Maritime &
Coastguard
Agency

Safer lives,
safer ships,
cleaner seas

MCA customer process for alternative fuels - electric

Overview

Batteries have been utilised in vessel design for many reasons. From providing redundant power supply for emergency equipment to peak shaving (scaling down the engine power by sourcing additional electricity from batteries) for engines.

However, with the introduction of higher energy density batteries the use of battery electric power to provide sustained propulsion is increasing.

For larger vessels this allows for reduction of in-port emissions and for smaller vessels they can be fully powered by battery power. This paper focuses on the uptake of Lithium-Ion batteries as these present the biggest current use case for fully electric vessels.

Currently, batteries largely serve either as backup power, or propulsion for short voyages and are mostly used on ferries, tugs and other small vessels. Batteries are not yet suitable for providing the required power for long voyages as the sole method of propulsion.

Advantages of Lithium-Ion

- Higher energy density compared to older battery types.
- Reduced maintenance requirements, including no in-service release of gases (like lead acid).
- Flexible electrical arrangements allowing for different engine configurations and power sources.
- Very quick response time to respond to loading without large drops in efficiency.
- Retrofitting of batteries can allow for improved flexibility of the propulsion system, such as peak shaving or even eliminating idle emissions.

Challenges associated with using Lithium-Ion

- Thermal runaway of batteries requires specific safety requirements and increased operational consideration. This can also make post-incident and fire-fighting difficult.
- Retrofitting of batteries can be difficult to fit into tight spaces due to the often-rectangular nature of the units and the need to have specific safety equipment/isolation.
- Lower energy density compared to fossil fuels.
- Increasing demand for batteries can make sourcing batteries difficult and costly.
- Limited shore-side infrastructure to allow for higher current charge rates.

Regulations and guidance

All major class societies have comprehensive prescriptive rule sets for the use of batteries within vessels. These cover installation, maintenance, operation, and the emergency safety requirements.

For lithium-ion batteries, many of these rule sets have been adapted or supplementary rules have been issued to account for the specific safety hazards. This also includes the Type Approval of batteries; this is mostly based on IEC 62619 but some have enhanced the requirements.

For domestic vessels under 24 meters in length, **Workboat Code 3** contains an annex covering the use of hybrid or fully electric vessels and the use of lithium-ion batteries. This contains many of the same safety precautions from the class societies rule sets but scaled to be applied to under 24-meter vessels.

For domestic passenger vessels that fall under the **Inland Waterways Passenger Ship Code Edition 2** (all new build passenger ships post 2018) they are allowed to use relevant class rules. This would include the above-mentioned class rules on lithium-ion. This would only cover the build of the vessel and would be included as part of the partial declaration to the Maritime and Coastguard Agency (MCA) before the MCA certificated the vessel. The MCA can issue a letter of acceptance of the use of class rules for the electric elements if required.

For other vessel types this would be carried out on a case-by-case basis. There is guidance for industry on the installation of lithium-ion batteries in **MGN 550**. This contains critical safety elements from class rules as well other issues that should be considered, whilst remaining goal based and allowing for the future development in technology. This was created with industry to reflect best practise on the installation of batteries. The assessment of the case-by-case, or for the use of novel designs, the process in **MGN 664** or the International Maritime Organisation (IMO) Alternative Design Arrangement (ADA) would be used to assess the risks. These are both risk-based design processes which identify the main hazards/risks associated with the operation and mitigates them to the satisfaction of the flag administration and other stakeholders.

There are no current training requirements in place for the use of electric vessels. For larger vessels, that fall into the requirements of the Standards of Training, Certification and Watchkeeping for Seafarers (STCW), there is already existing information with the Electro Technical Officer (ETO) courses on the use of electrical powering. The inclusion of lithium-ion and other battery chemistries are being considered by the IMO as part of the STCW review for alternative fuels. For domestic training certification the MCA has published the criteria for the **Approved Electric Propulsion Course** (AEPC) which sits alongside the existing Approved Engine Courses (AEC).

Delegated authority

The delegation of approval for the use of electric battery power as the main propulsion is very dependent on the size and type of vessel. As described above, some vessel types, such as workboats, have prescriptive requirements and the Certifying Authority (CA) can be authorised to approve these vessels.

Other vessel types have no requirement and would require an exemption of equivalence. The specifics of the requirements and any delegation would be highly dependent on the specific ship regulatory framework. Where Class Society is a Recognised Organisation (RO) and applying their rules for batteries then the MCA could allow a greater level of delegation. An example of this is where a vessel uses the **Inland Waterways Passenger Ship Code Edition 2** where there is allowance for use of class rules. If an RO was involved in a project, then they would need to sign a Project Specific Authorisation.

The delegation of any authority would be discussed at the initial meeting of the project with the relevant stakeholders. For more information, please contact the MCA with specifics of the vessel and project.

