

UNDERSTANDING TIME-BASED SHARING FOR EV CHARGING INFRASTRUCTURE USING A STANDARD 40A BREAKER, DELIVERING 32A @ 208V = 6.7kW

The main issue surrounding EV infrastructure is limited power, the question is how to take the available power and optimize it without affecting EV drivers' ability to charge when they need to, and drive as they please. One hour of charging at 6.7kW = 6.7kWh; this is a function of power consumed over time. The Evolute™ System is designed to deliver full power (6.7kW) during a charging session, as the power-sharing aspect is related to how much time or kWh each user will receive during a typical charging period. Based on a 12 hour span from 6PM to 6AM, and a 1:2 ratio (meaning doubling available power), each user can expect to receive a minimum of 6 hours at full amperage, resulting in 40kWh per day. It is rare that an EV driver would require this amount of charge time per day, which leads to the discussion around further optimization of time per driver. The Toronto and Vancouver Green Standards have narrowed down their minimum requirements to 16kWh and 12kWh during an 8 hour period. At full delivery of power (6.7kW), it will take 2-2.5hrs of charging to achieve these green standards, leaving lots of time to share the remaining available power. Other ratios may better suit the needs of the condo, all depending on how much available power there is and how to distribute it fairly and economically to as many cars.

Below are examples of how many cars can be connected to a power source with different ratios of time-based power-sharing

Available Power			No Sharing	2 x Sharing	3 x Sharing	4 x Sharing	Toronto Green Standard Minimum Requirements 16kWh over 8hr period	Vancouver Green Standard Minimum Requirements 12kWh over 8hr period
kVA	kW	100% Amps @ 208v	Minimum guaranteed block of time/kWh that each user will achieve if all users were to charge simultaneously for a 12 hour period. On average EV drivers are only charging 1-3 hrs per night, 3-4 times a week, leaving a lot more power for those who require it.					
			12hrs = 80kWh	6hrs = 40kWh	4hrs = 26.8kWh	3hrs = 20kWh	3.6hrs = 24kWh (over a 12hr period)	2.7hrs = 18kWh (over a 12hr period)
75	67	208	10	20	30	40	33	44
100	90	278	13	27	40	53	45	60
112.5	101	312	15	30	45	60	50	67
150	135	416	20	40	60	80	67	90
175	157	485	23	47	71	94	78	104
200	180	555	27	54	81	107	90	120
225	202	625	30	60	90	120	101	134
250	225	695	33	67	102	134	112	150
275	248	765	37	74	112	148	124	165
300	270	830	40	80	120	160	135	180
350	315	970	47	94	143	188	157	210
400	360	1110	54	108	163	215	180	240
450	405	1250	60	121	184	242	202	270
500	450	1385	68	136	204	269	225	300
550	495	1525	74	148	225	296	247	330
600	540	1665	81	162	245	323	270	360
650	585	1800	87	175	265	350	292	390
700	630	1945	94	189	286	377	315	420
750	675	2080	101	202	306	404	337	450
800	720	2220	108	216	327	431	360	480
850	765	2360	114	228	347	458	382	510
900	810	2500	121	243	368	485	405	540
950	855	2635	128	256	388	511	427	570
1000	900	2775	135	270	405	538	450	600

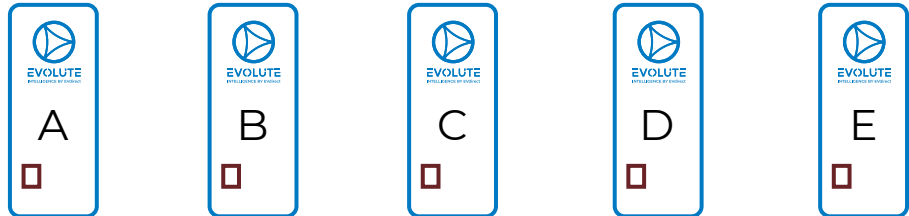
UNDERSTANDING SHARING RATIOS AND SIMULTANEOUS CHARGING ON A PANEL LEVEL

Max panel capacity vs Max active charging	EVOLUTE-40042 400A rated			EVOLUTE-60072 600A rated		
	20 CAR CAPACITY	Maximum Simultaneous Charging		32 CAR CAPACITY	Maximum Simultaneous Charging	
Voltage / kW	208V	6.7kW	8.3kW	208V	6.7kW	8.3kW
EVSE Breaker Size		40A Breaker	50A Breaker		40A Breaker	50A Breaker
When using a 600-208V Transformer	75 kVA = 208A	10	8	112.5 kVA = 312A	15	12
	112.5kVA = 312A	15	12	150 kVA = 416A	20	16
When using a Main Breaker @ 208V	200A@80% = 160A	7	6	400A@80% = 320A	15	12
	250A@80% = 200A	9	7	500A@80% = 400A	19	15
	400A@80% = 320A	15	12	600A@80% = 480A	24	19

20 Vehicle System EVOLUTE-40042 using 40A breakers

Various Transformer
and/or Breaker sizes

75kVA = 208A 112.5kVA = 312A 200A = 160A 250A = 200A 400A = 320A



	A	B	C	D	E
Simultaneous users	10	15	7	9	15
Waiting in queue	10	5	13	11	5
Total # of users	20	20	20	20	20
Sharing ratio	1:2	1:1.3	1:3	1:2	1:1.3

