2024 Rules & Requirements

Preface

This competition will be governed by 15 U.S.C. §3719 and this Official Rules document. This is not a procurement under the Federal Acquisitions Regulations and will not result in a grant or cooperative agreement under 2 CFR 200. The Prize Administrator reserves the right to modify this Official Rules document if necessary and will publicly post any such notifications as well as notify registered prize participants.

Preface Table 1. Chronological List of Modifications to 2024 Rules & Requirements

Date	Modification
October 2023	Added information on final event dates and location which will be May 20–23, 2024, in Portland, Oregon. Updated submission dates in Table 3 and Section 2.2, accordingly.
October 2023	Made changes to the Community Connections Challenge overview that provides a revised scope to include goals this challenge will accomplish (Section 1.6) as follows: "In the Community Connections Challenge, competitors will engage with the marine energy industry and their communities to achieve three goals: make connections with professionals to discuss a challenge in the industry that they are passionate about, create unique solutions to address these challenges, and take action towards one of these solutions." Updated the scope, midyear, and final report submissions (Section 2.3) and scoring rubric (Appendix B.5) to reflect the revised scope of the competition. Added new appendix to provide resources for students to understand the current state of the topics (Appendix J).
October 2023	Added a new appendix to provide marine energy resources (Appendix I).
October 2023	Added additional terms to the Key Terms section (Section 3): commercialization plan, end users and stakeholder).
October 2023	Changed word count maximum for Community Connections Challenge midyear submissions (Section 2.3.2).

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1 Introduction

1.1 Purpose

The U.S. Department of Energy (DOE) Water Power Technologies Office's (WPTO) Marine Energy Collegiate Competition (MECC, also referred to as the "Competition" in this rules document) invites diverse interdisciplinary teams of postsecondary, undergraduate, and graduate students from a variety of academic programs to solve ocean energy challenges in the blue economy. Through the competition, WPTO hopes to inspire students to innovate in and accelerate the emerging marine energy industry. The competition will enable students to network with marine energy professionals, learn about marine energy careers, and gain insights in marine energy's potential to contribute to a clean energy future. MECC will consist of four required and concurrent challenges: a Business Plan Challenge, a Technical Design Challenge, a Build and Test Challenge, and a Community Connections Challenge. Up to 20 teams will be selected to compete for a cash prize pool of $420,000. Teams competing in the four challenges, and who complete all required submissions, will be eligible for up to $20,000 in total cash awards and will compete for a part of the $20,000 grand prize cash pool. Specific requirements for each stage of the competition are included in the following sections.

Table 1. Cash Prize Distributions

All amounts are up to the total noted and are not guaranteed.

Stage	Cash Prize per Team	Total Cash Prize Pool
Application to Participate	$5,000	$100,000
Midyear Submissions	$10,000	$200,000
Final Event	$5,000	$100,000
Grand Prize*	TBD*	$20,000*
Total	**$20,000 (+grand prize awards)**	**$420,000**

**Grand Prize cash prizes will only be distributed to first-, second-, and third-place winners. Specific amounts for winner placements will be announced closer to the final event.*

As a part of the MECC, competitors may have the opportunity to engage in networking events with marine energy industry experts during the final event, to be held at an industry event. This engagement is intended to encourage connections between competitors and industry professionals and help prepare students for the job market in this industry.

1.2 Background

The term "blue economy" refers to various aspects of the economic, social, and ecological sustainability of the ocean.[1] Through the Powering the Blue Economy™ initiative, WPTO supports the advancement of technologies to integrate marine renewable energy to power applications in coastal and maritime markets to enable sustainable growth of the blue economy. Specific applications include autonomous vehicles to further ocean exploration, deepwater offshore aquaculture, battery and fuel cell technology for marine transportation, desalination and water treatment to serve coastal and island communities, and alternative fuels like biofuels derived from marine algae and hydrogen from seawater. These and other blue economy applications for marine energy are intended to be the basis of MECC projects.

[1] For more information, please see The Economist Intelligence Unit's *The Blue Economy: Growth, Opportunity and a Sustainable Ocean Economy* 2015 report: https://www.oceanprosperityroadmap.org/wp-content/uploads/2015/05/2.-State-of-the-Blue-Economy_briefing-paper_WOS2015.pdf.

1.3 The Competition

In the 2024 MECC, the competing student teams will have approximately 10–12 months to develop and present their concepts at the final event held alongside the 2024 Ocean Renewable Energy Conference in Portland, Oregon, May 20–23, 2024. During the competition, the teams will submit written documents demonstrating their progress on a schedule described in this document, attend monthly all-team calls, and have access to educational webinars and networking opportunities with marine energy experts.

This competition will consist of four challenges, described below, that will run concurrently. Each selected team will participate in all four challenges. Each challenge includes distinct submissions that selected teams must complete to be awarded cash prizes for that challenge. The teams' activities and ensuing results from the four challenges are intended to be incorporated into three separate final reports and two presentations at the final event.

The four challenges of the MECC are:

- **Business Plan Challenge**: Teams will identify a promising market within the blue economy and determine the best marine energy device to serve the market's needs. Competitors will then evaluate the performance requirements of the marine energy system for end users in the identified market.[2]
- **Technical Design Challenge**: Teams will complete a detailed design of a marine-energy- powered device to serve those end users.
- **Build and Test Challenge**: Teams will build a scaled prototype of their concept and perform a series of lab tests.
- **Community Connections Challenge**: Teams will create connections among competition participants, the marine energy industry, students, and local communities.

1.4 Prize Goals

DOE and the National Renewable Energy Laboratory (NREL) launched the first year of MECC in 2020. The competition's goals are to:

Bring together diverse groups of students from multiple disciplines.

Encourage teams to explore opportunities for marine energy technologies that can benefit other existing maritime industries via real-world concept development experiences.

Inspire future innovators as an entryway into the marine energy and blue economy sectors.

Teams will be evaluated on how effectively their projects meet these goals when determining winners for the Grand Prize.

This competition aims to provide experience with a wide range of blue economy and marine energy opportunities and provide a foundation for future opportunities in these sectors. Throughout the competition, teams will have the opportunity to gain insights into various marine energy and clean energy careers and access workforce development resources and career opportunities in these sectors. All teams will be invited to attend regular educational webinars and industry presentations intended to enhance their educational experience. The MECC has helped students in the past by connecting them with job opportunities and instilling an interest in and understanding of renewable energy careers.

[2] Potential future customers within the selected blue economy market.

1.5 Teams

Teams are required to submit an initial application to act as a competitor in the Competition and be eligible to receive prizes. Specific application requirements and evaluation criteria are included in Appendix A and details of the HeroX platform where applications will be accepted are included in Appendix F.

Up to 20 teams will be selected to participate in the Competition. Teams must meet the following criteria to be eligible:

- Teams may consist of a combination of undergraduate and graduate students but must be at least 50% students who are pursuing their bachelor's and/or associate degree at the beginning of the competition. Only 50% of the team may be pursuing an advanced degree (masters, Ph.D., etc.).
- Both U.S. and non-U.S. institutions are welcome to apply and participate.
- Non-U.S. institutions are not eligible to receive cash prize funding.
- In a team with students from U.S. and non-U.S. institutions, the lead institution must be a U.S. academic institution accredited by the U.S. Department of Education to be eligible for cash prize funding.

Eligible teams selected to participate can receive up to $20,000 in cash prize funding and will also be eligible to compete for a $20,000 bonus cash prize pool. Cash prizes will be paid to each winning team's lead institution.

Each institution may only sponsor one team. Multiple teams applying from an institution will be asked to partner internally. Institutions appearing on multiple teams, either acting as the lead or partner institution, will be required to choose only one team to participate in. All cash prizes will be paid to the lead academic institutions.

Based on prior experience with collegiate competitions, MECC prize administrators recommend a team size of six to eight participants, but there is no official limit to the number of participants per team. However, for each team, the number of students participating in the final event may be limited based on timing and/or space restrictions. Interdisciplinary teams including students with backgrounds in the following areas are highly encouraged: engineering, marine science, environmental science, business, marketing, communications, policy, and social sciences.

1.6 Challenges

During the competition, teams will compete in all of the following four challenges:

- In the Business Plan Challenge, teams will identify a promising market within the blue economy (either a market identified in the WPTO Powering the Blue Economy report or another potential market within the blue economy) and determine, within that market, the best marine energy application to address. Submissions in this challenge will count for approximately 28% of the total final score.
- 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. Submissions in this challenge will count for approximately 30% of the total final score.
- In the Build and Test Challenge, competitors will build a scaled prototype of their concept and perform a series of lab tests. The submissions in this challenge will count for approximately 16% of the total final score.
- Finally, in the Community Connections Challenge, competitors will engage with the marine energy industry and their communities to achieve three goals: make connections with professionals to discuss a challenge in the industry that they are passionate about, create unique solutions to

address these challenges, and take action towards one of these solutions. The submissions in this challenge will count for approximately 26% of the total final score.

All competing teams are expected to attend the final event in May 2024 to present results from all four challenges. The written submissions as well as presentations will be reviewed by experts selected by DOE. Specific details on submission requirements and scoring criteria are included in the following sections.

2 Competition, Challenges, Submissions, and Awards

The MECC consists of all the activities carried out as part of the four challenges leading up to and through the final event.[3] Teams will compete for a cash prize pool of up to $420,000.

Teams who complete all competition elements in all four challenges are eligible to receive up to $20,000 in cash prizes each, a participation plaque, and recognition through DOE and NREL channels. First-, second-, and third-place winners will also be awarded cash prizes from an additional $20,000 pool.

Since the primary theme of the competition is Powering the Blue Economy,[4] teams will frame each of their challenge submissions around applications within the blue economy. Teams are allowed to either advance existing technology through this competition or develop new technologies.

2.1 Submissions and Award Overview

During the period of the MECC, participants will need to submit and/or present:

- Application to participate
- Midyear submissions
- Three final reports
- Two public presentations
- A metrics report
- A poster.

Submission requirements are outlined in Table 2 and details on each of these elements are included in the following sections for each of the challenges. Appendix B describes the number of points a submission contributes to the overall score and the evaluation criteria against which a submission will be measured.

Table 2. Challenge Submissions Overview

Required Submissions	Business Plan Challenge	Technical Design Challenge	Community Connections Challenge	Build and Test Challenge
Application to participate	X	X	X	X
Midyear Submissions	X	X	X	X
Final Report	X	X		X
Presentation and Q&A	X	X	X	X
Poster	X	X		X
Metrics Report			X	

[3] If external circumstances do not allow for an in-person event, the event will move to a virtual format.
[4] https://www.energy.gov/sites/prod/files/2019/09/f66/73355-v2.pdf.

