02/13/13 Presentation: Emerging Energy Opportunities for Alaska

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Alaska Legislature
House Special Committee on Energy

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MEMORANDUM

To: Chief Clerk's Office
From: Dave Talerico, Committee Aide, House Special Committee on Energy
Subject: Meeting announcement for the week of February 11, 2013
Date: February 7, 2013
CC:

The House Special Committee on Energy will hold the following meeting next week.

Wednesday, February 13, 2013

+"Emerging Energy Opportunities for Alaska" presentation by Gwen Holdmann, Executive Director, Alaska Center for Energy, UAF.

The meeting will be held in the Barnes Room (124) from 8 a.m. to 10 a.m. and will be teleconferenced.

For more information, call Dave Talerico at (907) 465-4936 or Jeff Turner at 9907) 465-6588.

*First hearing in first committee of referral

+Teleconferenced

=Bill previously heard

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Alaska House of Representatives
Special Committee on Energy

February 13th, 2013

Gwen Holdmann, Director

Alaska Center for Energy and Power

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Alaska Energy Use

Assuming a constant fuel demand, we are on track to spend over $5 billion on diesel fuel in rural Alaska and ~ $60 billion on fossil fuels for Railbelt electric power generation.

Energy-related appropriations have totaled $2.3 billion since 2008 (PCE endowment, RE fund, AHFC programs, etc)

- Rep Bryce Edgmon Legislative Update Feb 8th, 2013

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Alaska's Energy Challenges

- High energy costs
- Fragmented electric grid
- Harsh climate
- End of supply lines
- Stranded resources
- Dispersed population

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Role of ACEP and the University of Alaska

- Developing Information for Decision Makers
  - Technology testing and optimization (industry)
  - Energy analysis (policy makers)
- Preparing students to work in energy-related disciplines
- Commercializing energy innovation

Partnerships for Energy Solutions

- Geophysical Institute
- Institute for Social and Economic Research
- Institute of Northern Engineering
- Petroleum Development Laboratory
- School of Natural Resources and Agricultural Sciences
- Institute of Arctic Biology
- UAA School of Engineering
- International Arctic Research Center
- Resilience and Adaptation Program
- Cooperation Extension Services
- Rural Campuses
- Geographic Information Network for Alaska
- Marsh Creek
- Golden Valley Electric Ass.
- Shell
- Siemens Building Technologies
- Ocean Renewable Power Company
- Kodiak Electric Ass.
- Bering Straits Native Corporation
- ABS, Alaskan
- ExxonMobile
- GraphiteOne
- WH Pacific
- BP
- Usibelli
- ABB
- Boeing

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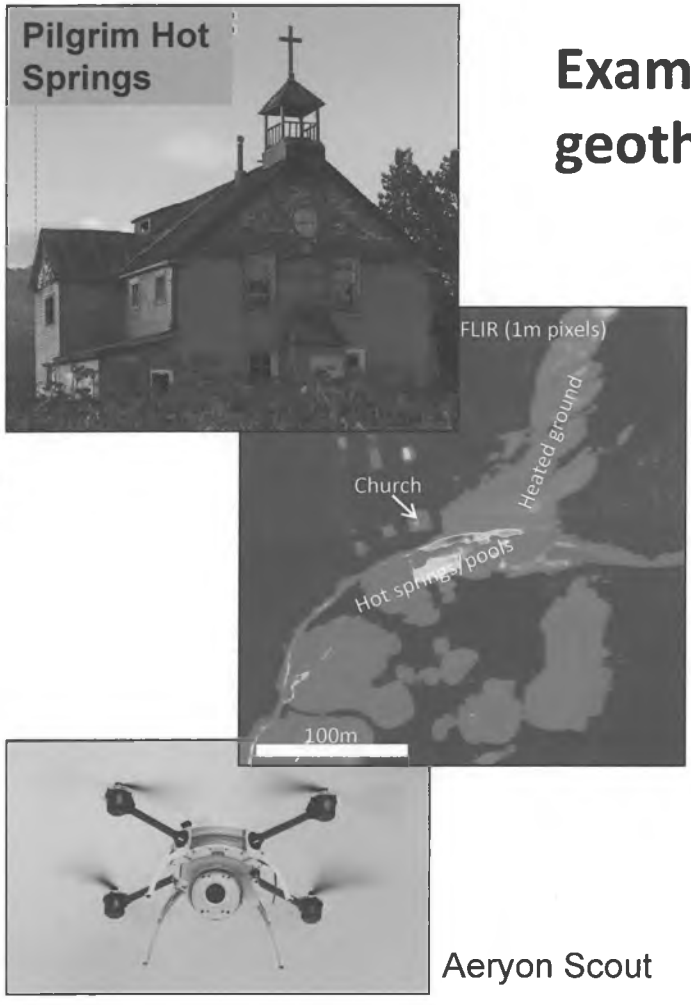


