Fostering innovative solutions to Alaska's energy challenges through applied energy research at the University of Alaska

# Alaska Hydrokinetic Research Center (AHERC)

# DRAFT STRATEGIC PLAN 2010-2013

## Program Overview

The Alaska Hydrokinetic Research Center (AHERC) is part of the Alaska Center for Energy and Power (ACEP), an applied energy research program based at the University of Alaska Fairbanks. ACEP researchers focus broadly on energy research related to community and industry-scale power generation, heating, and transportation, and AHERC focuses on applied research and engineering specifically related to extracting energy from the kinetic energy of moving water in rivers and tidal basins.

Many of Alaska's rural inland communities affected by high energy costs are situated along navigable rivers that could host hydrokinetic installations. Alaska's Railbelt power grid extends from Homer to Fairbanks and runs along Cook Inlet, which hosts one of the best potentially developable tidal resources in the world. Overall, Alaska is considered to have about 40% of the total U.S. river energy resource potential and about 90% of the total U.S. tidal energy resources. The proximity of significant river and tidal currents to both Alaskan rural and urban populations centers (through the Railbelt intertie), coupled with increasing energy costs, has led many Alaskan communities to consider whether they can access these resources to generate electric power.

Hydrokinetic technology is still in its infancy with no commercial projects developed in the U.S. to date. There are several manufacturers actively working on bringing their products to market, and there are a small number of pilot demonstration projects all of which are experiencing environmental issues or not meeting performance expectations. AHERC has been established to support development of technology and information needed by industry ad regulators to facilitate the development of the use of hydrokinetic power in Alaska. Specifically, AHERC's goals are to:

- Understand and act on the research needs for the development, deployment, and operation of hydrokinetic turbines.
- Work with manufacturers to develop and commercialize hydrokinetic products and systems for use under Alaskan conditions.
- Support industry, the Alaska Energy Authority, the Denali Commission, and other state and federal agencies through development and implementation of a statewide strategic plan to facilitate development of a hydrokinetic industry in Alaska.
- Conduct research and testing to validate commercial products for operation under Alaskan conditions and to understand critical environmental factors that affect turbine performance, including debris, icing, sediment, fish and marine mammal populations and behavior.

- Conduct technical, economic, regulatory, and cultural feasibility assessments and pilot studies to evaluate proposed solutions for targeted locations and uses prior to commitment of major financial resources.
- Develop methods and technology to facilitate successful installation and operation of hydrokinetic turbines in Alaskan marine and river waterways.
- Work along with key stakeholders to streamline the permitting system.
- Work with other campuses and programs to expand educational opportunities from technical training through graduate research in energy technologies.
- Serve as an information resource about what has, hasn't, and might work in Alaska.

Establishing test sites as part of AHERC will ensure continual refinement of hydrokinetic technology for Alaskan conditions and serve as a focal point for preliminary environmental studies to collect data needed to satisfy permit requirements and stakeholder concerns. Test sites are recognized nationally as necessary to facilitate development of new technology areas and to provide publicly accessible data to inform stakeholder decisions (e.g., federal and state agencies, consumers of energy, waterway users, and the general public). Privately financed research may be held as proprietary, as is common in other countries and industries. Time spent conducting research and testing upfront will help Alaskans take smart steps in the right direction to prepare Alaska to invest wisely in hydrokinetic energy technology solutions designed for Alaskan conditions. AHERC will ensure that critical information related to hydrokinetic power generation is available through ACEP - information that stakeholders can use to develop a predictable, affordable energy supply for Alaskans and to inform global energy priorities.

AHERC's model follows that of its parent organization ACEP - to build a wide range of strategic partnerships both inside and outside the University at the local, state, national and international level to ensure AHERC research will be relevant, current and world class. A council of advisors from industry (manufacturers, developers, and users), the university, and other stakeholders will provide advice on approach, priorities, and direction to best promote a sustainable hydrokinetic industry in Alaska.

AHERC will follow ACEP's model that connects our funding partners with researchers and resources throughout the University of Alaska system by building integrated, multidisciplinary teams. AHERC works across campuses to draw from a wide range of expertise to ensure we can be needs-driven, responsive and best able to meet the research needs of our clients.