2.2 Overview of Submission Deadlines

Competitors will be required to complete these submissions for each competition challenge by the specified deadline to be eligible for cash prizes. Refer to each submission section and the appendices for specific deadlines, format requirements, and submission instructions. The final event will be held alongside the 2024 Ocean Renewable Energy Conference (OREC) in Portland, Oregon the week of May 20, 2024.

Teams selected to compete will be eligible to receive cash prizes on the schedule outlined in Table 3 following submission of the required materials. Prize administrators encourage teams to use the first award of $5,000 and the second award of $10,000 to support travel and participation in the final event, purchase materials for the Build and Test Challenge, and/or foster sustained marine energy programs and curricula at their home institutions. Teams that attend and actively participate in the MECC final event in Spring 2024 will be eligible to receive an additional $5,000 per team in cash as a third award and will compete for the grand prize cash pool.

Table 3. Submission Deadlines

Submission	Submission Deadline	Funds Awarded
Application to participate (open March 2023), which includes all responses listed in Appendix A. All selected teams will be invited to compete in the rest of the competition.	April 24, 2023, 11:59 p.m. MT	Selected teams will be eligible to receive $5,000, distributed to the selected and eligible lead team's institution.
Business Plan: Team roster, including partner institutions* Detailed Technical Design: Confirmation of selected blue economy market Build and Test: Description of testing objectives Community Connections: (1) Team Overview* and (2) Interview Summary and Outreach Strategy	Jan. 28, 2024, 11:59 p.m. MT	Each lead team's institution can receive a $10,000 cash prize.
Submission of signed Safety and Technical Inspection Form	March 25, 2024, 11:59 p.m. MT	
Team photos and video (optional)	March 25, 2024, 11:59 p.m. MT	Each team is encouraged to submit any project photos, videos, short stories, or a self-interview video answering a few questions about their experience. Team submissions will be compiled into an all-team overview video and used for MECC promotion.
Submission of final reports	May 6, 2024 11:59 p.m. MT	
Submission of Metrics Report	May 13, 2024 11:59 p.m. MT	
During the Final Event	May 20–23, 2024	Each team that attends the final event, submits final reports, displays the poster, and participates in the presentations will be eligible to receive an additional $5,000 cash prize and is eligible to compete for a portion of the $20,000 grand prize cash pool.

Display of poster summarizing Business Plan, Technical Design, and Build and Test*	Bring to final event	
Presentation of (1) Community Connections Challenge presentation (10 minutes) and (2) presentation for Business Plan, Technical Design, and Build and Test Challenges (25 minutes)	Bring to final event	

*Template provided.

2.2.1 Final Awards and Grand Prizes

Awards and prizes will be determined according to Table 4.

Table 4. Final Awards and Grand Prizes

Award	Criteria	Prize
First Place	The team that earns the highest combined score in the four challenges	Trophy Split of a $20,000 grand prize pool. Cash prizes will be paid to each winning team's lead institution.
Second Place	The team that earns the second-highest combined score in the four challenges	
Third Place	The team that earns the third-highest combined score in the four challenges	
Individual Challenge Awards Business Plan Challenge Technical Design Challenge Build and Test Challenge Community Connections Challenge	The team that earns the highest score in the associated challenge.	Trophy
Rookie of the Year Award	For teams in which the lead institution is competing as the lead for the first time, an award will be given to the team from the institution who scores the highest combined score in the four challenges.[5]	Trophy

All teams will receive a participant plaque.

2.2.2 How We Determine and Award Winners

The Prize Administrator screens all completed submissions and, in consultation with DOE, assigns reviewers to independently score the applicable content of each submission. The reviewers will be composed of federal and nonfederal subject matter experts with expertise in relevant areas.

[5] For multi-institution teams to be eligible, the lead institution must be leading for the first time.

Reviewers will review submissions throughout the competition according to the described evaluation criteria in Appendix B. The Prize Administrator will tally the scores based on the scoring criteria described.

Final determination. The director of WPTO is the Judge of the competition and will make the final determination. Final determination of winners by the Judge will take the reviewers' scores and program policy factors in Appendix H into account.

2.2.3 Business Plan, Technical Design, and Build and Test Challenges

The Business Plan Challenge, the Technical Design Challenge and the Build and Test Challenge are described in this section.

- **Business Plan Challenge**: Teams will identify a promising market within the blue economy and determine the best marine energy device to serve the market's needs. Competitors will then evaluate the performance requirements of the marine energy system for end users in the identified market.[6]
- **Technical Design Challenge**: Teams will complete a detailed design of a marine-energy- powered device to serve those end users.
- **Build and Test Challenge**: Teams will build a scaled prototype of their concept and perform a series of lab tests.
- **Community Connections Challenge**: Teams will create connections among competition participants, the marine energy industry, students, and local communities.

2.2.4 Business Plan, Technical Design, and Build and Test Challenge Submissions

Competing teams will prepare the following submissions for the Business Plan Challenge, Technical Design Challenge, and Build and Test Challenge.

- Business Plan, Technical Design and Build and Test Midyear Submissions:
    - Business Plan Challenge: Team Roster, including partnering institutions.
    - Technical Design Challenge: Confirmation of selected blue economy market.
    - Build and Test Challenge: Description of testing objectives.
- Three Separate Final Reports: The final reports will describe the business plan, technical design, and build and test activities.
- Public Presentation and Private Q&A session: Teams will present a 25-minute public presentation during the final event, and will be expected to describe their business plan, technical design, and their build and test activities. This presentation will be followed by 15 minutes of questions from a panel of reviewers in a private setting.
- A poster: Teams will submit a 36-by-48-inch poster summarizing their activities in the business plan, technical design, and build and test activities. Examples of previous MECC posters can be found on the MECC website.[7]
- A signed Build and Test Safety and Inspection form.

[6] Potential future customers within the selected blue economy market.
[7] https://openei.org/wiki/PRIMRE/Prizes_and_Competitions/Marine_Energy_Collegiate_Competition_(MECC)/MECC_Teams.

Table 5 outlines the number of points that can be earned for each submission element. Specific evaluation criteria on how these submissions will be measured and incorporated into a competitor's final score are included in Appendix B.

Table 5. Possible Points per Submission Element of the Business Plan, Technical Design and Build and Test Challenges

Points allocated below contribute to the total Competition award.

Submission Element	Possible Points*
Midyear Submission for Business Plan Challenge	5
Midyear Submission for Technical Design Challenge	20
Midyear Submission for Build and Test Challenge	25
Business Plan Report	150
Technical Design Report	150
Build and Test Report	100
Business Plan Portion of Presentation and Q&A	100
Technical Design Portion of Presentation and Q&A	100
Build and Test Portion of Presentation and Q&A	25
Business Plan Portion of Poster	20
Technical Design Portion of Poster	20
Build and Test Portion of Poster	10
Maximum Possible Points	**725**

**Criteria for determining total points can be found in Appendix B.*

Business Plan, Technical Design and Build and Test Midyear Submissions

Business Plan Challenge: Teams will submit a complete team roster, including names, email addresses, and declared majors of each team member. The roster should include contact names and email addresses for students from partnering institutions. This midyear submission is due Jan. 28, 2024.

Technical Design Challenge: The midyear submission for the Technical Design Challenge should be up to 1 page long and is expected to describe the selected blue economy market the team will address, the reason for choosing that market, and an overview of issues to be explored and analyzed. The specifics of the design are not required at this time. This midyear submission is due Jan. 28, 2024.

Build and Test Challenge: The midyear submission for the Build and Test Challenge should be up to 1 page long and is expected to describe the team's testing objectives. The specifics of the test plan are not required at this time; however, reviewers will review the lab/tank tests the team plans to perform, objectives from performing these tests, the identification of risks and the teams' approach to risk minimization. This midyear submission is due Jan. 28, 2024.

Teams must also submit a signed Safety Specification form (see Appendix C) by March 25, 2024.

Business Plan, Technical Design and Build and Test Final Reports

Each team must submit three separate final reports covering the results of the Business Plan Challenge, Technical Design Challenge, and Build and Test Challenge. These reports are due May 6, 2024, at 11:59 p.m. MT.

- Up to 7,500-word report describing the Business Plan Challenge.
- Up to 7,500-word report describing the Technical Design Challenge.
- Up to 5,000-word report describing the Build and Test Challenge.

Each of the three reports should be follow these formatting requirements:

- Pages should be 8.5 inches by 11 inches, paginated, single-sided, and with 1-inch margins at a minimum.
- Content should be at a minimum single-spaced.
- The body of the report must use at a minimum an 11-point font.
- Captions for figures and tables must be numbered for easy navigation.
- The final document must be packaged into a single, bookmarked PDF file (see Appendix F).

The final reports are intended to be the primary means for a team to provide detailed information about their project to the reviewers. In particular, teams are encouraged to describe the technology design and how the business plan supported by market research shaped the design. In addition to the three final reports, teams should submit the following information:

- **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.**
- **Executive summary** briefly describing the project. This must not exceed 1,000 words (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.
- **List of References**.

Scoring criteria for the final reports are provided in Appendix B. At the conclusion of the competition, all team reports will be posted to the competition website.

The report's executive summary should briefly describe the team project. The information in the executive summary is intended to:

- Enable the prize administrators to promote the teams and competition through various media (e.g., the MECC website, event program, media kit, and competition signage).
- Communicate the teams' projects to visitors at the competition event.
- Help prize administrators and teams respond effectively to media inquiries.

Business Plan, Technical Design and Build and Test Presentation and Q&A Session

In addition to the final reports, each team will present one presentation on their Business Plan, Technical Design, and Build and Test Challenges results to a panel of reviewers. This public presentation is intended to enable teams to communicate the technical underpinnings, business case, and feasibility of commercialization of their system. The presentation should include specifics on the business plan and the design parameters of the team's device. Teams should be prepared to discuss the extent of their market analysis and design validation in their presentation.

The public presentation is limited to 25 minutes, which will be followed by up to 15 minutes of questions from the panel of reviewers in a private setting. It is at each team's discretion to determine how much time they allocate to each challenge during the 25-minute presentation. When pitching their marine energy project, teams should use their presentation to showcase maximum creativity and dynamism, highlighting the team strengths and unique approach in a professional manner.

Presenters should highlight their concept prototype and may use high-quality photos, maps, charts, or other visual aids or props to enhance their presentation using slides in the 16:9 widescreen format.

