



TECHNOLOGY

Clean Energy SOLUTIONS

that save money from **day one.**

Installed on all vessel types designed by Capital C.



Shipping's emission problem

A large part of global emissions but can be eliminated with electrification

- Transporting goods by ship is the most energy-efficient and environmentally friendly way of transport regarding CO₂ emissions per ton-mile²
 - Highly scalable with the largest cargo ships exhibiting the lowest specific emissions
 - 90% of all global products are transported by sea
- As most ships are fueled by fossil MGO¹ they still emit a substantial and growing amount – about 2.5% of global emissions (approx. 940 Mt CO₂ p.a.)
 - Despite technological developments, global CO₂ emissions from shipping continue to increase
- Applying a carbon tax of USD 40/tonne carbon point to a potential market size of around USD 38bn per year
- Trafigura, one of the world's largest ship charterers, on Sept. 25th 2020 proposed that the IMO introduce a carbon levy of USD 250-300/ tonne CO₂e on shipping fuels, to make zero and low-carbon fuels more economically viable and more competitive
- Shipping has the ability to radically improve the emissions landscape by deploying energy storage on vessels and taking more trucks off the road
- Installing batteries to include electricity in the energy mix – fully electric or hybrid can reduce emissions by 20-100%³
- Shift brings ready to market Zero Emission Turnkey Solutions today
- Over 80% of newbuild and retrofit marine vessels are being designed to incorporate Energy Storage

1) MGO – Marine Gas Oil, a heavy fossil fuel

2) Comparing with traditional fossil fueled alternatives such as airplane, trucks or rail

3) Assumes renewable power for full decarbonization

Source: European Commission, Trafigura *Time for a carbon levy on shipping fuel*

Electrification as a solution

Battery electrification can reduce or eliminate ship GHG emissions

Hybrid – Diesel electric with ESS

- Peak shaving/load smoothing allows for engines and generators to run at constant speed at optimal rpm – This will also be the setup for hydrogen fuel cell powered vessels
- Reduces fuel consumption/emissions and maintenance frequency
- Example case: **Vardehorn/Melshorn**
Hybrid Ferries with peak shaving and enhanced dynamic performance system - 100% electric or as hybrid operation resulting in 80% reduction in NOx



Shift technological edge

Best in class systems for the safe reduction of carbon emissions

Shift **Competitive Advantages**

- ✓ Patented liquid cooled cell carriers
- ✓ Patented gas extraction system
- ✓ BMS on individual cell level
- ✓ First to pass DNV 2020 certification
- ✓ Lloyds Register certified
- ✓ First to pass A60 certification
- ✓ Cell swap and recycling



Shift technological edge

Best in class systems for the safe reduction of carbon emissions

Delivers exceptional safety, performance, and value

Thermal runaway prevention

- Patented liquid cooling system extracts heat faster than it can be generated within cell chemistries – negating any negative impact of ambient temperature and prevents thermal runaway – even at 1,000 °C
- Lloyds Register exemption – No additional firefighting equipment needed in battery room for the systems

CanPower

- Containerized solution with fully integrated power electronics for a variety of marine, oil & gas, port and land-based applications

Monitoring and measuring

- Real-time measurement of voltage and temperature for every cell in every module providing full state of health of the ESS to operators
- BMS is fully integrated into an asset management tool and provide real time data for fleet owners

Cell swap and recycling

- Unique CellSwap™ system extends the life of an installed system to 30 years providing the best value for money in industrial ESS to end customers
- World leader in managing sustainability and recycling of marine ESS as the cores are 100% recyclable and Balance of Plant designed for 30 years

Rugged

- Designed to withstand harshest environments and able to withstand 65G impacts – capabilities of this design relevant also to non-marine applications including mining, drilling, military, etc.
- Rugged design already meets requirements for ESS to be swapped on and off vessels on a daily basis rather than fixed installations

Shift system design build up

Highly flexible design for optimal adaptability and efficient maintenance

Module based flexible battery systems



1: Cell

Cells are a critical component

The industry's most advanced cells with high energy density delivered by Kokam

Constant form factor; different chemistries – common BOM and form factor for all installations

2: CellCool[®]

Patented liquid cooling system CellCool[®] keeps cells at constant temperature 23-25 °C.

Prevents thermal runaway and increases the lifetime of system to maximizes the battery performance

Best in class safety features which are unique.