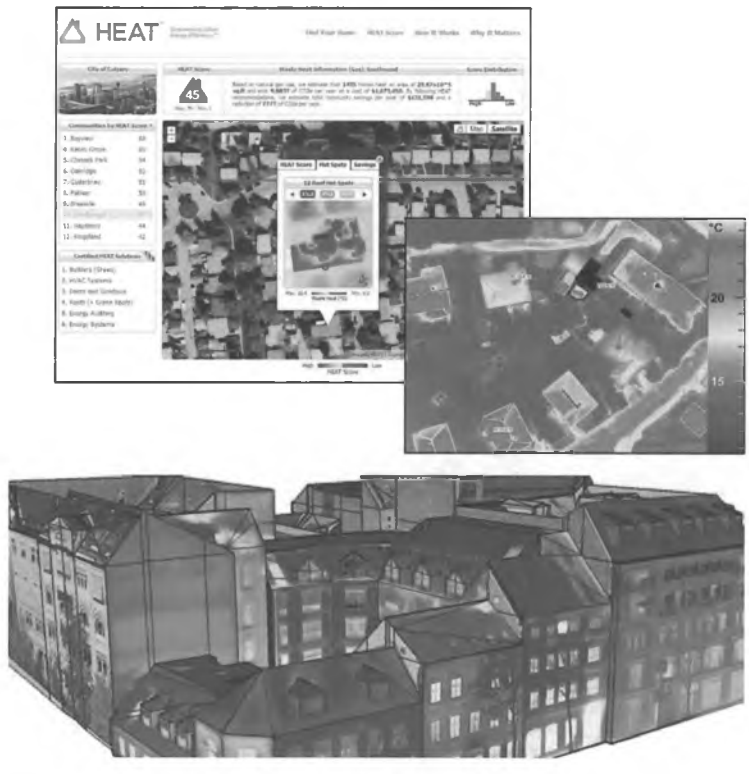
Aeryon Scout

Example: UAV for geothermal exploration

- Optical and FLIR cameras
- Potential for rapid, low-cost mapping and quantitative assessment
- Field trial at Pilgrim during 2013
- Complementary to airborne and satellite investigations

Airborne/UAV FLIR for targeting residential energy efficiency measures

- FLIR surveys to map building heat loss
- Rationale: poorly insulated homes will have hotter roofs or hot spots
- Calgary 'Heat' project
- UAV's offer potential for 3d FLIR mapping of buildings



Energy research as an engine for economic development

Community Energy Solutions

Powering the Economy

The EnergyField of the Future

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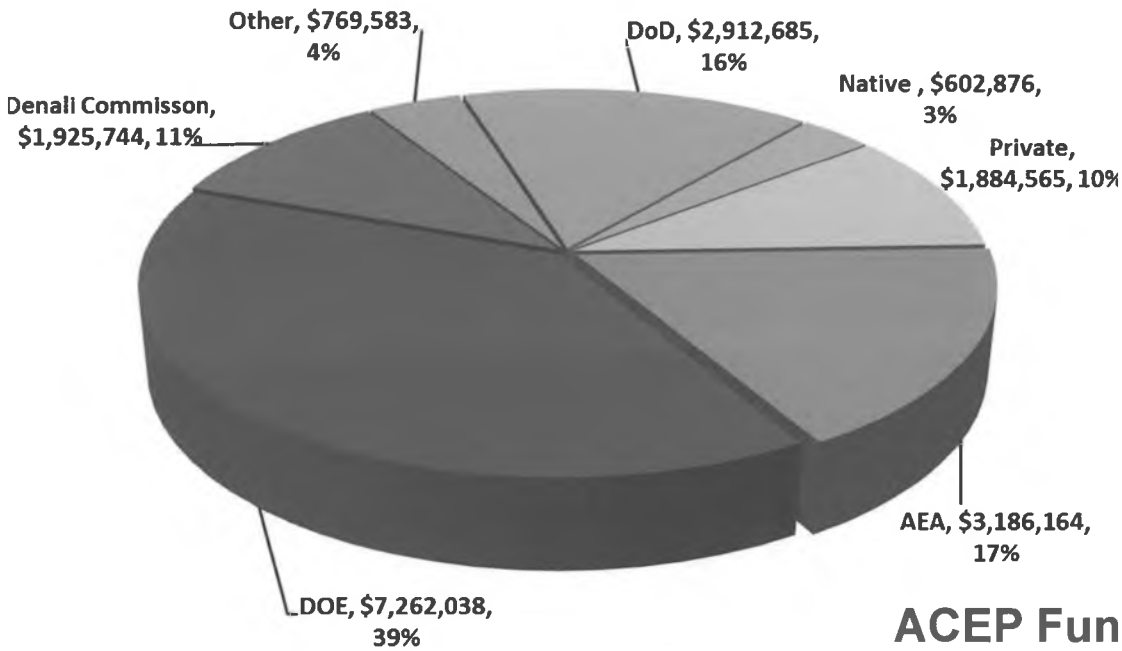
Economic benefits of Energy Research at UAF



