AYK

Hybrid to Zero
A New Approach



Zero Emission Roadblocks

- Port Electrification
  - Expensive
  - Long duration projects
  - Not possible in some cases
- Battery installation for retrofit vessel
  - Expensive
  - Complex class rules for battery rooms
  - Long downtime of vessel while retrofit
- Battery installation for new built vessels
  - Very large batteries can be difficult to maintain

AYK History

01



AYK Marine Battery Development History

Chris Kruger

AYK

Founder and President

- **3rd generation marine battery**
- High energy density and safety
- Low-cost reliable architecture



(CTO) - 2014

- **1st generation marine battery**
- First hybrid and full electric ferries
- Laid foundations for the marine battery industry

(Founder/CTO) -2018

- **2nd generation marine battery**
- First power battery. 3C continuous



The world's first hybrid ferry, the Prinsesse Benedikte
Denmark - Germany,
2013-present



The world's first all-electric ferry, the Ampere Ferry
Norway,
2013-present



First Large full-electric ferries
Denmark - Sweden,
2017-present

AYK History

- Raised over 15+ MUSD
- Revenue 18+ MUSD in 2024
- Positive EBITDA

2018
AYK Founded

- Established in Shenzhen
- Developed third-generation battery system



2019-2021
DNV Type Approval

- First Chinese company certified by DNV
- Completed angel investment & restructuring



2022
Global Strategic Partnership

- Expanded into international markets
- **Delivered 10MWh**
- Strategic partnerships with Wärtsilä
- Series A financing completed

2023
European Demonstration Vessel

- First hydrogen-electric cargo in Europe
- Built 300MWh assembly line in China
- **Delivered 20 MWh**
- Extend to LR, BV, RINA, ABS and CRS
- Received Series A+ institutional investment

2024
Largest LNG-Electric RoRo

- Develop higher energy density battery & 3C
- **Delivered 50 MWh,** including 12MWh world's largest LNG-Electric Roro
- Port electrification projects started
- EBITDA positive

2025-2026
Shore-to-Ship Integration

- Expansion to NA, Asia-Pacific
- **Expected cumulative order of 440+ MWh**
- Shore-to-ship integrated project launched
- Series B financing launched

Global Team, Global Reach

- Around 150 employees come from more than 15 countries and regions, across 6 continents
  1/3 Global R&D talents



Admin Center
Shenzhen, China

Production and R&D
Zhuhai, Andorra
Hong Kong (coming soon)