3: Modules

24 of the cells are assembled into standardized battery modules

Rugged design with additional armoring for physical protection against impacts up to 65G

Capacity: 6.5kWh / 7.6kWh / 8.8kWh

65G Impact Rated

4: Battery system

Modules are combined for fully scale-able system in 100V building blocks

Racks with patented venting and gas extraction system for each module

Safe- no voltage during shipping, install or service

Flexible - can be configured for 13 kWh to multiple MWh and located in multiple locations

5: BMS software

Each cell managed for voltage, temperature and individually charged and discharged

Designed to integrate to external power management systems

Remote access via OnWatch™ cloud-based real-time asset management software

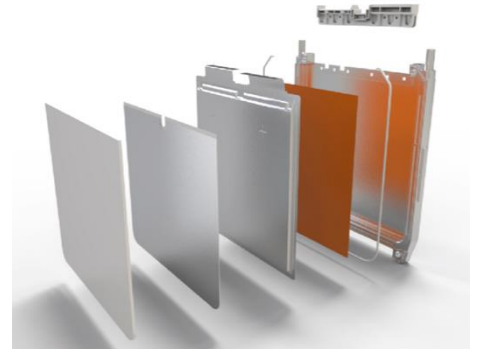
Exports data to IMO EDP Database for GHG environmental standard management

Battery safety

The world's safest battery systems with best-in-class liquid cooling and gas venting

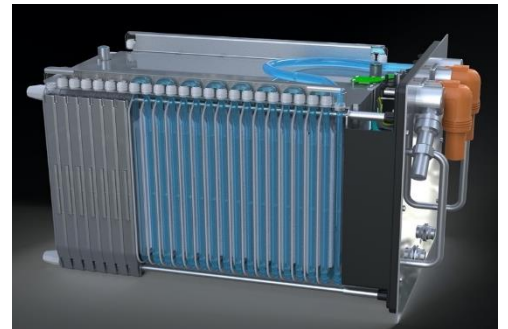
Individual cell carriers

- Full-body aluminum cell carriers with proprietary casting technique
- Cells placed under pressure to reduce layer delamination and premature aging – extends ESS lifetime and cycle life
- Temperature, voltage sensors and charge/discharge management on every individual cell – unique feature
- Armored to withstand impact and is the core component for fire risk protection
- Cooling 100% of surface of cell



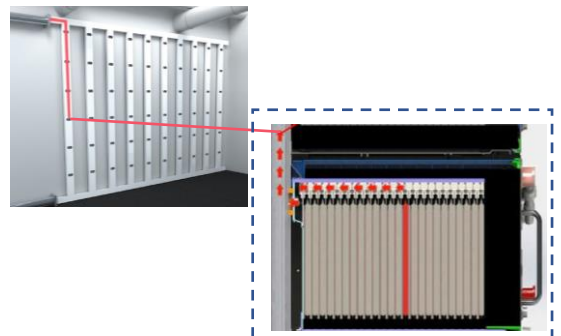
Liquid cooling

- Patented liquid cooling eliminates risk of thermal runaway – extracts heat faster than it can be generated
- Cools the cell across the whole surface reducing uneven aging of cell
- Built-in fire detection and fire-fighting
- Ambient temperature does not affect battery performance
- A60 approval underway with multiple agencies – eliminates need for A60 environment (1,000 °C direct heat > 60 mins)



Gas extraction

- Patented gas extraction system incorporated directly into racking of the ESS
- Fully sealed to each battery unit and with uni-directional valve in rack to prevent backflow keeping crew and passengers safe
- Negative pressure by simple fan
- Any gases that may be generated from a cell failure automatically removed from battery room
- Each module is a battery room – improved safety



Cost of ownership benefit from Shift

Technological advantages translated into better value for money for customers

Ancillary system savings

Liquid cooling technology – USD 30/kWh reduced system cost

- Eliminates need for HVAC in the battery room

Racking – USD 24/kWh reduced system cost

- Alleviates the need for external gas extraction and handling

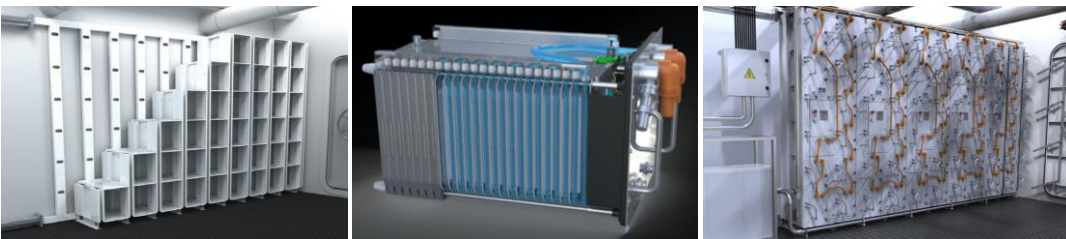
Safety features – USD 130/kWh reduced system cost

- Built-in fire detection and firefighting – reduces the need and cost for incremental firefighting equipment (Lloyds project approval)

A60 approval – USD 75/kWh reduced system cost

- Fire Safe in 1000 °C for over 75 min, Shift is moving towards exemption for locating battery in dedicated A60 machinery space – Game Changer

Up to USD 259/kWh in combined savings



Lifetime savings

CellSwap

- Re-using installations and system by swapping underperforming cells extends life of system from 10 to 30-year
- Cost of replacing cells in ESS after 10 years is 30-40% of the initial cost
- Reduces overall lifetime cost by 30%

Liquid cooling

- Constant optimal temperature in cells during varying operations and charging reduces cell degradation – increases lifetime

Cell pressurization

- Cell packs with pressurization provide constant pressure reduces aging of cells – increases lifetime
- SOH degradation 25% of conventional air-cooled systems

