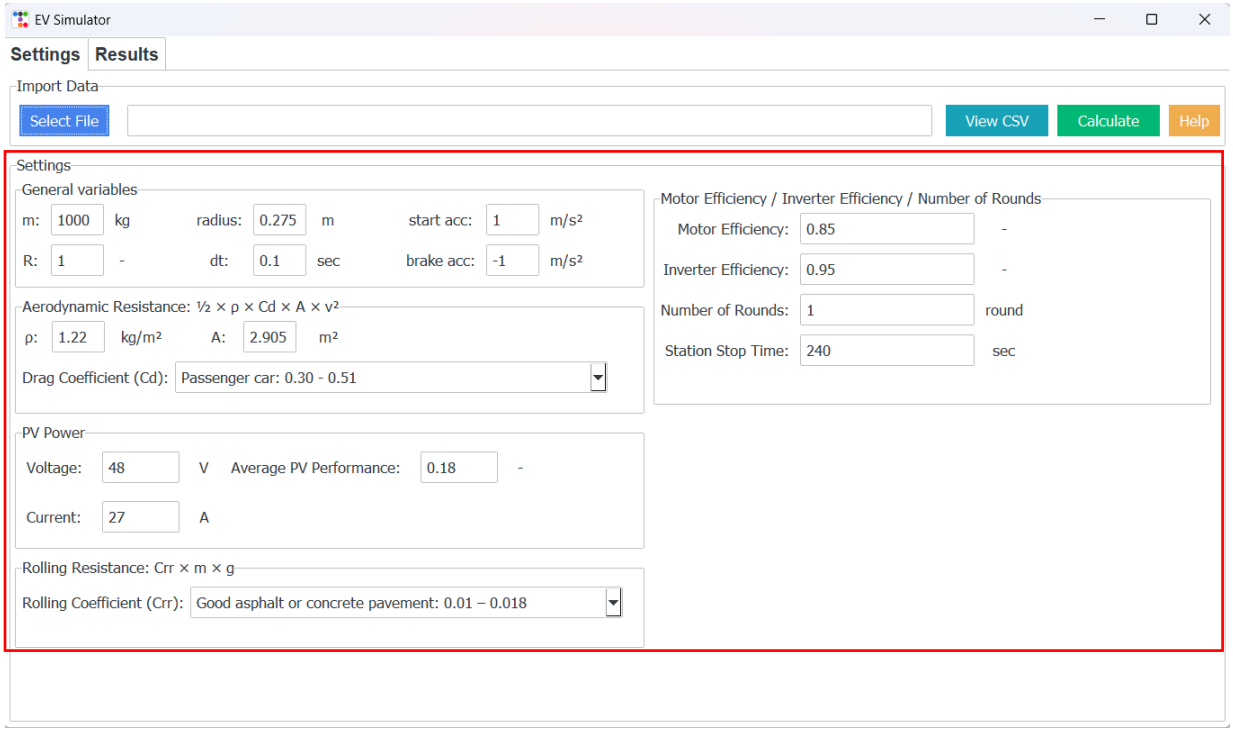


How to import distance and slope files in CSV format

2. You can check the file import at "View CSV". If the imported file has any abnormalities or errors, please verify that the CSV file encoding is UTF-8.

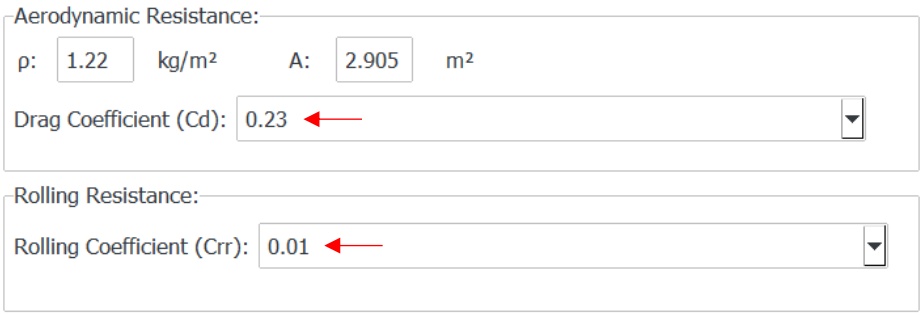
Checking the file by clicking the "View CSV" button

3. Enter the variable values and various detailed specifications of the vehicle to be calculated, then click the "Calculate" button.