The public presentation submission comprises a single file (see Appendix F), which should be brought to the final event.

The scoring criteria for the presentation are provided in Appendix B, Table B-7. Penalties for late submission are also described in Appendix B.

Business Plan, Technical Design and Build and Test Poster

One poster summarizing the team's efforts in the Business Plan Challenge, Technical Design Challenge, and Build and Test Challenge is required for each team. The poster does not need to include a summary of the Community Connections Challenge. Teams will bring their poster to the final event. Poster dimensions should be 36 inches by 48 inches, and a template is available in the HeroX Resources page. Teams are encouraged to showcase their creativity to tell a story of their efforts over the year. Challenge-specific information is provided in the sections below.

2.2.5 Business Plan Challenge

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 a business plan that must be described 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**. The Business Plan Challenge report must include descriptions of:

- **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.
- **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.).
- **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?

- **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.
- **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.

2.2.6 Technical Design Challenge

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 all mechanical components.

2.2.7 Build and Test Challenge

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 5,000 words. 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.

Competition prize administrators will provide educational webinars and be available to answer questions; answers to technical questions will be made available to all teams.

Resources documenting past marine energy testing projects may be helpful for teams to review when designing their experimental testing campaign:

- DOE's Wave Energy Prize rules document
- DOE's Waves to Water Prize rules document
- The North Carolina Renewable Energy Challenge website
- Telesto Marine Energy Development Pathway.

Teams can request support from NREL to connect them with nearby facilities to test their devices if the team does not have adequate on-site testing facilities at their institution. Teams are encouraged to research the TEAMER program, which provides various forms of support for testing and research needs. **It is recommended that teams investigate the TEAMER schedule and requirements immediately upon notice of selection to participate in the MECC.**

Teams who receive support from the TEAMER program or other outside entities are required to describe the work that was done outside of the student team and how the team incorporated any outside work.

Physical Design Constraints Within Testing Facility

Given the wide variety of concepts expected in this competition, there are no firm restrictions on the scale of the model that a team can test in an appropriate experimental facility. Therefore, the prize administrators expect the model scale will be dependent on two factors: (1) the dimensions of the testing facility chosen and (2) the available budget. Teams are allowed to seek supplemental funding from additional sources outside of MECC to build a larger model or complete a greater number of experimental tests if desired; however, the Build and Test Challenge scoring rubric will focus on the quality of the model design, test plan development, instrumentation and measurement techniques, and postprocessing of measured data rather than on the size and breadth of the experiment.

Safety Specifications

The competition staff requires that a safety inspection of the test article and load system by the test facility be passed before the test article can be installed and tested at the chosen experimental facility. Appendix C contains a draft version of the safety and inspection form used to evaluate the test article and accompanying instrumentation. The draft safety and inspection form is an example and should be edited to suit the needs of each team and their design. Although the test facility will make the final and official determination about whether a test article may be tested in the experimental facility, competition prize administrators can exclude teams from participating in this challenge if teams do not submit the safety and inspection form of sufficient detail. The safety and inspection form must be submitted to the MECC prize administrators prior to initiating any experimental testing, and failure to submit the safety and inspection form will disqualify the team from the Build and Test Challenge.

Marine Energy Device Challenge Testing

The marine energy device testing portion of the Build and Test Challenge consists of three distinct tasks: the performance task, durability task, and safety task. This section describes the requirement of the individual tasks in which the turbine is expected to perform and the parameters of the testing conditions.

Through testing, teams can demonstrate their marine energy device's performance through objective tasks, and the testing outcomes help determine if teams have succeeded in developing a durable, safe, high-performing machine. Performance is a strong indicator of a marine energy device's ability to compete successfully in the marketplace.

Each marine energy device, and potentially its corresponding load system, will be tested in the experimental facility chosen by each team. The challenge will include the following aspects: marine energy device performance, marine energy device durability, and marine energy device safety. While the prescribed order will be the same for each team, the exact amount of time spent on each task could vary between teams. Teams are not required to complete all tasks; however, addressing each task would demonstrate a holistic approach to the design of a complete system. Given that each team may have different levels of access and time at testing facilities, each team is required to complete at least one task, with suggested priority given in the order of the tasks listed.

Marine Energy Device Performance Task

The objective of this task is to test the marine energy device over a range of environmental conditions to develop a performance curve or matrix. Each marine energy device should be tested in various environmental conditions across the operational envelope for the given device. Each team is expected to test their device in at least six operational environmental conditions, which will be left to the team's discretion; teams should provide a description of their decision-making process for the conditions they chose in the final report.

The measured performance for each device can vary and will be decided upon by each team. For example, the team can choose to measure electrical power output, pumped water, compressed air, or simply device response (e.g., amplitude of oscillatory motion, rotations per minute), as this is generally associated with improved power extraction. Each team will be responsible for selecting the sampling rate of their data acquisition systems and will need to include details on any additional filters applied between the measuring instrument and the data acquisition system to reduce noise in the final report. Teams are strongly encouraged to understand the mechanical or electrical loads at model scale in order to select appropriate instrumentation such that the expected measured values do not fall within the noise range of the instrumentation.

Marine Energy Device Durability Task

Marine energy devices are expected to perform over the long term and will be subjected to a wide variety of weather conditions. Producing power effectively and over the course of the device's lifetime are desirable design qualities. These devices must be designed to withstand extreme environmental conditions without damage to their mechanical and electrical components. To control high mechanical and electrical loads, marine energy devices must be able to limit their response and output power in these particularly high-energy sea states.

In this task, the marine energy device should be subjected to an environmental condition that corresponds to an extreme or survival situation. Teams will be responsible for describing how and justifying why these sea states were chosen in the test report. The mechanical loads and/or device response should be compared to normal operating conditions to evaluate the survivability of the marine energy device. If the marine energy device changes shape, orientation, submergence, etc., depending on the environmental conditions, the team must describe how this change is implemented but will not be required to have a model with real-time capability during testing.

Marine Energy Device Safety Task

Safety is of utmost importance to device designers and manufacturers. To be certified, marine energy devices must be able to safely shut down rapidly and with a fail-safe shutdown capability.

Marine energy devices must shut down when disconnected from the grid as well as manually upon command. Each team may choose to address these shutdown scenarios with one or two systems or mechanisms.

In this task, the marine energy device will be required to safely shut down at one time during the testing period in any environmental condition. For each marine energy device, the shutdown process will be initiated once upon command. It is important that when initiating the command, the data acquisition system remains active and can continue to monitor the shutdown response of the system.

2.3 Community Connections Challenge

Marine energy workforce development requires a multidisciplinary approach, and marine energy is closely tied to communities and places where marine energy exists. In recognition of the multidisciplinary approach and the multiple areas of interest that impact marine energy and communities, this required challenge is designed to forge stronger connections between competition participants, the marine energy industry, and the local community to address the challenges they are facing. This challenge will also provide students opportunities to engage beyond engineering and site design, and allow for teams to take creative, scalable approaches to engaging between an emerging workforce, communities, and the marine energy industry.

The purpose of this challenge is to:

- Engage students to get exposure to the marine energy industry
- Enable these students to have a framework to be exposed (competitors in this prize) to the current problems that will need to be solved in the coming years
- Have students focus on not just technology development but work on issues/challenges extending beyond technology challenges work to better understand and appreciate those issues
- Come up a repeatable framework to expose more students to opportunities in the marine energy space.

Topics for Community Connection Challenge

The following is a list of topic areas in the industry, as identified by prize administrators that are critical to the marine energy industry. Students are encouraged to conduct their own research into their selected topic. Resources are listed in Appendix J.

- K–12 curriculum and awareness
- Marine energy perception
- Workforce pipeline
- Diversity, equity, inclusion, and accessibility
- Energy equity and environmental justice
- Permitting and reducing regulatory barriers
- Technology demonstrations
- Opportunities for marine energy to be paired with other generation or storage technologies
- Manufacturing and supply chain
- Funding and financing pathways.

As part of this challenge, competitors will submit a midyear submission (see Section 2.3.2), a final report (see Section 2.3.3), and a presentation at the final event (see Section 2.3.4).

In the midyear submission, teams will select a topic area from the list above and will conduct a minimum of four interviews with marine energy professionals to learn more about the state of this topic in the industry and the various problems and challenges that exist. Based on the information gathered from the interviews, the teams will propose in the midyear submission, three to five solutions and take action towards one of those solutions, engaging the broader marine energy community. The final report will include an after-action report on the event or activity undertaken to solve the challenges identified.

The team will be required to present and summarize the process and impact of their work. Specific requirements are defined in the following challenge segments, and deadlines are included in Table 3.

Table 6. Possible Points per Submission Element of the Community Connections Challenge*

Submission Element	Possible Points
Midyear Submission	50
Final Community Connection Challenge Metrics Report	50
Final Presentation and Q&A Session	150
Maximum Possible Points	**250**

*Criteria for determining total points can be found in Appendix B.

2.3.1 Community Challenge Best Practices and Suggested Approaches

Conducting Industry Interviews

For this challenge, teams are asked to explore multiple sectors of the marine energy industry to gain insight and develop solutions to the challenge topic. While the team must interview at least four marine energy professionals, there are some proposed best practices and principles teams should follow in interviewing marine energy industry representatives.

Teams are responsible for making their own connections to professionals in the industry. Returning teams are encouraged to interview individuals that team has not previously interviewed in past competition years. Teams are to conduct interviews for information gathering only. Any teams in need of support developing new contacts can begin their search using LinkedIn, webinars on marine energy topics, or bios from clean energy conferences.

Teams should ask questions that will help them develop a clear and compelling presentation covering specific details about the topic area that they are exploring, why this is important to the future of the industry, how it effects the local, or regional, community, and solutions to address these challenges. Details on other needs, challenges, solutions, or insights within each organization are also of interest.

Please note that these marine energy professionals will be volunteering their time. Be mindful of their availability and ensure team members are fully prepared, professional, and concise with their interactions.

Teams should conduct interviews with marine energy professionals in at least four different sectors of the industry. The following are some examples of industry sectors:

- Developers
- Regulators
- Investors
- Owners
- Operators
- Utility Professionals
- Consultants
- Government
- Community leaders
- Educators
- Researchers
- Engagement and outreach professionals.