Adding a 10 user Auxiliary panel to share the same power

	A	B	C	D	E
Simultaneous users	10	15	7	9	15
Waiting in queue	20	15	23	21	15
Total # of users	30	30	30	30	30
Sharing ratio	1:3	1:2	1:4	1:3	1:2

Adding a 20 user Auxiliary panel to share the same power

	A	B	C	D	E
Simultaneous users	10	15	7	9	15
Waiting in queue	30	25	33	31	25
Total # of users	40	40	40	40	40
Sharing ratio	1:4	1:2.6	1:5.5	1:4	1:2.6

32 Vehicle System

EVOLUTE-60072 (The Beast) using 40A breakers

Various Transformer and/or Breaker sizes

112.5kVA = 312A

150kVA = 416A

400A = 320A

500A = 400A

600A = 480A



	A	B	C	D	E
Simultaneous users	15	20	15	19	24
Waiting in queue	17	12	17	13	8
Total # of users	32	32	32	32	32
Sharing ratio	1:2.1	1:1.6	1:2.1	1:1.7	1:1.3

Adding a 20 user Auxiliary panel to share the same power

	A	B	C	D	E
Simultaneous users	15	20	15	19	24
Waiting in queue	37	32	37	33	28
Total # of users	52	52	52	52	52
Sharing ratio	1:3.5	1:2.5	1:3.5	1:2.5	1:2

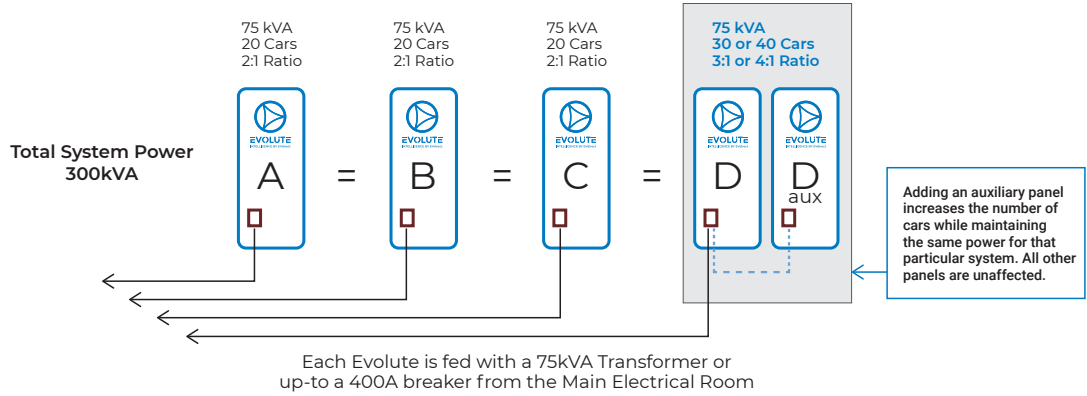
Adding a 32 user Auxiliary panel to share the same power

	A	B	C	D	E
Simultaneous users	15	20	15	19	24
Waiting in queue	49	44	49	45	40
Total # of users	64	64	64	64	64
Sharing ratio	1:4	1:3.2	1:4	1:3.3	1:2.6

UNDERSTANDING SHARING RATIOS AND DILUTION OF POWER ON A SYSTEM LEVEL

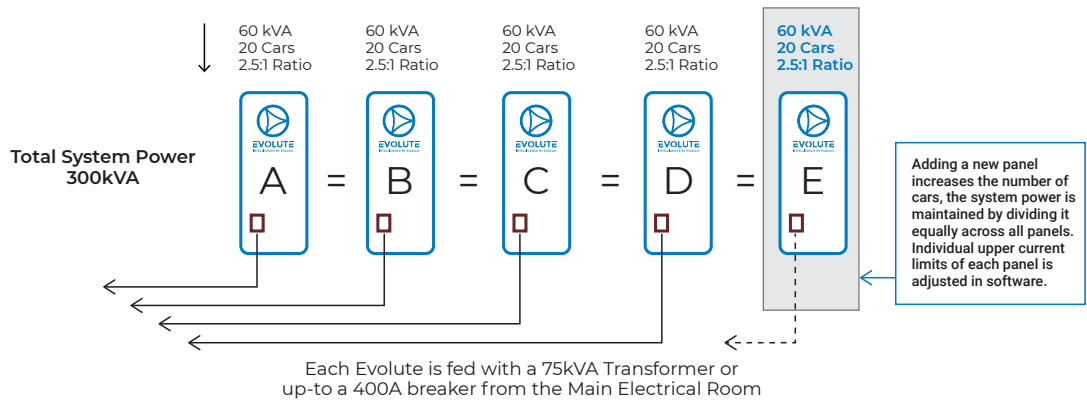
OPTION A:

Maintain full power to each panel while increasing the number of users



OPTION B:

Decrease power to each panel while increasing the number of users



OPTION C:

Monitor the Mains of the Building or Service to dynamically increase or decrease the system power based on real-time building demand.

