



Floating Solar Research Opportunities & Program Guide

AccuSolar Program for Innovation, Research, and Education

ASPIRE connects universities, researchers, students, and industry partners with real-world floating solar technology and project opportunities. The program is designed to support practical research, generate meaningful FPV data, expand educational opportunities, and advance the industry's understanding of floating solar performance and deployment.

ASPIRE Program Objectives

- Advance technical knowledge and real-world FPV performance data
- Support independent academic research and published findings
- Create hands-on educational opportunities for students
- Connect academic research with real-world industry challenges
- Encourage collaboration across engineering, environmental science, energy and related disciplines
- Develop the next generation of floating solar professionals
- Build a growing network of academic and industry research partners

Program Scope

1. ASPIRE will focus on establishing collaborative relationships with universities, faculty, and students whose research interests align with the advancement of floating solar technology.
2. Engagement may include research collaborations, engineering capstone projects, internships, technical presentations, and other academic partnerships that contribute to the development and understanding of floating solar systems.
3. The program will prioritize projects that produce practical engineering insights, measurable data, and real-world applications relevant to floating solar deployment and operation.



How AccuSolar Can Support Research

Where appropriate, AccuSolar can support ASPIRE research projects with floating solar equipment, system components, engineering guidance, operational data, and pilot or demonstration systems. Support is evaluated on a project-by-project basis based on the research objectives, available resources, and the potential contribution to advancing floating solar knowledge.

Equipment: FPV platforms and components

Engineering: Technical guidance and system-design support

Data: Access to applicable operational project data

Demonstrations: Pilot and research installations

Industry Connections: Developers, engineers, equipment manufacturers and project partners

Industry Collaboration

Where appropriate, AccuSolar can connect ASPIRE research partners with developers, engineering firms, equipment manufacturers, utilities, and other industry participants. These collaborations can provide technical insight, operational experience, project data, and additional resources to help keep research grounded in real-world floating solar applications.



The following table summarizes the current primary research topics identified under the ASPIRE initiative. Topics may change as the industry advances. Detailed Descriptions of each topic are provided in the sections that follow. Topics are in no particular order.

#	Research Topic
1	Floating Solar System Yield Benefits
2	Water Characteristics
3	Water Conservation
4	Water Quality Improvement
5	Levelized Cost of Energy (LCOE) Evaluation
6	Mooring Designs
7	Dynamic Loading on Anchoring Systems
8	Operations & Maintenance (O&M) Performance
9	Installation Methods and Deployment Efficiency
10	Structural Durability and Material Longevity
11	Storm Resilience and Extreme Weather Performance
12	Floating Solar Coverage Ratios
13	Hybrid Floating Solar Energy Systems
14	Robotic or Automated Cleaning of Floating Solar Panels
15	Daily Tracking on Water
16	Environmental Permitting and Regulatory Considerations
17	Utility Interconnect Delays
18	Electrical System Performance in Floating Solar Environments
19	Biofouling and Biological Growth on Floating Solar Systems
20	Hydrodynamic Behavior of Large Floating Solar Arrays



Research Topics

1. Floating Solar System Yield Benefits

- Floating solar systems are widely expected to provide improved energy performance compared to traditional land-based installations due to the cooling effects associated with water bodies and reduced module operating temperatures. Research in this area should focus on quantifying these performance benefits and validating the conditions under which they occur.
- Areas of study may include module temperature behavior, thermal cooling effects from water proximity, seasonal performance variations, and the relationship between environmental conditions and system output. Research should also evaluate modeled versus actual system performance in order to improve yield forecasting for floating solar installations.
- The objective is to develop reliable performance data that clearly demonstrates the potential energy production benefits associated with floating solar systems.

2. Water Characteristics

- Floating solar installations interact directly with the surface of water bodies and may influence certain physical characteristics of the water beneath and surrounding the array. Research in this area should focus on understanding how floating solar coverage affects water conditions over time.
- Areas of study may include monitoring changes in surface and subsurface water temperature, dissolved oxygen levels, and potential changes in thermal stratification within the water body. Research may also examine how varying levels of solar coverage influence these characteristics across different types of reservoirs, ponds, and treatment facilities.
- The objective is to better understand the relationship between floating solar installations and the underlying water environment, providing credible data that can help inform future project design, environmental considerations, and regulatory discussions.



3. Water Conservation

- Floating solar systems provide partial coverage of water surfaces and may reduce evaporation from reservoirs, ponds, and other water bodies. Research in this area should focus on quantifying the extent to which floating solar installations contribute to water conservation under varying environmental conditions.
- Areas of study may include evaporation reduction rates associated with different levels of solar coverage, seasonal variations in evaporation, and the influence of local climate conditions. Research may also evaluate the potential benefits of floating solar systems for water utilities, agricultural reservoirs, and other water management applications.
- The objective is to develop credible data that helps quantify the potential water conservation benefits associated with floating solar installations.