Global Service Offices
Andorra, China, Hong Kong,
US, Norway, New Zealand

World-Class Partnerships
































































Milestone: 12MWh x 2 delivered in 4 months













Examples of Battery Application Supplied by AYK



Hybrid LNG Electric RoPax *2
UK-France



Hybrid RoPax
Finland-Sweden



Pure Electric Ferry
Croatia



Hybrid Electric Megayacht
Netherlands



Hybrid Tug*4
Australia



Hydrogen Electric Barge
Netherlands



Hybrid LNG Electric RoRo
Korea



Hybrid Bulk Carrier
Australia



Full Electric High-speed Ferry*3
Australia/ Denmark



Inland Workboat
Netherlands



Methanol Hybrid Tug
Sweden



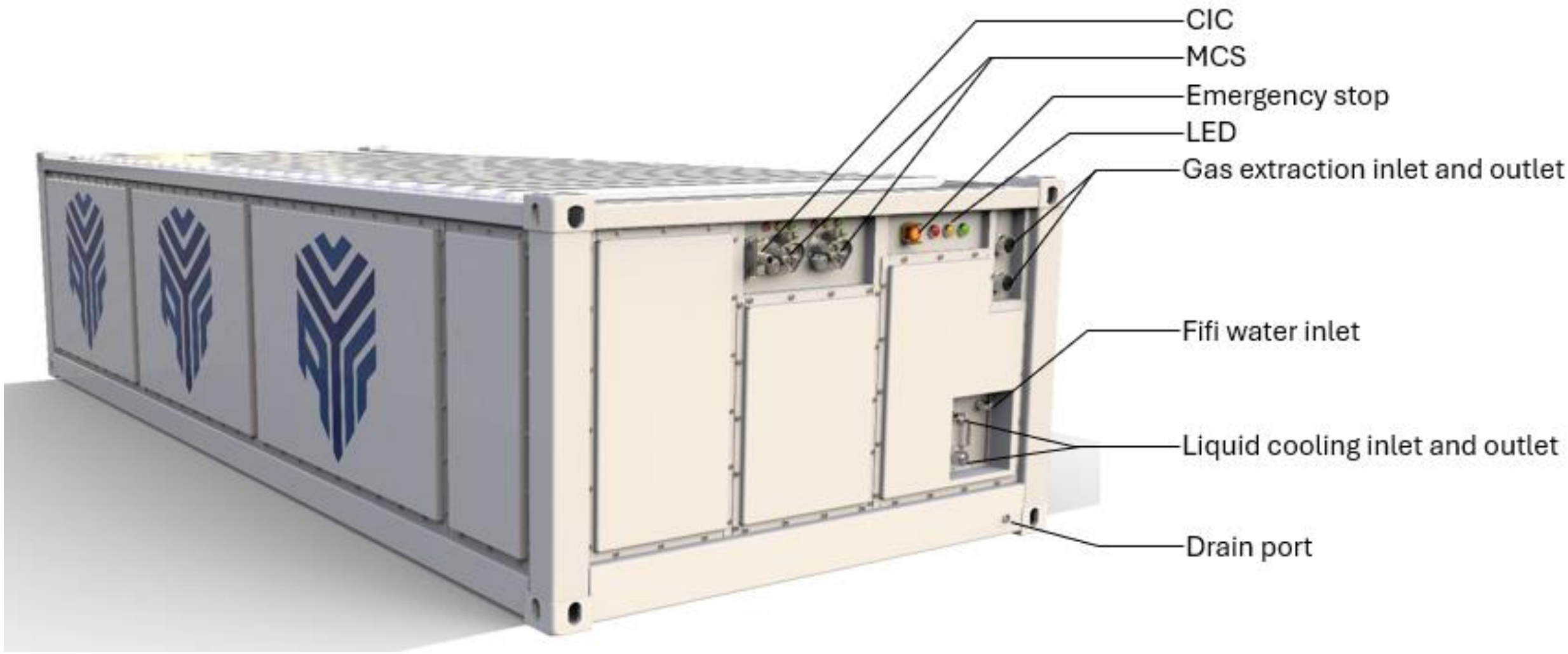
Hybrid Fishing Vessel
Norway

Solution – Use AYK Containers

02

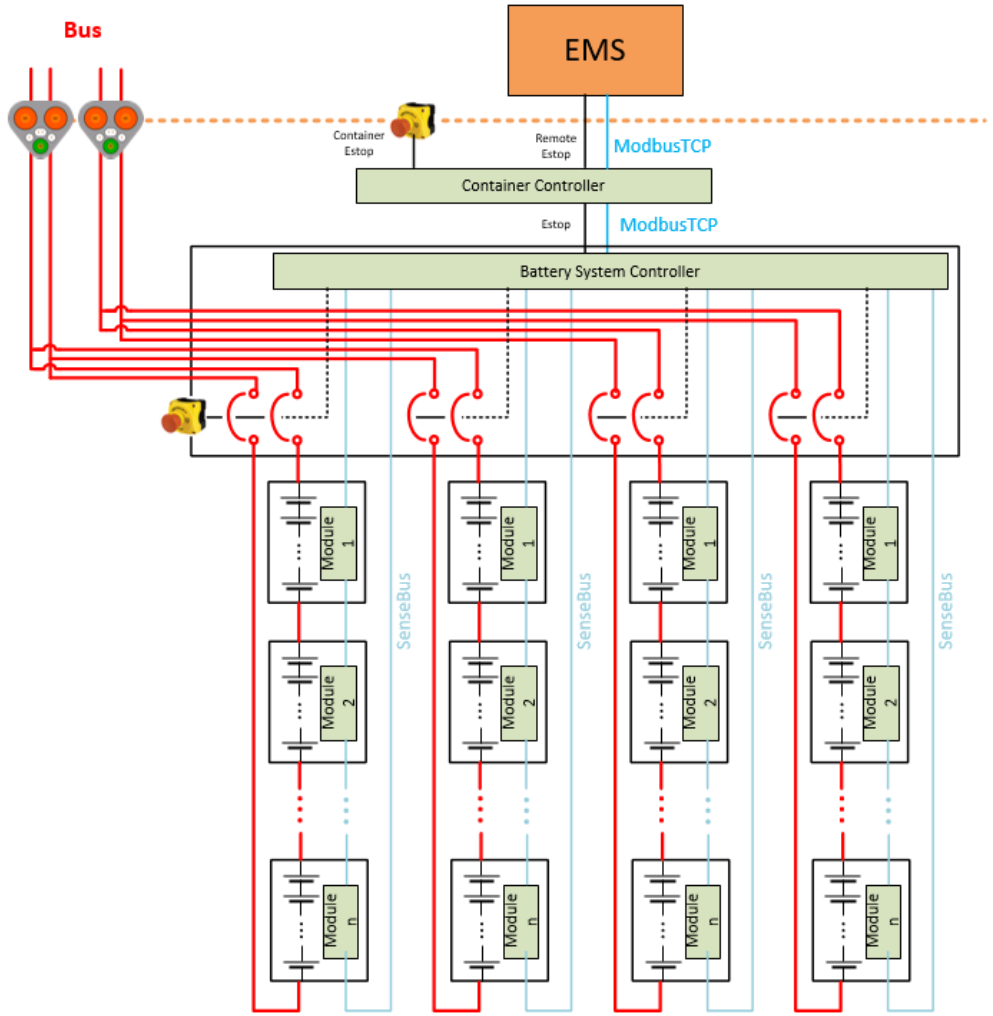


AYK Marine Battery Container



AYK Marine Battery Container Block Diagram

- Four strings in parallel
- Power connection through one or two MCS connectors or Roxtec
- Two or four strings per connector
- 1MW power



AYK Marine Battery Container Key Advantages

- Very high energy density
  - 5.6MWh per 20’ container
  - 117Wh/kg and 132Wh/liter
- Stackable up to 10 containers high
  - 28.15MWh per 20’ footprint
- Swappable
  - 20g shock (z) and 3g shock (x, y)
- Marine certified (ABS)
  - stacking in between normal cargo
- Industrial standard interface
