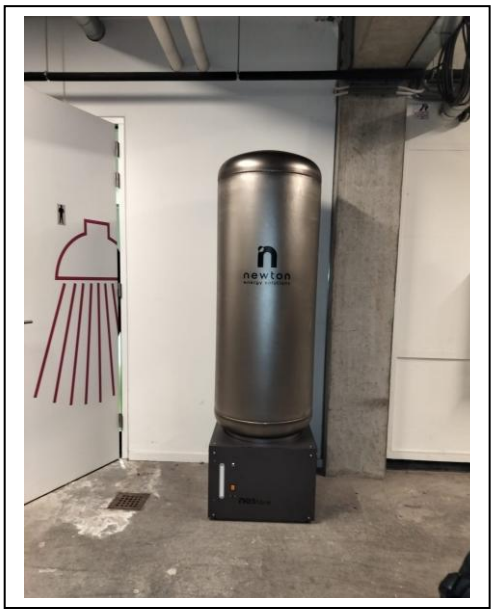
1. **Innovative**

The NEStore is an innovative heat battery with a very high insulation value and very large storage capacity. This makes it possible to store energy for several days. This allows users to store energy at the most sustainable and cheapest time and use it when they need it.



The NEStore uses a patented, only 3 cm thin, vacuum insulation and an innovative design that minimizes the number of heat bridges. This combination ensures that the system minimizes downtime loss to 1% per day (0.17kWh).
Due to the extremely good insulation, it is possible to heat the water to a higher temperature, without this being associated with high energy losses. The water in the NEStore is heated to 110oC.
The higher temperature and thin insulation allows 6-8x more energy to be stored in the same system volume compared to a conventional water heater. The NEStore E20 (200l) contains 20kWh of energy when fully charged, the system can supply 600l of hot tap water (40oC), this is enough for +/- 1.5 hours of showering.

Due to its high capacity, the NEStore can store hot water for several days (20 kWh provides 3-5 days of hot water for a family of 4 people). This makes it possible to store energy at the most sustainable/economical moment. The NEStore charges when there is excess capacity from the solar panels, or based on the most favorable dynamic energy rates. This will increase the share of renewable energy to >90%, lowering CO2 output and energybill.

The NEStore was developed by Newton Energy Solutions. From the start of the company in 2022, the NEStore has been developed and certified in 1.5 years. The NEStore has been commercially available in a limited edition since July 2023. From the beginning of 2024, production capacity will be further scaled up.