4. Water Quality Improvement

- Floating solar installations may influence water quality through surface shading and reduced solar radiation reaching the water column. These effects may help limit conditions that contribute to excessive algae growth and other water quality challenges.
- Research in this area should examine how floating solar coverage may impact algae formation, nutrient activity, and overall water quality conditions within reservoirs, treatment ponds, and other managed water bodies. Studies may also evaluate how varying levels of surface coverage influence biological activity and light penetration.
- The objective is to better understand whether floating solar systems can contribute to improved water quality conditions and provide additional operational benefits for water utilities and facility operators.



5. Levelized Cost of Energy (LCOE) Evaluation

- Floating solar installations have cost characteristics that differ from traditional land-based solar systems due to the inclusion of floating structures, anchoring systems, and specialized installation methods. Research in this area should focus on evaluating the cost structure associated with floating solar projects and identifying factors that influence overall project economics.
- Areas of study may include installation costs, anchoring and mooring system costs, operational and maintenance requirements, and long-term system performance. Research may also evaluate how project size, installation efficiencies, and system standardization influence economies of scale and overall cost reductions as floating solar deployment increases.
- The objective is to improve understanding of the economic drivers associated with floating solar deployment and identify opportunities to enhance long-term project viability.

6. Mooring Designs

- Floating solar installations require mooring systems that maintain array position while accommodating water level changes, wind forces, and wave movement. Research in this area should focus on evaluating different mooring system configurations and their performance under varying site conditions.
- Areas of study may include the performance and durability of elastic mooring systems, rope-based systems, cable systems, chain systems, and hybrid approaches. Research may also examine how different mooring strategies respond to reservoir level fluctuations, environmental loading conditions, and long-term material fatigue.
- The objective is to improve understanding of effective mooring system design for floating solar installations and to identify configurations that balance reliability, adaptability, and cost efficiency across a range of project environments.



7. Dynamic Loading on Anchoring Systems

- Floating solar arrays are subject to dynamic environmental forces including wind, wave action, and fluctuating water levels. These forces can introduce varying loads on anchoring and mooring systems that differ from those experienced by static land-based solar installations.
- Research in this area should focus on understanding how floating solar arrays respond to dynamic environmental conditions and how those forces are transferred through mooring systems to anchoring points. Areas of study may include wind-induced loading, wave interaction with floating structures, load cycling on mooring lines, and the resulting stresses placed on anchoring systems.
- The objective is to develop improved models and data that support reliable anchoring system design, enhance long-term durability, and improve engineering standards for floating solar installations.

8. Operations & Maintenance (O&M) Performance

- Floating solar installations introduce operational and maintenance considerations that differ from traditional land-based solar systems due to limited access, environmental exposure, and the movement of floating structures. Research in this area should focus on evaluating the expected maintenance requirements and operational performance of floating solar installations over time.
- Areas of study may include inspection requirements, maintenance accessibility, component durability in water-based environments, and long-term operational reliability of floating system components. Research may also examine how maintenance practices compare with initial operational expectations and how system design can improve serviceability.
- The objective is to develop a clearer understanding of long-term operations and maintenance requirements and identify design and operational practices that support reliable system performance.



9. Installation Methods and Deployment Efficiency

- Installation of floating solar systems involves unique logistical and assembly considerations compared to land-based solar installations. Research in this area should focus on improving deployment strategies, assembly workflows, and installation methodologies that can reduce labor requirements, improve installation efficiency, and shorten project schedules.
- Areas of study may include modular assembly techniques, on-water installation sequencing, equipment requirements, and methods for scaling installation processes for larger floating solar projects.
- The objective is to identify deployment practices that improve installation efficiency and support cost-effective scaling of floating solar systems.

10. Structural Durability and Material Longevity

- Floating solar systems operate in environments that expose system components to ultraviolet radiation, moisture, temperature variation, and mechanical stresses associated with environmental loading. Research in this area should focus on evaluating the long-term durability and performance of materials used in floating solar systems.
- Areas of study may include structural materials, flotation components, framing systems, connection hardware, and other critical system elements. Research may also examine long-term degradation, fatigue behavior, and maintenance considerations associated with prolonged environmental exposure.
- The objective is to improve understanding of long-term system durability and support design practices that enhance reliability and service life.

11. Storm Resilience and Extreme Weather Performance

- Floating solar installations must withstand environmental conditions including high winds, wave activity, and severe weather events. Research in this area should focus on evaluating system performance under extreme weather conditions and identifying design considerations that improve resilience.



- Areas of study may include wind loading behavior, wave interaction with floating structures, mooring system response during severe weather events, and system recovery following extreme conditions through both real-world performance observations and simulated modeling environments.
- The objective is to support the development of floating solar systems that maintain structural integrity and operational reliability in demanding environmental conditions.

12. Floating Solar Coverage Ratios

- The percentage of water surface area covered by floating solar systems may influence system performance, environmental conditions, and project economics. Research in this area should focus on evaluating how varying levels of surface coverage affect energy production, water characteristics, and operational considerations.
- Areas of study may include optimal coverage percentages, shading effects on water bodies, system layout strategies, and environmental impacts associated with different coverage levels.
- The objective is to better understand how floating solar coverage ratios influence system performance and environmental interaction.

