

LONG-TERM MODEL

# EVALUATION



Moshe K. Levy put a 2018 Zero SR to the test during his commute of more than 100 miles per day and confirmed two things: The electric Zero is cheaper to operate than a gas-powered bike and the power cell has cooling problems.

## TACKLING THE **MEGA COMMUTE**

The electric Zero SR can be the ultimate low-cost champ, if it can just keep its cool.

> By **Moshe K. Levy**

**I**n a previous Model Evaluation (MCN 9/14), we summarized that the 2014 SR ZF11.4+ was “fast, fun and unique. In some ways, it is a very high-tech premium product, but in others, not so much.” Zero has significantly updated the SR since that test, directly addressing two of our major complaints—subpar suspension and tires.

Our 2018 Pearlescent Sierra White SR ZF14.4 arrived with

adjustable Showa suspension in place of the 2014’s Fastace components, and Pirelli Diablo Rosso II tires instead of the older model’s IRC Road Winners. Bosch ABS is now standard.

Torque is up from 109.2 to 116 lb.-ft., battery capacity is up to from 11.4 to 14.4KWh (optionally up to 18KWh) and range is a claimed 135 miles in mixed use, among other improvements.

It was also outfitted with the \$250 Touring Screen, \$550 Givi top case, and \$2,295 6KW 240VAC Charge Tank option with

## DAILY OPERATING COST: GAS VS. ELECTRIC

*It's preposterous to compare the SR to the RT in functional terms, but purely for evaluating commuting costs on the same exact loop, here is how numbers added up:*

Motorcycle	Average Efficiency Over 107-Mile Commute	Energy Cost	Total Energy Cost Per Day Round Trip
2015 BMW R 1200 RT	47.4 MPG	\$3.49 per gallon (premium)	\$7.89
2018 Zero SR ZF14.4	15.12 KWh expended	\$0.09 KWh (NJ rate)	\$1.36

J1772 receptacle, allowing us to recharge from 95-percent empty in only two hours (or 9.3 hours on 120VAC). This SR was \$19,590 as tested, before any government incentives.

### MEGA-COMMUTING TEST CONDITIONS

A mega-commuter rides over 100 miles per day round trip to work, which is something I've been doing for over 15 years. To test the thesis of SR as viable mega-commuter which could potentially save thousands of dollars per year in energy and maintenance costs, I logged almost 1,000 miles on this SR over a few weeks in late August and early September, in temperatures ranging from 70 to 95 F, rain and shine. Most of the mileage was highway commuting on the notorious New Jersey Turnpike. Here are some of the highlights and concerns:

### GENERAL RIDING IMPRESSIONS

After a few weeks, it was apparent that all of the raves from the 2014 evaluation were still present on this 2018 model: The instant rush of massive torque from the 75-7R brushless motor, the perfectly linear power delivery, the total absence of noise, vibration and harshness (NVH), the eager chassis, and the way the rider can customize the drivetrain settings such as top speed, maximum torque, and maximum regen via smartphone app were all welcome benefits.

Of course, the suspension and tire

upgrades were appreciated as well, delivering a compliant ride and plenty of grip, though the tidal wave of immediate torque can easily break the rear loose on wet roads. There is no traction control, so caution must be exercised in such cases.

Acceleration is ferocious, as one would expect when 116 lb.-ft. of torque is applied to a 414-pound motorcycle. The 34-liter Givi case provided ample storage, though the Zero Touring Screen (which has an integrated laminar lip) didn't do very much to reduce the highway wind blast. The seat was firm but comfortable; the overall riding position was neutral.

The clutchless direct drive means there's no shifting required—hop on, twist the throttle and go. The electric motor acts as a de facto brake when the throttle is closed, with an adjustable rate of drag via the Zero app. The drag has the added effect of generating energy (aka regen), which is used to charge the battery on the fly. The effects of this are more pronounced in city driving, and can increase range by 10 percent or more.

### PARSIMONIOUS CONSUMPTION

Electric motorcycles promise exponentially reduced energy and maintenance costs compared to their gasoline-powered counterparts, and here, the Zero exceeded expectations. Normally, I commute 107 miles round trip to work on my personal 2015 BMW R 1200 RT.