## AHERC Mission and Vision Statement

The **Mission** of the Alaska Hydrokinetic Research Center is to conduct applied research and work with other stakeholders to foster development of practical and innovative solutions to hydrokinetic power generation to help meet Alaska's energy challenges.

**Our Vision** is to develop a self-sustaining Alaska Hydrokinetic Energy Research Center (AHERC) with capabilities to conduct applied research needed to facilitate the development and implementation of hydrokinetic power generation worldwide.

## AHERC Core Values

In order to be successful, AHERC's values are aligned with those developed by ACEP:

**The integrity of our research is our most critical asset.**

We believe strongly that unbiased, third party testing, analysis, and evaluation of available technologies and their impact on the environment best serves the public, industry, and regulatory and funding agency efforts to build Alaska's hydrokinetic energy future. Our integrity, the validity of our findings, and impartial reporting of results is critical to establishing and maintaining public and industry confidence in AHERC and will not be compromised.

**We are building the future of hydrokinetic power in Alaska.**

The way that hydrokinetic power generation is developed and implemented in Alaska will have far reaching results and long-term impact. Project direction and priorities are guided by our advisory council. Projects connect students, industry, and communities to their future through internships and student work programs, collaborative industry/AHERC projects, and community outreach and consultation. Student involvement provides an avenue for early entry to hydrokinetic power research and technology and provides the basis of a sustainable hydrokinetic industry in Alaska.

**Partnerships and alliances allow AHERC to be responsive and connected to our clients.**

AHERC collaborates with key stakeholders in the hydrokinetic energy production industry to seek solutions with a high probability of success, broad application, statewide and global relevance and that make economic sense.

**Alaska's complex hydrokinetic solutions require collaboration.**

Hydrokinetic solutions can only be created by an effective team integrating multiple disciplines, perspectives and skill bases. Whenever possible, AHERC collaborates with researchers from throughout the University of Alaska system, private industry, and other organizations with a model of integrated, multidisciplinary teams. Our research partners include national laboratories, industry leaders, manufacturers, state and federal agencies, tribal governments and other key stakeholders.

**A hybrid organization combining academic freedom and curiosity with pragmatism and fiscal responsibility sets AHERC apart.**

ACEP operates under a model to complete projects on-time, within budget, and timely reporting of results within the University system. Our organization is lean and comprised of researchers whose priority is meeting the needs of our partners and constituents. Due to the nature of AHERC's research, our schedule is often dependent on seasonal opportunities; however, our goal is to complete projects quickly and produce reports and other work products that are concise, timely, and easy to interpret.

# Defining the Need for AHERC and Hydrokinetic Research

Energy is a primary concern of Americans and Alaskans. National and state policy-makers are addressing this concern by developing energy plans prioritizing development of sustainable, cost-effective energy solutions. A major component of these plans include accelerating development of renewable resources, such as hydrokinetic power from rivers and tides, through state and federal renewable energy funding and the formation of research centers and collaborative networks. Such centers and networks provide economic efficiencies associated with testing in a singe place, close to population and infrastructure centers instead of in remote communities (e.g., Ruby & Eagle). This benefits both rural and urban communities by collecting information and developing protocols that can simplify regulatory testing.

Funding organizations include the Department of Energy (DOE) Water Power Program and the Alaska Renewable Energy and Emerging Energy Technology Grant Funds. National research centers, such as the Northwest National Marine Renewable Energy Center (NNMREC) work with technology developers and states to develop

improved technology and methods. Associations to foster development of hydrokinetic power production through shared knowledge, advocacy, and joint projects include the Clean Energy States Alliance (CESA), Virginia Coastal Energy Research Consortium, the Marine Renewable Energy Consortium (MREC), and others.

The partnerships also work to influence priorities for research and development as well as funding at the federal level. For Alaska to participate in consortia activities, influence research priorities at the national level and successfully compete for federal funds requires a unified and coordinated approach of state funding, planning, policies, and research and development activities related to hydrokinetic technology development. AHERC provides a research and development component to the state's approach and demonstrates Alaska's commitment to hydrokinetic power technology development and to participate in national and international research consortia to stay at the forefront of this emerging technology sector.

Developing engineering concepts for innovative new hydrokinetic devices is an iterative process that is complicated by the fact that hydrokinetic turbines generate electricity in marine and/or river environments, requiring that they be sufficiently robust to survive the extremely harsh conditions. Testing, performance monitoring, and analysis to understand interactions between turbines and their environment can deliver economic benefits through increased performance of turbines and arrays, increase survivability and operational robustness, lower permitting costs, and lower capital and deployment costs. Advantages include conducting environmental and technical studies that benefit a broad cross-section of developers to address regulatory concerns about fish, marine mammals, transportation, sediment transport, ice, debris, materials, anchoring, and other factors that all developers and users face in common. Such topics include fish and marine mammal baseline studies of interest to permitting agencies, approaches to anchoring and debris mitigation, the prevalence of turbulence and its effects, and other problems common to the Alaskan hydrokinetic power generation efforts.

Improvements and cost reductions may be achieved through the better use of materials, improved control schemes, lower cost next generation devices, deployment array patterns to optimize efficiency, and improved installation and operating procedures. AHERC and its partners provide a range of testing facilities from theoretical and numerical modeling, through scale model testing, to full-scale prototype and demonstration projects installed in real-world marine and river environments. AHERC and its partners will also provide facilities to test and analyze technology and operations approaches as the hydrokinetic power industry grows to create iterative improvements and best practices that can reduce the probability of failures as demonstration scale projects move toward commercial scale projects.

Applied research conducted through AHERC will be a critical component to effectively design and implement a long-term hydrokinetic energy strategy for the state. Policy makers and funding agencies are interested in determining if hydrokinetic power generation can be successfully and economically generated from Alaska's extensive hydrokinetic resources. AHERC provides a means to provide the research and information that policy makers and funding agencies need for decision-making and to provide solutions to the significant challenges that need to be overcome before hydrokinetic technology can be successfully deployed in Alaska.

## AHERC's Preliminary Research Agenda and Infrastructure Plan

AHERC's primary research goals are to understand the interaction of hydrokinetic turbines with Alaskan river and marine waterways and to use this knowledge to mitigate challenges to installation, operation, and maintenance of hydrokinetic turbines, and to optimize turbine efficiencies (i.e., maximize the ratio of power output to cost). The form and priority of AHERC research goals will be guided by input from the AHERC advisory

council from industry, state and federal agencies, and community stakeholders who will help define research needs to facilitate hydrokinetic power development in Alaska.

Currently, there are many external factors Alaska must address that present challenges to developing a hydrokinetic power generation industry. The primary goal (and challenge) is to determine where the most suitable locations to produce and supply hydrokinetic power are located. This requires determining the factors that affect the economic feasibility of hydrokinetic projects, for example:

1. Characterizing the hydrodynamic conditions of likely resource locations at various scales (regional, local, and site specific).
2. Determining the proximity of the resource to population centers and/or transmission grids.
3. Determining the factors that affect deployment, operation, and maintenance of hydrokinetic infrastructure.

Hydrodynamic conditions of interest include the hydrokinetic power density, turbulence, and sediment transport that affect turbine power production potential, the stress regime acting on a turbine, turbine component wear, river/ocean bed stability, and turbine anchor performance. Proximity to population centers and electrical grids affect the economics of transmitting power to users, but also introduce the need to consider community acceptance of this technology and integration of hydrokinetic turbine produced power with other power sources on electric grids. The ability to deploy, operate and maintain hydrokinetic infrastructure are influenced by varied and multifaceted physical and regulatory factors that are related to how turbines interact with aquatic environments (i.e., (1) how the aquatic environment affects the turbine and (2) how the turbine affects the aquatic environment).

To determine how turbines interact with aquatic environments it is first necessary to understand the baseline aquatic environmental conditions, such as hydrodynamic conditions, benthic environment, fish and mammals, sediment transport, debris and ice, and stakeholder usage and acceptance. Once baseline conditions are known then interactions between turbines and the aquatic environment can be observed to determine how debris, turbulence, ice, sediment, and other factors affect turbine performance (e.g., fatigue loading, component wear, debris pileup and impact loads, anchor performance). It also becomes possible to examine turbine effects on the aquatic environment (e.g., current flow regimes, fishes and mammals, sediment and erosion, and stakeholder usage, river and marine navigation impacts, benthic habitat modification).