13. Hybrid Floating Solar Energy Systems

- Floating solar installations may be integrated with other energy technologies to improve overall system performance and energy utilization. Research in this area should examine opportunities to combine floating solar with complementary technologies.
- Areas of study may include integration with energy storage systems, hybrid renewable energy configurations, and applications where floating solar systems support on-site energy demand or other energy infrastructure.
- The objective is to explore system configurations that enhance the operational flexibility and economic viability of floating solar projects.



14. Robotic or Automated Cleaning of Floating Solar Panels

- Floating solar installations may benefit from robotic or automated panel cleaning systems due to the unique access conditions and environment associated with water-based installations. Research in this area should focus on evaluating the effectiveness and practicality of automated cleaning technologies deployed on floating solar systems.
- Areas of study may include cleaning efficiency, optimal cleaning frequency, integration of robotic cleaning systems with floating solar structures, and the operational reliability of cleaning technologies under real-world conditions. Research may also examine the economic impact of automated cleaning compared to manual maintenance approaches.
- The objective is to better understand how automated cleaning solutions may support long-term system performance while reducing operational complexity and maintenance costs.

15. Daily Tracking on Water

- Floating solar platforms may present opportunities for incorporating solar tracking technologies that allow modules to follow the sun throughout the day. Research in this area should focus on evaluating the potential performance benefits and mechanical considerations associated with tracking systems deployed on floating structures.
- Areas of study may include the energy yield improvements associated with single-axis or other tracking configurations, the mechanical feasibility of integrating tracking systems with floating platforms, and the effects of environmental forces such as wind and wave movement on tracking reliability. Research should also evaluate how tracking systems may influence anchoring and mooring system loads, including potential changes in wind loading profiles and dynamic forces transferred to anchoring systems.
- The objective is to determine whether tracking technologies can provide meaningful performance benefits for floating solar installations while maintaining system reliability and cost effectiveness.



16. Environmental Permitting and Regulatory Considerations

- Permitting requirements for floating solar installations can vary significantly depending on jurisdiction, water body classification, and environmental considerations. Research in this area should focus on identifying common permitting challenges and evaluating regulatory pathways that influence floating solar project development.
- Areas of study may include environmental review processes, permitting timelines, regulatory frameworks, and potential approaches that support responsible project development while addressing environmental concerns.
- The objective is to improve understanding of regulatory considerations and help identify best practices that support responsible deployment of floating solar systems.

17. Utility Interconnect Delays

- Utility interconnection timelines have become an increasingly significant challenge for solar project development. Research in this area should focus on evaluating how floating solar projects may be impacted by interconnection delays and identifying potential strategies that allow projects to proceed despite grid constraints.
- Areas of study may include project configurations that reduce reliance on traditional interconnection pathways, such as behind-the-meter applications, hybrid energy systems, or on-site load integration. Research may also examine regulatory and market factors that influence interconnection timelines and explore potential pathways for accelerating project deployment.
- The objective is to identify pathways that allow floating solar projects to proceed in environments where interconnection limitations may otherwise delay or prevent development.



18. Electrical System Performance in Floating Solar Environments

- Floating solar installations operate in environments with increased humidity, proximity to water, and potential exposure to corrosive conditions. These factors may influence the long-term performance and reliability of electrical components used in floating solar systems. Research in this area should focus on evaluating electrical system behavior in water-adjacent environments.
- Areas of study may include long-term performance of cabling and connectors, grounding and bonding strategies, corrosion impacts on electrical hardware, and the reliability of electrical components operating in high-humidity conditions. Research may also examine best practices for electrical system design in floating solar installations.
- The objective is to improve understanding of electrical system performance and support the development of reliable electrical design practices for floating solar systems.

19. Biofouling and Biological Growth on Floating Solar Systems

- Floating solar installations remain in continuous contact with water for extended periods and may experience biological growth on structural components. Over time, biofouling may influence buoyancy, hydrodynamic behavior, and long-term maintenance requirements.
- Areas of study may include accumulation of algae and other biological growth on floats and structural components, impacts on buoyancy and system performance, potential effects on hydrodynamic forces, and strategies for mitigating long-term biological buildup.
- The objective is to better understand how biological growth may influence floating solar system performance and identify practices that support long-term operational reliability.



20. Hydrodynamic Behavior of Large Floating Solar Arrays

- As floating solar installations increase in scale, the interaction between large floating arrays and surrounding water bodies may influence wave behavior, internal water movement, and overall system dynamics. Research in this area should focus on understanding how large floating solar arrays interact with hydrodynamic forces.
- Areas of study may include wave attenuation within floating solar arrays, internal wave reflection patterns, the influence of array size and configuration on hydrodynamic behavior, and the resulting impacts on mooring loads and structural forces.
- The objective is to improve understanding of hydrodynamic interactions associated with large-scale floating solar systems and support more accurate engineering models for future project design.

The research topics listed above represent areas of current interest within the floating solar industry. The ASPIRE Initiative will remain flexible and may expand or refine these research areas as new technologies, industry needs, and collaborative opportunities emerge.