MECC 2025 Final Technical Report Guidance

This document serves as guidance on what to include in each section of the final technical report for the 2025 Marine Energy Collegiate Competition. The final report should include the following:

- **Cover sheet** including all involved team members, mentors, faculty, and others (e.g., sponsors and advisors), contact information, and a clear indication of their role. The total word count must be included on the cover page. **Only one Cover Page is required for the compiled report, which includes the business plan, technical design and build and test final reports.**
- **Executive summary** briefly describing the project. This must not exceed 2 pages (including figure captions). The Prize Administrators recommend that teams write this section after completion of their reports to summarize the key aspects of their project. **Only one Executive Summary is required for the compiled report, which includes the business plan, technical design and build and test final reports.**
- **Report narrative** of up to 15 pages for each challenge.
- **List of references.**

1 Business Plan Challenge: Final Report Guide

In developing their business plan, competing teams must evaluate the near-term market potential for their concept and/or system, ideally in the next 5–10 years. Business plans will be reviewed based on whether teams completed a robust market analysis and considered any potential shortfalls.

This section describes the various aspects of the business plan Competition Organizers encourage teams to describe in the Business Plan Challenge final report. It is intended to guide the teams to carry out activities that address all aspects of the Business Plan Challenge during the competition.

1.1 Concept overview

Information about the concept, such as business model and vision, and a concise overview of the concept's value proposition (e.g., financial, social, and/or environmental).

If a team's school competed in the previous year's competition, provide a clear and concise description of any aspect that is the same as or similar to the previous year's concept and why. The team must demonstrate an understanding of how previous research has shaped the decisions for the current year.

1.2 Relevant stakeholders

Teams should identify relevant stakeholders and end users and include in the report a description of outreach and engagement conducted to understand the needs of the end users. This could include interviews, research, or surveys. The end-user engagement is intended to result in an identification of the power needs and any other technology considerations that can help inform the design of a marine-energy-powered system (i.e., specific community needs, environmental impact, energy justice needs, etc.).

1.3 Market opportunity

Teams should characterize the overall market opportunity and explain how their proposed concept will relate to the relevant market. At a minimum, a definition of the problem or market gap should be included in the report, along with an assessment of the specific market, market opportunity forecast, potential solutions, and competition analyses. Each team is expected to perform substantial market analysis that includes the direct outreach to market stakeholders as noted in the above paragraph. Some specific questions this is intended to address include:

- What specific market needs does the product meet and in what segments will the product compete? How does the team's particular concept meet the needs and desires of the indicated target market?
- How will a price for the concept be determined? Does the price consider financial incentives and, if so, how and when? How will the value proposition from the customers' perspective be considered?

1.4 Development and operations

Teams should describe the development of the concept and associated activities related to deploying the final system, including potential environmental impacts and permitting requirements. Preliminary designs presented within the technical design section of the final reports should be referenced as relevant to the broader business plan. Some specific questions this section is expected to address include:

What are the considerations in the manufacturing and deployment process? What partnerships could be leveraged, what are the significant risks within manufacturing and deployment, and what is the team's recommended approach to managing these risks?

Are there technical barriers to implementation? What are other social, regulatory, and environmental impacts and/or opportunities involved?

What are the anticipated operations and maintenance schedules? How will these differ from other non-marine-energy (e.g., diesel generator or cable [from device] to shore) power sources.

1.5 Financial and benefits analysis

Teams should describe the financial potential of the concept, including ancillary benefits, noting required capital, financing, and key assumptions (e.g., marginal costs, whether the team wishes to scale up the prototype, and the rate at which they wish to do so). In particular, the report should include any expected operating expenses and associated assumptions (e.g., maintenance schedule, expected time to failure). Full pro formas (standard financial documents required in traditional business plans) are not required here; higher-level, longer-term financial summaries may be used in the business plan narrative to communicate the value of the concept for investment.

2 Technical Design Challenge: Final Report Guide

In the Technical Design Challenge, competitors will evaluate the performance requirements in their chosen blue economy market by identifying and interviewing at least three potential end users. Teams will complete a detailed design of a marine-energy-powered device to serve those end users.

As a note, marine energy as defined in the Powering the Blue Economy report does not include offshore wind energy or solar power, and MECC requires that at least 51% of the total energy system

be powered by marine energy. Therefore, offshore wind energy and solar power can be included in a hybrid design with marine energy but cannot be the sole power-producing unit.

The Technical Design Challenge final report should include a description of the proposed system/concept from an engineering perspective. Teams should provide detail that is adequate for a thorough review of the operating principles of the proposed system. At a minimum, this report must include:

- **A description of the design objective and how the design components support this objective**, including the power production component, the load and related power needs, and any associated storage.
- If a team's school competed in the previous year's competition, the team must provide a clear and concise description of what is the same as the previous year's design and why. The team must demonstrate an understanding of how previous design decisions have shaped the team's decisions for the current year and describe how the concept has advanced since then.
- **A performance analysis** that considers the power-conversion-capture efficiency toward optimizing the available marine energy resource and the overall system (waves-to-electricity, waves-to-water, etc.) efficiency.
    - This analysis can include other supplementary power sources in addition to marine energy if applicable.
    - It should include justification that the proposed power conversion technology is both cost-competitive at the location of the proposed market(s) and has a cost-optimal ratio of conversion capacity to battery storage.
- An analysis of the device's mechanical loading, power requirement, and load profile (and associated safety factors within the design where applicable).
- A demonstration that the proposed technology is designed to withstand standard operating mechanical forces and moments.
- A description of how the technical design addresses the power or operational needs identified in the market analysis.
- Engineering diagrams of mechanical components illustrating the full system or important subsystems.

3 Build and Test Challenge – Final Report Guidance

In the Build and Test Challenge, teams will build an effective prototype that will be tested in a lab or tank for performance and will deliver measured results. These efforts should be described in a final report not to exceed 15 pages. Teams have the discretion to decide what to test and where to perform tests. Open-water testing is outside the scope of this competition. At a minimum, teams will need to build and test a scaled model of the system component that is extracting energy from a marine energy resource.

Teams can reference the business plan and technical design reports for device description and operation, and they can focus the Build and Test Challenge report to include, at a minimum, information on:

- The design process, potentially including early concepts, requirements, design reviews, and any iterative loops.
- The fabrication of the prototype.
- The testing, including a list of instrumentation and methods used and a description of the measurements taken.
- An analysis of the raw measurements and summary of results.
- A description of lessons learned from the design, build, and test processes.