An update on the status of the industry interviews, the insights gained, three to five proposed solutions, and the outreach strategy will be submitted as part of the mid-year deliverable outlined in Section 2.3.2 The team will submit interview metrics (number of interviews, types of attendees, etc.) as part of the final report, outlined in Section 2.3.3. A summary of insights and proposed solutions that the team develops in this challenge element will be part of the final presentation. More details on requirements for the final presentation are included in Section 2.3.4.

Suggested Actions to Address Proposed Solutions

After the team has developed three to five proposed solutions that address the topic area, they will take action towards one of those solutions. Actions must occur prior to the final competition date so teams can speak to these experiences during their final presentation to the reviewers. An overview of the goals for the actions taken, the planning process, outcomes, as well as best practices and lessons learned should be included in the final presentation.

The following is a list of possible actions that may be modified to the topic area and one of the solutions the team is proposing. This list is not exhaustive of all possible efforts and teams are able to propose an action that they feel best contributes to addressing the topic area. Any actions outside of the list below should be communicated to the prize administrator in the mid-year deliverable.

For any events conducted, teams are encouraged to capture high-quality photos and videos of their activities to present during the final presentation and to include in their reports (described in Appendix D). Teams should provide a photo release form (see KidWind's release form as an example) to any event attendees they take photos or videos of, especially at events where minors are present.

Student and Local Community Engagement

Teams can run one educational event with K–12 students, college students, or community members. Teams should work with teachers, administrators, or local community leaders, to develop and host an event that best meets the intended audience. Teams could engage the student and local community by teaching a marine energy topic in the classroom, inviting students or community members to the team's university, or educate the local community on marine energy and/or topic areas they're aiming to address. These engagement events may be done virtually or in person.

Development of an Educational Webinar

Teams can develop an educational webinar that informs the broader community on the challenge topic and solutions that they have identified. As part of the webinar, the team may host a panel of industry professionals, academics, competition alumni, or other students engaged in the marine energy industry in some way. These webinars will be recorded and included in the MECC reference library. These webinars may be held as live presentations and should include time for MECC students to discuss the topic and/or ask questions of the presenters or hosts.

Host an Industry Activity or Event

Teams can organize an activity or event that benefits the greater MECC community. This activity or event may be held virtually or in person and may be live events or ongoing discussions on a virtual platform. Teams may choose to include industry and/or alumni in these activities or events to foster connections.

Activities or events could include but are not limited to:

- Host a job or internship fair
- Host a training session related to career development (e.g., using LinkedIn, resume building, etc.)
- Host an industry panel.

Communications Material

Teams can create at least one piece of communications material aimed at educating and addressing the broader community about the topic area. Teams who create communications materials should additionally develop a plan before distributing these materials to an intended strategic audience explaining the intended impact of the communications materials. Plans should include the justification for the materials created, the intended audience and how this material will reach them, and the intention behind the promotional strategy.

Communications materials could include:

- Promotional videos
- Social media campaign
- Fact sheets
- Websites and blogs
- Online or print ads.

Teams will be evaluated on the quality of the product, rationale for decisions, and teams' ability to show proof of impact. Be creative and identify the most effective communications techniques through your research.

2.3.2 Midyear Submission: Team Overview, Interview Summary, and Outreach Strategy

The midyear submission will include two separate documents: (1) a team overview and (2) an interview summary and outreach strategy. The team overview should be no more than 500 words, and the interview summary and outreach strategy should be no more than 1,500 words and formatted according to specifications detailed in Appendix F.7. Submissions will be evaluated on quality of the content and not the length of the submission. The deadline is listed in Table 3.

Team Overview

The team overview will use storytelling to introduce team members and their vision for the competition and the clean energy community. The prize administrator will post excerpts from these reports as the team overview on the MECC website and may edit the text for consistency between teams and to meet necessary web standards on energy.gov. Teams should promote the components of the team overview through their social media channels and media connections once they are live on the MECC website. Students should include a strategy of how they will continue promotion.

This team overview may include topics such as:

- Team name, institution name, city, and state.
- Faculty advisor and student lead names and email addresses.
- An introduction to each team member, their current studies, and their professional goals.
- Why the team is participating in the MECC and what the team is most excited for in this competition.
- The team's vision for a clean energy future.
- Team structure, including if it is a club team, capstone, or other; and student leadership roles.
- The team's history and lessons learned from previous years, or how new teams got involved in the MECC.
- Brief overview of technology concept.

- A team photo, including the names of the team members in the order in which they appear. Students in the photo should follow practices consistent with local social distance and mask guidelines when the picture is taken. This photo must be submitted as a separate .jpg or .png file in addition to being included in the report.

Interview Summary and Outreach Strategy

An interview summary will detail the progress made to date in engaging marine energy professionals to explore the topic areas that the team has identified, and the insights gained from those interviews. The outreach strategy is an industry best practice to help keep announcements on track and serve as an activity roadmap. The report should address the following and describe the team's proposed activities throughout the year:

- An overview of the interviews completed to include who was interviewed, the sector and state/region they represent, their job title and organization, and a summary of the topics area
    - Key take aways and insights the team has gained from these interviews.
    - A statement of the topic area they'd like to address and high-level goals the team aims to achieve with their outreach activities.
    - Three to five proposed solutions to the topic area and how the team has identified these solutions.
    - An overview of the actions the team plans to take by the end of the competition to address one of the proposed solutions.
    - Any industry connections or partnerships that the team has, and how the team will leverage these connections to achieve their outreach goals.
    - The team's social media and communications strategy that highlights progress and milestones, including team social media accounts with hyperlinks, and relationships developed with the team's school newspaper or local media outlets.
    - A timeline of events presented in chart form (see the engagement toolkit in Resources on HeroX for an example), including:
        - Timeline for proposed events.
        - Timeline for event development and promotion of event.
        - Planned outreach announcements and social media posts.
    - Up to 10 photos or social media images that have been developed for outreach purposes.

2.3.3 Final Report

Teams will submit a final report detailing the metrics of their Community Connections Challenge activities throughout the year. This report should include the following:

- After Action Report
    - Overview of actions taken to address the challenge topic since the mid-year deliverable.
    - Discussion of challenges the team faced, how these challenges were mitigated, and lessons learned.
    - Description of how these actions met the team's high-level outreach goals and

impact to the marine energy community.

- Reflection on Community Connections Challenge as a whole.
- Up to 10 photos or social media images that depict their outreach activities.

- Metrics Report
  - Industry interviews outcomes, including:
    - Number and types of interviews.
    - Metrics on team and participant attendance at interviews.
    - For each interview completed, provide contact information for each interviewee, including:
      - Full name, company affiliation, and email address.
      - Origin of the relationship (i.e., professional or alumni).
      - Sector in the marine energy industry.
      - Response regarding if this person would be open to continued participation in future MECC events.

- Action outcomes, including:
  - Activities or events
    - Number and types of activities or events.
    - Number of attendees, if applicable.
    - Types of attendees (industry, academia, community members, etc.).
    - Geographic regions represented.
    - Metrics on team and participant attendance at events.
  - For communications materials
    - Number of page clicks.
    - Number of downloads.
    - Location of viewers.
    - Locations where materials were distributed.

- Outreach strategy outcomes, including:
  - Number of persons engaged through outreach.

    - Types of outreach.
    - Reflection on outreach strategy, best practices, and lessons learned.
- Social media strategy outcomes, including:
    - Metrics on social media account growth.
    - List each platform with number of followers, number of posts and likes, and how this grew throughout the year.
    - Reflection on the team's original social media plan versus results attained, lessons learned, and best practices.

When collecting data or feedback from stakeholders, attendees or program participants, teams should communicate how their information will be used. This report should be no more than 2,000 words in length and formatting guidelines. Points will be deducted if formatting guidelines are not met. Reports from each of the teams will be published on the competition website, used for reference for future events, and could be used to develop future competition submissions. Reports should be submitted using the specifications detailed in Appendix F.7.

2.3.4 Final Presentation and Q&A

Teams will develop a final PowerPoint presentation to share their results on the challenge during the final event. This presentation must include:

- Details on the team, each team member's current studies, and future professional goals.
- A statement of the topic area the team has addressed, an overview of insights gained from industry interviews, a brief discussion of the three to five solutions identified to address this topic area, planning and execution of the action, and an assessment of action impact.

Teams should emphasize the quality and visual appeal of each slide and the accompanying presentation by the speaker. Slides should include high-resolution photos to represent each challenge element. Teams may use videos, but this is not required. There will be no template for these slides so teams can choose how to best convey their Community Connections Challenge experience.

Each team will have 10 minutes to present to a panel of reviewers and to the public during the final MECC event. This will be followed by 10 minutes of questions from the reviewers. Teams will be scored on the professional and clear structure of the presentation, use of effective storytelling techniques and visual elements, and their completion of each of the required submissions. Scoring rubric for the final presentation is detailed in Appendix B.5.

3 Key Terms

Term	Definition
Commercialization Plan	Process of bringing your product or service to the market. Typically involves production, distribution, marketing, sales, customer support and other key functions critical to achieving commercial success.
Competition	The competition is all aspects and activities leading up to and through the final event. It is collectively referred to for a given year as the U.S. Department of Energy Marine Energy Collegiate Competition: Powering the Blue Economy™.
End-users	The individuals or organization who will ultimately be using your product or service. These are the people your products or services are designed for.
Final Event	The final event is when and where the teams compete in the challenges.
Stakeholder	A person, group, or organization with a vested interest, or stake, in the decision-making and activities of a business, organization or project. This can include customers, employees, suppliers, regulators, competitors, communities and the environment.
Submissions	Submissions are what the team builds, writes, submits, and brings to compete in the final event. These include midyear submissions, final reports, public-facing presentations, and a poster.
Team Booth	Each team is provided an assigned area during the final event, known as a team booth, to use as a central location to practice their presentation, regroup, and showcase their hard work throughout the year to the public. There will be electrical outlets available in the team booth area to allow students to access computers and other equipment that the teams deem necessary.

Appendix A. Application Requirements

Interested teams must submit an application in PDF format to participate on the HeroX platform by 11:59 p.m. Mountain Time on April 24, 2023. Teams will not be eligible to compete if an application is not submitted by the deadline. Submissions will be reviewed and scored by national laboratory researchers and U.S. Department of Energy (DOE) staff using the evaluation criteria listed below and in the scoring rubric in Appendix B. Each application for the Marine Energy Collegiate Competition (MECC) should be a maximum of 1,500 words and include a response for each of the following sections.

Ultimately, this collegiate competition is designed to foster educational programs and would benefit from classroom curriculum as well as the creation of remote learning, industry partnerships, informal independent-study projects, industry mentorships, and clubs.