  - Megawatt Charge System



AYK Marine Battery Container Safety

- Short circuit protection
  - Fuse in module
  - Breaker and fuse per string
- IP67 ingress protection
- Module gas exhaust separate from battery compartment
- 8 levels of safety to prevent thermal runaway
  1. BMS firmware – Over voltage and temperature
  2. BMS hardware – Independent over voltage
  3. Single cell passive thermal runaway containment
  4. Module passive thermal runaway containment
  5. Smoke detector and water in module
  6. Smoke or gas detected in the battery container
  7. A60 fire wall
  8. Flooding of battery compartment

AYK Marine Battery Container Specification

System Specification	
Battery chemistry	Li-ion LFP
System Installed Energy (kWh)	2815.2
Number of Battery Banks	1
Max Voltage (VDC)	1000
Nominal Voltage (VDC)	927.4
Min Voltage (VDC)	864
Number of Strings	4
Number of Modules per String	6
Capacity (Ah)	3036
Peak Charge Current (A)	1600
Peak Discharge Current (A)	1600
Average Current (A)	1000 Depending on plug used on vessel
DC power connector	2 x MCS level 2 – air cooled w/ status lights
Communication Interface in MCS	SPE (single pair Ethernet) ModbusTCP Protocol
Control connector	Phoenix HEAVYCON
Communication Interface Control Connector	Cat6 - ModbusTCP Protocol
Cyber Security	Yes
Control power (A @ 230VAC)	10
Cooling Type	Liquid

