The Reason ITEZZE is the one EV Technology that Works

ITEZZE works because it is an economically viable way to replace oil fuel in cars, trucks and buses running over long distance and to run tractors and harvesters continuously. Hydrogen will cost the equivalent of diesel at US$5-40/litre[i] (AUS$8); and the driver of an electric truck cannot wait for 2½ hours for their trucks to recharge every 2-3 hours on a long trip. A person ploughing or harvesting their crops needs to be able to run their tractor or harvester continuously. ITEZZE allows equipment to be electric and run with high speed swaps of the battery (approx. 1½ minutes/swap).

What makes ITEZZE different is that it is works financially. Electric Trucks (ET) travelling from Brisbane to Sydney need to swap batteries every 250 km (i.e. 4 swaps per trip). It costs $400,000-600,000 to buy each battery (Semi or Double B size truck) and the batteries weigh 4-5 tons hence they cannot afford to carry more than one at a time. It would cost an owner around $2.1 million in batteries to run their truck from Brisbane to Sydney. They would then need infrastructure every 200-300 km to recharge and swap the batteries. The truck owner could not afford to buy the batteries or run the network. Working with service station operators would overcome the recharge problem.

The ownership of the batteries however, would require a bank or financier to own the batteries and rent them out through the service stations to the truck operators. This way they could pick up the batteries at one 'servo' and drop them at the next. To do this requires a mechanism to ensure that the financier is paid for the battery kWh Cycle Fee (or usage life). A battery only operates for a certain number of recharge/discharge cycles. This may be 10,000 cycles for a battery costing $1,500 for each kWh. So, the kWh cycle cost is $1500-00 divided by 10,000 which equals 15 cents/kWh. If someone tries to recharge it and use it without proper payment the financier loses money and hence won't fund the battery. What ITEZZE did was patent a mechanism to ensure that a financier was paid for every kWh cycle; hence the swap battery network is now economically viable.

Farmers work on a similar mechanism whereby they'll own one or more batteries for day to day work and then hire in a bank of Batteries during the ploughing or harvest season. These banks of batteries would then be moved around the country to service different groups of farmers during the different seasons in each state. ITEZZE means the cost of running an electric truck/tractor is in the order of $1-30/litre of diesel replaced. Hence, it is an effective replacement for diesel fuels and means farming and transport will be able to switch to ITEZZE and still be viable as diesel prices rise.

Why Carmakers do NOT want to build other Electric Vehicles (EVs)

Western markets have a high quality-assurance paradigm built into their mentality. So, when they buy a car with a 3-year warranty they expect it to perform adequately for at least 3-4 years (or even up to 7 years). Warranties in their view are the minimum standard, so more is expected. When a carmaker builds a small petrol fuel family vehicle, their cost is around $17,000; they sell it for $27,000 and make a margin. Warranty is not a problem; internal combustion engine cars (ICEs) have been successfully built and sold for over 50 years, so most run out the warranty period without event (unless a part fails in which case, they go back to the component supplier for the warranty as they're built by other manufacturers e.g. Takata).

Why EVs are different is that the battery cost is $30,000, so a small car which sells for $51,000 (AU$) might have $30,000 worth of batteries in it. If the batteries fail the manufacturer must replace them, (warranty may be difficult) which is why one carmaker has had to replace the batteries in the EVs they sell every year for 5 out of 6 years. Manufacturers selling EVs to this price bracket survive on sales of petrol/diesel cars. They lose money on every EV sold. Expensive car makers sell a similar car for $99,000. It may be a $99,000 car but it basically costs them around the same to build. Thus, if batteries fail, they have margin up their sleeve. This is why vehicle makers like to sell 50 times more petrol cars than EVs. The $30,000 loss can be amortised over 50 petrol cars. Secondly, many sell into markets where people don't travel far. People in China don't normally travel between cities in their car; and in the EU most distances are shorter.

But, when it comes to replacing oil fuel vehicles for industry, long distance and general use it is not viable using the old EV model. Built-in batteries require recall when they fail and charging is a problem.

So, why do their batteries fail so often?

Electric vehicles (EV) currently in production mainly use Lithium Batteries (except for some using lead acid batteries). The reason for this is simply battery weight. A Lithium based battery (Li Ion or Li S) weighs about 10 kg/kWh. Tesla Model S with 100 kWh has 1 ton of batteries. The new Porsche weighs 2040 kg (or 2.04 tons). In most countries when the Tare (dry weight) of the vehicle is over 2 ton, it needs a truck license to drive it. The new Porsche weighs over 2 tons. Legally, drivers need a truck license to drive it.

The problem with Lithium batteries is they:

1. Can catch fire when damaged;
2. Can explode (or catch fire) when being recharged;
3. Run on shorter kWh life cycle paradigms.

So, the Lithium based battery is fantastic for small swap batteries and regeneration work where the 2-3 kWh battery gets power back from the wheels when braking and then uses it to start and move the car off at lights. It can do this for 7000-9,000 cycles without too much problem. But, when the battery is used for deep-cycle work, in **non-ideal** charging paradigms, it is prone to failure.

Deep-cycle work is where the battery runs down to 1-2% or nil power left in it before being recharged. Doing this to the Li battery can reduce the available cycle life from 9,000 down to 3,000. Most people don't read the instructions for their car; or drive Teslas and charge on Tesla recharge stations (where the charge station runs the recharge and takes 1 hour and 3 minutes to recharge a 70-kWh battery). They like to treat EVs as tricked up petrol vehicles where they can stop, charge and go fast.

The other big problem with the Li batteries is that, if not charged properly they lose charge depth. So, the classic case is a bus company that brought new electric buses to do a double shift. Mornings till 1-2 pm; then evening till 10-11 pm with a driver change half way (lunchtime). For the first 18 months the buses performed well; drivers changed and drove away. Then the batteries stopped carrying enough charge to do the 2nd run.

The bus operator had the options of:

1. using his old diesel buses again; or,
2. buying a second fleet of EV buses to do the afternoon run; or,
3. buying some more or different batteries; or.
4. sitting his buses there for 2½ hours in the afternoon to recharge; or,
5. trying to get warranty from an overseas supplier.

EV buses cost $900,000; batteries cost $300,000-$400,000/set – they are difficult choices.

The one EV system that doesn't have these problems is the ITEZZE Swap Battery model where vehicles have a smaller permanent Backup or *Drive battery*; a separate *Regeneration battery* and a slot to take a swap battery for using solar or doing long trips where a hired *swap battery* can change over every 250-300 km in less than 2 minutes.

The ITEZZE paradigm overcomes the weight problem because most of the time the vehicle only has about 20-30 kWh of battery in it so it doesn't matter if Nickel type batteries which weigh 17 kg/kWh are used. (Swap batteries for trips are normally 23- 47 kWh batteries and they are put in with robotic arms on the kiosk). See: itezze.com

ITEZZE works for cars, trucks, buses, road trains, mine trucks; tractors/harvesters and vans. **It is a universal system**. [ii]

[i] electrek.co

[ii] An understanding of why ITEZZE works can be found in ***Why ITEZZE Works***.