A.1 Team Contact Information

The team contact information will include the:

- Lead institution
- Partner institutions (if applicable)
- Team Faculty Advisor(s) name and department (faculty member or primary representative)
- Faculty Advisor(s) email
- Faculty Advisor(s) phone number
- Collegiate Team Student Leader(s) name and declared/intended major (if known)
- Collegiate Team Student Leader(s) email.

A.2 Introduction

Teams should provide a brief introduction of their team, why they are interested in participating in this competition, and their commitment to engage in the MECC educational opportunities. This includes, but may not be limited to, subject matter expert speakers, tools overviews and other educational webinars.

A.3 Educational Objectives and Integration (35%)

Teams should answer the following questions:

- How do they see the competition being integrated into their academic experiences (e.g., courses integrating competition elements or other programs that otherwise support competition-related work, scholarships, independent-study projects, or research assistantships designed to support successful student participation in the competition)?
- Alternatively, is there a plan to cultivate knowledge through other means (e.g., remote learning, industry partnerships, informal independent-study projects, industry mentorships, clubs, and so on)?

A.4 Organization and Project Planning (30%)

Teams should describe:

- How the team will execute elements of the competition, including how unique obstacles, such as academic calendars or virtual collaboration challenges, will be overcome (if applicable, noting previous participation in similar competitions) and how the team will be supported by faculty and staff to ensure that students can be successful in achieving the competition objectives (e.g., list faculty, staff, and other mentors and how they will advise students throughout the competition).
- Which departments across the institution will participate to meet competition requirements.

A.5 Team Diversity and Inclusivity (25%)

Teams should describe efforts to ensure that the team makeup will be consistent with DOE's and the National Renewable Energy Laboratory's (NREL's) efforts to cultivate a water power workforce comprising diverse backgrounds, skill sets, and educational training. For example, the team should describe how:

- The team has created ambitious yet achievable diversity, equity, and inclusion objectives that will be incorporated in the competition that are applicable across multiple academic disciplines. These objectives must be specific, measurable, assignable, realistic, and time-related (often called SMART).
- The team has a clear plan to measure the success of the proposed diversity, equity, and inclusivity objectives.
- The team is likely to be successful in achieving the objectives they have defined, engaging team members of diverse or unique backgrounds.

A.6 Institutional Support and Fundraising (10%)

$20,000 will be provided per team by NREL per the conditions outlined in Table 1. Applicants should clearly describe how they expect to spend these funds and how that will help them achieve their project goals. Note that these funds may not cover the full expenses of this project or participation for all students, applicants should describe how they will seek additional resources (e.g., software, educational materials, project planning tools, and so on) they anticipate needing as part of the competition.

Appendix B. Evaluation Criteria

B.1 Application

Table B-1. Scoring Rubric for Team Applications to Participate

Description	Maximum Possible Points
Educational Objectives and Integration: The application provides an achievable and detailed description of how the competition would be integrated into their academic experiences and describes a plan to cultivate student knowledge.	35
Organization and Project Planning: The application provides an achievable and detailed description of: • How the team will execute elements of the competition, including how unique obstacles, such as academic calendars or virtual collaboration challenges, will be overcome. • How the team will be supported by faculty and staff, and external partners, where applicable, to ensure that students can be successful in achieving the competition objectives (e.g., list faculty, staff, and other mentors and how they will advise students throughout the competition). • Which departments across the institution will participate and actively support the team to meet competition requirements including a description of what this support will look like across each of these departments.	30
Team Diversity and Inclusivity: The application includes: • Ambitious yet achievable diversity, equity, and inclusion objectives that will be incorporated in the competition that are applicable across multiple academic disciplines. These objectives must be specific, measurable, assignable, realistic, and time-related (often called SMART). • A clear plan to measure the success of the proposed diversity, equity, and inclusivity objectives. • Justification for why the team will be successful in achieving the objectives they have defined and engaging team members of diverse or unique backgrounds.	25
Institutional Support and Fundraising: The application includes a detailed and achievable description of how they will seek additional resources (e.g., software, educational materials, project planning tools, and so on) they anticipate needing as part of the competition.	10
Total	**100**

B.2 Submissions

Table B-2. Scoring Summary for All Competition Submissions (975 Points)

		Submissions				
Competition Challenges	**Maximum Points**	Midyear Submissions	Final Reports	Final Presentations	Poster	Metrics Report
Business Plan Challenge	**275**	5	150	100	20	
Technical Design Challenge	**290**	20	150	100	20	
Build and Test Challenge	**160**	25	100	25	10	
Community Connections Challenge (separate submissions for all)	**250**	50	N/A	150	N/A	50
Total	**975**	**100**	**400**	**375**	**50**	**50**

Table B-3. Business Plan, Technical Design and Build and Test Challenge Midyear Submissions

Description	Maximum Possible Points
Business Plan Challenge Midyear Submissions*	**5**
Team roster is complete and in compliance with the template provided by Prize Administrators	5
Technical Design Challenge Midyear Submissions*	**20**
The team identifies a blue economy market they have decided to address	10
Extent to which the team provides justification for choosing the market and identifies issues to be explored	10
Build and Test Challenge Midyear Submissions*	**25**
Safety and technical inspection form has been signed and submitted	5
The team provides a summary of proposed tests and describes the reasons for pursuing each test	10
Extent to which the team summarizes potential technical, budget, schedule, and safety risks and identifies mitigation strategies	10
Total	**50**

**10 points will be deducted for each day the submissions are late up to 3 days, at which point the team is no longer eligible to receive points for this challenge.*

B.3 Final Reports

Table B-4. Scoring Rubric for the Final Business Plan Challenge Report (150 Points)*

Description	Maximum Possible Points
Extent to which the team demonstrates market feasibility (marketability, buildability, public/market acceptance, identification of stakeholders and end users, cost competitiveness in comparison to other energy sources)	50
The team thoroughly evaluates risk through recognition of potential risks and proposes mitigation strategies(e.g., recognition of failure maintenance, operational expenses)	35
Extent to which the business plan demonstrates innovation, creativity, and originality	15
The team conducted at least three end-user interviews/surveys and inputs received are of high quality	20
Accuracy of financial analysis and inclusion of supporting documentation	20
Clear demonstration of student learning and contributions toward the business plan	10
Total	**150**

**10 points will be deducted for each day the report is late up to 3 days, at which point the team is no longer eligible to receive points for this challenge. Formatting requirements are in place to ensure an equal amount of space for all teams to tell their stories to the reviewers. Reports not formatted to the requirements in Section 2.2.1 that are deemed to be utilizing more than the allotted words will be penalized at the discretion of the reviewers proportional to the infraction. Furthermore, extra words will be ignored.*

Table B-5. Scoring Rubric for the Final Technical Design Challenge Report (150 Points)*

Description	Maximum Possible Points
Clear design objective description	25
Accuracy of the power performance analysis	20
Accuracy of the mechanical and electrical loads analysis and associated safety factors	20
Clear description of system optimization efforts (e.g., power/storage capacity to overcome resource intermittency issues)	15
Quality of engineering diagrams, including mechanical and electrical drawings	25
Incorporation of environmental and sustainability factors	15
Incorporation of user needs as part of the design system	20
Clear demonstration of student learning and contributions toward the technical design	10
Total	**150**

**10 points will be deducted for each day the report is late up to 3 days, at which point the team is no longer eligible to receive points for this challenge. Formatting requirements are in place to ensure an equal amount of space for all teams to tell their stories to the reviewers. Reports not formatted to the requirements in Section 2.2.1 that are deemed to be utilizing more than the allotted words will be penalized at the discretion of the reviewers proportional to the infraction. Furthermore, extra words will be ignored.*

Table B-6. Scoring Rubric for the Final Build and Test Challenge Report (100 Points)*

Description	Maximum Possible Points
Clear description of the scaling factors considered in designing and fabricating the model-scale device	20
Clear description of the development of an experimental test plan and how the test plan would allow for the collection of data to prove the team's stated objective	20
Demonstration that the test plan was executed successfully and description of how the instrumentation and measurement design was completed	20
Clear description of how the raw measurements, recorded during model testing, were postprocessed to generate useful data that characterizes the device performance	20
Quality summary of lessons learned during execution of the Build and Test Challenge showing what device modifications, new tests, or changes in recorded measurements the team would consider if their concept were to go through a second round of experimental testing	20
Total	**100**

**10 points will be deducted for each day the report is late up to 3 days, at which point the team is no longer eligible to receive points for this challenge. Formatting requirements are in place to ensure an equal amount of space for all teams to tell their stories to the reviewers. Reports not formatted to the requirements in Section 2.2.1 that are deemed to be utilizing more than the allotted words will be penalized at the discretion of the reviewers proportional to the infraction. Furthermore, extra words will be ignored.*

B.4 Public Presentation: Business Plan, Technical Design, and Build and Test Challenges

Table B-7. Scoring Rubric for the Public Presentation (225 Points)

Description	Maximum Possible Points
The presentation is compelling and includes a narrative of inspiration and purpose behind the business plan	30
Demonstrates thorough market analysis and triple-bottom-line risk assessment	40
Demonstrates consideration of risks, issues, and challenges along with design assumptions	40
The team describes lessons learned during execution of the Build and Test Challenge and what device modifications, new tests, or changes in recorded measurements the team would consider if their concept were to go through a second round of experimental testing	25
The presentation is practiced and polished, the team has a professional appearance and manner, and the team clearly communicates technical topics	30
The team incorporates high-quality graphics, media, and props to support presentation	20
Accurate and thorough ability to answer reviewers' questions	30
Demonstration of learning through the competition requirements by the students	10
Total	**225**

**The final presentation must be submitted online to the Prize Administrators in advance of a team's presentation during the final event, and teams should bring a USB with the presentation as backup.*

B.5 Scoring for the Community Connections Challenge

Table B-8. Scoring Rubric for the Community Connections Challenge (250 Points)*

Description	Maximum Possible Points
Midyear Submission	**50**
Quality and informativeness of team overview with engaging and creative storytelling	15
Quality, depth, and specificity of the industry interviews, insights gained from interviews, and three to five proposed solutions	15
Quality and creativity of outreach activities as represented in the Outreach Strategy Report	20
Final Metrics Report	**50**
After-action report: concise, readable, and descriptive with logical flow; communicates information clearly	30
Quality of industry interview metrics reporting	5
Quality of action metrics reporting	5
Quality of outreach strategy metrics reporting	5
Quality of social media metrics reporting	5
Final Presentation**	**150**
PowerPoint is concise and visually engaging, and presentation to reviewers is professional and clear, uses effective storytelling techniques	30
Demonstrated execution and measurements of outreach to a diverse group of stakeholders	30
Execution and demonstrated impact of chosen action	30
Demonstrated development of best practices and lessons learned through insights gained	30
Successful completion and integration of contest elements	30
Total for Community Connections Challenge	**250**

**5 points will be deducted for each day a submission is late, up to 3 days, at which point the team is no longer eligible to receive points for this challenge.*

***The final presentation must be submitted online to the Prize Administrators in advance of a team's presentation during the final event, and teams should bring a USB with the presentation as a backup.*

****5 points will be deducted from the final submission score for each submission that doesn't meet formatting guidelines.*

B.6 Poster

Table B-9. Scoring Rubric for the Poster (50 Points)

Description	Maximum Possible Points
Poster is visually appealing	15
Concept is clearly understood	20
Important elements of Business Plan, Technical Design, and Build and Test Challenges are represented on poster	15
Total	**50**

Appendix C. Sample Safety and Technical Inspection

A sample of the safety and technical inspection form used to ensure teams are prepared for testing devices is provided below. Teams are required to work through this process in advance of testing their device with a qualified research technician, advisor, or similar university personnel; however, the competition prize administrators have the final say in approving the Safety and Technical Inspection form after being submitted by each team. The competition prize administrators may ask a team to revisit the Safety and Technical Inspection form if they believe there are safety concerns that have not been addressed. The sample Safety and Technical Inspection form is meant to provide guidance and by no means captures all the potential safety requirements each test facility may have.

