

SBD Explores: 800V EVs

What are 800V EVs and should automakers be adopting it?

10-minute Insight

800V architecture is being introduced by vehicle manufacturers. This new architecture can give automakers a significant advantage over their competition, specifically related to consumer experience. This comes at a higher build cost than current 400V architectures, however.

The adoption of 800V architecture is in the early stages and, for the technology to be successful, it will require suitable charging infrastructure. Infrastructure must also keep pace with consumer demand for high-speed charging.

In this edition of SBD Explores, we provide a snapshot of the current 800V market and outline the advantages, disadvantages, and major players in the 800V race.

Target audience

Product planning Strategy

Engineering Investing

Focus market(s)

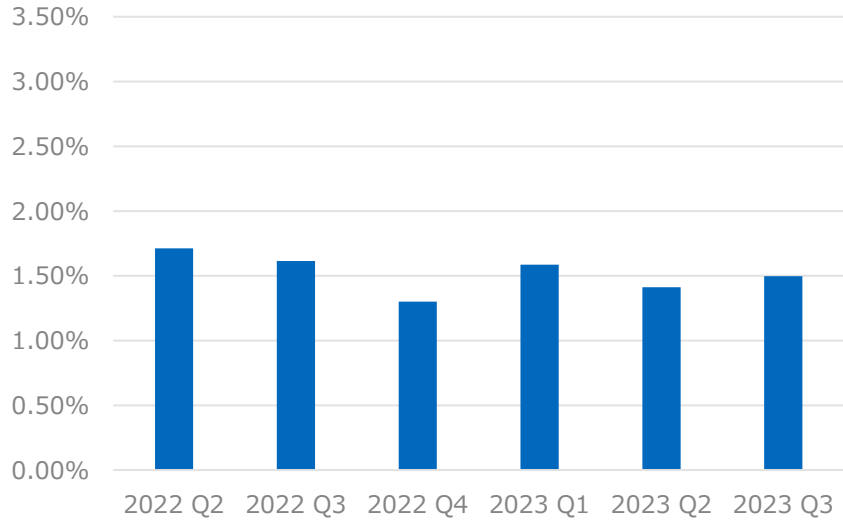
Global



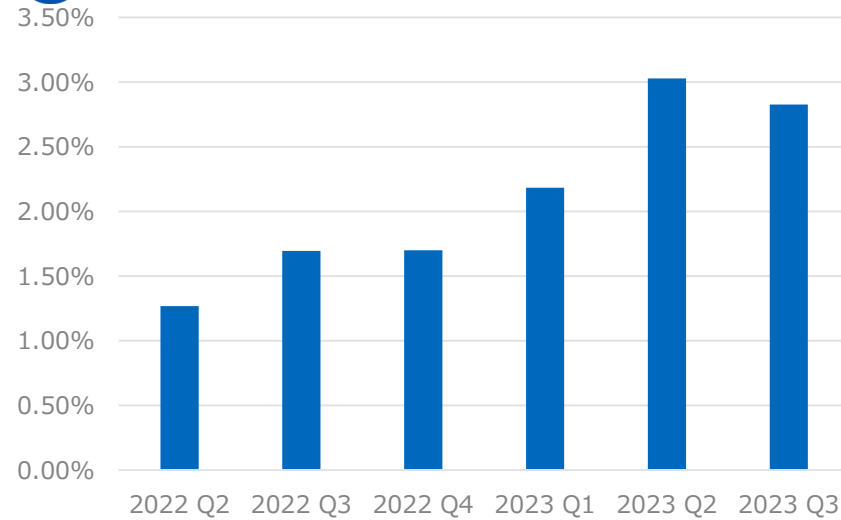
What is happening?



US – Penetration of 800V Chargers



EU – Penetration of 800V Chargers

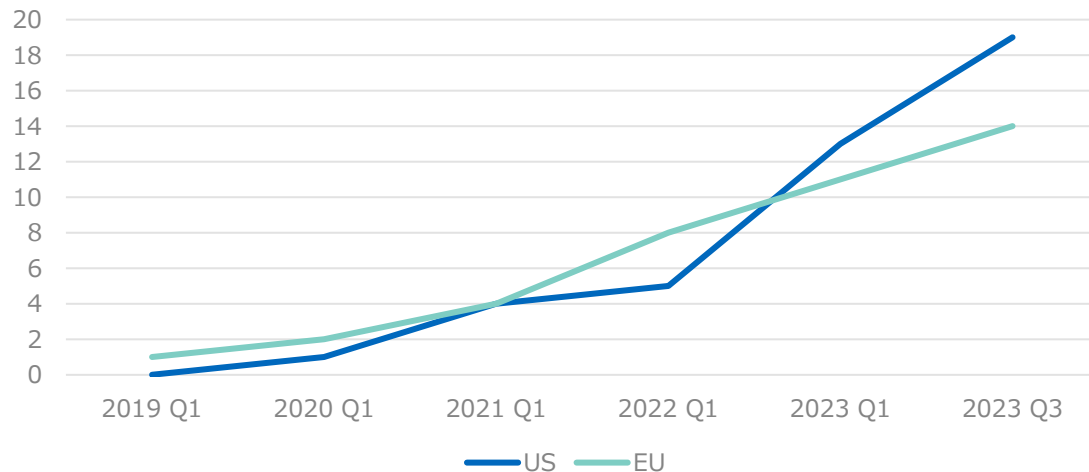


Key takeaway

800V batteries and systems are already offered by component manufacturers. This has enabled some automakers to adopt the technology and bring 800V vehicles to market. Charge point providers are expanding support for these types of vehicle by making 800V-capable chargers available.