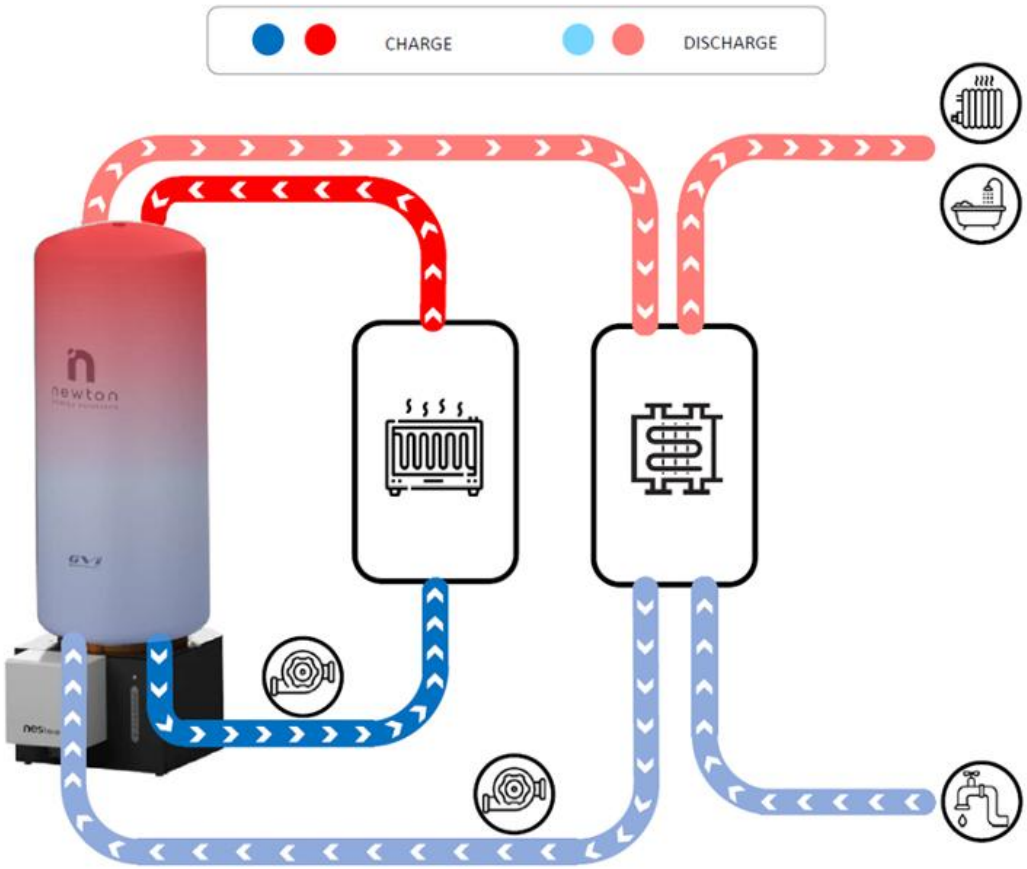
2. **Solution-oriented**

The NEStore is a solution to various challenges in the sector: the hot water demand in homes and utility buildings, installation capacity of installers and the necessary increase in self-consumption of generated energy.

Hot water is a growing part of the heat requirement. In new-build homes, this is regularly >50%. The demand is year-round, typically 55-60oC in homes (higher utility depending on the configuration) and requires a lot of power (average 15 and 20kW, large rain shower towards 40kW). For many heat pumps, both the high temperature and the high power are a challenge. The NEStore is capable of storing the required amount of energy and delivering the right power.
The NEStore is very easy to install in both existing and new construction. A NEStore can be installed within half a day. In addition, the NEStore requires no maintenance. Repairs can be made without the need to move/empty the NEStore.

The NEStore is able to store the excess capacity of electricity generated for use at the right time. Based on information from the smart meter, the NEStore can adjust the power with which it charges to the amount of energy that is fed back. In this way, the NEStore contributes to the reduction of the pressure on the energy network during times of high energy generation.

3. Practical applicability



The NEStore is an electric hot water battery that can heat the internal process water by means of an electric element based on 1 phase with 3.4kW (230v). The water is heated to 110oC. When discharged, the hot water will heat the tap water to the set temperature via a heat exchanger. The process water will cool down to the supply temperature of the tap water (usually 15 - 20oC). This cooled water is returned to the bottom of the NEStore. This allows a delta T of 90oC (110oC - 20oC).
The charging of the NEStore is controlled on the basis of feed-in to the grid and dynamic energy prices. With this, the NEStore steers towards the most sustainable and economical way of charging the system. With a capacity for 3-5 days, the system offers the flexibility to actually wait to charge until the optimal time is reached.

The NEStore has two main applications. The most important one is the supply of domestic hot water. In doing so, the NEStore will function independently of other heat dissipation systems. This can be done excellently in combination with a heat pump, where the heat pump will provide the heating needs, the NEStore will take care of the tap water demand. A

second application is to support the heating requirement. The NEStore is placed within the central heating system and can, for example, ensure that a smaller heat pump can be installed.
The NEStore was developed in the Netherlands and is produced in the Netherlands and Germany. The product has been tested and certified for use on the Dutch market. At the moment, the NEStore is only available in the Netherlands.