Teams are also strongly encouraged to conduct a hazard identification (HAZID) and assessment[8] for their own design, installation procedure, and test plan, which is consistent with how safety plans are completed in the industry. During this process, each team would develop a risk assessment matrix (RAM) and mitigation strategies for any of the identified risks.[9] Given the wide variety of possible designs, the risk identification processes will help those team members involved in the Build and Test Challenge to identify the inherent and unique risks for their design and testing procedure. If possible, teams should have their HAZID reviewed by a qualified expert to audit and possibly help guide in the process.

MECC 2024 Safety and Technical Inspection Form	
Team Name: _____	
SAFETY	
□	Wiring is deemed safe and uses adequate gauges—no electrocution or overheating hazard
□	Electrical systems are tied to earth ground with 100 kiloohms or lower resistor
□	Energized electrical components are adequately shielded—both electrically and mechanically
□	Proper heat rejection
□	Voltage is ≤48 volts DC at electrical load connection to data acquisition system or other monitoring systems at all times
□	All mounting fixtures fit without having to be forced
□	For any electrical load: all charging or bulk energy storage follows industry-accepted best practices (i.e., safe circuitry overvoltage/undervoltage protection, flame/spill containment)
Electrical	
□	All electrical components outside the wet testing space are contained in enclosures (no tape)
□	Cable passthroughs in enclosures provide strain and chafe protection (e.g., cable glands)
□	Marine energy model device electronics and load electronics in separate enclosures
□	All external wiring is in cable form and utilizes commercial connectors

[8] United States Department of Labor. 2016. "Recommended Practices for Safety and Health Programs." Occupational Safety and Health Administration. https://www.osha.gov/shpguidelines/hazard-Identification.html.

[9] Teams are directed to the Marine and Hydrokinetic Technology Development Risk Management Framework for additional information: Snowberg, David, and Jochem Weber. 2015. *Marine and Hydrokinetic Technology Development Risk Management Framework*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-63258. https://www.nrel.gov/docs/fy15osti/63258.pdf.

□ All electrical components are mechanically secured to enclosures
Marine Energy Model Device
□ Marine Energy model device for testing is substantively the same as in the report
□ Marine Energy model device side of any electrical load: no batteries, excessively large capacitors (individual or combo ≤10 joules)
□ Capable of installation in the wet testing facility in one assembly to minimize the chance of shifting pieces in the water.
□ Designed to be safely lifted by no more than two team members. If the device weighs more than what two team members can safely lift, adequate lifting points for a crane or equivalent hoist will need to be designed and inspected. Each team will need to evaluate each member's ability and fitness for physical work and material handling.
□ Able to be fully assembled outside of the wet testing facility to allow for mechanical and electrical system checks to be completed before entering the water. It may be necessary for a team to design a dry test stand or mount where the device can be attached without risk of accidental movement (do not simply place on a tabletop).
Mechanical
□ Review model design, installation, and test plan to minimize pinch points, sharps, entrapment, entanglement, etc.
□ Review model design, installation, and test plan to ensure there are appropriate safety measures in place if using an energized system (hydraulic pressure, compressed air, etc.)
Personal Protection Equipment (PPE)
□ Verify that all team members working on the Build and Test Challenge have access to appropriate PPE, such as gloves, eye protection, closed-toe shoes, appropriate work clothing, basic medical kit, etc.
Environmental
□ Review installation and testing plan to account for the additional risk of working in or near water.
□ Ensure all materials, oils, fluids, etc. used in the build are test are properly handled and disposed of at completion.
Wiring
□ Wiring will reach the data acquisition system for measurements that are made outside of the wet testing facility.
□ Emergency-stop terminated with standard JST female receptacle with male pins (test fit to data acquisition system)
□ Emergency-stop signal (JST connector wiring) never draws more than 3 amperes and uses normally closed polarity during operation (students to describe)
Load
□ Team-supplied electrical or other load is certified for desired use
Inspecting Safety Personnel Printed Name and Signature: _____
Date and Time: _____
*noncompliant checkboxes should be circled above
Collegiate Team Faculty Advisor Printed Name and Signature: _____
Date and Time: _____

Appendix D. Roles and Responsibilities

Table D-1 shows the competition roles, who is performing in each role, and what the role entails.

Table D-1. Roles and Responsibilities

Role	Individual(s) Assigned	Responsibilities
Collegiate Team	Multiple	Team carries out work on the project within the rules and requirements of the competition, based on direction and advice from their fellow team members, Student Leader(s), and Faculty Advisor(s)r.
Collegiate Team Student Leader(s)	Minimum of one and maximum of two per team	The student leader(s) attends informational sessions with the Faculty Advisor, represents the team when communicating with competition prize administrators and other teams, and disseminates information received from the competition prize administrators over the course of the entire project, including monitoring communications. A minimum of one and maximum of two student leaders per team is allowed, but at least one must be an undergraduate. These names shall be reported to the Prize Administrators prior to the Team Student Leader kickoff meeting expected to occur in August 2023.
Collegiate Team Faculty Advisor(s)	Minimum of one per team	The Faculty Advisor serves as the lead faculty member and primary representative of a participating institution in the competition. This person also engages with competition prize administrators and provides guidance to the team throughout the project and ensures that the Student Leader(s) disseminates information received from the competition prize administrators. The Faculty Advisor advises, provides input to, and coaches the students on the skills necessary to compete in the various aspects of the competition. Some teams may specify multiple Faculty Advisors who contribute to the team. The name(s) shall be reported to the Prize Administrators prior to the Faculty Advisor kickoff meeting expected to occur in August 2023.
Collegiate Team Co-Advisors(s) or Supporting Faculty	Multiple	Supports the Faculty Advisor and Student Leader(s) in the above duties but typically does not directly engage with U.S. Department of Energy/National Renewable Energy Laboratory prize administrators.
Prize Administrator		The prize administrator leads correspondence with the collegiate teams regarding contracts, challenge questions, and team expectations. During the competition, the prize administrator is the primary point of contact for questions related to engagement with the reviewers, logistics, and protocol. Tasks include developing team schedules, coordinating/collating scores and team feedback from the challenges in time for the awards ceremony, and supporting the collegiate teams, reviewers.

Challenge Reviewers	To be announced prior to the competition	The Challenge Reviewers conduct and evaluate each individual challenge.
Competition Judge	Director, WPTO	The director of WPTO is the judge of the competition and will make all final determinations.

Appendix E. Safety and Conduct

E.1 Safety

The competition is a forum for students with an interest in marine energy to showcase innovative ideas and further develop their knowledge. The event is designed to be safe, fair, and competitive as well as a fun learning experience and a professional growth opportunity. Each team is responsible for the safety of its operations in accordance with the subcontract agreement. Participants are expected to conduct themselves in the spirit of the competition by being team players both within their own teams and among competitor teams.

There will be electrical outlets available in the team booth area to allow students to access computers and other equipment that the teams deem necessary.

E.2 Conduct

As part of the culture of the U.S. Department of Energy and the National Renewable Energy Laboratory, renewable energy and sustainability go hand in hand—a common public perception as well. As a result, though the competition is about renewable energy, we expect that participants will embrace and showcase sustainability where possible during all aspects of the event (e.g., reducing waste in packaging for shipping, reusing packaging materials used in transporting items to the final event, and eliminating the use of nonrecyclable materials, such as foam packing peanuts). In addition, we encourage team members to engage in common sustainable activities, such as recycling paper and beverage containers. Team creativity to support this mission is encouraged but not scored.

While teams work on their submissions, faculty advisors, faculty co-advisors, graduate student advisors, and members of industry secured by each team for support can provide feedback about the team's design so the students can identify fatal flaws, prove technical rigor, or demonstrate feasibility of their concept. Teams are highly encouraged to pursue mentorships and sponsorships early in the competition, as it will provide immense benefit to the learning and overall competition experience. However, only student team members may take an active role in any competition event. It is the role of the non-student team members to provide a supportive environment and the educational background necessary for the students to achieve success in the competition.

In addition, teams are encouraged to bring to the prize administrators' attention rules that are unclear, misguided, or in need of improvement. The prize administrators will seriously consider suggestions that are feasible, within their constraints, and are intended to improve the competition, its rules, fairness, measurable outcomes, or precision.

Appendix F. Communications and Challenge Details

F.1 External Communications

The MECC website will showcase the various elements of the competition, ongoing collegiate team engagement, and information about how to participate in future competitions. The website will also feature important documents, such as this manual and the MECC application template.

F.2 Internal Communications

It is each team's responsibility to stay abreast of the latest competition communications from the prize administrators. Communication between the teams and the prize administrators occurs via one or more of the following:

- HeroX Forum: Official communications suitable for viewing by all team members and prize administrators will be posted on the competition's HeroX Forum.
- HeroX Resources: All MECC resources, templates, and meeting recordings will be uploaded to the HeroX Resources page.
- Virtual meetings: Teams are strongly encouraged to participate in scheduled virtual meetings with the prize administrators. Invitations and instructions for participation in these meetings are provided by the Competition Operations Manager(s) via email and the HeroX Forum.
- Meetings during the final event: An opening ceremony will be held during the final event week.
- Email: The official email address for the competition is Water.Competition@nrel.gov questions should be sent directly to this email address, and answers that may be of interest to all teams will be posted on the competition's HeroX Forum. For expediency and to protect confidentiality, the prize administrators may choose to communicate with teams via team members' email addresses as listed in the HeroX database; however, most official communications occur via the HeroX Forum.