- In the EU, there is a steady increase in the availability of 800V charging stations. In the US, the growth is stagnant.
- The stagnant growth of 800V chargers in the US contrasts with the rising availability of 800V vehicles in the US. More 800V vehicle models are available in the US compared with the EU.
- The range of 800V models available on the market in China is small. However, SBD expects this to increase. BYD has a strong presence in the 800V segment with their e-platform 3.0 and Xpeng has released their latest G9 model with 800V architecture.

Number of 800V In-Production Vehicle Models



OEMs with 800V models










Why does it matter?



Key takeaway

There are benefits to moving from existing 400V architecture to 800V architecture. SBD expects that when OEMs quantify these benefits, it will show that investment in 800-volt technology is justified.

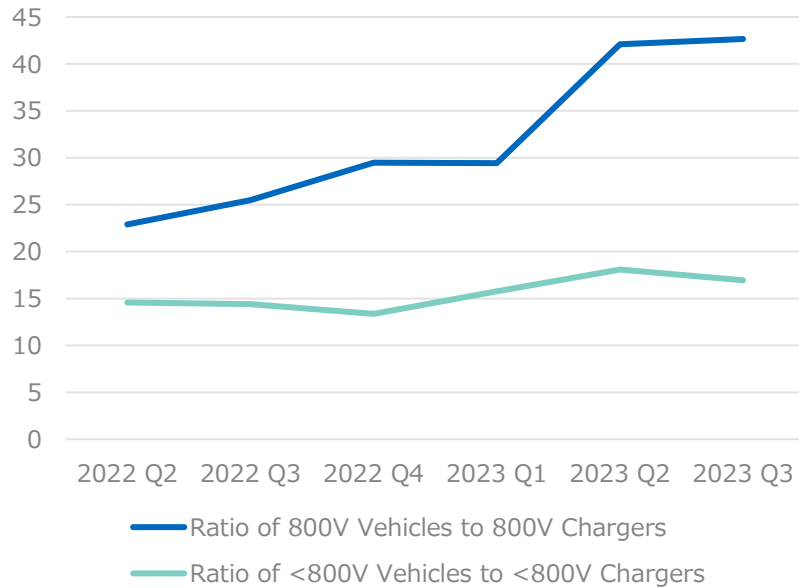
- The main direct impact of 800V technology to the consumer is faster charging times. 800V architecture can support faster charging times when used with 800V capable chargers.
- Vehicle weight can be reduced with 800V architecture. Increasing the voltage allows a lower current to be used, which allows thinner cables and smaller electronic components to be used. This reduces weight and some manufacturing costs. Lower current also reduces energy lost to heat, thus increasing efficiency.
- Higher voltage batteries can provide greater power to the electric drive motor and achieve better regenerative braking at a lighter vehicle weight than 400V architectures. This also contributes to greater vehicle efficiency.
- 800V architectures are more expensive to manufacture than their 400V counterparts due to the smaller market share and nascence of the technology.

	400V Architecture	800V Architecture
 Faster Charging Times	Charge times are typically current-limited either due to the capacity of the cables or the heat generated by the higher currents.	Supports higher power charging due to lower current needed for similar power.
 More Power	Higher power potential with similar current profiles and smaller motors.	Can provide more power to the motors for faster acceleration.
 Low-Current Cable Support	Many high-power chargers use 200A cables, limiting 400V vehicles to slower-than-expected charging speeds.	Higher voltage enables the use of lower current cables. This applies to both charging and the powertrain.
 No Additional Hardware Needed	400V vehicles are already compatible with both 400V and 800V chargers.	Requires a DC/DC converter to be able to charge on existing 400V charging infrastructure.
 Greater Efficiency and Range	Heavier components and less energy recovery potential compared to 800V. Higher currents produce more heat.	Able to capture more power from regenerative braking. Less energy lost to heat. Overall lighter build leads to better efficiency/range.
 Lighter Components	Current limitations lead to heavier cables, power equipment, and motors being used due to lower voltage.	Lighter cables, power equipment, and motors can be used due to high voltage supporting lower current.
 Lower Cost to Build	No new architecture required and existing high-volume components can be used.	Requires a rework of vehicle architecture and investment into new electronic components.

