Complete the following calculations.

1. Both the Tesla Model S and the Nissan Leaf require a minimum voltage of 376 V in order to charge their battery packs.
   1. How many 1.5 V, 0.75 A modules would need to be wired together in series in order to achieve this voltage?
   2. What would be the maximum amperage of this array?
   3. What would be the size of this array in m2(each modules is .0063 m2)?
2. The 75 kWh Tesla Model S has a storage capability of approximately 200 Amp-hours (Ah). How long (in hours) would it take to charge the battery pack using this array?
3. The Nissan leaf has a storage capacity of approximately 64 Ah. How long would it take to charge the battery pack using this array?
4. If the modules receive direct sunlight for an average of 6 hours each day, how many days would it take to charge each of the vehicles?
5. To make the charging time even remotely practical, let’s assume we need to achieve at least 3.0 A. How much power would be needed in order to produce both 376 V and 3.0 A?

\_\_\_\_\_\_\_ Watts

* 1. A typical 200-Watt solar panel is about 1.5 m2. How much space is needed to produce the number of watts you calculated above? Would this fit on top of a typical passenger vehicle?
  2. How long (in days) would it take for this array to fully charge the 75 kWh Tesla Model S assuming the same 6 hours of direct sunlight per day?

1. Assume that the top-facing surface area of a passenger vehicle is capable of integrating the equivalent of three 200 W solar panels. How many Watts is this? If the voltage of this array is stepped-up to 376 V in order to charge a battery pack, how many amps would we generate (Note: assume no losses in the step-up conversion)?
2. How long (in days) would it take for this array to fully charge the 75 kWh Tesla Model S assuming the same 6 hours of direct sunlight per day?
3. Assume you live in Arizona and your car sits in a sunny parking lot for 8 hours each day while you are at work. How many miles could you drive on the charge acquired during this time?
4. The Tesla Supercharger boasts an 80% charge for the 75 kWh model in just 30 minutes. What is the power of the Supercharger if this is true?
5. If we were to attempt to achieve this same amount of power using a solar PV array, how many 200-Watt panels would be required? How much space would be needed (assuming each panel is 1.5 m2)?