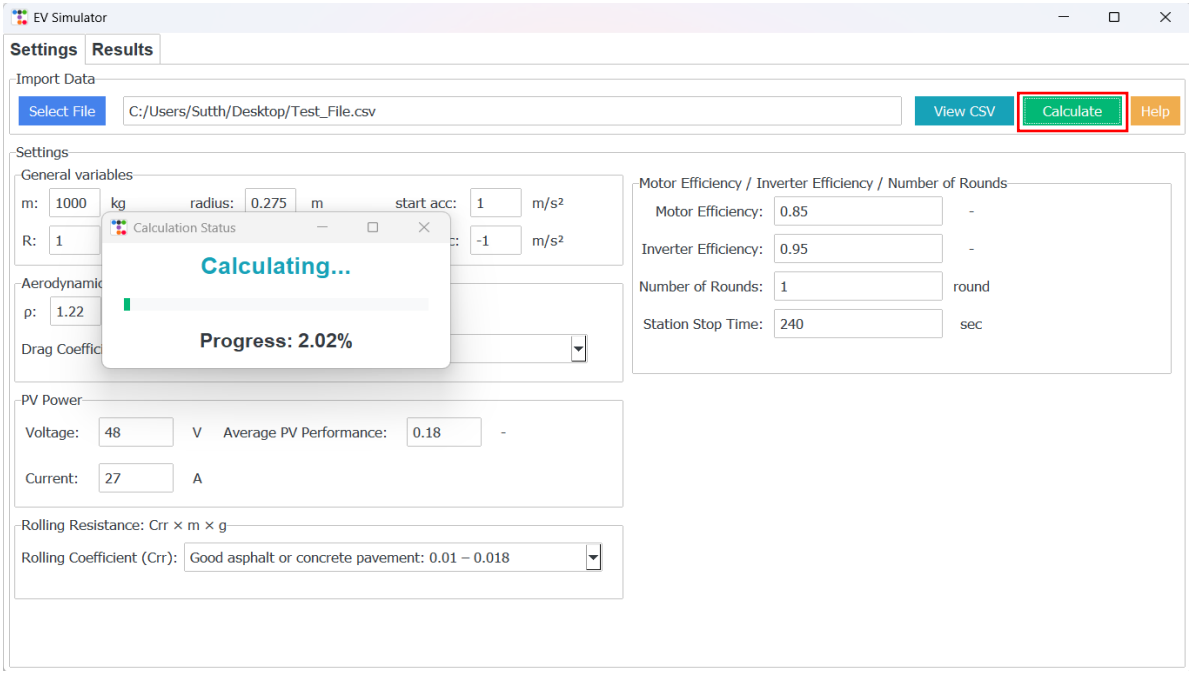
Variable Input Window

Tip: If you need an option that is not available in the combobox, you can enter a numeric value directly into the combobox.



