

# Team Overview – Midyear Submission



## **NAU Hydropower Collegiate Competition**

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### **Faculty Advisor**

Carson Pete

### **Word Count**

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# 1 Introduction

As senior-year mechanical and electrical engineering students at Northern Arizona University, our team's involvement in the HCC is the culmination of our academic studies, serving as our capstone project. This competition aligns perfectly with our academic and professional interests, offering a practical application of our engineering skills and a deeper understanding of sustainable energy solutions. This competition represents not just an academic milestone for us, but a real-world platform to contribute to the evolving narrative of clean energy.

Our excitement for this competition stems from both our academic and professional goals. We are particularly eager about the practical aspects of the competition, including the chance to travel and present our work, which promises a valuable experience beyond the classroom. This competition is an excellent opportunity for us to gain insight into the hydropower industry, explore potential career paths, and establish connections with professionals and peers. We look forward to seeing our theoretical knowledge come to life, contributing to sustainable solutions that have a genuine impact on our communities.

Our vision is to actively support advancements in hydropower, fostering a future where renewable energy sources are seamlessly integrated, and communities are actively involved. We want to be part of a movement that enhances the solutions and efficiencies of hydroelectric dams while strengthening community engagement and environmental sustainability. We believe that even small steps in this direction can collectively create a significant impact towards a sustainable and resilient energy future.

## 1.1 Team History

Last year, NAU marked its presence in the HCC with a third-place finish, setting a high standard for the school's future capstone teams. Our team, although new to the HCC, recognizes the dedication that led to their success and are motivated to not only uphold but also build upon this recognition. Their accomplishments highlighted the importance of teamwork, creative problem-solving, and strong industry collaboration. Our team's name, Hydro Homies, was inspired by carrying on last year's team's legacy with the same name. As a new team, we're excited to bring our unique skills and fresh ideas to the table and aim to meet these past achievements.

## 1.2 Technology Concept

Our team examined potential sites for the conversion of a non-powered dam into a clean and sustainable energy source by capturing the energy from moving water to generate electricity. At the current state of our project, we have been looking into run-of-river sites with the potential to install hydro turbines into the existing structure with minimal construction to reduce cost and materials required. This has allowed us to narrow down our search to either spillway gates or abandoned locks. Our conceptual plan is to utilize turbines such as the Stream Diver from Voith as they provide immense benefits to such conversion implementations.

## 2 Team Overview

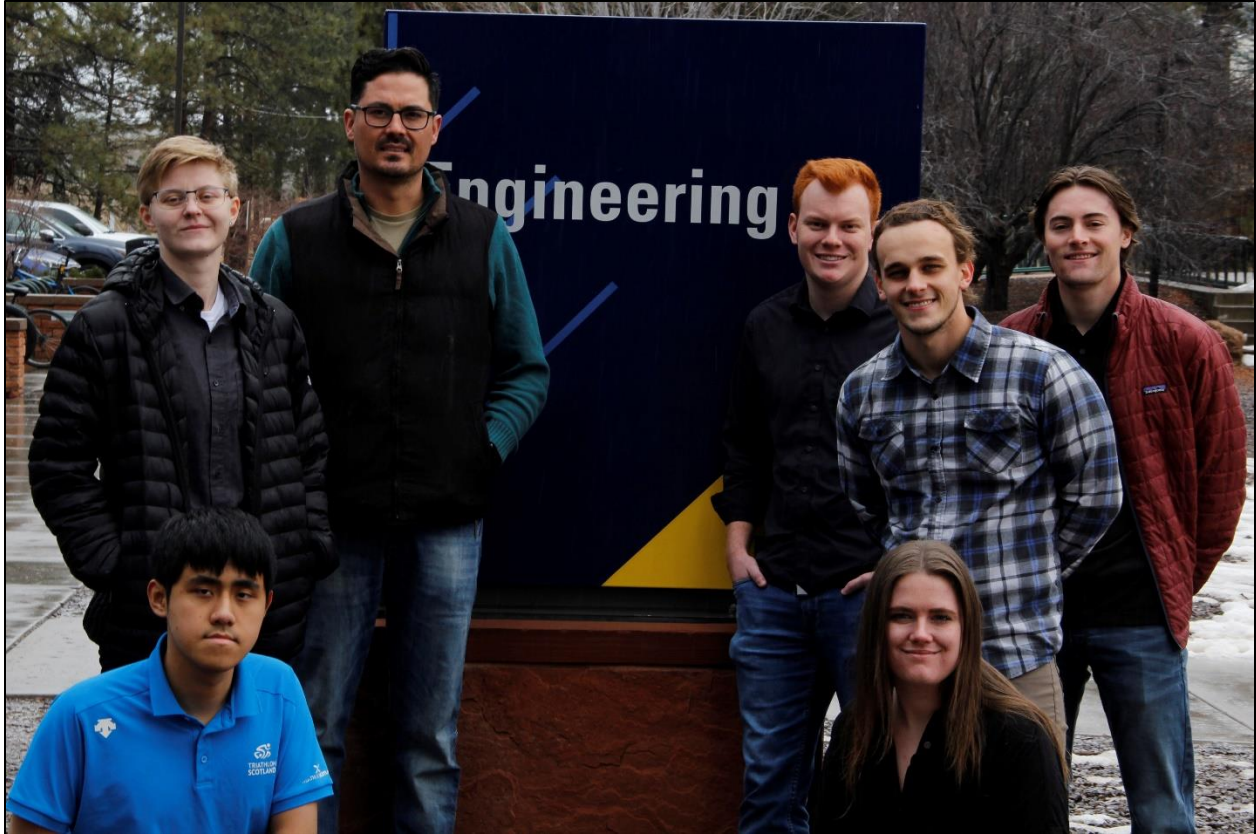
Our team, Hydro Homies, from Northern Arizona University in Flagstaff, Arizona is participating in the competition and completing our engineering senior design capstone project. We are excited to be exposed to the hydropower industry since we have extensive knowledge of wind and solar but have rarely heard about hydropower during our engineering undergrad. Members of the team who traveled to the Clean Currents Conference were interested in seeing the new technologies in hydropower.

Our team's vision for a sustainable and clean future regarding energy production and transmission encompasses a wide variety of energy sources to build and sustain the energy grid far into the future. Rarely hearing of hydropower these days as many renewable giants like solar and wind are expanded upon, we realize that the grid cannot be sufficiently fed by one source of energy generation and requires either major advancement in energy storage or that which hydropower provides. The future of energy is always evolving and becoming more complicated, and our team is excited about the future of innovation and research into such topics.

Our project consists of in-depth calculations to prove technical feasibility, and studies on environmental and economic impacts of a non-powered dam conversion. We are striving to connect with the local community, learn more about hydropower and engage others in the world of hydropower. We plan to accomplish this through detailed research and participation in community events.

### 2.1 Team Roster

Our team is comprised of three senior mechanical engineering and three electrical engineering students from Northern Arizona University. As members of the NAU Energy Club, we share a passion for renewable energy and are interested in the future of power generation. Combining our engineering backgrounds will allow us to excel in this competition, as we will be able to use our resources and knowledge to plan a conceptual design for an entire hydroelectric facility. While we may lack civil and environmental experience in our group, we have many resources from the Energy Club as well as our collegiate experience and expert consultation to master such topics.



*Figure 1: Hydro Homies Team. Pictured (left to right): Zonghua Ouyang, Riley Frisell, Carson Pete, Evan Higgins, Evie Melahn, Winston Steele, and Trevor Senior.*

### 2.1.1 Faculty Advisor

#### **Carson Pete**

Carson Pete is a Northern Arizona University alumnus where he achieved his bachelors and master's in mechanical engineering and is currently a professor. Before becoming a professor, his work in the industry specialized in renewable energy design and contributed to many societies and projects in aiding his community. Carson is our faculty advisor and will support our team throughout this project.

### 2.1.2 Mechanical Engineering Sub-Team

#### ***Riley Frisell***

As a mechanical engineering student at NAU that has always had a drive to promote sustainable and environmentally conscious engineering, I was immediately excited to contribute to this project and expand my knowledge of hydropower. After I complete my bachelors degree, I will be continuing my education at NAU and investigating my thesis.

### ***Evan Higgins***

As a mechanical engineering student, my passion for solving complex problems and advancing sustainable development has been enriched by my experience in the HCC. Although my immediate post-graduation career will be in water/wastewater, this competition has broadened my perspective on renewable energy. I'm excited to contribute to our team's efforts in addressing the challenges in this industry and to apply these learnings in my future career.

### ***Trevor Senior***

As a senior studying mechanical engineering at NAU, I have been exposed to many career paths, but I have always leaned toward the renewable energy sector. However, I never thought about hydropower until this competition. After graduation, I am hoping to begin my engineering career working in design, and the hydropower industry has interested me over the past few months.

## **2.1.3 Electrical Engineering Sub-Team**

### ***Evie Melahn***

As a senior at NAU studying electrical engineering, I have been able to explore different potential career avenues. Although initially focused on renewable energy, hydropower has captivated my attention. Post-graduation, I aspire to find myself with a job where I can explore the many different career paths that an electrical engineering degree can offer.

### ***Zonghua Ouyang***

As an electrical engineering undergraduate student at NAU, I am interested in renewable energy technologies. Hydropower is an intriguing field, especially turning non-powered dams into hydroelectric dams.

### ***Winston Steele***

As the team lead for the electrical engineering sub team this is a very exciting branch to research from my degree and focus. I am currently a senior electrical engineer major with a computer scientist minor at NAU in Flagstaff, Arizona. As I look forward to graduation and the development of my professional career, I have goals of working where I can use my creative ingenuity to create solutions to our world's many issues be that energy or other engineering solutions.

### 3 Contacts

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