Hydropower
COLLEGIATE COMPETITION

U.S. DEPARTMENT OF ENERGY

2023 Rules & Requirements

Preface

The U.S. Department of Energy (DOE) Hydropower Collegiate Competition (HCC) invites interdisciplinary teams of post-secondary, undergraduate, and graduate students from a variety of academic programs to engage in this competition program. With the Prize, DOE hopes to inspire the next generation of hydropower workers and offer unique solutions to complex hydropower challenges.

Through the competition, DOE's Water Power Technologies Office (WPTO) offers students direct industry experience, valuable exposure to hydropower career pathways, and greater knowledge of hydropower's potential to contribute to a clean energy future. The competition application is shown in Appendix A.

The 2023 student teams will have nearly a year to develop a concept to solve leading hydropower challenges; participate in two contests, the Case Study Contest and the Connections Creation Contest; and present at Waterpower Week or a similar industry event in Spring 2023. The competing teams will also produce several deliverables throughout the year, attend monthly all-team calls, and have access to valuable educational and industry-focused webinars.

For the Case Study Contest, teams will focus on hydropower's role in a future power grid supported by 100% renewable energy and the associated opportunities and challenges of incorporating the hydropower fleet into this future power grid. Case study requirements include a final report and a 10-minute presentation at Waterpower Week in Spring 2023 or a similar industry event. The Connections Creation Contest, which is designed to create connections among competition participants, the hydropower industry, students, and local communities, will include three elements that will be due by certain dates throughout the year: Team Story, Discovering the Hydropower Industry, and Community Engagement.

After receiving applications, the HCC organizers will select up to 20 teams to carry out the competition activities. Teams may consist of a combination of post-secondary, undergraduate, and graduate students, but teams must be at least 50% post-secondary and/or undergraduates. Both U.S. and non-U.S. institutions are welcome to apply, but non-U.S. institutions must partner with a U.S.-accredited institution to participate. In a team with students from U.S. and non-U.S. institutions, the lead institution must be a U.S.-accredited institution to be eligible for funds. To receive a cash prize, teams must attend the Hydropower Collegiate Competition event. Each team must have a student from all partnering institutions listed in their application.

Each team (led by a U.S. institution) selected to participate in the HCC will be eligible to receive up to $20,000 in cash awards if the team provides the required deliverables and meets the deadlines outlined in this rules document. Each institution may only sponsor one team. Each eligible team will have the opportunity to receive up to $10,000 in cash awards prior to and including the culmination of the competition in Spring 2023. Additional prize money will be given to the teams winning first, second, or third place in the overall competition. Funds will be disseminated in three waves as follows:

- Teams that submit the December deliverables (described in Section 2.1) will be eligible for $5,000 each.
- Each team that attends and actively participates in the HCC final event in Spring 2023 will receive an additional $5,000 each in cash as a final award.
- Teams attending the final HCC event will compete for a portion of a $20,000 prize purse. Awards will be made based on their performance in the Case Study Contest and Connections Creation Contest.

The competition will be governed by this document, which is intended to establish fair contest rules and requirements. In the case of a discrepancy with other competition materials or communication, this document takes precedence. The organizers reserve the right to change contest criteria, rules, and measurable outcomes.

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Revision History

Last updated on April 6, 2022

1. Introduction

1.1. Purpose

The Hydropower Collegiate Competition (HCC) invites interdisciplinary teams of post-secondary, undergraduate, and graduate students from a variety of academic programs to solve complex hydropower challenges. In addition to participating in two contests embedded within HCC, competitors may be given the opportunity to engage in networking events with hydropower industry experts during Water Power Week (WPW), or a similar industry event, hosted annually by the National Hydropower Association. The competition application is shown in Appendix A.

In alignment with the U.S. Department of Energy's (DOE's) intention to catalyze the timely, material, and efficient transformation of the nation's energy system, the competition will have the students address the challenge of how hydropower can play a critical role in enabling 100% clean energy. The specifics of the challenges will change each year to address evolving industry needs and foster innovation, collaboration, and creativity.

1.2. Background

As the nation's largest source of renewable electricity for over 100 years, hydropower provides energy storage and essential services to the electric grid and jobs to rural communities across America. Yet about a quarter of the current hydropower workforce is already eligible for retirement or will be within the next decade.

The hydropower industry is critical to the Biden administration's goal of achieving a carbon pollution-free power sector by 2035. Hydropower already plays an important role in our power system—it provides 37% of total U.S. renewable electricity generation and 93% of grid-scale energy storage—yet it still has untapped potential and significant opportunity for growth. However, this growth can only be realized with further innovation and a new generation of skilled workers to support the clean energy transition.

According to a hydropower curricula assessment conducted by DOE's Water Power Technologies Office (WPTO) and the National Renewable Energy Laboratory (NREL), students have a growing interest in renewable energy but are unaware of hydropower job opportunities and the projected growth of the industry. Of industry representatives who were surveyed, less than 10% said students were well-prepared for careers in hydropower when entering the workforce.

To pave the way for next-generation workers to start their careers in clean energy, WPTO and NREL, in partnership with the Hydropower Foundation, have established the HCC.

1.3. Diversity, Equity, and Inclusion

It is the policy of the Biden administration that:

> [T]he Federal Government should pursue a comprehensive approach to advancing equity[1] for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.
>
> By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.[2]

As part of this whole government approach, the HCC seeks to encourage the participation of underserved communities[3] and underrepresented groups. Applicants are highly encouraged to include individuals from groups historically underrepresented[4,5] in science, technology, engineering, and

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[1] The term "equity" means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

[2] The White House. 2021. "Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government." *The White House*. Jan. 20, 2021. https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/.