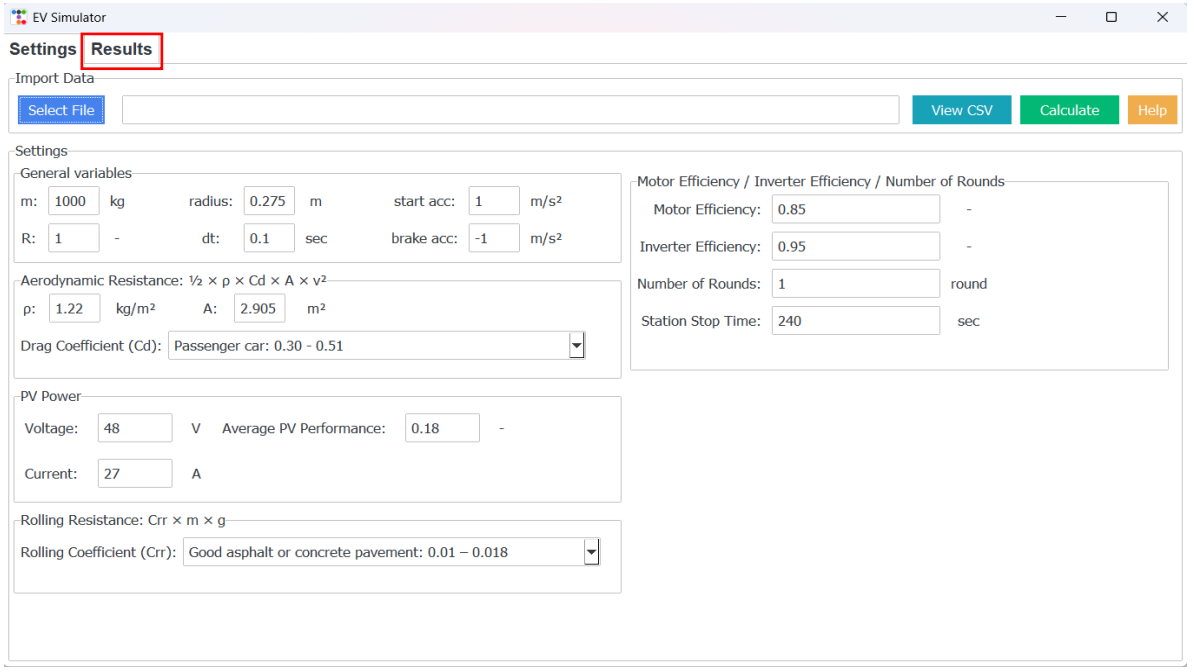
Entering a value in the combobox if the desired option is not available

4. Click the "Calculate" button to start the simulation and obtain the results.



Position of the "Start Calculation" button

5. View the simulation results by clicking on the "Results" tab.



Position of the Tab displaying the calculation results

6. Review the results, which include the following information:

1. Mechanical Power Graph for Vehicle Operation.

    (The graph display can be adjusted in Section 3 of the image above.)

2. Results Obtained from Calculations:

    2.1 Motor Size: The motor size required for the vehicle to operate on the given route.

    2.2 Inverter Size: The inverter size required to drive the motor.

    2.3 Motor Torque: The motor's torque (adjustable via Gear Ratio).

    2.4 Motor Speed: The motor's rotational speed (adjustable via Gear Ratio).

    2.5 Battery Size: The minimum battery size required for operation.

    2.6 With-PV Battery Size: The battery size when PV (solar panels) is installed.

    2.7 PV Power: The power generated by the PV system.

3. Select Y-axis and X-axis Data. Then click the "Show Selected" button to plot a new graph.

4. Enable or Disable Sub-Graphs. (Only available for Power and Force.)

Warning: The "Revert" function, which reverses the vehicle's running direction, will only reverse the distance, slope, and speed in the CSV file. Therefore, the speed must be set in the last row of the distance data. Additionally, the position where the speed is set to 0 (set speed = 0) must be adjusted to the correct position beforehand to ensure proper vehicle stopping, as shown in the image below.

Normal

Revert

	A	B	C	D	E	F
1	Distance	Angle	Set Speed	Irradiance PV	Temp PV	
2	0	-0.32	25	1000	33	
3	5	-0.09	25	200	25	
4	10	-0.21	25	300	25	
5	15	-0.14	25	400	25	
6	20	-0.37	25	500	25	
7	25	-0.15	25	600	25	
8	30	-0.44	25	700	25	
9	35	0.61	0 Normal	800	25	
10	40	-0.77		900	25	
11	45	-0.88		1000	25	
12	50	-0.6		1100	25	
13	55	0.12		1200	25	
14	60	-0.03		1300	25	
15	65	-0.3	0 Revert	1400	25	
16	70	-0.01	20	1500	25	
17	75	-0.39	20	1600	25	
18	80	0.12	20	1700	25	
19	85	-0.31	20	1600	25	
20	90	-0.7	20	1500	25	

Direction of the Revert Function and Changes in the Stopping Position