



## Project Road Map – SeCat G6230

### Phase 1: Initial Setup and Research Framework (Months 1-6)

- **Objective:** Establish a collaborative research environment and optimize the membrane/electrolyte system.
- **Key Tasks:**
  - Form the research teams across all participating institutions.
  - Optimize osmotic membrane configurations for effective separation between seawater and alkaline electrolyte.
  - Begin testing for salt rejection and water transport kinetics.
  - Set up communication protocols and management procedures.
- **Milestones:**
  - Collaboration platform established.
  - Initial membrane testing results.

### Phase 2: Electrode Development and Characterization (Months 6-12)

- **Objective:** Develop and optimize nickel-based cathodes and anodes for hydrogen and oxygen evolution reactions.
- **Key Tasks:**
  - Synthesize novel Ni-based cathodes using advanced deposition techniques.
  - Start detailed characterization of cathodes using XRD, SEM, TEM, XPS.
  - Optimize anode compositions with Ni-Co alloys and surface modifications.
- **Milestones:**
  - Completion of initial electrochemical characterization.
  - Benchmarked results for cathode performance.

### Phase 3: System Integration and Prototype Development (Months 12-18)

- **Objective:** Integrate optimized electrodes into a functioning osmosis-assisted electrolysis system.
- **Key Tasks:**
  - Construct and optimize the full membrane-electrolyte-cathode-anode system.
  - Begin coupling the electrolyzer with solar cells for a fully operational prototype.
  - Evaluate overall system performance under realistic conditions (seawater and solar power integration).
- **Milestones:**
  - Demonstration of system's functionality.
  - Initial results from real-seawater tests.

### Phase 4: Advanced Testing and Real-World Simulations (Months 18-24)

- **Objective:** Conduct real-world validation and further refine the system for optimal performance.
- **Key Tasks:**
  - Test system durability and scalability under varying environmental conditions.



- Apply advanced electrochemical testing (SECM, EC-MS) to monitor long-term performance.
- Validate chloride rejection efficiency and energy consumption in real seawater.
- **Milestones:**
  - Real-world test results.
  - Chloride rejection performance verified.

#### **Phase 5: Final Optimization and Project Closure (Months 24-36)**

- **Objective:** Finalize the design, and prepare the technology for future industrial scale-up.
- **Key Tasks:**
  - Final optimization of the full system (materials, electrodes, membranes).
  - Prepare intellectual property documents and explore commercialization opportunities.
  - Disseminate findings and develop plans for follow-up projects and partnerships.
- **Milestones:**
  - Final report submission and publication.
  - Technology readiness level (TRL) 4-5 achieved.

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