[3] The term "underserved communities" refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list of in the definition of "equity." E.O. 13985. For purposes of this prize, as applicable to geographic communities, applicants can refer to economically distressed communities identified by the Internal Revenue Service as Qualified Opportunity Zones; communities identified as disadvantaged or underserved communities by their respective States; communities identified on the Index of Deep Disadvantage (Wadley, Jared and Lauren Slaughter. 2020. "New Index Ranks America's 100 Most Disadvantaged Communities." *University of Michigan News*. Jan. 30, 2020. https://news.umich.edu/new-index-ranks-americas-100-most-disadvantaged-communities/.), and communities that otherwise meet the definition of "underserved communities" stated above.

[4] According to the National Science Foundation's 2019 report titled "Women, Minorities and Persons with Disabilities in Science and Engineering" (National Center for Science and Engineering Statistics. 2019. Women, Minorities and Persons with Disabilities in Science and Engineering. Alexandria, Virginia: National Science Foundation. https://ncses.nsf.gov/pubs/nsf19304/digest/about-this-report.), women, persons with disabilities, and underrepresented minority groups—blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are vastly underrepresented in the science, technology, engineering and mathematics (STEM) fields that drive the energy sector. That is, their representation in STEM education and STEM employment is smaller than their representation in the U.S. population. For example, in the U.S., Hispanics, African Americans and American Indians or Alaska Natives make up 24%t of the overall workforce, yet only account for 9% of the country's science and engineering workforce. DOE seeks to inspire underrepresented Americans to pursue careers in energy and support their advancement into leadership positions. (Erin R. Pierce. 2013. "Introducing the Minorities in Energy Initiative." U.S. Department of Energy. Sept. 25, 2013. https://www.energy.gov/articles/introducing-minorities-energy-initiative.)

[5] Note that Congress recognized in section 305 of the American Innovation and Competitiveness Act of 2017, Public Law 114-329:

> "(1) [I]t is critical to our Nation's economic leadership and global competitiveness that the United States educate, train, and retain more scientists, engineers, and computer scientists; (2) there is currently a disconnect between the availability of and growing demand for STEM-skilled workers; (3) historically, underrepresented populations are the largest untapped STEM talent pools in the United States; and (4)

mathematics on their project teams. As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. These objectives should include specific, measurable, assignable, realistic, and time-related (often called SMART) milestones supported by metrics to measure the success of the proposed actions. This criterion will be evaluated as part of the review process presented in Appendix A.

In keeping with the goal of growing a community of innovators, competitors are encouraged to form multidisciplinary teams while developing their concept.

1.4. Teams

Up to 20 teams will be selected to participate in the competition activities. Teams may consist of a combination of post-secondary, undergraduate, and graduate students, but teams must be at least 50% post-secondary and/or undergraduates. Both U.S. and non-U.S. institutions are welcome to apply, but non-U.S. institutions must partner with a U.S.-accredited institution to participate. 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 funds. All institutions must send a team of students to the final, culminating HCC event to receive cash prizes. All cash prizes will be paid to the academic institutions.

Based on experience with other student competitions, HCC organizers 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 judged pitches may be limited based on timing and/or space restrictions. Interdisciplinary teams are highly encouraged in the following areas of study: engineering, business, marketing, communications, policy, and social sciences. The teams will compete in two contests—the Case Study Contest and the Connections Creation Contest—which include the following deliverables for:

- **The Case Study Contest:**
  - **A case study report**. Teams will submit a 20-page report analyzing a case study issued by NREL that focuses on how hydropower fits into a future power grid supported by 100% renewable energy and the associated opportunities and challenges of incorporating the hydropower fleet into this clean energy vision.
  - **A pitch and Q&A session**. Teams will participate in a 10-minute public pitch, sharing their approach to their case study. This will be followed by 10 minutes of questions from a panel of judges.
- **The Connections Creation Contest:**
  - **A team story**. Teams will submit a 1- to 2-page team summary detailing their project, goals, and background.

given the shifting demographic landscape, the United States should encourage full participation of individuals from underrepresented populations in STEM fields."
114th U.S. Congress. 2017. *Public Law 114–329 American Innovation and Competitiveness Act*. Washington, D.C.: U.S. Congress. https://www.congress.gov/114/plaws/publ329/PLAW-114publ329.pdf.

- **Discovering the Hydropower Industry interviews.** Teams will explore multiple sectors of the hydropower industry and learn about career opportunities. Each team will interview a minimum of four industry professionals and share insights about their roles and experience in the final presentation.
- **Community engagement**. Each team will organize and run at least one educational event with middle school, high school, or post-secondary students and/or the general public.
- **A final presentation**: Teams will develop a final PowerPoint presentation to share their results on each competition element. Each team will have 10 minutes to present to a panel of judges. This will be followed by 10 minutes of questions from the judges.

In the Case Study Contest, competitors will be presented with a case study describing a regional power grid. They will then derive a hydropower-based solution to enable 100% clean energy within this defined region. The case study provided will require teams to learn about the role of hydropower in the power grid. Specifically, teams will learn to understand how to enhance a hydropower plant's operational flexibility, and how to utilize hydropower's unique characteristics to enable the use of variable renewable energy sources, such as wind and solar (note: variable because solar energy is most effective when the sun is shining and wind energy is most effective when the wind is blowing).

In addition to submitting a written analysis of the case study, teams will participate in a Connections Creation Contest described herein that will foster networking opportunities and outreach with hydropower stakeholders in multiple sectors. All the selected teams will attend WPW 2023 or a similar industry event to present their Case Study Contest and Connections Creation Contest responses to the hydropower community. These submissions will be reviewed by DOE and external experts selected by DOE.

Teams that submit the Dec. 1, 2022, deliverables described in Section 2.1 will receive $5,000 per team in cash as a first award and teams that attend and actively participate in the HCC final event in Spring 2023 will receive an additional $5,000 per team in cash as a second award. The prize administrators encourage the teams to use these awards to support travel and participation in the final event and/or to foster sustained hydropower programs and curricula at their home institutions.

Teams who complete all competition elements will receive a participation plaque, recognition through DOE and NREL channels, and introductions to professionals in the hydropower industry. Additionally, teams will compete for final cash prizes. Cash prizes for the 2023 final HCC winners will be allocated from a $20,000 prize pool.