AHERC has outlined a preliminary applied research agenda and corresponding outreach and education plan to examine the critical issues needed to develop the answers and solutions to our primary questions. This research agenda defines the areas of applied research that we think are needed to accelerate development, acceptance, and deployment of hydrokinetic devices. These topics are fairly well known given the results of past work by researchers and developers around the world, as well as our initial research efforts both in the laboratory and in the field. AHERC's initial research agenda will seek to:

1. Develop methods to characterize populations and behaviors of fish and marine mammals, identify their interaction with turbines, and develop mitigation methods to adverse interactions. Managing the potential impacts to critical fisheries and marine mammals is a key issue for permitting as well as cultural acceptance of this technology by community and stakeholders concerned about the environmental health of aquatic environments.
2. Determine the key baseline characteristics of existing aquatic environment for specific river and tidal hydrokinetic resources that may affect installation and operation of hydrokinetic devices. This may include current dynamics, debris, ice, river or ocean bed conditions, sediment transport, fish and marine mammal populations.

3. Characterize the interactions that occur between hydrokinetic turbines and the aquatic environment after their installation (e.g., current dynamics, debris and ice, sediment, turbine and anchor performance, river or ocean bed modification, etc.).
4. Develop methods and instruments to characterize the hydrokinetic resource and its effect on turbine operations. This would include river/tidal dynamics turbulence, channel stability, sediment deposition erosion, ice problems and how they relate to performance of the turbine and eventual power output.
5. Develop tools to identify likely locations and characteristics of potential hydrokinetic resource site locations taking into account available power density, turbulence, river/ocean bed stability and susceptibility to scour or deposition, and community view.
6. Identify specific solutions and develop technology and methods that support the deployment of hydrokinetic technology. This currently includes turbine array placement & optimization, minimization of adverse fish/marine mammal interactions, debris mitigation, anchoring systems, ice effects and sediment impact. This also includes turbine modifications to handle these issues.
7. Assess and quantify turbine performance characteristics under unique Alaskan conditions including substantial and ever-changing river currents and stage, considerable debris, significant sediment transport, and ice formation and break up.
8. Design controls, models and tools to aid integration of turbine systems with electrical grid systems, especially isolated grids with high renewable energy penetration. This may also include integration with hydrokinetic, diesel, wind, solar, and electrical interties.
9. Define socio-economic impacts including creation of economic assessment systems for developing hydrokinetic power systems both separately and in combination with other power generation systems such as hydrokinetic/diesel hybrid systems.
10. Identify and implement outreach and education channels for stakeholders including researchers, developers, agencies, community planners, and other key decision makers.

AHERC will continue to work with industry, agency, research, and engineering partners to define and catalogue research needs, identify potential funding sources and collaboratively build research teams tailor-made for specific multi-disciplinary solutions. Not all research questions may be answered by AHERC, but AHERC will play the role, working with our partners, to keep the research agenda moving ahead and ensure findings and other data analysis are easily accessible and well communicated.

AHERC will acquire infrastructure and collaborate with other organizations with infrastructure and expertise needed to support the AHERC agenda, including personnel and equipment. The top priority is to develop an instrumented barge that can be adjusted to accommodate direct studies of fish, turbine performance, anchoring and debris, and the interaction of turbines with the aquatic environment. The barge will be adaptable to accommodate full sized turbines with a double hull that can confine flow around the turbine to conduct turbine interaction studies with fish, debris, and sediment in a controlled setting. This effort will require a control and data acquisition system to disseminate and connect to information.

## AHERC Key Strategic Operational Questions

In addition to defining a research focus and corresponding agenda, AHERC will develop a successful organizational framework and procedures to support its development. As recommended for young organizations with limited resources, AHERC will use issues-based planning to define this structure.

As a first step, an analysis of the strengths, weaknesses, opportunities and threats (SWOT analysis) was used to identify and prioritize AHERC's major critical issues. The goal with this SWOT analysis is to leverage strengths and

opportunities and mitigate weaknesses and threats. This preliminary analysis has led the organization to the following key strategic questions to be answered in defining our organizational formation:

1. What are the primary goals and objectives of the hydrokinetic industry in Alaska?
    - What role does AHERC have in facilitating the development of a hydrokinetic industry in Alaska?
    - What is the process to determine, prioritize, and justify the industry's goals and objectives?
2. What specific areas of applied research, outreach, and education should AHERC focus on?
3. How do we develop AHERC (structure and function) to become a leader in facilitating the development of a hydrokinetic industry in Alaska?
4. What mechanisms are available to provide necessary resources for AHERC infrastructure, people, and functions?
5. What key organizations and people should AHERC develop as partners to develop capability and capacity, funding, leadership position, and a reach that extends throughout the state, the nation, and internationally? How do we best communicate and acquire buy-in and cooperation from these organizations?
6. How do we measure success and adjust our plans and actions to surmount challenges and develop a lessons-learned organizational memory?