ACEP Funding

$18M in 20 active projects

$12 in external grants and contracts for every $1 in state base funding

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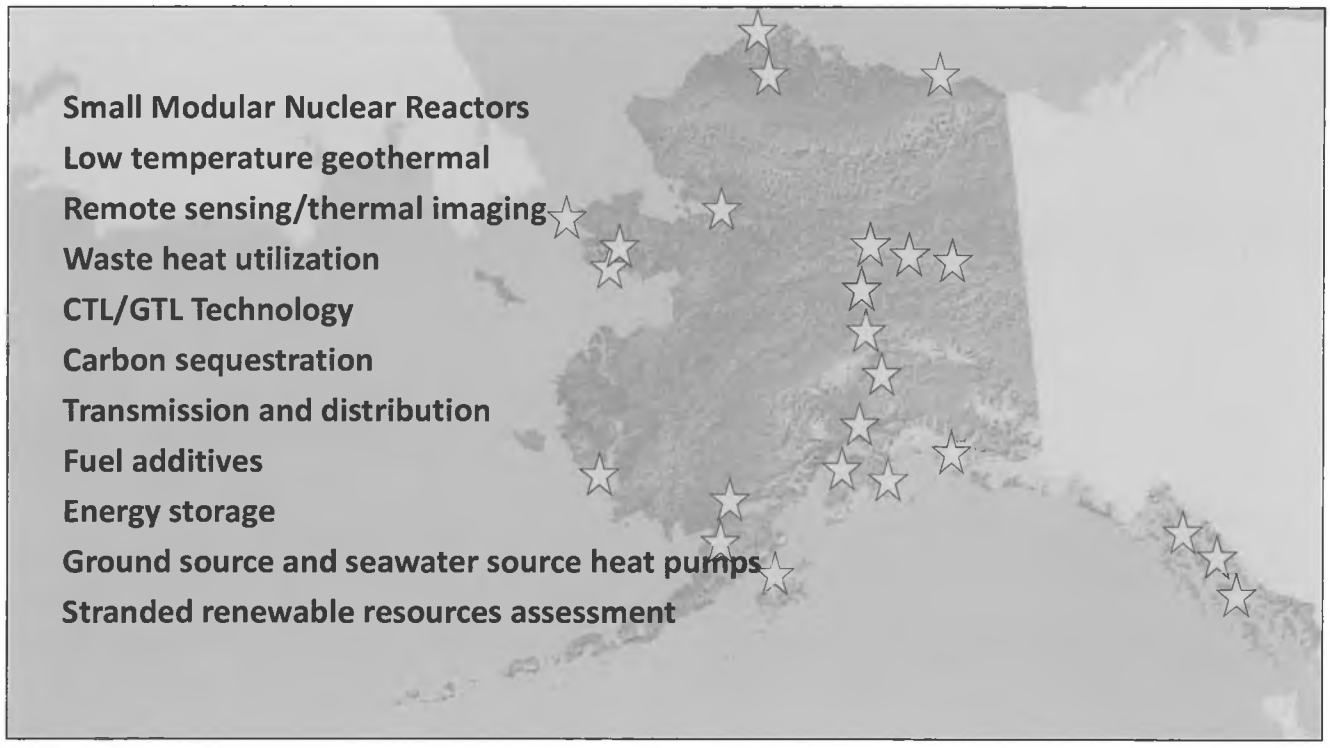
ACEP Projects are Statewide



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Supporting Statewide Economic Development: *Alaska's comparative advantages*

- High contribution renewables
- Niche technologies (low temp geothermal, hydrokinetics)
- Difficult to extract/transport fossil fuels
- Value added processing – exporting energy through means other than pipelines and transmission lines (example - energy intensive industries)

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Alaska is a pioneer in 'island' energy systems

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High contribution renewables