Throughout the competition, teams will also gain insight into various hydropower and clean energy careers and gain access to workforce development resources and career opportunities. All teams will be invited to attend regular educational webinars and industry presentations that will enhance their educational experience.

2. Competition, Contests, Deliverables, and Awards

The competition consists of all the aspects and activities leading up to, during, and following the final in-person event. If circumstances do not allow for an in-person event, the event will move to a virtual format.

An overview of the deliverables that contribute to the scoring of each of the contests is presented in Table 1. Appendix B details the number of points a deliverable contributes to the overall score.

Table A-1. Contests and Deliverables Overview

Contest	
Case Study Contest	**Connections Creation Contest**
Written Report	Midyear Milestones: • Team Story • Industry Contact Details Slides
Public-Facing Presentation and Private Q&A	Public-Facing Presentation and Q&A
Poster (Optional, Not Included in Score)	Poster (Optional, Not Included in Score)

2.1. Overview of Deliverable Submission Deadlines

This section gives an overview of when deliverables should be delivered. Refer to each deliverable section and the appendices for specific deadlines, format requirements, and submission instructions. Information on scoring and penalties can be found in Appendix B. The dates of the event will align with the WPW 2023 dates (or a similar industry event), and this document will be updated when those dates are confirmed. This rules document is written to ensure that learning will occur in the instance that the in-person final event must become virtual. See Appendix H for more information regarding procedures for a virtual final event.

Table A-2. Deliverable Deadlines (Items Highlighted Indicate Where Prize Funding Is Awarded)

Deliverables	Submission Deadline	Funding Schedule
Submission of Intent to Participate (Open April 2022)	May 8, 2022, 11:59 p.m. MT	Institutions will be selected to compete. Selected institutions will be eligible to receive funding.

Submission of Team Roster and Partner Institutions Delivery of Connections Contest Team Story Delivery of Case Study Stakeholder Engagement Plan	Dec. 1, 2022, 11:59 p.m. MT	Every institution must sponsor at least one team. If a team completes these deliverables, their sponsoring institution will receive $5,000 in prize funding. Regardless of the number of teams, an institution will only receive $5,000.
Delivery of Case Study Report	Two Weeks Prior to Final Event	
During the Final Event		
Display of Poster Summarizing Case Study and/or Connections Creation Activities (optional)	Bring to Final Event	
Delivery of Connections Creation Contest Presentation and Case Study Contest Presentation Slides	Bring to Final Event	Each team that attends the final event and actively participates will be eligible for remaining $5,000 in prize funding.
Following the Final Event		
Competition of Feedback Report/Survey	June 30, 2023, 11:59 p.m. MT	

Note: Winners of the HCC will receive funding from a $20,000 prize pool.

2.2. Awards

Awards will include but not necessarily be limited to:

- A first-place winner: the team that earns the highest combined score across the required deliverables
- A second-place winner: the team that earns the second-highest combined score across the required deliverables

- A third-place winner: the team that earns the third-highest combined score across the required deliverables.

Winners of each category will receive a trophy recognizing their specific award and teams will split a $20,000 prize pool. Funds will be paid to each winning team's lead institution. All participating teams will also receive a plaque. The intent of this final prize money is to foster sustained hydropower tracks and curricula at participating institutions with the goal of building the next-generation hydropower workforce, which is, at its core, the primary objective of the HCC.

2.3. Contest Information

2.3.1. Case Study Contest

The specific Case Study Contest problem set is available in Appendix C.

Case Study Report

The case study report can be a maximum of 20 pages. The case study will present a regional power grid. Students must focus their report on how hydropower fits into this power grid supported by 100% renewable energy and the associated opportunities and challenges of incorporating the hydropower fleet into this future power grid. Teams will use open-source tools for power grid assessments, water resource analysis, environmental and societal analysis, and hydropower planning.

At a minimum, the report must include the following sections:

- **Cover Sheet**: Teams should begin the report with a one-page cover sheet that includes school affiliation, contact information, project name, team roles/hierarchy, and approximately how many students, faculty, and others (e.g., sponsors, volunteers, and family members) were involved in the project. A template will be provided by the organizers for consistency.
- **Project Description**: This should include information about the hydropower plant and reservoir technical details, water inflow patterns, past energy generation, plant layout and maps, sensitive environmental or community regions, nonpower water uses, the purpose for site selection, risks and fatal flaws, and any other details the team deems relevant. The description should also include future power grid information, which is for a specific balancing authority related to the hydropower plant, including the power generation capacity mix, wind and solar generation pattern, energy, other grid services prices and other information used for the study.
- **Operational Plan and Analysis**: This section should also outline the approach for case study analysis. Teams shall prepare a hydropower operation plan for a high-renewable power grid (for the planned year 2036 power grid scenario) including methods for technical, economic, environmental, and social impact assessment. These should be both qualitative and quantitative in nature where applicable, with select examples as follows:
    - Technical (e.g., new machinery to enhance efficiency, environmental friendliness, and hybridization with other resources and planning)
    - Economic (e.g., new power markets, investment, analysis)
    - Environmental (e.g., fish passage, dissolved oxygen, sedimentation)
    - Social (e.g., stakeholder analysis, recreation, other industries).
- **Stakeholder Engagement**: Teams will need to develop a pitch or a plan outlining how they would theoretically engage stakeholders and incorporate input into their governance approach and provide details on how equity goals are being met. For example, an effective and equitable governance approach often considers social, environmental, and other societal factors by including participatory, transparent, accountable, effective, and equitable approaches. This section should also describe the iterative process used by the team to optimize hydropower operation planning while considering multiple criteria analysis and stakeholder analysis.

Final Presentation and Q&A

Teams will also develop a final PowerPoint presentation to share the information contained in their report. Teams may use videos and/or posters, but these are not required. See Appendix G for instructions on formatting and submission.

Each team will have 10 minutes to present their slides to a panel of judges, which will be followed by 10 minutes of questions from the judges. The full scoring criteria can be found in the rubrics in Appendix B.

Final presentations from each of the teams will be published on the competition website, used as reference for future events, and could be used in the development of future competition deliverables.

2.3.2. Connections Creation Contest

This contest is designed to forge stronger connections between competition participants, the hydropower industry and local communities, including students in the community. It is broken up into three elements: a team story, Discovering the Hydropower Industry interviews, and community engagement. The deliverables required throughout the contest will build on each other and inform activities in additional competition elements.

Because the team will often be required to present and summarize the purpose and impact of its work in a professional setting, this contest is designed to develop this skill. Specific requirements are defined in the following contest segments, and deadlines are included in Table 1.

Team Story

Teams will submit a team story that details their project, goals, and background. Any information on the work completed for the competition to date is also of interest. When developing the story, teams can use the following as a guide:

- School and team name
- Reasons for participating in HCC
- Project details and goals, including outreach goals
- Team's vision for a clean energy future
- Competition objectives
- Team's plan for achieving goals
- Team strengths and hurdles
- How the team recruited members and ensured diversity and inclusion
- Lessons learned from industry members.

Submission of the story must also include a high-resolution photo of the team or screenshot from a virtual meeting. All meetings and photos should comply with school and local area health and safety

protocols. Organizers may edit the story for consistency between teams and to meet necessary web standards on energy.gov.

Teams are encouraged to promote their team story through their social media channels and media connections once the stories are live on the HCC website.

Discovering the Hydropower Industry

For this contest element, teams are asked to explore multiple sectors of the hydropower industry and learn about career opportunities. The goal of this activity is to learn more about the industry and create outreach materials to educate and inspire younger students as well as the general public.

Teams shall interview four industry professionals to learn about their roles and produce four slides highlighting insights learned from the interviews. The professionals interviewed may be alumni that have gone into the hydropower industry or other industry contacts. Teams are responsible for making their own connections with professionals in the industry.

Some good places to find contacts include LinkedIn, webinars on hydropower topics, or biographies of energy conference presenters and attendees.

Teams should ask questions that will help them develop a clear and compelling presentation covering specific details about each job, what is interesting about it, and requirements to enter the field. Details on other entry-level positions, internships, scholarships, or fellowships available within each organization should also be included in the deliverables.

Please note that these industry professionals will be volunteering their time. Team members should be mindful of the interviewees' availability and should be fully prepared, professional, and concise with their interactions.

Teams should choose four professionals spanning different sectors of the hydropower industry, including but not limited to: federal (e.g., the U.S. Department of the Interior or the U.S. Department of Defense), private sector, academia. The following are some examples of types of hydropower in which a professional may be involved:

- Conventional hydropower
- Run-of-river hydropower
- Pumped storage hydropower
- In-conduit hydropower
- Powering nonpowered dams.

Discovering the Hydropower Industry Milestone

Teams must submit four slides (one for each interviewee) and details about each contact. The timing for this deliverable is detailed in Table 2. NREL organizers will provide a template for the slides no later than Oct. 21, 2022.

As part of the midyear milestone, teams must submit a list of completed interviews along with contact information for each interviewee. The contact details must include:

- Full name of interviewee
- Company affiliation
- Origin of the relationship (i.e., professional or alumni)
- Sector in the industry
- Email address
- Whether this person would be open to continued participation in future competition events.

The slides developed in this contest element will be part of the final presentation, along with the deliverables from the other contest elements. The slides should also be shared during your community engagement event to illustrate opportunities in the hydropower industry. More details on requirements for the final presentation are included below.

Community Engagement

Each team shall organize and run at least one educational event with middle school, high school, or college students and/or the general public. The event should meet a goal chosen by the team, but this goal does not need to be defined immediately. Goals could include but are not limited to:

- Raising student and community awareness of hydropower
- Inspiring new students to participate in the competition
- Educating and exciting younger students about opportunities in hydropower.

These engagement activities may be in-person or virtual events and could include but are not limited to:

- A hydropower event organized by KidWind
- An event at a local school or your university
- An event within the local community.

As part of these events, teams are encouraged to describe their project and give highlights from their story and other work on the competition to date. Teams should also share what they have learned about hydropower and include some discussion about career opportunities in the industry.

During each event, teams are encouraged to capture high-quality photos and videos to present during their final presentation. Teams will need to submit a photo release form provided by NREL to any event attendees they take photos or videos of, especially at events where minors are present.

Events must occur prior to the final competition date so teams can speak to these experiences during their presentation to the judges. An explanation of the goals of the event, the planning process, estimated number of attendees, and the impact should be included in the final deliverable.

Final Presentation and Q&A

Teams will develop a final PowerPoint presentation to share their results on each competition element. This presentation must include:

- A slide covering the development and dissemination of the team story, including how it was used and associated use metrics
- Four slides covering the four industry interviews
- Discussion of the team's high-level outreach goals
- A slide for each community engagement event that the team holds.

Emphasis should be placed on the quality and visual appeal of each slide and the accompanying presentation by the speaker. Teams should include a high-resolution photo or graphic to represent contest elements on each slide, as appropriate, and may use videos (e.g., "but videos are not required"). See Appendix G for instructions on formatting and submission.

Each team will have 10 minutes to give their presentation to a panel of judges. This will be followed by 10 minutes of questions from the judges. 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 deliverables. The full scoring criteria are included in the rubrics in Appendix B.

Final presentations from each of the teams will be published on the competition website, used for reference for future events, and could be used in the development of future competition deliverables.

2.3.3. Unscored Deliverables

Although this is optional, it is highly recommended that teams prepare a poster summarizing their activities and outcomes. Posters can be used during the pitches and presentations and can also be used to communicate their efforts with industry professionals who come by their team booth during WPW. Teams will also be eligible to win a Best Poster Award.

In addition, to evaluate the impact of HCC on the participating students and institutions as well as the competition's contribution to DOE's goal of preparing students for the hydropower workforce, NREL/DOE will request general information from participants about the value of the overall effort and specific competition elements via a competition feedback report. A feedback report template will be provided. Feedback reports will be due June 30, 2023.

Glossary

Competition	The competition is all aspects and activities leading up to, during, and following the final event. It is the subcontract project agreement between the competitively selected collegiate teams and NREL, and it is the contests, deliverables, and event, collectively referred to for a given year as the U.S. Department of Energy Hydropower Collegiate Competition.
Final Event	The event is when and where the teams compete in the contests.
Deliverables	Deliverables are what the team builds, writes, submits, and brings to compete in the final event (i.e., deliverables). These include midyear milestones, a written report, a public-facing pitch, a private presentation, and an optional poster.
Team booth	Each team is provided an assigned area, known as a team booth, to use as a central location throughout the final event 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 to participate to the competition's email address (Water.Competition@nrel.gov) by 11:59 p.m. Mountain Time on May 8, 2022. Teams will not be eligible to compete if an application is not submitted by the deadline. Submissions will be reviewed and judged by national laboratory researchers and U.S. Department of Energy (DOE) staff. Each application for the Hydropower Collegiate Competition (HCC) should be a maximum of five pages and include a response for each of the following sections.

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 umber
- Collegiate Team Student Leader(s) name and declared/intended major (if known)
- Collegiate Team Student Leader(s) email.

Introduction

Teams should provide a brief introduction of their team and why they are interested in participating in this competition.

Educational Objectives and Integration (25%)

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 required knowledge through other means (e.g., remote learning, industry partnerships, informal independent-study projects, industry mentorships, clubs, and so on)?

Organization and Project Planning (25%)

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)

- 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.

Team Diversity and Inclusivity (25%)

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

- Describe how team members of diverse or unique backgrounds will be engaged and recruited to ensure team diversity
- Describe how the team will successfully incorporate the multiple academic disciplines to meet competition requirements
- List and justify resources (e.g., software, educational materials, project planning tools, and so on) organizers could provide to help fill any identified gaps.

Institutional Support and Fundraising (10%)

$10,000 will be provided per team by NREL per the conditions outlined in Table 2. These funds may not cover the full expenses of this project or participation for all students. What is the team's planned approach to acquire additional funds, if needed (e.g., grants, fundraising, or direct institutional funding commitment)?

Communications and Outreach (15%)

Teams should demonstrate ability and willingness to participate in the competition's outreach activities and to cultivate the spirit of the competition in the broader community. Outline actions they may take to actively engage with the local or campus media, the student body, the community, or local K–12 schools about the team's participation in the competition through social media, blog posts, and other outlets.

Appendix B. Rubrics

Case Study Contest

Table B-1. Scoring Rubric for Case Study Contest Deliverables (350 Points Total*)

Description	Possible Points*	Score
Written Report	**250**	
Innovation, creativity, and originality of the approach taken	50	
Stakeholder engagement plan and governance approach in addressing risks and opportunities	50	
Technical design of the approach and depth of analysis	50	
Demonstration of understanding of economic, environmental, and social impacts and opportunities	50	
Assessment of market deployment feasibility	50	
	Subtotal	
Presentation	**100**	
Quality of presentation** (i.e., how well the study is presented and clearly communicates opportunities, risks, challenges, and outcomes)	100	
	Subtotal	

*10 points will be deducted for each day the report is late.

**The final presentation must be delivered digitally to the organizers in advance of a team's presentation during the final event, and teams should bring a USB with the presentation as a backup.

Connections Creation Contest

Table B-2. Scoring Rubric for Connections Creation Contest Deliverables (150 Points Total*)

Description	Possible Points*	Score
Midyear Milestones	**50**	
Quality of team story	25	
Delivery of hydropower industry contact details and quality of slides	25	
	Subtotal	
Final Presentation**	**100**	
Delivery of slides that are concise and visually engaging and a presentation to judges that is professional and clear and uses effective storytelling techniques	20	
Demonstration of understanding of hydropower career opportunities	20	
Inclusion of inspirational or creative illustration of career opportunities	25	
Execution of a virtual or in-person outreach event	15	
Demonstration of impact of the outreach event	20	
	Subtotal	

*5 points will be deducted for each day a milestone is late.

** The final presentation must be delivered digitally to the organizers in advance of a team's presentation during the final event and teams should bring a USB with the presentation as a backup.

Appendix C. Case Study

Planning Hydropower Operations in High-Renewable-Energy-Penetration Power Grid.

Competitors will derive a hydropower-based solution to enable 100% clean energy within a defined region through a case study analysis. Teams will develop an understanding of the role of hydropower in power grid operations and a hydropower plant's operational flexibility to provide multiple grid services—specifically, the opportunities and limitations of a hydropower plant in a high-renewable-energy-integrated power grid. The case study analysis will explore water resources planning for hydropower operation for power grid requirements and environmental and other nonpower constraints and will consider the variability of water flow. Further, study teams will explore enhancing a hydropower plant's operation flexibility and value through facility upgrades or hybrid approaches that integrate with other energy technologies.

Selection of Hydropower Plant for the Study

Competitors will identify an existing hydropower plant in a region of their choice for this case study. The list of hydropower plants can be found from Oak Ridge National Laboratory's HydroSource.[6] Teams shall select a hydropower plant with capacity greater than 10 megawatts. Teams will gather water inflow data, power plant-related parameters, and environmental and other nonpower constraints related to the hydropower plant.

The technical characteristics of hydropower provide various grid services to the power grid to maximize renewable (e.g., solar, wind) energy generation or minimize the renewable curtailment and minimize system cost. Variable renewable energy generation sources, such as solar and wind, require a flexible generation source capable of providing power on demand when the wind isn't blowing or the sun isn't shining to maintain power system stability. Competitors will explore the hydropower plant's capabilities of providing various grid services such as energy, capacity, ancillary services, black-start facility, and short and seasonal storage with the technical characteristics of quick start, quick generation ramp-up and ramp-down, and reservoir capacities.

Hydropower plants are limited in their ability to provide grid services because of the many factors that inform water releases from dams, such as potable water, irrigation, flood control, and recreation demands that can be constrained by downstream uses and aquatic biota. In addition, the variability of water inflows that occur in multiple time scales challenges hydropower planning for the power grid. Teams will explore multiple water use constraints and hydraulic variability and flexibility of hydropower plants to provide various grid services in the case study analysis.

Higher Renewable Power Grid Operation

Teams will envision the hydropower plant operation in a future high-renewable-energy-integrated power grid. To understand the potential future power grid operation, competitors are encouraged to

[6] Johnson, M.M., S.-C. Kao, N.M. Samu, and R. Uria-Martinez. 2021. "Existing Hydropower Assets, 2021. HydroSource." Oak Ridge, Tennessee: Oak Ridge National Laboratory. DOI: 10.21951/EHA_FY2021/1782791.

explore the *2021 Standard Scenarios Report: A U.S. Electricity Sector Outlook*,[7] which contains forward-looking scenarios for a 95% renewable-contributed power grid by 2035 using the Cambium[8] web portal. In Cambium ("Standard Scenarios 2021"), power grid data are presented in the balancing authority (BA) levels as well as at the state level (Figure C-1). Competitors will select a balancing authority related to their selected hydropower plant. Power grid data such as electric load, wind and solar generation, and price information relevant to a specific BA can be obtained from the Cambium dataset. For this case study analysis, the year 2036 of the "95% renewable-contributed power grid by 2035 future scenario" shall be used[9].

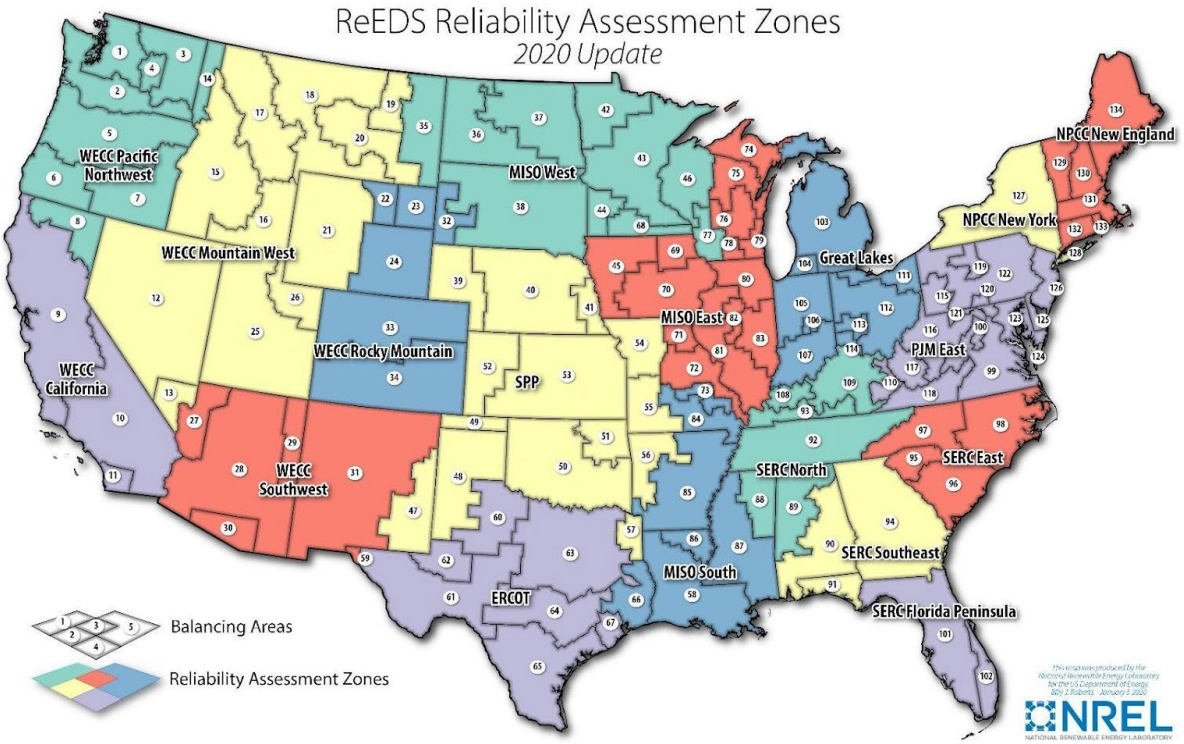

Figure C-1. Balancing authorities (numbers) and reliability assessment zones (in various colors) of the U.S. power grid considered for the Standard Scenario 2021 study. Teams should get power grid data for a specific region (balancing authority) relevant to their hydropower plant of interest.

[7] Cole, Wesley and J. Vincent Carag. 2021. *2021 Standard Scenarios Report: A U.S. Electricity Sector Outlook*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-80641. https://www.nrel.gov/docs/fy22osti/80641.pdf.

[8] Gagnon, P., Frazier, W., Cole, W., & Hale, E. (2021). *Cambium Documentation: Version 2021* (No. NREL/TP-6A40-81611). National Renewable Energy Lab.(NREL), Golden, CO (United States).

[9] National Renewable Energy Laboratory. 2022. "Scenario Viewer: Data Downloader; Cambium 2021." *Cambium*. Retrieved April 1, 2022 (https://scenarioviewer.nrel.gov/)

Develop a Plan for Hydropower Operation for Future High-Renewable-Integrated Power Grid

Teams will develop a detailed plan for the selected hydropower plant operation for the future high-renewable-energy-penetration power grid. Teams should consider upgrading the plant to improve efficiency and flexibility. Further, teams should include a hybrid of the hydropower plant with any other technology(ies) (e.g., battery or another technology) to increase the economic value and mitigate the environmental and social impacts in water resources planning. Teams shall include uncertainty of water inflows and water release patterns for hydropower generation considering economic and other constraints in their analysis. Specifically, fish passage and dissolved oxygen should be included in the environmental impact analysis. The approach should include the identification of risks and rewards across technical, economic, environmental, and social categories. Additionally, teams will need to develop a detailed plan outlining how they would theoretically engage stakeholders and incorporate responses into their recommended approach and output and outlining their governance approach.

Appendix D. Roles and Responsibilities

Table C-1 shows the competition roles, the individual(s) responsible for performing in each role, and what each role entails.

Figure 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)/Technical Monitor. Teams may consist of a combination of post-secondary, undergraduate, and graduate students, but teams must be at least 50% postsecondary and/or undergraduates. Expected team size is six to eight participants, but there is no limit to the number of participants per team. However, for each team, the number of students participating in the judged pitches may be limited based on timing restrictions. Interdisciplinary teams are highly encouraged in the following areas of study: engineering, business, marketing, communications, policy, and social sciences. Non-U.S. institutions are welcome to apply but must partner with a U.S.-accredited institution with the U.S.-accredited institution serving as the lead. In a team with students from U.S. and non-U.S. institutions, the lead institution must be a U.S.-accredited institution and students from all institutions must be represented at the final culminating Hydropower Collegiate Competition event. Non-U.S. teams will not be eligible to receive support funding from the U.S. Department of Energy/National Renewable Energy Laboratory and must provide their own support.

Collegiate Team Student Leader(s)	Maximum of two per team	The student leader(s) attends informational sessions with the Faculty Advisor, represents the team when communicating with competition organizers and other teams, and disseminates information received from the competition organizers over the course of the entire project, including monitoring communications. Maximum of two student leaders per team are allowed, but at least one must be an undergraduate.
Collegiate Team Faculty Advisor(s) and Technical Monitor (for the purposes of funding support)	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 organizers and provides guidance to the team throughout the project and ensures that the Student Leader(s) disseminates information received from the competition organizers. 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, but only one person should be identified as the Technical

		Monitor for contractual purposes.
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 competition staff.
Contest Judges	To be announced prior to the competition.	The Contest Judges conduct and evaluate each contest at the final event.
Industry Steering Committee	Multiple	A steering committee comprising diverse industry representatives meet with the organizers regularly to ensure alignment between academia and industry as the competition is developed and executed.

Appendix E. Logistics

Many logistical details will be provided throughout the course of the academic year leading up to the event. While organizers will make concerted efforts to keep teams informed, competitors are responsible for familiarizing themselves with the details provided and proceeding accordingly. Some of these topics are detailed in the following subsections.

If the U.S. Department of Energy and the National Renewable Energy Laboratory decide an in-person event in Spring 2023 is not feasible, the pitches, presentations, and planned networking activities will be organized virtually. That decision will be made and communicated to the teams at least 3 months in advance of the National Hydropower Association's Waterpower Week (WPW). If the competition pitches take place at WPW as planned, student teams will still be offered the opportunity to present virtually if they prefer not to travel.

Event Schedule

The event schedule is currently evolving, and the viability of having an in-person final event will be evaluated on a regular basis, but teams will be required to participate in the following:

- Connections Creation Contest presentation (presented in a public setting)
- Case Study presentation (presented in a private room open to the public with private Q&A to follow)
- An industry networking event (poster recommended)
- An awards ceremony.

Event Registration

All individuals attending the event will be required to register with the organizers. The number of individuals that can attend from each team will be limited based on constraints, such as event space. This limit will apply to all attendees from each university, including students, faculty advisors, technical monitors, co-advisors, supporting faculty, and mentors. The limit for attending participants for the 2023 event will be provided closer to the final event date.

Lodging

Organizers will investigate desirable, cost-effective lodging options and provide information to teams for consideration. It is ultimately up to each team to book appropriate accommodations.

Local Resources

Each team is responsible for considering what local resources may be needed and identifying reasonable options near the event. These resources may include:

- Printing shops
- Shipping services
- Transportation services.

Team Booths

Teams will be provided a space to use as their home base during the final event. There will be electrical outlets in the team booth area. 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 hydropower industry, especially at a visible industry networking event such as WPW 2023.

Shipping

It is each team's responsibility to transport materials to the event safely and on time. It is also each team's responsibility to arrange the return transport of these items. It is advised that teams consider how to ensure access to these items quickly upon arrival at the event and that they consider the safest way to transport fragile items, minimizing risk of damage.

Storing Items at the Event

Organizers are not responsible for the security of supplies stored at the event space. If teams wish to avoid transporting supplies to and from the event each day, they are advised to explore reasonable options to store and secure these items appropriately. Gear that could aid in this might include lockable totes.

Feedback

Throughout the organization and execution of the event, organizers will request feedback from participating teams, judges, volunteers, and others. This feedback is taken very seriously both during the year and for future competitions as competition staff work to improve the organization and execution of the event. To support that continued improvement, it is crucial that participating teams seriously consider and convey both positive and critical feedback. All participants should expect and plan to provide feedback at the conclusion of the event. Teams should consider opportunities to capture and provide individual and/or team feedback to organizers throughout the year as well.

Appendix F. Safety and Conduct

Safety

The competition is a forum for students with an interest in hydropower 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.

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 deliverables, 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 nonstudent 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 organizers' attention rules that are unclear, misguided, or in need of improvement. The organizers 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 G. Appendix G. Communications and Contest Details

External Communications

The Hydropower Collegiate Competition (HCC) 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 HCC application template.

Internal Communications

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

- **Slack User Group**: Official communications suitable for viewing by all team members and organizers will be posted on the Slack User Group channel. Instructions for joining the Slack User Group will be provided by the National Renewable Energy Laboratory (NREL) to the teams following each team's commitment to participate.
- **Google Drive**: This tool is used by the organizers and teams to transfer large files, such as competition deliverables. Notification of or requests for file transfers are made via the Slack User Group or email.
- **Virtual meetings**: Teams are strongly encouraged to participate in scheduled virtual meetings with the organizers. Invitations and instructions for participation in these meetings are provided by the Competition Operations Manager via email and the Slack User Group.
- **Meetings during event**: Briefing meetings will be held each day that competition events are scheduled during the final in-person event.
- **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 Slack User Group. For expediency and to protect confidentiality, the organizers may choose to communicate with teams via team members' email addresses as listed in the Slack User Group database. However, most official communications will occur via the Slack User Group channel.