F.3 Branding

Teams are encouraged to develop an online presence and branding platform for their team to showcase their work throughout the year, and this platform should be shared as part of the Community Connections Challenge portion of the competition.

This platform may include web pages, social media, outreach material, and team T-shirts. Regular updates and engagement with the team's school and external media are recommended, and efforts will be shared by NREL and the U.S. Department of Energy (DOE) channels as allowed. In addition, teams will be asked to report on these efforts through the scored Community Connections Challenge component. Teams must receive permission to use the competition logo or name as part of individual school/team branding and platform; requests should be sent to Water.Competition@nrel.gov.

Teams are expected to set up a professional space in their team booths to highlight the team's branding. This can include the concept design, posters, team logo, and school information. The team booths are the teams' chance to showcase all the work they have put into their project over the course of the year and are the best way to communicate their efforts to the industry.

F.4 Reviewing and Scoring

A panel of Challenge Reviewers is responsible for scoring team performance in each challenge and for each submission. The Reviewers will have expertise related to the content they are responsible for evaluating. The panel will include diverse backgrounds that allow the Reviewers to evaluate performance from a variety of angles.

Prize administrators will ensure that, to the extent possible, Reviewers will not:

- Have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in the competition.
- Have a familial or financial relationship with an individual who is a registered participant.
- Provide advice to teams, although they can provide clarification on the reviewing process.
- Discuss team performance with other teams or their advisors.

Names of the selected reviewers will be announced prior to the final in-person event. Reviewers for midyear submissions may be different than those providing reviews at the final event. The director of WPTO is the Judge of the competition and will make the final determination.

F.5 Team Feedback

In an effort to provide as much feedback as possible, teams will receive their scores following completion of the competition. Teams will also receive a short narrative derived from the challenge reviewers' deliberations after each team's presentation.

Scoring Statements

Reviewers will use detailed scoring statements to evaluate team performance in each of the categories. These statements give all participants a clear idea of what they will be evaluated on in each challenge.

Midyear submissions will be thoroughly reviewed and evaluated by the reviewers. The competition prize administrators will hold a meeting to brief the reviewers s on the competition requirements and convey any team-specific information deemed salient by the prize administrators, such as team members' involvement in internships with NREL or previous MECC experience and results. Each Challenge Reviewer will complete a rubric independently after each team's presentation or based on the review of submissions. The reviewers will convene after all teams have presented to share their scores and agree on rankings.

Team Feedback

In an effort to provide as much feedback as possible, teams will receive copies of the scored rubrics, which will be provided following completion of the competition. Teams will also receive a short narrative derived from the Challenge Reviewers' deliberations after each team's presentation.

F.6 Submissions and Submission Locations

Go to HeroX and follow the instructions for registering and submitting all required materials before the deadline in Table 3 and as displayed on the HeroX website.

The HeroX platform provides a space where parties interested in collaboration can post information about themselves and learn about others who are also interested in competing. Teams can submit early copies and updated revisions until the deadline. If a team wants to submit after a deadline, you must contact the prize administrator and points will be deducted according to what is identified in the evaluation criteria in Appendix B.

F.7 Submissions

PDF Requirements

Submitted PDFs must meet the following criteria:

- Have embedded fonts.
- Have all images be a minimum resolution of 300 dpi.
- Creating a PDF:
- From scans or by outputting the content into a raster image format (e.g., .jpg, .tiff, .png, or .gif) is not acceptable.
- That is an all-raster PDF should be avoided because, despite being large files at 300 dpi, they are of unacceptable quality at lower resolutions and are not scalable without degradation.

Audiovisual Presentation Requirements

Audiovisual presentation format requires that:

- Videos, if used, are in a .MOV or H.264 compressed .MP4 (MPEG-4) file type with a resolution of 720 × 480.
- Presentations should be in a 16:9 aspect ratio.
- No background music that violates U.S. copyright laws is included; all incorporated music must be an original or royalty-free composition and proof of licensing must be submitted with the final file and transcript.

Electronic File-Naming Instructions

The required file-naming convention for all electronic files is:

[TEAM ABBREVIATION] _[SUBMISSION]_[SUBMISSION DATE (YYYY-MM-DD)].[EXTENSION]

For example, a report submitted by California Maritime Academy on April 24, 2024, would have the following file name: MARITIME_Report_2024-04-23.PDF.

Appendix G. Alternative Competition Structure

In the event of a cancellation of an industry event or alternative reason for cancellation of the in- person event, this document will be updated to reflect changes resulting in the cancellation. All of the required submissions will remain unchanged, but the event and submissions schedule may be updated. Should there be extenuating circumstances for some but not all teams, a hybrid solution between a standard in-person event and virtual will be developed and further communicated to the teams with as much advanced notice as feasible.

The primary goal of the competition is to maximize learning, and the prize administrators will work with each team to determine what is possible.

The following best practices are highly recommended for remote participation in any event.

G.1 Prior to the Final Event

Prior to the final event, a team should:

- **Know the competition schedule**. Teams are responsible for keeping track of the final event schedule and confirming their meeting point of contact.
- **Test their technology**. Teams should explore the virtual meeting platform and test their audio and video capabilities. The prize administrators have built in transition time, but it is limited.
- **Check their Internet connection**. Teams are encouraged to use a hard-wired internet connection (i.e., ethernet cord). Wi-Fi connections can be used but are not ideal because they are prone to more connection issues.

G.2 Day of the Final Event

On the day of the final event, a team should:

- **Note their audio settings**. Teams are responsible for muting their audio connection (phone or computer) when they are not intending to speak. The prize administrators will mute participants with excessive background noise. Ensure team members are only using one audio connection, connecting to audio via their phone or computer but not both. Connecting with two audio connections results in electrical feedback that is very uncomfortable for all involved.
- **Verify their video preferences**. Teams are encouraged (but not required) to use their webcam when presenting. Audio narration of slides is also acceptable. Ensure team members have a clean background while streaming their video (e.g., no inappropriate or offensive images in the background or people walking around) and avoid window backdrops because of lighting.
- **Be prepared**. Teams should look professional in their dress and speak professionally during their presentation. Refrain from distracting behavior while sharing their video and/or audio, such as drinking or eating.

Appendix H. Additional Terms and Conditions

H.1 Verification for Payments

The Prize Administrator will verify the identity and role of all competitors before distributing any prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrator will notify winning competitors using provided email contact information for the individual, team, or entity that was responsible for the submission. Each competitor will be required to sign and return to the Prize Administrator, within 30 days of the date on the notice, a completed NREL Request for ACH Banking Information form and a completed W-9 form (https://www.irs.gov/pub/irs- pdf/fw9.pdf). In the sole discretion of the Prize Administrator, a winning competitor will be disqualified from the competition and receive no prize funds if: (i) the person/team/entity does not respond to notifications; (ii) the person/team/entity fails to sign and return the required documentation within the required time period; (iii) the notification is returned as undeliverable; (iv) the submission or person/team/entity is disqualified for any other reason as specified in eligibility section in the executive summary or universal content section above.

In the event of a dispute as to any registration, the authorized account holder of the email address used to register will be deemed to be the competitor. The "authorized account holder" is the natural person or legal entity assigned an email address by an internet access provider, online service provider, or other organization responsible for assigning email addresses for the domain associated with the submitted address. All competitors may be required to show proof of being the authorized account holder.

H.2 Teams and Single-Entity Awards

The Prize Administrator will award a single U.S. dollar amount to the designated primary submitter, whether consisting of a single or multiple entities. The primary submitter is solely responsible for allocating any prize funds among its member competitors or teammates as they deem appropriate. The Prize Administrator will not arbitrate, intervene, advise on, or resolve any matters or disputes between team members or competitors.

H.3 Submission Rights

By making a submission and consenting to the rules of the challenge, a competitor is granting to DOE, the Prize Administrator, and any other third parties supporting DOE in the challenge, a license to display publicly and use the parts of the submission that are designated as “public” for government purposes. This license includes posting or linking to the public portions of the submission on the challenge website, DOE websites, and partner websites, and the inclusion of the submission in any other media worldwide. The submission may be viewed by the DOE, Prize Administrator, and reviewers for purposes of the challenge, including but not limited to screening and evaluation purposes. The Prize Administrator and any third parties acting on their behalf will also have the right to publicize competitors’ names and, as applicable, the names of competitors’ team members and organization, which participated in the submission on the challenge website indefinitely.

By entering, the competitor represents and warrants that:

1. Competitor’s entire submission is an original work by competitor and competitor has not included third-party content (such as writing, text, graphics, artwork, logos,

photographs, likeness of any third party, musical recordings, clips of videos, television programs or motion pictures) in or in connection with the submission, unless (i) otherwise requested by the Prize Administrator and/or disclosed by competitor in the submission, and (ii) competitor has either obtained the rights to use such third-party content or the content of the submission is considered in the public domain without any limitations on use.

2. Unless otherwise disclosed in the submission, the use thereof by Prize Administrator, or the exercise by Prize Administrator of any of the rights granted by competitor under these rules, does not and will not infringe or violate any rights of any third party or entity, including, without limitation, patent, copyright, trademark, trade secret, defamation, privacy, publicity, false light, misappropriation, intentional or negligent infliction of emotional distress, confidentiality, or any contractual or other rights;
3. All persons who were engaged by the competitor to work on the submission or who appear in the submission in any manner have:
    a) Given the competitor their express written consent to submit the submission for exhibition and other exploitation in any manner and in any and all media, whether now existing or hereafter discovered, throughout the world;
    b) Provided written permission to include their name, image, or pictures in or with the submission (or, if a minor who is not competitor's child, competitor must have the permission of the minor's parent or legal guardian) and the competitor may be asked by the Prize Administrator to provide permission in writing;
    c) Not been and are not currently under any union or guild agreement that results in any ongoing obligations resulting from the use, exhibition, or other exploitation of the submission.

