Technical Assistance Request

For project “Moon Shine” by Green Cycle Design Group, LLC

Technical assistance request for circuitry design and implementation:

1. Our innovation will incorporate multiple topologies for Switch Mode Power Supplies. We are in selection for a buck converter IC controller capable of communicating via I2C with the ability to control the output voltage and current. We are targeting a 40 Amp charge rate for the entire range of 2.7 to 4.0 volts. However, we understand that other topologies or management circuitry may solve this need better. Assistance would be appreciated in helping to determine the optimum topologies and driving circuitry is best to meet our target goals.
2. Switch Mode Power Supplies can operate at various frequencies to produce higher currents with smaller magnetics. The relationship of the magnetics specifications to the frequency factors into the efficiency, size and cost of the system. The balance between these is critical to produce the most efficient options for the size and price. Assistance would be appreciated in helping to determine the optimum inductors to meet our application. Additionally, custom inductors could be created but advice would be needed for how to create these cost-effectively.
3. Our design will require a seperate power supply that converts 120/240 VAC to a range from 20 to 40 VDC to feed our charging circuit. We will begin by using an external power supply but would like to integrate this function onto our circuit board. Converting AC to DC requires additional work in Switch Mode Power Supplies to efficiently perform the conversion. Assistance would be appreciated in helping determine the optimum topology and construction strategy while reducing cost of the AC to DC converter.
4. Converting AC to DC requires the use of a transformer that will need to be operated at high frequencies. The size, construction and frequency all play a role in determining the correct transformer to use. Assistance would be appreciated in selecting the appropriate transformer and/or creating a custom transformer cost effectively.
5. Switch Mode Power Supplies switch high currents at high frequencies, therefore, creating Electromagnetic Interference. Strategies can be employed in the circuit board design to locate parts in such a manner to reduce these emissions. Additionally, strategies can be employed to quence emissions before they leave the circuit board. Assistance would be appreciated in integrating these EMI reductions techniques into the circuit design and onto the circuit board.
6. There is usually a big difference in theory and reality. Switch Mode Power Supplies can operate with high efficiency, however, a small error in design can result in significantly reduced performance. Therefore it is necessary to test designs to ensure efficiency. We

would appreciate assistance in determining how to perform efficiency tests and in how to hunt for and identify the areas to redesign in order to realize the theoretical efficiencies.

Technical assistance request for testing, documentation, certification, and marketing:

1. Testing and documenting efficiencies on charging systems
    a. Document the overall efficiency of our system at various states of activity for including in marketing literature.
    b. Document the overall energy consumption of our system when all cell boards are active
        i. During full charging capacity when our system is at full charge
        ii. During balancing mode when our system is at reduced charging to facilitate top balancing mode
    c. Document the energy consumption on an individual cell charging at full capacity when one cell is much lower than the others.

Additional assistance would be appreciated in creating the following business:

- Marketing
    - Assist in laying out testing documentation for marketing literature
    - Assist in creating a questionnaire to send to potential customers
    - Assistance in creating a YouTube video and how to attract hits from it.
        - Do we use stand-in models or make it personal as owners
- Business plan
    - Assist in creating a rough draft of our business plan
    - Design this strategy to attract investors
    - Assist in creating a final draft of our business plan