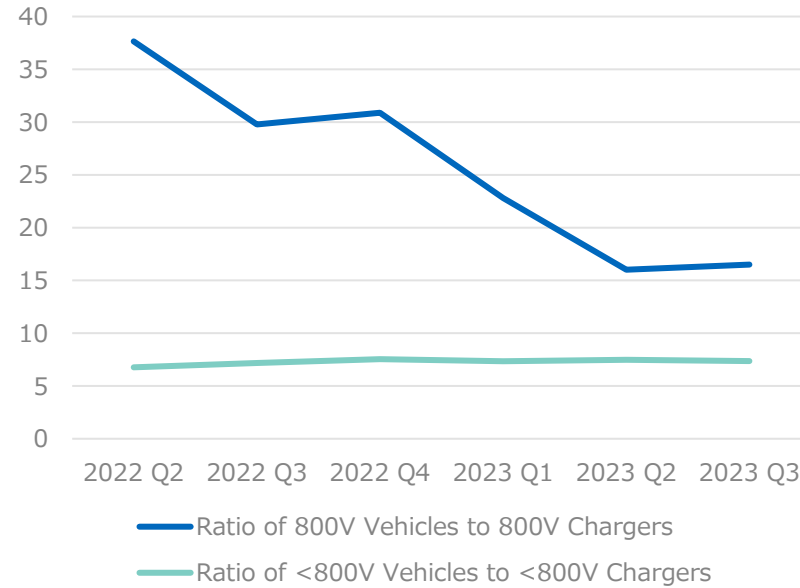
Where Next?



US - Ratio of Number of Vehicles to Compatible Chargers



EU - Ratio of Number of Vehicles to Compatible Chargers



Key takeaway

The ratio of 800V vehicles sold to the number of 800V chargers in the US and EU was compared. The number of vehicles is a running total of vehicles sold from January 2019 to the quarter specified. This was compared to the number of available charging stations for that quarter.

- 800V vehicles will see more success with consumers in the EU before the US. This is because public charging is more frequently used in the EU than in the US, making faster charging times more critical for EU customers.
- The EC has set minimum charging speed requirements. Current laws require stations along major highways to have 1 or more 150kW chargers. Charging operators are frequently including 800V technology in their chargers to future-proof their assets.
- In the US, there are issues (inoperable or not operating at full capacity) with existing charging infrastructure that need to be addressed before 800V stations are built. These fixes can be made, and new stations installed through the NEVI Formula, which provides funding to states to support further charging station expansion.

Chargers		2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3
USA	800V	1,006	1,524	1,682	1,694	2,008	1,770
	<800V	28,672	87,467	102,492	128,481	124,566	123,598
EU	800V	3,149	5,445	7,720	8,679	12,855	19,856
	<800V	167,592	423,871	447,799	501,819	576,034	635,729

Cumulative EV Sales		2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3
USA	800V	34,891	42,865	49,919	59,069	74,510	97,122
	<800V	1,275,246	1,476,348	1,717,196	1,963,602	2,236,061	2,538,102
EU	800V	204,948	229,832	268,060	293,054	318,112	346,891
	<800V	2,867,882	3,215,931	3,786,133	4,232,952	4,759,227	5,316,312

What to watch out for?



OEM	Model	Regions
	e-Tron GT Quattro	
	RS e-Tron GT	
	ATTO 3 (Yuan Plus)	
	Dolphin	
	Seal	
	Song	
	GV60	
	GV70	
	G80 (Electrified)	
	Hummer EV Pickup	
	Hummer EV SUV	
	IONIQ 5	
	IONIQ 6	
	EV9	
	Taycan	
	G9	

Key takeaway

At the time of writing this report, there are sixteen 800V models on the market. These models are spread across 8 OEMs. These OEMs are gaining early experience with 800V architecture and will hold a key advantage going forward.

- Porsche only offer one model in 800V architecture; however, they were the first OEM to implement this technology in a production vehicle. The Volkswagen group have since rolled out the technology to Audi. The Volkswagen Group will likely continue to develop and refine this technology, starting by expanding within these two brands before bringing it to its volume brands.
- Hyundai Motor Group has implemented 800V technology across all its vehicle brands.
- BYD and Xpeng plan to bring 800V vehicles to the EU. This will have a large impact on the industry. Chinese OEMs can manufacture 800V components much cheaper. This will allow them to bring vehicles with faster charging times to market more quickly than Western OEMs.
- GM first introduced 800V architecture with the GMC Hummer EV. The electric Cadillac Escalade will be 800V as well.

How should you react?



1

Prepare

If not already doing so, automakers who are producing EVs should plan to include 800V vehicles within their future line-up.

2

Implement

OEMs should first implement 800V architectures in their high-end models. This technology should then trickle down to entry level vehicles over time.

3

Refine

800V architectures will become less expensive with scale. In the meantime, consider offering 800V as an option on high volume vehicles to allow for cost transparency with the consumer.

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