

The wind charge controller schematics and sketches for the Heltec ESP32 as well as the Arduino Mega located on the work bench can be found in this repository. Our suggested improvements for future teams are listed below:

- add an additional INA219 at the beginning of the circuit to measure the generator voltage and current - this can be function can be added in the WindChargeControllerESP32.ino sketch using the same library and implementation as 'getvolatge_Battery'. A 'getvolatge_Generator' function has already been predefined in the function prototypes
- the RPM reading can be made more accurate using the RTC and Arduino mega sketch MotorControllerTest_2.ino
- the current software check the battery voltage, when it is greater than or equal to 12V the battery is fully charged and the user is no longer allowed to enter PWM values to run the generator - this is our enable disable safety function - a suggested improvement would be to send a message to the web-based interface informing them that the battery is charged & the user will not be allowed to restart the generator until the battery is discharged. This message can be sent through the client-server connection, as all the other values are.
- Input filtrations of generator voltage
Current circuitry includes a larger capacitor which might act as a battery and become the source of power the buck converter uses, which could create some potential problems.
- Check and control the current and voltage through the microcontroller
Use a switching mechanism through the microcontroller to control and stabilize current and voltage after reading.
- Design an implement a buck converter
Current buck converter can only support up to 32V of input voltage (with 15-ohm load), creating a buck converter that can support higher input voltage will increase the robustness of system and allow user to have more control over the input PWM values
- Eliminate the boost converter
Boost converter lowers the current, increases the voltage to maintain the same power. Battery requires 1 Amp of current to charge, and by boosting the voltage, we're reducing the current below the required current.
- Important notes ——
 - the INA219 uses the OLED SLA and SDA pins not the boards original SLA and SDA pins, the WindChargeControllerESP32.ino sketch configures this for the existing INA219
 - the serial connection uses pin 16 & 17 (TX & RX) - 16 is also the OLED reset so the OLED screen does not work when we use the serial connection
 - The maximum voltage that can be measured with the INA219 sensor is 26V and the maximum current is 3.2A.
 - libraries needed for the client-server connection can be downloaded here - <https://randomnerdtutorials.com/esp32-client-server-wi-fi/>