## AHERC Primary Goals and Objectives

AHERC goals and objectives are a subset of ACEP goals and objectives, but focused on the specific area of hydrokinetic power production. They are based on the key strategic operational questions listed above. Preliminary goals and objectives include:

1. Provide the applied research, information, expertise, and leadership to accelerate the development and installation of commercial hydrokinetic power projects that can operate and be sustained in Alaskan river and tidal currents (we exclude wave energy for now). Technology acceleration from applied research coupled with efforts of others can bolster the creation of a hydrokinetic industry in Alaska.
    - ✓ Indications of success include number of quality research projects, key external leadership positions by AHERC affiliated staff and faculty, number of submitted and awarded proposals, number of perceived and actual connections, links and other mentions with key stakeholders and partners, number of peer-reviewed published papers.

2. Develop a wide range of partnerships within and outside the UA system at local, statewide, national, and international levels to provide expertise, financial support or credentials for efforts.
    - ✓ Indications of success include number of AHERC affiliated researchers, number of partnerships with national laboratories and relevant academic institutions, number of relationships with funding partners, number of tribal, community and political partners.

3. Build an infrastructure base to support research and technology development for both river and tidal hydrokinetic device testing.
    - ✓ Indications of success include recruitment of new research faculty, consultants and students, procurement of research equipment, creation of both laboratory and field-based test bed facilities.

4. Focus on information dissemination and support of information networking.
    - ✓ Indications of success include publications, presentations and other communication of results to key stakeholders, conference involvement and other speaking engagements, website presence.

5. Broaden the presence and focus of hydrokinetic potential for Alaska and the U.S.
    - ✓ Indications of success include increase in funding percentages.

## Defining AHERC's Organizational Plan

AHERC will succeed only if it is perceived as providing tangible research, technology, and information products and connections that will actually move the hydrokinetic industry forward (as compared to being merely an academic exercise). This means that AHERC needs to develop a structure that is cognizant of industry, community, agency, and state needs and requirements along with those of the university system of which it is a part.

AHERC's function will be dictated by our goals and areas of research, which can be described as working with our partners to conduct research, outreach, and education to advance technology and satisfy regulatory and stakeholder concerns

## AHERC Organizational Structure

The current organizational structure for AHERC is based on financial and personnel limitations which are realities for this developing center. This structure consists of a part time faculty director who defines the strategic plan and research agenda, develops partnerships, identifies and seeks funding opportunities and oversees research. This director is currently a faculty member of the Institute of Northern Engineering. In addition, ACEP provides research engineers, qualified students and other staff as necessary and as funds allow.

To effectively address opportunities based on limited resources, AHERC will rely on research faculty, research associates, and partnerships from throughout the University system. Recruiting and staffing will focus on project needs and staff hiring will only occur if the need cannot be met elsewhere in the INE, UAF or UA system. It is important to note that affiliation with AHERC is entirely voluntary. Researchers self-identify as being part of AHERC through projects, while remaining housed within their major academic unit or organization.

Like ACEP, AHERC will rely on the Institute of Northern Engineering business office to assist with proposal creation, grant management, procurement and other administrative processes. The center will leverage a minimal but essential business capacity from ACEP to address the details of the business office including budgeting and tracking, project management, and human resource tasks as needed. In addition, ACEP will focus on business development tasks including marketing, communications, public relations and outreach.

As funds and needs allow in the future, the structure will grow to consist of a full time center director, additional research and academic faculty, a part-time senior mentor faculty with in-depth knowledge of this technology area, undergraduate and graduate student researchers, research engineers and technicians housed in both local (UAF) and virtual (remote) locations, as well as potential administrative staff.

