Rancho San Joaquin

Stack Garage Electricity Limitations and Electric Cars

March 18, 2022

Like our shared water meters in which our HOA assessment covers residential water use, electricity use in the stack garages is also on shared meters in which **stack garage electricity use is also covered by our assessment**.

> *Electricity use in the townhome garages is measured by the townhome's individual meter in which the owners pay for the electricity, not the HOA.*

When RSJ was built almost 50 years ago, like water, electricity was inexpensive and the HOA covering the stack garage electricity was a small expense. That's because the garages were used to occasionally open the garage door, turn on a light, and maybe run a power tool.

But now, electric vehicles – cars, motorcycles, scooters, and bikes – are growing in popularity, especially as gas prices increase.

As more stack residents charge an electric vehicle in their garage, **our HOA electricity bill will continue to increase.**

> ***Stack residents should NOT plug in an electric car into the garage's 110-volt outlet*** *because the outlet is on a shared circuit in which THE BREAKER WILL TRIP if adjacent garage(s) start to draw power on the same circuit.*
>
> *Also, homeowners may not alter the stack garage electrical panel without permission, as this is HOA common area.*

Quick Lesson: Volts, Amps, and Watts

To understand our stack garage electric infrastructure, one needs to understand **volts**, **amps**, and **watts**.

Think of electricity like water flowing through a garden hose as shown in Image 1 below:

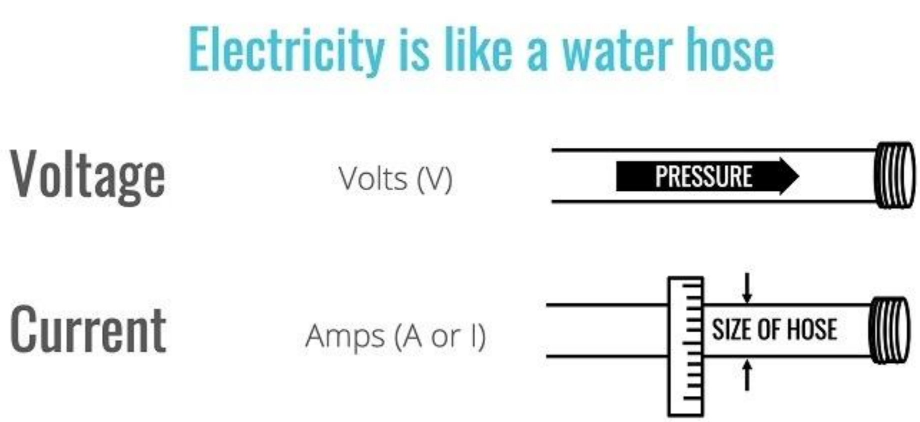

Image 1: Volts and amps analogy to water

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Volts are like water pressure in a garden hose. The electric wiring in our stack garages supports only 110 volts. A voltage of 220 or 240 volts would require a thicker, more insulated wire (or a larger *gauge* of wire).

The amount of electric flowing on a wire (or *circuit*), like the diameter of a hose, is measured in **amps** and can range from 15, 20, 30, to 40 amps and higher. But the number of amps on a circuit – like the size of a hose – is limited to the wire gauge and its circuit breaker in the electrical panel.

> *A **circuit breaker** is like a safety switch that "trips" or cuts off the electricity if the amount demanded exceeds the number of amps and/or amount of heat that the circuit can support.*
>
> *For example, a 15-amp breaker ensures the electricity flowing on a circuit never exceeds 15 amps – although most breakers are designed with an 80% "safety factor" which limits the circuit to 12 amps for a 15-amp breaker.*
>
> *A breaker can also trip if there's a "continuous" electric load of several hours – even if the amps are less than the safety factor – because it could generate more heat than the wire can support.*
>
> *A breaker reduces the risk that the circuit will overheat or worse, start a fire.*

Using the analogy in Image 2 below, think of watts as how quickly the water flows out of the hose and **watt-hours**, or **kilowatt-hours** (*1,000 watt-hours*) as the amount of water that fills a bucket.

