



# Remedion's HWPS

## Developing The Hydroelectric Water Purification System Whole-Home Market Model

ELECOMP Capstone Design Project 2024-2025

### Sponsoring Company:

#### *Remedion*

191 2nd Ave.

Warwick, RI 02888

<http://remedion.blue>

### Company Overview:

Remedion is a clean tech company dedicated to providing pollutant-free alternative food and water products. Our utility patent-pending processes remove legacy and emerging contaminants from source water to produce our pollutant-free products. Remedion's innovative technologies include a deep-water culture hydroponic system, an in-land closed aquaculture system, a process that removes pollution from source water then bottles it, and a water treatment system that co-generates purified water and hydroelectric energy. Our mission is to remediate the pollutants in our diets.

### Technical Director:

#### **Alexander Tompkins**

Inventor, Founder, & CEO

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## **Project Motivation:**

Our project is driven by the urgent need to address water pollution. Currently, our Hydroelectric Water Purification models are designed for large-scale systems used by utilities and municipalities. However, the unknown material composition of the pipes delivering this water raises concerns about potential contamination. To tackle this issue, we are developing whole-home market models of our HWPS. This innovation aims to provide the purest water possible while also reducing energy bills by generating hydroelectric power.

## **Anticipated Best Outcome:**

The anticipated best outcome for this project is the successful development of whole-home Hydroelectric Water Purification System (HWPS) market models. This would lead to a significant improvement in tap water quality, ensuring safer and purer water free from contaminants. Additionally, households would benefit from reduced energy bills through the generation of hydroelectric power, contributing to energy savings.

## **Project Details:**

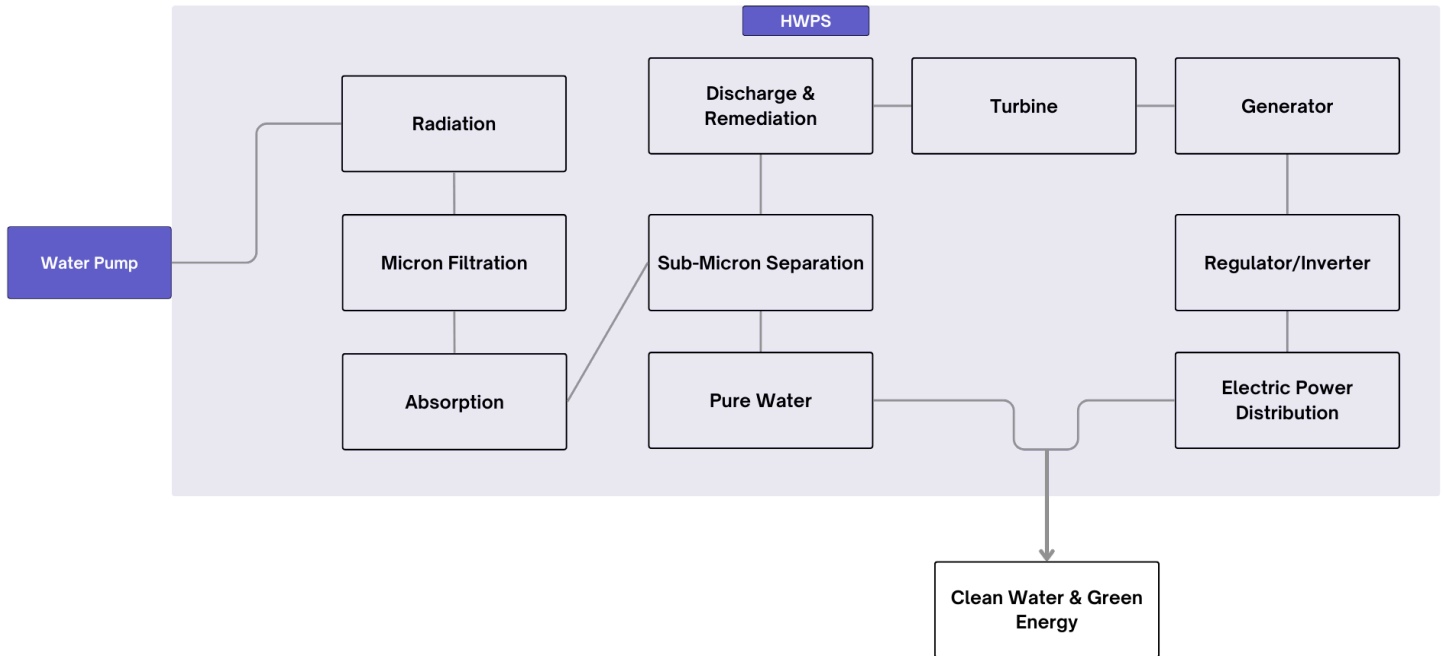
The project involves a dedicated team of two engineers working alongside the technical director to adapt our current Hydroelectric Water Purification System (HWPS) designs for a whole-home solution. These engineers will leverage their expertise to refine and scale down the existing models, ensuring they meet the specific requirements of residential use. The technical director will oversee the project's progress, providing strategic direction and ensuring that the development aligns with our high standards of innovation and efficiency. Together, this team will work to bring advanced water purification technology into homes, delivering safe, clean water and energy savings.