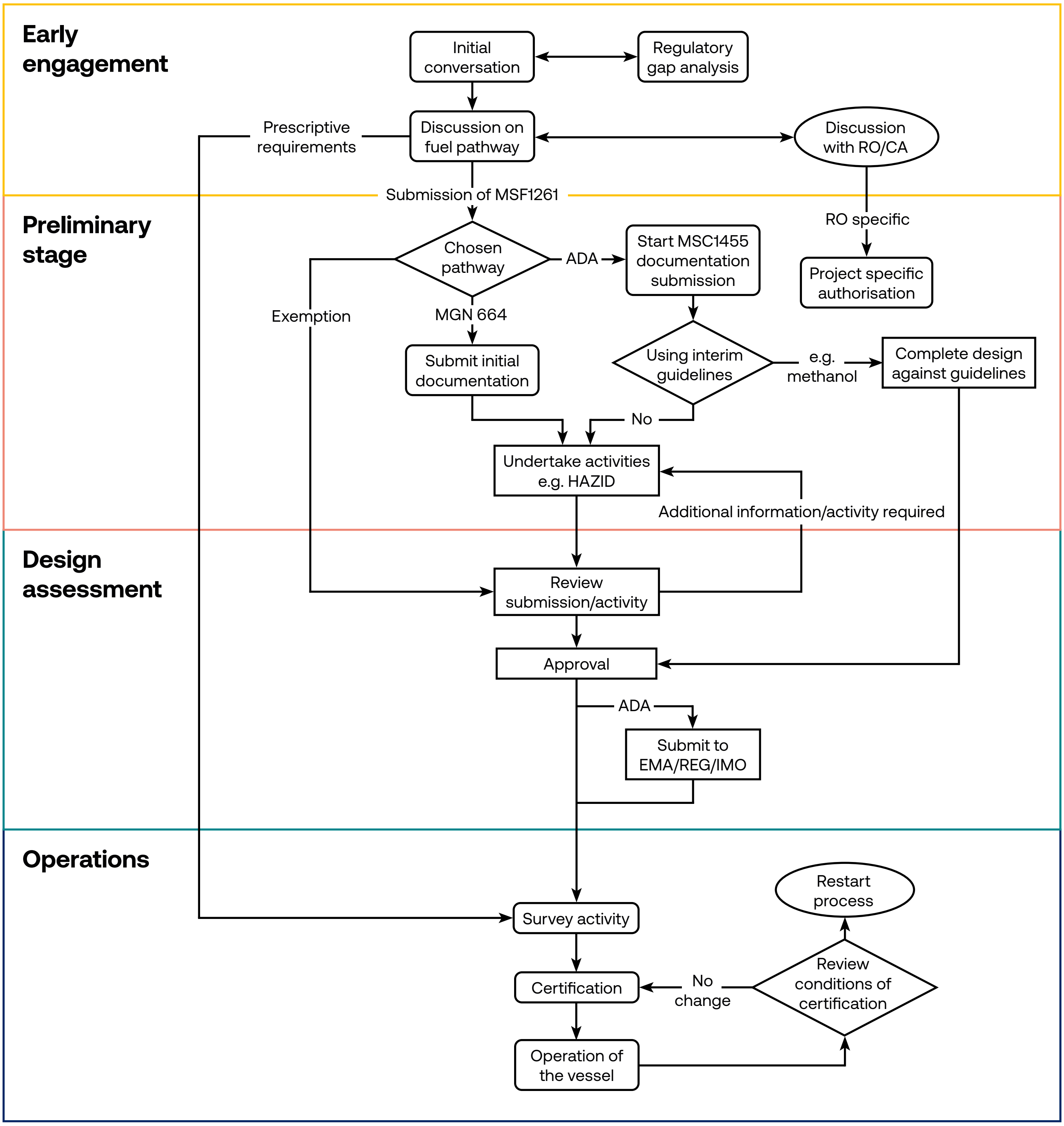
An indicative table of the activities undertaken and the responsibility is described in the table below.

Activity	Responsibility	Outcome Objective
Initial meeting.	Operator/ MCA/ Class Society/ Certifying Authority	Introducing the project and initial design. Discussion around approval process and timelines to reach certification.
Submission of plans demonstrating the battery installation in accordance with the Classification Society rules, Domestic or Inland Waterway Regulations and, if required, requests for any exemptions/ equivalents/ADAs.	Operator/ Class Society/ Certifying Authority	Demonstration of compliance against published standards, identifying gaps against those standards and, where required, provision of mitigation to support equivalent levels of safety.
Review and approval of the plans and exemptions/equivalents/ ADAs, if any.	MCA	Approval allows design to be finalised and project to progress in accordance with agreed requirements. This is an iterative process.
Seafarer qualifications and training issues.	Operator/MCA	Specific crew training requirements associated with the operation will be identified.
Land based infrastructure for charging.	Operators/Port Authorities/HSE	Operators should consult the appropriate authorities to ensure adequate charging infrastructure, exists for their areas of operation.

Timelines

Below is a diagram of the process described above with the different stages.

As can be seen much of the activity is related to activities being undertaken by the submitter. The MCA would review the outcomes of these activities within a maximum of 28 days. Due to this being a cyclic process the overall time for a project is mostly based on the quality of the application and the overall risk levels of the project. Once a project has had an initial meeting and started submissions with the MCA for a project, then better estimates for approval time can be provided.



Key contacts

Any existing customers wishing to build or convert a vessel to operate using electric as part of the vessel propulsion system are encouraged, in the first instance, to contact their MCA Customer Service Manager who will be able to advise further on the process and where necessary set up a meeting with MCA subject matter leads to discuss the proposals in detail.

New customers or those without a Customer Service Manager should contact:

HQSurvey@mcga.gov.uk

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