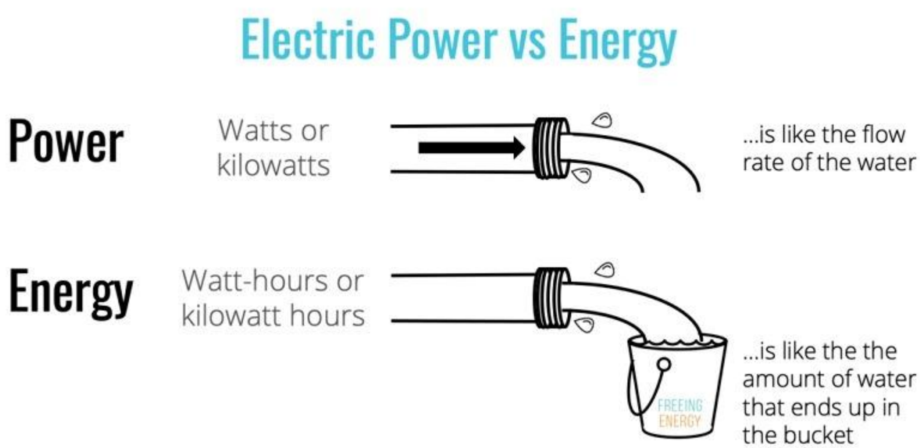

Image 2: Watts and watt-hours analogy to water

The number of kilowatt-hours used depends on the voltage and number of amps. That is, kilowatt-hours (*usage*) = volts (*pressure*) × amps (*amount of current*).

Southern California Edison (SCE) bills electricity use based on the number of kilowatt-hours used each month.

Limited Capacity: Stack Garage Electrical Infrastructure

For electric cars and motorcycles, the vehicle's manufacturer recommends if it will be charged in a garage that the owner install a **dedicated circuit** – i.e., a circuit that's connected to its own breaker and supports one outlet.

This reduces the risk that the electric vehicle will trip the breaker should another appliance or electric vehicle be plugged in on the same circuit in which the number of amps needed trips the breaker.

Unfortunately, our stack garages consist of ***shared*** **110-volt circuits with 15- or 20-amp breakers**. That is, the outlets in each row of garages are connected to the same shared circuit. And the lights in the same row of garages are connected to another shared circuit.

> *Note that it is VERY expensive for the HOA to upgrade the stack garage infrastructure to dedicated circuits by rewiring the garages with new circuits and breakers.*

The Problem with Charging Electric Cars On Shared Circuits

Some small- or medium-size electric cars *can* charge on a regular 110-volt outlet – referred to as "Level 1" charging. (*Level 2 charging is faster but requires a dedicated 240-volt outlet connected to a 40- or 50-amp circuit.*)

If a small electric car is used for short trips, it can fully charge when it's plugged in a 110-volt dedicated outlet – usually overnight – for 8 to 12 hours.

However, if an electric car is plugged in the stack garage's 110-volt *shared* outlet, the car will draw 12 amps on a 15-amp breaker – but when someone in the adjacent garage opens their garage door or plugs in a power tool or another electric car, **the breaker will trip and shut off the electricity**.

> *Some small electric cars like the BMW i3, Hyundai Ioniq, Nissan Leaf, and Volvo XC40 have a charging cable that lets the owner set it to Low which limits the charge to 5 or 6 amps. But this reduces the charge to a "trickle" which takes a lot longer to charge the car.*

Another Issue: Dedicated Circuits Result in Unfair "Sharing" of Electricity

The stack garages on each street are provided electricity from a power line connected to a main breaker on the main electrical panel that's on a nearby stack home building. (*The main panel also contains breakers that provide electricity for each stack home.*)

For example, the 13 stack garages on Rana receive their electricity from a 90-amp main breaker. This means a maximum of 90 amps of electricity – *really 72 amps based on the breaker's safety factor* – can be supplied to all 13 garages.

(*The main breakers for the stack garages range from 50 amps to 100 amps on each street.*)

If a dedicated 40-amp circuit were to be installed for a stack garage to charge an electric car, it "takes away" 32 amps, leaving only 40 amps (*72 amps minus 32 amps*) for the remaining 12 garages. **This results in an unfair allocation of electricity for the stack garages.**

If a second dedicated 40-amp circuit were to be installed for another stack garage, it takes away another 32 amps leaving only 8 amps (*40 amps minus 32 amps*) for the remaining 11 garages – *this makes the allocation even more lopsided and unfair for the stack garages.*

And if the amount of electricity demanded by all the garages exceeds the 90-amp main breaker, *it will trip and shut off the electricity for ALL the garages*.

Every dedicated circuit that's installed for a stack garage leaves less electricity available for the remaining garages, increasing the chance the main breaker will trip.