Maximise Your Energy

In cooperation with

redTenergy.com
Applications

The modular, versatile nature of redT energy storage machines make them suitable for a wide range of applications, from small off-grid sites to large-scale, grid-connected, solar and wind installations

Renewables

A key issue in supplying renewable energy to the grid is the mismatch between availability and demand. redT energy storage is ideal for coupling to renewables, such as PV and wind. Unlike most energy storage systems, it does not degrade, even when performing 100% charge/discharge cycles, and is suited to long duration storage, meaning it can handle the high volatility inherent in renewable generation. The machine’s life also matches that of renewable assets (25 years), further minimising costs. Use redT energy storage with renewables to maximise your utilisation through time-shifting and peak shaving, remove constraints on existing renewable generation or gain full autonomy from the grid.

Grid Services

Conventional power plants have traditionally provided both energy and grid balancing services. However, with the increasing proliferation of renewable energy, the grid must now adapt to the larger share of mid-to low power generation, leaving utilities with the issue of how to perform grid services.

redT energy storage is capable of performing grid services at both transmission and distribution levels, requiring discharge durations ranging from seconds to days and power ratings from 100kW - 10MW. Use the machine to provide capacity to the grid for balancing, deferral, congestion relief and other services - opening up new revenue streams and maximising your return on investment.

Off-Grid

Energy storage provides a solution for locations with a weak or non-existent grid connection. redT machines are equally well suited to coupling with renewables, diesel generators or a combination of the two.

For renewables, the energy storage machine can absorb intermittent and volatile generation and time-shift it for when there is demand. redT systems can also stabilise the addition of renewables to a micro-grid, enabling maximum flexibility of operation.

For non-renewables, a diesel genset can run 3x more efficiently at full loads than load. By coupling diesel assets with redT energy storage, the genset can run at a higher loading to charge the battery whilst still supplying demand. This not only reduces fuel consumption (as the genset is only run at optimum efficiencies) but also prolongs the life of the generator, reducing replacement and maintenance requirements, leading to significantly lower total operating costs.

Telco

In order to provide extensive coverage, telecommunications stations often need to be installed in remote locations where diesel generators must be used due to weak or non-existent grid connections.

redT energy storage machines reduce site operating costs by increasing generator efficiency, and have the potential to eliminate the need for fuel when used alongside sufficient solar PV assets.

The low maintenance requirements and remote monitoring capability of the redT system minimises the need for site attendance and, unlike lead-acid batteries, the system is not a target for theft as there is no easily accessible secondary market for vanadium.

The redT energy storage machine

After 15 years of research and development, redT has developed a new and proprietary energy storage machine which enables the efficient and sustainable storage of electrical energy in liquid form

Who is redT?

We develop and supply durable and robust energy storage machines for use in a wide range of on and off-grid industrial, commercial and grid-scale applications. Unlike conventional batteries, where energy is stored in a cell, our patented energy storage modules store energy in a liquid. This technology does not degrade like conventional batteries and affords exceptionally long life with (100%) discharge functionality, making the system perfectly suited to integration alongside renewables such as wind and solar.

The system is equally well suited to working alongside diesel generators in off-grid applications, improving efficiency and reducing expenditure on fuel and other associated costs.

How does it work?

Vanadium Redox Flow Battery (VRFB) technology utilises the flow of vanadium electrolyte across an ion exchange membrane. When this occurs, a reversible electrochemical reaction takes place, allowing electrical energy to be stored and subsequently returned.

The technology relies on the ability of Vanadium to exist in four different oxidation states ($V^{3+}$, $V^{4+}$, $V^{5+}$ and $V^{6+}$), each of which holds a different electrical charge.

Demonstrated by the diagram above, the electrolyte in the negative half-cell contains $V^{3+}$ and $V^{4+}$ ions, whilst the electrolyte in the positive half-cell contains $V^{5+}$ and $V^{6+}$ ions. This represents the machine in its charged state. On discharge, a redox reaction occurs in the central stack, creating a surplus of electrons at the negative terminal, generating an electrical current.

The setup of the electrolyte and the membrane stack can be compared to that of an engine and fuel tanks. The membrane stack (engine) delivers power, rated in kilowatts (kW), whilst the fuel (the vanadium electrolyte) delivers energy, rated in kilowatt hours (kWh).
The redT advantage

The redT energy storage machine offers numerous advantages when compared to other technologies available on the market today.