This means that every single workday

in this scenario, the Zero saves \$6.53, which calculates to \$130.60 per month, or \$1,567 per year.

The difference in maintenance costs is also staggering. Over the first 12,000 miles in use, assuming the dealer performs all factory recommended service using published hourly rates for this region, the Zero costs \$298.50. The BMW, by contrast, needs proper services, parts and lube, setting its owner back \$1,271.75 over the same period.

In fairness, the Zero's maintenance schedule consists almost entirely of simple inspections, which even a mechanical novice can perform. It is likely that most owners will do these inspections themselves, and not pay any maintenance over this period.

Bottom line, assuming a 24,000-mile riding season and allowing some leeway for variables, the Zero SR has a cost advantage of approximately \$3,500 per year—more than enough to pay for my motorcycle insurance, plus fund a few nice road trips.

Compare these numbers to your own motorcycle and energy cost variables, but an electric bike will almost always have a significant per-mile running cost advantage over gasoline motorcycles.

### RANGE AND THERMAL MANAGEMENT

The Effects of Speed: The SR's range is greatly affected by the speed it's asked to maintain on the highway. This model's





**Thanks to its 14.4 kWh electric motor, the Zero SR is nearly six-times less expensive to refuel than most gas-powered motorcycles.**

advertised range is 109 miles at 55mph constant, or 90 miles at 70mph constant. It hit these targets successfully during our tests, but as speeds are ramped up, range can drop quickly.

Prolonged cruising at over 80mph consistently drained the battery in under 60 miles, and had the sporadic effect of pushing the motor temperature past 200 degrees, where power delivery is cut to allow the motor to cool. While the SR can maintain 95mph, owners can limit the top speed via the Zero app as a hedge against shorter range and high motor temperatures.

**The Effects of Temperature:** The thermal management of the SR's 14.4KWh battery pack had issues coping with mega-commuting duty. August was a hot month, with ambient temperatures peaking between 85 and 95 degrees on most days. The Zero's battery spent its time either being discharged while riding, or being charged after riding.

Both scenarios generated heat within the battery pack, which we monitored on a smartphone using the Zero app. After charging overnight in the garage (typically 75 to 80 F) using the onboard 1.3KW

120VAC system, the battery temperature ranged from 114 to 118 F. Riding to work at sustained highway speeds of 55 to 65 mph kept that temperature relatively steady, but cruising over 65 mph to keep up with local traffic kept temps climbing over the course of the ride.

From what we discerned, the battery's protection electronics kick in at approximately 122 F, at which point it will not accept a charge until the temperature naturally cools to about 118 F. This process can take several hours. On one 89-degree day, I arrived at work with 119 F battery temperature, parked in the shade and proceeded to charge on 120VAC. The battery hit the 122 F threshold within a few hours, and wouldn't accept a charge for about three hours afterward, when the battery cooled off.

This limited my range, which forced me to ride slowly in ECO mode to get home. For reference, charging using the 240VAC Charge Tank alleviated the temperature rise during charging by an observed 2 or 3 degrees, but 240VAC isn't available at my office, and it is still not enough of a cushion to alleviate the concern.

## CONCLUSIONS

We were disappointed to find the SR's battery teetering on the edge of thermal lockout while commuting during the East Coast summer, since much of the country experiences temperatures above 85 F for a good portion of the summer riding season.

This Zero is quite a comfortable and capable machine, but until this issue is rectified, it's surely better suited to more urban assignments than the prolonged highway speed conditions tested here. We have high hopes that this thermal management issue will be addressed.

For comparison, the BMW C-Evolution we tested (MCN 1/18) had a powerful integrated fan in its battery pack cooling tunnel, which ran while charging and never experienced thermal issues during our tests, including running it completely open at over 80mph for an entire discharge cycle.

Zero has made great strides in both range and features in the last decade, and we'd like to see the SR battery's thermal management brought up to snuff, at which point it could revolutionize mega-commuting! **MCN.**