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 Connections Creation Contest 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 Connections Creation Contest 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, especially at a visible industry networking event, such as Waterpower Week (WPW) 2023.

Confidentiality and Intellectual Property

There are portions of the competition that are decidedly open to the public for the purposes of generating interest and providing general information. In addition, team members should keep in mind that various media outlets may be present during the final event. Any information made known and/or discussed should be expected to receive widespread and uncontrolled dissemination. Teams should consider in advance what level of information regarding all aspects of their concept they desire to have publicly available versus information that provides a competitive advantage, is critical to their performance in the competition, or is of a proprietary nature and essential to potential future business endeavors.

Team members agree to the use of their names, likenesses, content, graphics, and photos in any communication materials issued by the organizers and event sponsors.

Content and images (graphics and photos) as well as any publications in which the content and images appear may be viewed and made available to the general public via DOE, NREL, and event sponsor websites with unrestricted use.

The organizers and event sponsors will make all reasonable efforts to credit the sources of content and images, although they may be published without credit. To ensure proper usage of and credit for images, teams should submit photos and graphics through the competition Google Drive.

Judging and Scoring

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

Competition organizers will ensure that, to the extent possible, Contest Judges 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 judging process

- Discuss team performance with other teams or their advisors.

Names of the selected judges will be announced prior to the final in-person event.

Judging Rubrics

Contest Judges will use detailed scoring rubrics to evaluate team performance in each of the categories. These rubrics give all participants a clear idea of what they will be evaluated on in each contest.

Deliverables submitted prior to the event will be thoroughly reviewed and evaluated by the Contest Judges. The competition organizers will hold a meeting to brief the Contest Judges on the competition requirements and convey any team-specific information deemed salient by the organizers, such as team members' involvement in internships with NREL or previous HCC experience and results. Each Contest Judge will complete a rubric independently after each team's presentation or based on the review of submitted deliverables. The judges 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 Contest Judges' deliberations after each team's presentation.

Submittals and Submission Locations

Submittals are considered on time if they are received by the Competition Manager(s) by the respective due date stated in this document.

All deliverables must be saved in the formats indicated (see each deliverable section) and submitted to organizers.

Submission Locations

Deliverables due ahead of the final event must be delivered to the competition Google Drive folder (a link will be provided in the Slack User Group channel). A folder for each team will be created, and it will be the team's responsibility to provide email addresses for each student that needs access to upload files to the account.

Teams can submit early copies and updated revisions until the deadline. Each folder will be closed, or "unshared," after the submission deadline. If a milestone or report is submitted after the deadline, points will be deducted as stated on the contest rubrics and distributed evenly across each contest section that is impacted.

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

For example, a report submitted by California Maritime Academy on April 23, 2023, would have the following file name: MARITIME_Report_2023-04-23.PDF.

Appendix H. Alternative Competition Structure

In the event of a cancellation of Waterpower Week 2023 (or another conference where the final event is to be held) 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 deliverables will remain unchanged, but the event and deliverable 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 organizers will work with each team to determine what is possible.

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

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 organizers 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.

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 organizers 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 I. Additional Terms and Conditions

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.

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.

Submission Rights

By making a submission and consenting to the rules of the contest, a competitor is granting to DOE, the Prize Administrator, and any other third parties supporting DOE in the contest, 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 contest 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 judges and reviewers for purposes of the contests, 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 contest 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.

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.

Contest Subject to Applicable Law

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

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 contest.

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.

Publicity

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

Except where prohibited, participation in the contest 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.

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 contest. 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 contest, whether the claim or cause of action arises under contract or tort.

In accordance with the delegation of authority to run this contest 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.

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.

General Conditions

DOE reserves the right to cancel, suspend, and/or modify the contest, 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 contests, as determined by DOE in its sole discretion, DOE may cancel the contest.

Although DOE may indicate that it will select up to several quarterfinalists, semifinalists, finalists, and winners for each contest, 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 quarterfinalists, semifinalists, finalists, or winners and will award no prize money.

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 contest 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.

National Environmental Policy Act (NEPA) Compliance

DOE's administration of the Hydropower 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/.

Request To Waive the Domestic Ownership and Control Eligibility Requirement

If an entity seeking to compete as the registered competitor does not have domestic ownership and control, the entity should include a waiver request that addresses the following waiver criteria and content requirements below along with their submission. DOE's Office of Energy Efficiency and Renewable Energy (EERE) may consider issuing a waiver of that eligibility requirement where the entity submits a compelling justification; the entity is incorporated in and maintains a primary place of business in the United States; and the entity otherwise meets the eligibility criteria. There are no rights to appeal EERE's decision on the waiver request.

Waiver Criteria

Entities seeking a waiver must demonstrate to the satisfaction of EERE that its participation: (1) has a high likelihood of furthering the objectives of this prize competition and (2) aligns with the best interest of the U.S. industry and U.S. economic development.

Content for Waiver Request

A waiver request must include the following information:

a) Entity's name and place of incorporation
b) The location of the entity's primary place of business
c) A statement describing the extent the entity is owned or control by a foreign government, agency, firm, corporation, or person who is not a citizen or permanent resident of the United States, including the applicable percentage of ownership/control
d) A compelling justification that addresses the waiver criteria stated above
e) A description of the project's anticipated contributions to the U.S. economy
f) A description of how the entity has benefitted U.S. research, development and manufacturing, including contributions to employment in the United States and growth in new U.S. markets and jobs
g) A description of how the entity has promoted domestic manufacturing of deliverables and/or services.

Requests should be emailed to the prize administration email.

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