AHERC staff will be supported with test equipment and facilities located locally (UAF), at AHERC's test site on the Tanana River in Nenana, at an ocean environment tidal site yet to be determined, and at partner organizations within the state and nationally. AHERC will ensure this structure accommodates partner organizations with whom they can partner through joint positions and resource sharing.

**Governance**

AHERC is housed within the Alaska Center for Energy and Power at the University of Alaska Fairbanks. AHERC policies and procedures will be created in relation to the University of Alaska Policies and Procedures established through the Board of Regents.

AHERC and ACEP are based in the Institute of Northern Engineering (INE), the research and development arm of the College of Engineering and Mines (CEM) at UAF. AHERC's director will report to the Director of ACEP who in turn reports to the Director of INE.

**Industry Advisory Council**

AHERC will form an Industry Advisory Council that will include key hydrokinetic stakeholders throughout the state. The goal of the council is to guide the development of AHERC's research agenda and ensure its work is relevant, responsive and utilized. Council membership is intended to represent a broad cross section of stakeholders representing developers/manufacturers, energy/resource advisors, rural/tribal organizations, regulatory agencies, utilities, and the university. This group will meet annually (or more frequently as needed) to provide insight and expertise to ensure AHERC is well informed of research needs, industry trends, and potential issues related to the technology sector. This group will also provide guidance and advice to develop AHERC's structure and function.

# AHERC Funding

AHERC will be funded primarily through competitively awarded grants and contracts. However, it is unrealistic to expect AHERC test equipment and infrastructure to be developed solely from competitive grants. For this reason, general operating funds need to be identified through other channels. This may include university or state support similar to the model followed by ACEP in developing the Wind-Diesel Application Center (WiDAC) which relied on partnerships and small but critical investments by ACEP and the university to jump-start the program.

Opportunities to access federal grants will be impacted by the state's level of interest and willingness to provide support. This means that AHERC will need to leverage funding from a variety of sources to be successful, and must focus on developing private partnerships as well as state and federal partnerships with the Alaska Energy Authority, Department of Energy, Denali Commission, Mineral Management Service, as well as legislators at the state and federal level. Such partnerships can accelerate growth of a statewide and national hydrokinetic industry as developers are attracted to Alaska due to its significant marine and river resources and high cost of power. This combination of resource availability and need position Alaska a primary first-adopter of commercial products. AHERC will need to establish itself as a leader in establishing the direction for hydrokinetic development in addition to being a key player in both state and national hydrokinetic research. This will allow AHERC to leverage more funds to the state through competitive grants and direct funding of AHERC.

# AHERC Partnerships

Due to the relative infancy of this industry and resulting distributed decision making structure, lack of leadership and limited funding, partnerships will be critical for the development of AHERC. Partnership development will be somewhat organic, but AHERC should be strategic in which partnerships to form and how to prioritize them based on limited resources and time.

Initial partnerships will be focused on strengthening existing relationships and will depend on the purpose of the partnership (i.e., technical, political, funding environment, other). In priority order these will include:

- Technical – UA system, other academic institutions, industry support companies, national laboratories.

- Industry and user stakeholders – turbine developers/manufacturers, regulatory agencies, utilities, rural/tribal organizations, energy/resource advisors, and others.
- Funding environment – State and federal legislators, Department of Energy, federal and state agencies, other funding sources.
- Political – Legislators, rural organizations, industry.
- Regulatory – federal and state agencies.
- Others as needed.

Partnerships should be prioritized somewhat sequentially, building from the contacts that ACEP/AHERC have currently developed. The Alaska Energy Authority and Denali Commission will be critical primary partnerships to foster in the state. In addition, formation of the AHERC Industry Advisory Council will also jump start the creation of this partnership network.

In addition to federal and state funding agencies, hydrokinetic research is grounded in relationships with regulatory agencies. AHERC has already made strides in developing relationships with regulatory agencies such as FERC, DNR, ADNR and ADFG.

**Internal Partnerships**

Since energy solutions cut across many disciplines, AHERC's first goal is to collaborate with energy research resources at each of the three major campuses. Hydrokinetic solutions will require economists, engineers, scientists, and resource managers from throughout the UA system. AHERC will connect with research faculty and staff with relevant skill sets and interest in hydrokinetic research and compile a list of available resources to leverage for projects.