System Specification	
Cooling Requirement	P=1.0-1.5bar, Q(flow)=100-150L/min, T=21℃±2 Q(heat)≤20kW depending on electrical load
Fire fighting	P=2-4bar, Q≥10L/min
Gas extraction	Camlock Female Coupling DN65
Estop	Remote Estop through CIC. Local Estop on container
Status lights	On container connection face
Ambient Temperature	-25 to 55° C
Dimensions	20-foot ISO container (half height) Base: 20 FT (ISO 668 1CX) Height: NON-STANDARD (half of 9'6")
Corner post load	942 kN/corner (ISO 1496-1 6 Ed.)
Insulation	A60 fire protection for battery section A0 fire protection for auxiliary section
IP rating	IP67
Weight	24 Ton
Installation Location	Side by side, stacked on top of each other in close distance, surrounded by normal cargo containers
Stackable	Up to 10 containers

AYK MBC Port Electrification

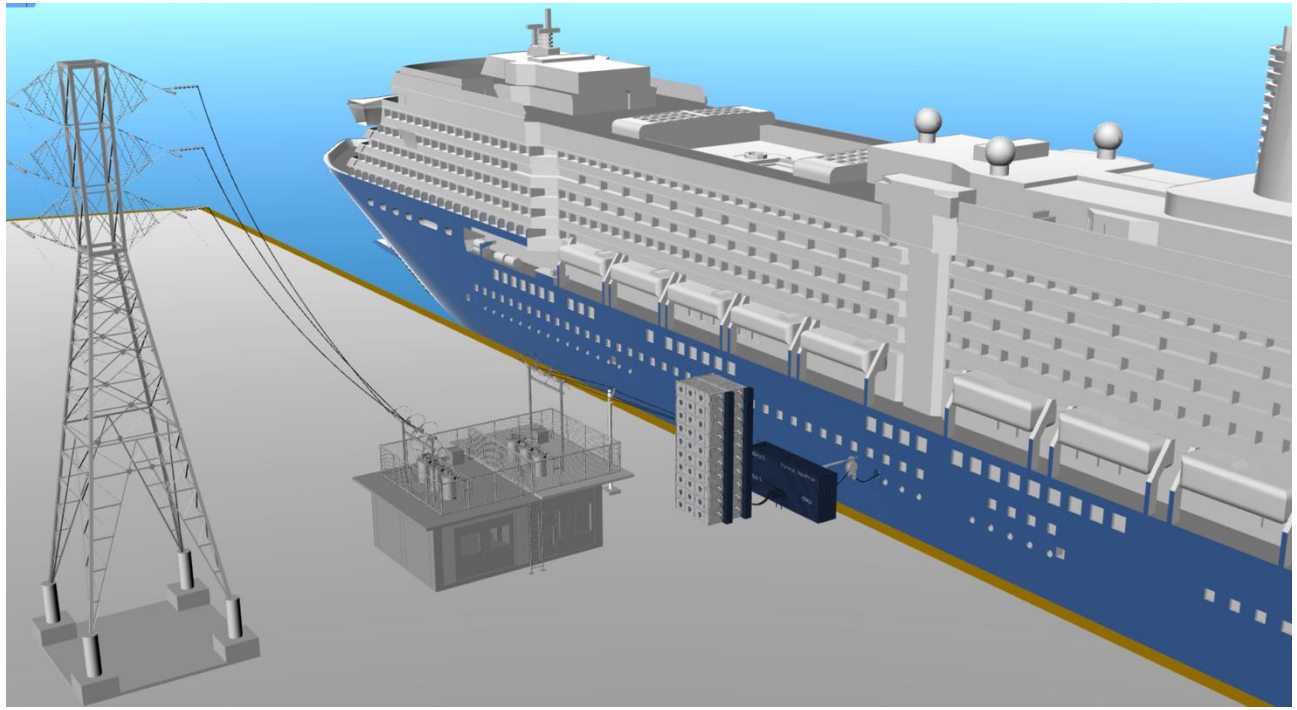
03



Port Electrification – Shore Battery

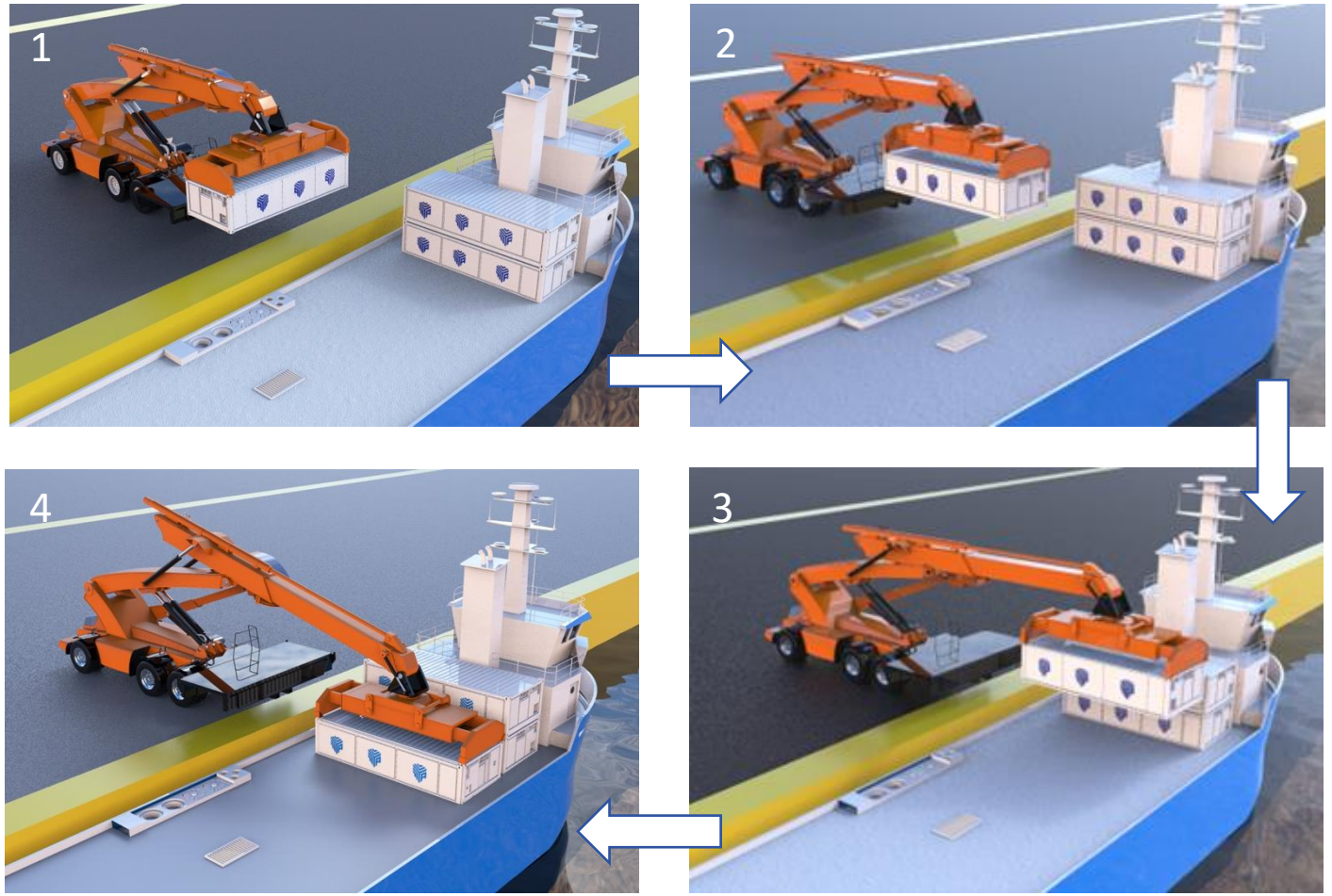
Limited Real Estate Available

- AYK MBC can be stacked to 10 high
- 28MWh in 20’ container footprint
- 10MW power in 20’ container footprint



Port Electrification – Battery Swapping

- MBC charged at remote renewable energy source
- Moved to the port on flat bed trailer
- MBC Swapped by Container Handler



Port Electrification – Battery Swapping

- Standard handling equipment can be used for Container feeder vessels
  - Approximate Battery Energy required 230MWH
  - Less than 90 AYK MBC containers
  - Easy to swap during other cargo transfer



