



cogen-battery

11/30/2022

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Cogeneration Battery



This webpage QR code

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One of the benefits of a flow battery using salt water is that you can also use it simultaneously for thermal storage. Using a high efficiency heat pump you can store hot water or cold water which triples the cost benefits of the battery. A true cogeneration battery is now available.

PDF Version of the webpage (first pages)

Cogeneration Battery

Considered a hybrid between a standard flow battery and a thermal storage device, the battery provides simultaneous heat or cold liquid storage as well as electrical energy storage.

The Cogen Battery has a variety of applications which include:

- storage of thermal energy (heating or cooling) from unused thermal resources
- storage of electrical power for backup power and grid strength
- utility grid power rate mining opportunities to store off-peak low cost power for later use during demand (on-peak) hours
- storage of thermal energy for Organic Rankine Cycle (ORC) power production while simultaneously storing the electrical output from the turbine generator
- using off-peak low cost power to make heating and cooling for later use
- reducing peak demand utility rates by peak energy shaving

11/30/2022

Analysis Explained | Battery Efficiency

Battery efficiency is the round trip efficiency of charging and discharging. At this point it is a estimation until a prototype is built.

Analysis Explained | Power Density

Power density gives you the watts per liter. The kW loss per round trip is based on the battery efficiency. At this point it is a estimation until a prototype is built.

Analysis Explained | Manufacturer Data

This is the data if you are building and selling (or using internally) battery systems under license from us.

The materials costs for the electrodes are estimated.

The liquid electrolyte may be standard liquid tank shipping containers or larger capacity tanker trailers. The tank trailers are a much better value.

The tax credits at \$35 per kW are based on you building and selling the fully completed battery system. If you are using internally, you won't be eligible for the \$35 per kW credit (other credits may be available).

While these systems are not as efficient in terms of Power Density compared to the lithium Tesla Megapacks or others, it is a system based on a non combustible salt water electrolyte and much less expensive materials. This results in a lower acquisition cost (or build cost) and allows for a much higher net profit ratio. It also allows you to build a system based on commercial available materials, components, and off-the-shelf parts. The wait time for a Tesla Megapack is greater than one year.

Analysis Explained | Manufacturer License Payback

If you buy a license for \$999,999 and sell the system for \$500,000 at a build cost of \$145,252 your net profit is \$354,748.

$\$999,999 / \$354,748$ is 2.82 units sold for the payback on the license investment.

Your build costs may vary, depending on if you just assemble off-the-shelf parts and tank containers, or vertically integrate components by building in-house.

Analysis Explained | End User Pricing

You set the end user (customer) pricing.

Based on this example, the \$166/kW pricing is far below the Tesla Megapack at over \$600/kW. Build and delivery time on a Tesla 2 hr duration Megapack is Q3 2024 at a price of \$2,414,070 with annual maintenance contract of \$6,570. That is $\$2,414,070 / 3,900 \text{ kW (energy)} = \$618.99 / \text{kW}$.

Analysis Explained | kW Price Difference

This is the price difference:

(a) if you buy at off peak power prices versus daytime on peak power

or

(b) the savings you have from demand charges

If you can buy at off-peak rates, and resell or use yourself during on-peak rates, you are essentially mining power from the utility and doing an arbitrage to leverage the difference for savings and payback.

Analysis Explained | Revenue or Savings

These are based on charging on off-peak hours, then selling or using during on-peak hours. It is assumed you can charge and use for one cycle. There may be opportunities for more cycles, but for this example, we are using one cycle.

The figures are based on the full system capacity, less the round-trip loss.

Figures are provided on a day, month, and year.

Analysis Explained | Payback

User payback is based on one cycle charge and use.

For a \$.10 savings, the payback period is 4.99 years based on a purchase price of \$500,000.

If you build these for in-house use, you will pay the license fee, and then the lower build cost which will result in a substantial value if you can build multiple units to recapture the \$999,999 license investment.

This extends even further if you sell systems, and become the manufacturer.