H.4 Copyright

Each competitor represents and warrants that the competitor is the sole author and copyright owner of the submission; that the submission is an original work of the competitor or that the competitor has acquired sufficient rights to use and to authorize others, including DOE, to use the submission, as specified throughout the rules; that the submission does not infringe upon any copyright or any other third-party rights of which the competitor is aware; and that the submission is free of malware.

H.5 Challenge Subject to Applicable Law

All challenge are subject to all applicable federal laws and regulations. Participation constitutes each participant's full and unconditional agreement to these Official Challenge Rules and administrative decisions, which are final and binding in all matters related to the challenge. This notice is not an obligation of funds; the final award is contingent upon the availability of appropriations.

H.6 Resolution of Disputes

The U.S. Department of Energy is solely responsible for administrative decisions, which are final and binding in all matters related to the challenge.

Neither the U.S. Department of Energy nor the Prize Administrator will arbitrate, intervene, advise on, or resolve any matters between team members or among competitors.

H.7 Publicity

The winners of these prizes (collectively, “winners”) will be featured on the DOE and NREL websites.

Except where prohibited, participation in the challenge constitutes each winner's consent to DOE’s and its agents’ use of each winner's name, likeness, photograph, voice, opinions, and/or hometown and state information for promotional purposes through any form of media worldwide, without further permission, payment, or consideration.

H.8 Liability

Upon registration, all participants agree to assume any and all risks of injury or loss in connection with or in any way arising from participation in this challenge. Upon registration, except in the case of willful misconduct, all participants agree to and, thereby, do waive and release any and all claims or causes of action against the federal government and its officers, employees, and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential, and whether foreseeable or not), arising from their participation in the challenge, whether the claim or cause of action arises under contract or tort.

In accordance with the delegation of authority to run this challenge delegated to the director of the Water Power Technologies Office, the director has determined that no liability insurance naming DOE as an insured will be required of competitors to compete in this competition per 15 USC 3719(i)(2).

Competitors should assess the risks associated with their proposed activities and adequately insure themselves against possible losses.

H.9 Records Retention and Freedom of Information Act

All materials submitted to DOE as part of a submission become DOE records and are subject to the Freedom of Information Act. The following applies only to portions of the submission not designated as public information in the instructions for submission. If a submission includes trade secrets or information that is commercial or financial, or information that is confidential or privileged, it is furnished to the Government in confidence with the understanding that the information shall be used or disclosed only for evaluation of the application. Such information will be withheld from public disclosure to the extent permitted by law, including the Freedom of Information Act. Without assuming any liability for inadvertent disclosure, DOE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for review of the application or as otherwise authorized by law. This restriction does not limit the Government’s right to use the information if it is obtained from another source.

Submissions containing confidential, proprietary, or privileged information must be marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

The submission must be marked as follows and identify the specific pages containing trade secrets, confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain trade secrets, confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes. [End of Notice]

The header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Trade Secrets, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure." In addition, each line or paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets.

Competitors will be notified of any Freedom of Information Act requests for their submissions in accordance with 29 C.F.R. § 70.26. Competitors may then have the opportunity to review materials and work with a FOIA representative prior to the release of materials.

H.10 General Conditions

DOE reserves the right to cancel, suspend, and/or modify the challenges, or any part of it, at any time. If any fraud, technical failures, or any other factor beyond DOE's reasonable control impairs the integrity or proper functioning of the challenges, as determined by DOE in its sole discretion, DOE may cancel the challenge.

Although DOE may indicate that it will select up to several winners for each challenge, DOE reserves the right to only select competitors that are likely to achieve the goals of the program. If, in DOE's determination, no competitors are likely to achieve the goals of the program, DOE will select no competitors to be winners and will award no prize money.

H.11 Program Policy Factors

While the scores of the expert reviewers will be carefully considered, it is the role of the prize judge to maximize the impact of challenge funds. Some factors outside the control of competitors and beyond the independent expert reviewer scope of review may need to be considered to accomplish this goal. The following is a list of such factors. In addition to the reviewers' scores, the below program policy factors may be considered in determining winners:

- Geographic diversity and potential economic impact of projects.
- Whether the use of additional DOE funds and provided resources are non-duplicative and compatible with the stated goals of this program and the DOE mission generally.
- The degree to which the submission exhibits technological or programmatic diversity when compared to the existing DOE project portfolio and other competitors.
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers.
- The degree to which the submission is likely to lead to increased employment and manufacturing in the United States or provide other economic benefit to U.S. taxpayers.
- The degree to which the submission will accelerate transformational technological, financial, or workforce advances in areas that industry by itself is not likely to undertake because of technical or financial uncertainty.
- The degree to which the submission supports complementary DOE funded efforts or

projects, which, when taken together, will best achieve the goals and objectives of DOE.

- The degree to which the submission expands DOE's funding to new competitors and recipients who have not been supported by DOE in the past.
- The degree to which the submission enables new and expanding market segments.
- Whether the project promotes increased coordination with nongovernmental entities for the demonstration of technologies and research applications to facilitate technology transfer.

H.12 National Environmental Policy Act (NEPA) Compliance

DOE's administration of the Marine Energy Collegiate Competition is subject to NEPA (42 USC 4321, et seq.). NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at http://nepa.energy.gov/.

H.13 Return of Funds

As a condition of receiving a prize, competitors agree that if the prize was made based on fraudulent or inaccurate information provided by the competitor to DOE, DOE has the right to demand that any prize funds or the value of other non-cash prizes be returned to the government.

ALL DECISIONS BY DOE ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CHALLENGE.

Appendix I. Marine Energy Resource Library

Students can refer to some of the following resources to better understand marine energy, desalination technologies, and additional information about the Marine Energy Collegiate Competition or U.S. Department of Energy (DOE) Water Power Technologies Office (WPTO) within the Office of Energy Efficiency and Renewable Energy (EERE).

I.1 High-Level Overviews and Supporting Materials

For general informational and educational materials on renewable and marine energy, explore:

- DOE's Energy 101: Marine and Hydrokinetic Energy video for a broad introduction to marine energy.
- DOE's Tidal power 101 video for an introduction to tidal power.
- DOE's Powering the Blue Economy™ Appendix, developed as part of the recently published Powering the Blue Economy Report, this appendix provides an overview of marine energy technology types, resource potential, energy costs, laboratories, testing facilities, industry standards, and more.
- DOE's Marine and hydrokinetic energy device types glossary of the some of the known device types for wave, current, tidal, and ocean thermal energy converters.
- National Renewable Energy Laboratory (NREL) publication on Marine Hydrokinetic Energy Site Identification and Ranking Methodology Part I: Wave Energy
- NREL publication on Marine Hydrokinetic Energy Site Identification and Ranking Methodology Part 2: Tidal Energy
- NREL tool Marine Energy Atlas
- NREL publication on Marine Hydrokinetic Resource Assessment for Domestic Army, Air Force, and Coast Guard Facilities
- The European Marine Energy Center Ltd's List of Worldwide Wave Developers
- The European Marine Energy Center Ltd's List of Worldwide Tidal Developers
- Bureau of Ocean Energy Management webpage on Renewable Energy on the Outer Continental Shelf
- Ocean Energy Systems Annual Report 2018
- NPS Physics video on Fundamentals of Wave Energy Lecture 1
- NPS Physics video on Fundamentals of Wave Energy Lecture 2.

I.2 Desalination

For informational and educational materials on desalination, explore:

- Powering the Blue Economy—Chapter 7: Desalination
- Numerical Modeling and Dynamic Analysis of a Wave-Powered Reverse-Osmosis System
- The cost of water from an autonomous wave-powered desalination plant.

I.3 Technical Deep Dives

For technical materials, explore:

- DOE publication on marine and hydrokinetic online resources, including quick links for information on marine and hydrokinetic energy, a central data repository, interactive mapping tools, and an environmental data site.
- DOE documentation on levelized cost of electricity guidance and supporting information.
- Ocean Energy Systems news article on "International Levelized Cost of Energy for Ocean Energy Technologies" from May 29, 2015.
- Sandia National Laboratories Reference Model Project funded by DOE, a partnered effort to develop open-source marine and hydrokinetic energy point designs as reference models to benchmark technology performance and costs and an open-source methodology for design and analysis of technologies, including models for estimating capital costs, operational costs, and levelized cost of energy. This project (read the NREL published project summary) contains detailed reports for six types of marine energy devices including a: Tidal Current Turbine; River Current Turbine; Wave Point Absorber; Ocean Current Turbine; Oscillating Surge Flap; and an Oscillating Water Column.
- A publication on the capture-width ratio of wave energy converters.
- A publication on a selection of wave energy converters.

I.4 Literature for Further Reading

For more extensive education, participants can read the following books:

- *Fundamentals of Ocean Renewable Energy*, which presents the basic concepts of mechanics and introduces the various technical aspects of marine energy.
- *Handbook of Ocean Wave Energy*, which offers state-of-art research and applications in the two related and interdependent areas of ocean engineering and oceanography.
- *Ocean Wave Energy*, which gives a comprehensive description of marine energy conversion devices.
- *Ocean Waves and Oscillating Systems*, which examines the interaction between ocean waves and oscillating systems.
- *Market Study on Ocean Energy*, which estimates the financial needs of the ocean energy sector in the European Union, identifies and analyzes potential financing gaps and possible financing solutions and analyzes recommendations of the ocean energy roadmap in that context.

I.5 Additional Links

The following are additional resources that may prove useful:

- DOE WPTO website.
- DOE WPTO Project Map, which lists all projects funded by WPTO and high level descriptions.
- Collegiate Wind Competition Archives, which includes reports from past Collegiate Wind Competitions.
- Funding opportunities and where you can get DOE news:
    - EERE Funding Opportunity Exchange
    - Small Business Innovation Research/Small Business Technology Transfer solicitations
    - Advanced Research Projects Agency–Energy funding opportunity announcements.

- WPTO's newsletters, which provide updates and notices for funding opportunities, program activities, events, and publications.
- WPTO Semiannual Stakeholder Webinar, which details WPTO's hydropower and marine energy programs along with ways to partner and get involved in new initiatives.
- PacWave Test Site, which describes the first grid-connected, full-scale test facility for wave energy conversion technologies.
- WPTO's standards Site.

Appendix J. Community Connections Challenge Resources

Students should research the current state of these topics in the industry before meeting with industry professionals. Resources include but are not limited to:

- Marine Energy Science, Technology, Engineering, and Mathematics Portal
- National Renewable Energy Laboratory Marine Energy Program News
- U.S. Department of Energy Water Power Technologies Office Hydropower Program
- Marine Energy Collegiate Competition meetings and webinars.