# Academic Programs

Degree programs in engineering subjects relevant to energy and power are offered by UAF's College of Engineering and Mines and UAA's School of Engineering. UAF's College of Natural Science and Mathematics and School of Natural Resources and Agricultural Sciences, and the management and business schools of both campuses, offer related degree programs in ecology and resource development and management. In addition, ACEP will work with UAF's College of Engineering and Mines toward developing an interdisciplinary renewable energy undergraduate curriculum.

ACEP believes strongly in the role students can play in energy related research – students who will become the workforce of tomorrow. AHERC relies on graduate and undergraduate students to be integral members of project teams, working side by side with research faculty and other staff as well as our industry and agency partners. AHERC provides their student employees with a unique opportunity to build their skills while solving real problems for Alaska's communities. In addition, AHERC can offer thesis research opportunities for graduate and undergraduate students, with associated research faculty serving as mentors and advisors to help students develop their long-term goals and become effective members of the workforce.

# Priorities for Growth

**Space**

ACEP and AHERC currently operate from the Mineral Industries Research Laboratory (MIRL) building, and have access to other University laboratories, machine and electronic shops, and IT resources. Space to prepare for field work and to house additional resources has been a limiting factor for AHERC.

Construction on a stand-alone High Bay Research Lab Modules is ongoing as the first phase of an eventual Energy Technology Facility on the UAF campus. This will include a hydrokinetic research bay and is anticipated to be completed in the fall of 2011. It will provide essential large scale laboratory space to prepare equipment for field work. Office and small-scale laboratory space will need to be a top priority to achieve anticipated growth for researchers and staff.

**People**

AHERC hiring will be exclusively needs-driven and based on available funding. All researchers will be recruited based on achieving a balance between existing UAF faculty with key skill sets, and hire of new research staff and faculty in areas of deficiency.

**Funding**

AHERC must secure base funding to support basic infrastructure development. This funding may come from state, private, philanthropic or foundation sources and will be a priority.

AHERC will strive for a diversified portfolio of funding including federal, state and private sector and will create a reliable funding platform based on competitive awards by actively submitting proposals whenever possible.

Most of these competitive proposals will require matching funds of up to 50% of the total project budget. It is hoped that in the future these matching funds can be leveraged from state financial resources specifically allocated to this type of activity. Without designated matching funds, AHERC will be limited in its ability to apply for and receive competitive research dollars at a national level.

## Moving Beyond the Strategic Plan

Once this Strategic Plan has been adopted, AHERC will create a more detailed Action Plan which identifies what specific actions are needed to accomplish our goals and objectives, determine a timeline for action, and delegate specific tasks in a way that can be monitored and tracked. A preliminary Action Plan can be found in Appendix A.

In addition, key metrics that are discrete measurements of progress will be identified and goals established that can be tracked quarterly and reported annually. This action plan will be used to assess performance and a process will be established to determine how to respond to each progress report.

Potential metrics include - increased budget from sources external to the university, increased capability and capacity through new staff and infrastructure, project success, leadership in committees and statewide organizations that influence the hydrokinetic industry, etc.

**APPENDIX A**
**Preliminary AHERC Action Plan**

- Circulate the AHERC strategic plan with key industry, state, academic, and community stakeholders and solicit feedback.
- Identify means to secure preliminary base funding and work to secure such funds.
- Create the AHERC advisory council and work with stakeholders to populate the council appropriately.
- Develop creative research proposal concepts and aggressively develop partnerships to compete for funds and execute the work.
- Conduct good quality applied research on relevant topics and get results published quickly to establish a level of expertise and capacity (i.e., communicated via conference, web, journals)
- Develop a wide range of targeted technical partnerships within the UA system and outside the UA system at the statewide, national, international levels to provide expertise for multi-disciplinary efforts in research and technology development (e.g., UA system, UW, U Maine, AOOS, Sandia, ORPC, Vortex Hydro, Pulse Tidal, Terrasond, other).
- Develop a wide range of community and political partners to provide justification and support for the work and to help provide access to stable funding (e.g., rural, legislature, congressional, DOE, MMS, other).
- Build an infrastructure base to support research and technology development for both river and tidal hydrokinetic device testing.
- Recruit new research faculty, a senior faculty mentor, and students to help build capacity and help set direction.