Analysis Explained | Cogen Battery Thermal Savings

The real profit and savings potential of this system are if you can use both the electrical grid energy and thermal arbitrage.

Because this system uses salt (brine) water as the liquid electrolyte, you can also use it to store heat and cold liquid applications.

If you have a high efficiency 2-3 COP or higher heat pump, you can convert off-peak low cost utility rate power to make hot water or cold water to use during on-peak hours.

This type of system is used by Calmac thermal battery storage systems (see link below).

Of course, you can install your own hot or cold water system by purchasing a high efficiency heat pump or chiller compressor and storing the thermal liquid using the salt water battery. For this option, you will need to have insulated tank containers to retain the thermal mass.

Deploying this type of thermal bank further reduces the end-users payback to under two years at \$.10 per kWh grid savings, and under a year if the kWh rate is higher.

This type of cogen may also give you access to other tax credits.

Calmac describes the system: A Thermal Battery system helps overcome the intermittency of renewable energy. It can store excess energy to be used during times when the sun does not shine or wind does not blow. Additionally, a recent study suggests that these systems do more to help the grid during heat storms than previously thought.(2) This is important for both grid resource adequacy planning and providing proper financial compensation which in turn means more incentives.

Analysis Explained | System Configuration

The system configuration using standard shipping tank containers gives you vertical flexibility with tanks and control container stacked or horizontal.

Over the road bulk liquid tank trailers will require horizontal format layout.

Tax Credits

Commercial Flow Battery: 4 MW

$\$35 \times 4,000 \text{ kW} = \$140,000$

Utility Scale Flow Battery Bank:

$\$35 \times 4,000 \text{ kW} \times 100 = \$14,000,000$

Note: The credit would apply to components produced and sold after December 31, 2022, and would begin to phase out starting in 2030. Access: Electrochemical cell comprised of one or more positive electrodes and one or more negative electrodes, with an energy density of not less than 100 watt-hours per liter (.1 kW/L), and capable of storing at least 20 watt-hours of energy.

What is Brine

What is brine?

In general, brine is any solution with an extremely high concentration of salts, such as sodium chloride, which can occur either naturally (as with seawater, deep-water ocean pools, salt lakes, producer water from oil and gas drilling) or as a byproduct of industry. These byproducts, or brine waste streams, are typically highly concentrated salt solutions that, in some cases, contain more than twice the amount of concentrated salts than natural brine solutions.

Brine waste streams can also be highly concentrated with total dissolved solids (TDS), such as waste streams in many chemical manufacturing processes, and they can be some of the most challenging to treat or discharge because their composition and purification requirements are dynamic and complex.

Some examples of brine waste created as a byproduct of industry include:

- cooling tower and boiler effluent
- reverse osmosis (RO) and ion exchange waste/reject streams
- produced water from extracting oil and natural gas
- chlor-alkali and chemical plant waste
- acid rock and mine drainage
- food preservation and manufacturing waste streams
- desalination waste from potable water creation
- irrigation runoff

Our novel solution is treating this solution considered and expensive headache, into a battery technology system.

Elon Musk and Tesla even think that recovery of lithium from brine is worth patenting. However, they are not the first to do so. ([1962 Lithium from Brine Patent](https://patents.google.com/patent/US3268289A/en))

Battery Technology: With the advent of the new USA tax credits for producing and selling batteries (\$35/kW) we are focussing on a simple [flow battery](https://infinityturbine.com/flow-battery.html) using shipping containers as the modular electrolyte storage units with tax credits up to \$140,000 per system. We are focussing on the [salt battery](https://infinityturbine.com/salt-battery.html). This battery can be used for both [thermal and electrical](https://infinityturbine.com/cogen-battery.html) storage applications. We call it the [Cogeneration Battery](https://infinityturbine.com/cogen-battery.html) or Cogen Battery.

We are also looking into converting salt based water conditioners to [simultaneously produce power](https://infinityturbine.com/water-conditioning-power-production.html).