4. Social impact

Better use of our own sustainable electricity delivers:

- Relief from the low-voltage energy grids.
- Lower residents' energy bills
- Keeping a larger part behind the meter sustainably
- Increasing user comfort within the home

More relief for the low-voltage energy grids:

- Winter situation: The NEStore can store heat over several days. This allows it to be charged at times when the electricity grid is less heavily loaded, the surplus of central or own sustainable electricity.
- In the summer: In the event of a future phasing out of the net metering scheme and possible compensation for the return of locally generated electricity, the NEStore can store electricity in heat to use it at a later date. Due to the stratification and good insulation, it is possible to supply (excess electricity) energy through an electric heating element. This can take place at times of low/negative energy costs.

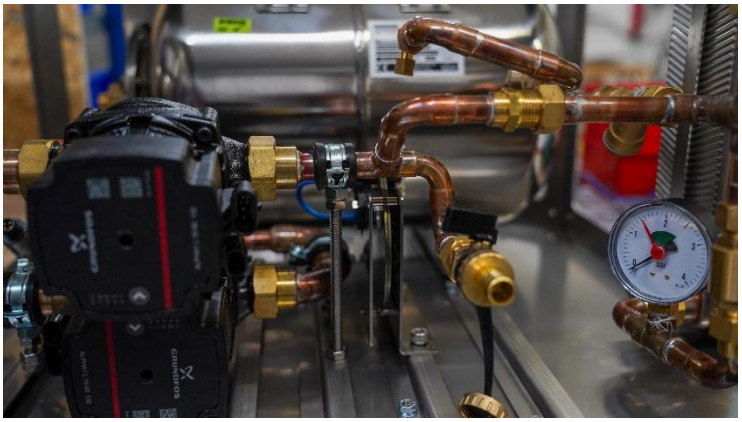
As an alternative to the electric home battery, water as a storage medium also has a reduced risk of raw material production under poor working conditions.

Energy efficiency vs CO_2 emissions

	Standard Boiler	Heat pump Boiler	NEStore
COP	0,9	3	0,99
Energy used per person (kWh)	761	256	685
% of self-consumed energy	20	20	85
CO_2 emissions (kg/person)	269	81	50

5. Sustainability

The sustainability of the NEStore has been taken into account both in its production and in its use. In production, the impact on the environment and the use of scarce or harmful materials is limited. When using the NEStore, the share of renewable energy will be optimised.



The NEStore has been developed with great attention to the environmental impact. The product consists of a double stainless steel shell containing a fiberglass-like material. Both materials are mined in Europe and are not scarce materials. The barrel has an expected lifespan of >30 years and can be fully recycled. The bottom cabinet is designed with common and widely available 'standard' products. This allows the system to be fully repaired if parts break. This has resulted in a very sustainable product.

The use of the NEStore stimulates the use of renewable energy. Overcapacity of own PV panels will be stored directly in the NEStore. If that is not sufficiently available, the system will charge at the most favorable times based on dynamic energy tariffs. When energy prices are low, the share of renewable energy will be the highest. This will optimize the share of renewable energy that is used.

6. Financial impact

The NEStore has a positive impact both for the user in the short term and for the energy system in the medium term. For the user, it is a relatively inexpensive investment that ensures savings on energy costs. With large-scale implementation of the NEStore, a significant reduction in grid congestion can be achieved.

The cost of the current version of the NEStore is 230 – 275€/kWh. That is already far below the cost of an electric home battery (approx. 750-1000€/kWh) and above the cost of a standard electric hot water boiler (140€/kWh).

Financial benefits for building owners and occupants:

- Much less space required, because capacity is higher
- Less downtime loss because of no maintenance
- More opportunities to use self-generated electricity
    - Reduced feed-in costs
    - Better electricity price at the time of the abolition of net metering
- More room to make use of flexible contracts
- Due to lower grid load, PV panels in peak areas are less likely to be switched off.

On a larger scale, the NEStore can significantly reduce the load on the energy grid. Due to the decentralised presence of a large number of NEStores, overcapacity on the grid can be

disposed of decentrally. The NEStore has the inherent advantage that the stored energy can no longer be returned to the grid as electricity.