- **100% Depth of Discharge**: Charge and discharge the system fully from 0-100% without significant degradation, unlike conventional batteries which suffer drastic capacity loss if discharged below 50%.

- **Low Levelised Cost of Storage (LCOS)**: LCOS calculates the cost of storage over a system’s life and accounts for all operating and maintenance costs, together with efficiency.

- **Long Lasting**: The machine can last for 25 years with no significant degradation, matching the life of solar and wind assets.

- **Low Maintenance**: The system can be monitored remotely and requires minimal maintenance, reducing the need for frequent site visits.

- **Safe**: Unlike lead acid and lithium batteries, the redT energy storage machine is at no risk of thermal runaway and is non-explosive and non-flammable.

- **Environmentally Friendly**: redT energy storage machines contain no heavy metals and are emission free. The electrolyte is fully reusable and recyclable, alongside the majority of components used in the system.

LEVELISED COST OF STORAGE (LCOS) vs USABLE CAPACITY VS CYCLE LIFE

What can energy storage do for your business?

**Save on grid purchases**
redT energy storage machines enable you to store energy from a renewable source to offset power purchases from the grid. Using an energy storage machine will also allow you to take part in arbitrage activities (peak/off-peak prices) and avoid time of use or Triad charges.

**Maximise utilisation of renewables**
Incorporate as much renewable energy as possible, right up to 100% renewable and full grid independence.

**redT energy storage systems are ideal for coupling to renewables, such as PV and wind. Unlike most energy storage systems, it does not degrade when fully discharged and is suited to long duration storage. This means it can handle the high volatility and diurnal cycle characteristics of these sources.**

**Make the most of constrained grid connections**
Connection upgrades can cost several hundred thousand Euros, depending on the location, size and type. Installing a redT energy storage machine can avoid this, allowing you to increase self-consumption, and import and export power when there is spare capacity.

**Your own utility asset - hedge energy prices**
Invest in your own utility infrastructure. Whilst lead acid and lithium batteries may require frequent replacement, a redT energy storage machine can last 25 years in typical use, matching the life of solar and wind installations.

Use storage with renewables to reduce exposure to energy prices, which have increased by an average of 10% per year over the past 5 years. In addition to this, the system may earn additional income providing support services to the grid, a market which is expected to grow rapidly as existing infrastructure comes under increased strain.

Utilise a redT energy storage machine as a long term, revenue producing asset. Because redT energy storage machines do not degrade like conventional batteries, there is no additional cost of extra services.

As demonstrated by the diagram above, utilise storage for multiple revenue streams, either behind the meter in C & I applications or in front of the meter at generation & distribution level.
Modular Energy Storage

Combine multiple redT energy storage machines for kW to MW scale stor-

One of the key features of the redT energy storage machine is its ability to separate power (kW) from energy (kWh), making the system easily scalable. The stack size determines the power, whilst the electrolyte volume determines the energy.

Our energy storage range is based on the redT 5kW stack module and by using this 5kW stack as a ‘building block’, it is possible to build bespoke systems up to MW scale.

Further details of our systems can be seen below:

<table>
<thead>
<tr>
<th>Unit Name</th>
<th>Power (kW)</th>
<th>Capacity (kWh)</th>
<th>Continuous discharge at rated power †</th>
<th>Dimensions</th>
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<tbody>
<tr>
<td>redT 5-20</td>
<td>5</td>
<td>20</td>
<td>4 hours</td>
<td>6ft ISO</td>
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<td>redT 5-40</td>
<td>5</td>
<td>40</td>
<td>8 hours</td>
<td>9ft ISO</td>
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<td>redT 5-75</td>
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<td>75</td>
<td>15 hours</td>
<td>10ft HC</td>
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<td>5 hours</td>
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<td>7.5 hours</td>
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<td>5 hours</td>
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<td>5 hours</td>
<td>20ft HC</td>
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<td>Multi 20ft HC</td>
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</table>

† Discharge duration is proportional to power requirements i.e. if discharging at 50% rated power, duration is doubled.

Note: redT energy withhold the right to change product specification without prior notice. Please consult redtenergy.com for latest specifications.