AYK MBC Vessel Solutions

03



Battery Installation for Retrofit

- Place container on top deck
  - No need for costly battery room conversion
  - Containers installed and commissioned in a few days instead of months
  - Example – Tycho Brahe
    - Can install 12 MBC
    - 33MWh – 12MW





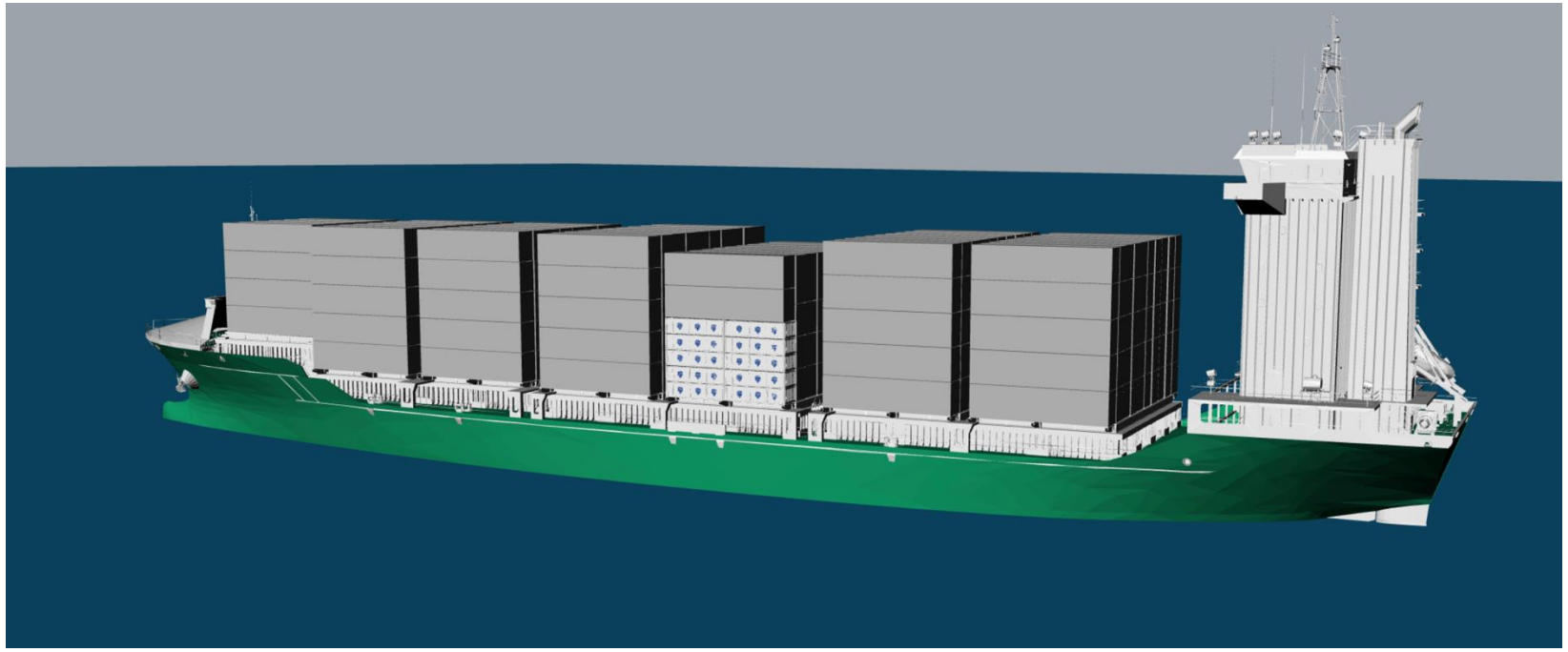
Battery Installation for Retrofit

- Place container below deck
  - No need for costly battery room conversion
  - Cut hole in ship and close after installation
  - Container satisfy class battery room requirements
  - Batteries can be serviced in situ



Large Energy Battery Installation

- Permanent installation of large Energy users like Feeder Vessels
  - Permanent installation of 90 Containers +
  - No Need for elaborate battery room design
  - Stack containers up to 10 high with access to sides for service



THANKS