Certificate No:
TAA00003BF

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Control and Monitoring System

with type designation(s)
Orca Energy Storage System (ESS) and Lighthouse

Issued to
Corvus Energy Inc.
Richmond, BC, Canada

is found to comply with
DNV rules for classification – Ships Pt.6 Ch.5 Sec.21 Cyber security

Application :

This type approval covers security capabilities in accordance with DNV security profile 1 and IACS UR E27 (Apr. 2022), subject to conditions stated in this certificate.

Issued at **Høvik** on **2023-10-12**
This Certificate is valid until **2025-10-11**.
DNV local unit: **Vancouver**

for **DNV**

Approval Engineer: **Pål Børre Kristoffersen**

Jarle Coll Blomhoff
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

Orca Energy Storage Systems (Orca ESS) are large scale lithium ion battery products, designed for hybrid and all-electric ferries, tugs, cruise ships, superyachts, and port cranes.
Orca ESS provides a Battery Management System (BMS) designed specifically to maintain the batteries in a safe and healthy state. The Orca ESS consists of Corvus Energy designed electronics and hardware and runs Corvus Energy developed embedded software for the Battery Management System (BMS) functionality.
The Lighthouse consists of a third-party sourced single board computer (SBC) in a ruggedized enclosure and Corvus Energy developed software that performs the function of connecting to cloud services for uploading data from the ESS and retrieve and update the ESS software.

This type approval covers cybersecurity capabilities and reference architecture for:

Orca Controlled Release version 1.x.y, Orca EMS Firmware version 2.x.y, Lighthouse Software version 5.x.y

Approval conditions

For each delivery of the Orca ESS to vessels with DNV class notation Cyber secure, the following information shall be submitted to demonstrate that the delivery is covered by this TA certificate:

- Reference to this Type Approval Certificate
- Inventory list
- System block diagram (topology)
- A declaration demonstrating that required security capabilities have been correctly implemented and configured in accordance with relevant approved configuration documents and “Orca BMS & Lighthouse Configuration”.

Any modifications in the system to be delivered compared with the type approved system covered by this certificate shall be documented and submitted for approval in each case.

Major changes of the type approved system affecting future deliveries shall be informed to DNV. If the changes are considered to affect functionality for which rule requirements apply, a new functional type test may be required, and the certificate may have to be renewed to identify the new version. Minor changes are covered by this type approval.

Application/Limitation

All hardware devices and accessible interfaces in the Orca Energy Storage System (ESS) and Lighthouse systems shall be installed in areas with means to prevent unauthorised access and/or with physical access restrictions.

The connection from ship Energy Management System (EMS) to the Orca Energy System through the Modbus interface shall be installed in areas with means to prevent unauthorised access and/or with physical access restrictions. The Modbus network shall be dedicated to this purpose.

When the Orca Energy Storage System is implemented as multiple non-adjacent packs, the Corvus inter-pack network shall be installed in areas with means to prevent unauthorised access and/or with physical access restrictions. This network shall be dedicated to this purpose.

The Lighthouse function to retrieve and update the ESS software shall not be used without the acceptance and acknowledgment by the responsible person on board. Ref DNV Rules for classification Ships Pt.4 Ch.9 Sec.1, 1.5.5, July 2023.

Type Approval documentation

Tests carried out

Applicable tests according to DNV-RU-SHIP Pt.6 Ch.5 Sec.21 edition July 2023, security profile 1.
Relevant manuals and instructions of Corvus Orca battery management system have been verified for compliance with IACS UR E27 chapter 5.

Marking of product

The components in the type approved systems shall be marked/identified in accordance with name, model and version as listed in the document “Orca Software Controlled Release Versioning Specification”.

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:
- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate.

A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE