

# Why Choose Us?

## Hirate Energy's Electric Vehicle Solution

### A new approach to EVs

At Hirate Energy, we strive to create fully customizable green energy solutions for a wide range of markets.

We have developed one of the first functional electric vehicles that use **gel batteries** as its energy source and a **switched reluctance motor** as its traction system. The solution also incorporates a **battery management system** which has proven to extend the lifetime of the battery pack. The combination of these technologies opens up a direction of EV production that is unprecedented, and we are excited to share it with our clients and the world.

### Advantages of our EV solution

There are a number of reasons why Hirate Energy's solution will be a strong competitor in the development of EVs.

#### Performance

Using the switched reluctance driver technology, the SRM provides efficient torque values at a wide range of speeds, out-performing conventional motor systems at key ranges (low speeds and high speeds)

#### Range

Gel tech battery provides high capacity and deep cycles which allows the vehicle to travel long distances on a single charge

#### Lifetime

By equipping the vehicle with a battery management system, our gel batteries last longer and increase the overall lifetime of the vehicle

#### Cost

Our gel batteries are more cost-effective than traditional lead-acid and lithium ion batteries, and the SRM is also cheaper and simpler to manufacture in mass production. We estimate that the electricity use of our EV will cost **\$0.036 USD** per kilometer travelled, much cheaper when compared to other battery technologies:

Battery Pricing (\$USD / kWh)

TWN (LiFePO4)	\$450
CHN (LiFePO4)	\$300
JPN (LiFePO4)	\$600
<b>Hirate (Gel)</b>	<b>\$125</b>



### Comparison with other EVs

Comparing with existing electric vehicles in production, Hirate Energy's EV has **excellent performance** in a number of attributes. The below table shows a comparison between different EVs in the same vehicle class (seats 2).

	Hirate Energy EV	EV using Lead-Acid	EV using LiFePO4
Energy Capacity (kW)	<b>14.4</b>	14.4	19.8
Range (km)	<b>120 ~ 130</b>	80 ~ 90	120 ~ 140
Top speed (km/h)	<b>85 ~ 95</b>	60~70	90 ~ 120
Energy efficiency (kW/100km)	<b>12</b>	15	18~19
Fast recharge	<b>Yes</b>	No	Yes
Life cycle (year)	<b>1.5 ~ 2.5</b>	0.5 ~ 1	1 ~ 2
Sales price (USD)	<b>15,000</b>	12,500	22,000 ~ 30,000

Hirate Energy's EV is **fully customizable**, so we can tailor it to the client's needs, whether it is the energy capacity, motor size, top speed or range.

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## Why gel battery?

Gel batteries outperform other conventional batteries that are being used in EV applications today.

Single Battery Attribute	Gel battery	Lead-acid battery	LiFePO4 battery
Voltage	2.0	2.0	3.2
Capacity (Wh/kg)	<b>45</b>	40	105
Discharge (C.A.)	<b>20C</b>	7~10C	~25C
Cycles (DOD 100%)	<b>&gt;400</b>	200	1500
Operating Temp.	<b>-20°C ~ 60°C</b>	-5°C ~ 60°C	-10°C ~ 60°C
Self-discharge rate (mo)	<b>18</b>	9	24
Price	<b>1.3</b>	1	>5

In summary, Hirate Energy's gel batteries have the best **cost VS efficiency** out of the technologies listed. Li-ion solution may provide high efficiency and cycles, however the pricing of Li-ion batteries limits their application range. Normal lead-acid batteries simply do not perform well in EV applications as energy storage. With Hirate Energy's gel battery, customer can achieve the range and lifetime demand of a road vehicle, while acquiring the technology at a very reasonable price.

## What is the battery management system?

Hirate Energy uses an active BMS in its EV product, to **prolong battery pack life, protect against surges and overheating, and allow monitoring of battery use**. In LiFePO4 solutions, a BMS is required to monitor the batteries due to their susceptibility to small overheating or overcharging. These solutions are often very *expensive* and complicated to implement. Gel batteries have a higher tolerance against these scenarios, and when overstressed will not explode like the Li-ion counterpart.

Attribute	Hirate Gel Battery Pack	Hirate Gel Battery Pack + BMS
Cycle lifetime (DOD 100%)	Up to 300	<b>Above 400</b>
Charge/discharge control	None	<b>Active control</b>
Energy monitoring	None	<b>Yes</b>

In reality, all existing and upcoming EVs should and must have a battery management system, in order to maximize the battery's lifetime, optimize the energy usage, and allow the user to see the battery pack status. This will be a crucial component when it comes time to standardize EV specifications; all electric cars will be equipped with one, and Hirate Energy already has the definitive solution.

## Is switched reluctance motor better?

In EV application, SRM outshines existing motor technologies in many aspects, and proves to be a viable solution.

Characteristics	Permanent DC	Induction	AC Synchronous	SRM
Peak efficiency (%)	86~88	90~95	95~97	<b>88~92</b>
Peak speed (r/min)	4000~8000	9000~15000	4000~10000	<b>&gt;15000</b>
Low speed torque	Normal	Normal	Excellent	<b>Excellent</b>
Cost / Torque (\$)	10	8~10	10~15	<b>6~10</b>

A main advantage of SRM is its simple structure. It uses no permanent magnets, does not require an external casing, and nearly all its dimensions can be customized. If a sophisticated controller is combined with a SRM, it will **outperform every electric motor in all aspects**. Therefore Hirate Energy is fully engaged in the development and perfection of a SRM system that will, in the future, be the best choice to be used in EV applications.

## How do I get the Hirate Energy EV solution?

Hirate Energy's EV solution has one of the best **cost efficiency** out of all the electric vehicles in the market today, and we are privileged to offer our product for our valued customers.

### *Hirate Energy's Electric Car System Integrated (SI) solution*

Each solution package includes:

1. **Hirate Energy's gel battery pack, 120V @ 120Ah**
2. **Battery management system (BMS) designed for Hirate Energy's gel battery pack**
3. **Battery charger designed for Hirate Energy's BMS, 3000W @ 25A**
4. **Switched reluctance motor and controller, 11 kW**

Because Hirate Energy's EV solution is fully customizable, all above specifications can be altered. If you like a more powerful engine, more energy capacity, faster charger, everything can be arranged.

In summary, our EV solution possesses comparable performance with other existing technologies, affordable pricing, and will enable electricity cost at less than 4 cents USD per kilometer travelled. The solution is low maintenance, due to the BMS being present. Hirate Energy's EV solution has the definitive answer to the current problems that the EV industry is facing; and we are happy to present it to the public.



Hirate Energy's own EV prototype, consisting of an 11kW SRM motor and controller system, a 120V120Ah gel battery pack, and an active BMS.

If you would like to know more about our EV product or other related products, please visit our website for detailed descriptions and specifications.

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