**Overall system concept:**

The Hydroelectric Water Purification System (HWPS) represents a groundbreaking advancement in water treatment and clean energy production. Unlike conventional chemical methods, the HWPS employs a mechanical approach to remove contaminants larger than one nanometer without adding pollutants to the environment. Crafted from durable stainless steel and ceramic materials, the system ensures long-lasting operation and exceptional filtration accuracy, refining from 5 microns to a tenth of a thousandth of a micron. Inspired by biopharmaceuticals, water treatment, waste management, and military applications, the HWPS integrates various filtration techniques, making it adaptable to different water sources and environmental settings.

**Block Diagram:**



**Hardware/Electrical Tasks:**

The construction of a whole-home Hydroelectric Water Purification System (HWPS), rated for 500 gallons per day (GPD), involves several intricate hardware and electrical tasks. Engineers will meticulously design and assemble the water treatment components and housings using durable materials such as stainless steel and ceramic to ensure longevity and efficiency. The system's electrical components will be integrated to manage and optimize the purification process, including sensors to monitor water quality and maintain optimal pressure for effective water purification and home delivery. Additionally, the system's ability to capture and convert energy will be rigorously tested and verified, guaranteeing it not only purifies water but also contributes to energy savings. Electrical engineers will design and implement the circuitry required to efficiently deliver the generated energy to the home system, ensuring seamless integration with existing electrical infrastructure and maximizing energy utilization.



### **Firmware/Software/Computer Tasks:**

The software and firmware development for the Hydroelectric Water Purification System (HWPS) are critical to ensuring its user-friendly operation and monitoring. The Computer engineer will design an intuitive interface on the HWPS unit that displays real-time water quality metrics and the status of the purification equipment. Additionally, he/she will develop a companion mobile app that provides users with remote access to these features. The app will inform users of their current water quality, notify them when system components need to be replaced, and suggest convenient locations where replacement cartridges can be purchased.

**Composition of Team:** 1 Electrical Engineer & 1 Computer Engineer

### **Skills Required:**

#### **Electrical Engineering Skills Required:**

- Proficiency in CAD software for mechanical design
- Ability to integrate electrical components into designs
- Strong problem-solving and troubleshooting skills
- Effective collaboration and communication in teams
- Commitment to continuous learning and adaptability

*These aspects are also important and appropriate help will be given to learn these:*

- Knowledge of materials science
- Understanding of fluid dynamics and hydraulics
- Familiarity with manufacturing processes and cost optimization
- Understanding of regulatory standards and compliance

#### **Computer Engineering Skills Required:**

- Proficiency in software development for user interfaces and system controls
- Knowledge of IoT (Internet of Things) for connectivity and remote monitoring
- Experience with data analysis and visualization
- Ability to integrate sensors and actuators for automated system monitoring
- Familiarity with mobile app development for user interaction and scheduling
- Understanding of cybersecurity principles for data protection and system security
- Skills in UX/UI design for intuitive user interfaces
- Competence in firmware development for device control and optimization
- Capability in software testing and debugging for reliable performance



## **Anticipated Best Outcome's Impact on Company's Business, and Economic Impact**

The anticipated best outcome of developing and implementing the whole-home Hydroelectric Water Purification System (HWPS) will significantly impact the company's business and the broader economy. For the company, achieving this outcome will position it as a leader in innovative water purification solutions, driving brand recognition and increasing market share. The successful deployment of HWPS will open new revenue streams through both direct sales and replacement components, fostering sustained business growth. Economically, widespread adoption of HWPS will reduce household energy bills, contributing to increased disposable income for consumers. Additionally, improving water quality can lead to better public health outcomes, potentially reducing healthcare costs and enhancing overall quality of life.

## **Broader Implications of the Best Outcome on the Company's Industry:**

The broader implications of achieving the best outcome for the whole-home Hydroelectric Water Purification System (HWPS) extend beyond the company's immediate business to significantly influence the entire water purification and renewable energy industries. By setting a new standard for water treatment solutions, the HWPS will drive innovation and competitiveness within the industry, encouraging other companies to adopt similar mechanical and energy-efficient approaches. This could lead to a shift away from traditional chemical-based methods, promoting environmentally sustainable practices. As a pioneer in integrating water purification with energy generation, the company will inspire advancements in multifunctional home systems, potentially sparking new trends and technological developments. Furthermore, the success of HWPS could attract increased investment and research into combined utility solutions, accelerating the growth of green technology sectors and contributing to the global effort to combat environmental challenges.