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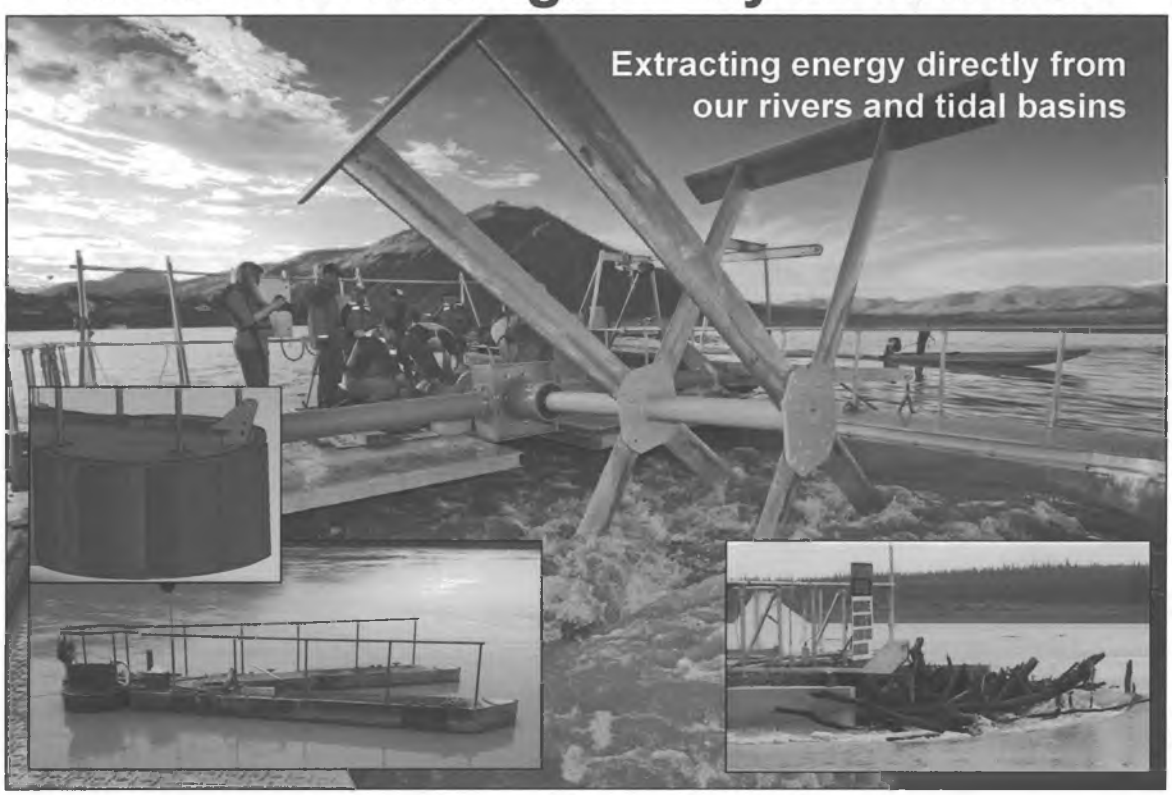
Niche Technologies - hydrokinetics



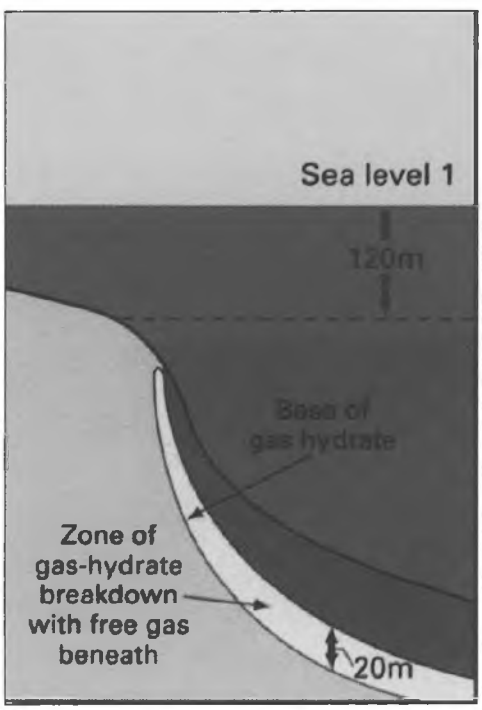
Niche technology: Low-temp Geothermal

Electratherm testing at UAF

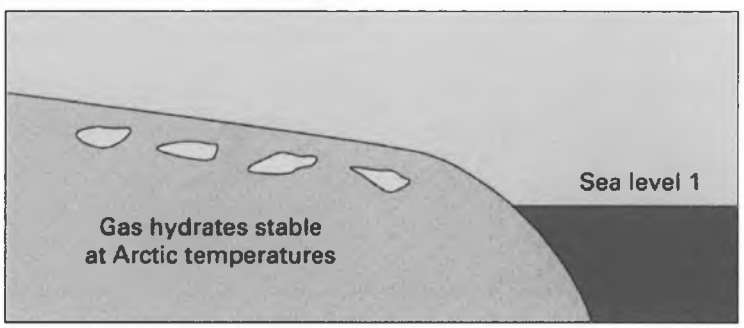
Chena Geothermal Project – lowest temperature commercial geothermal system in the world

First Organic Rankine Cycle power plant using geothermal energy *in the world* operated at **Manley Hot Springs** in 1980

Difficult to extract fossil fuels: On-Shore Methane Hydrates



Energy content in methane hydrate resources worldwide dwarfs conventional oil and gas resources



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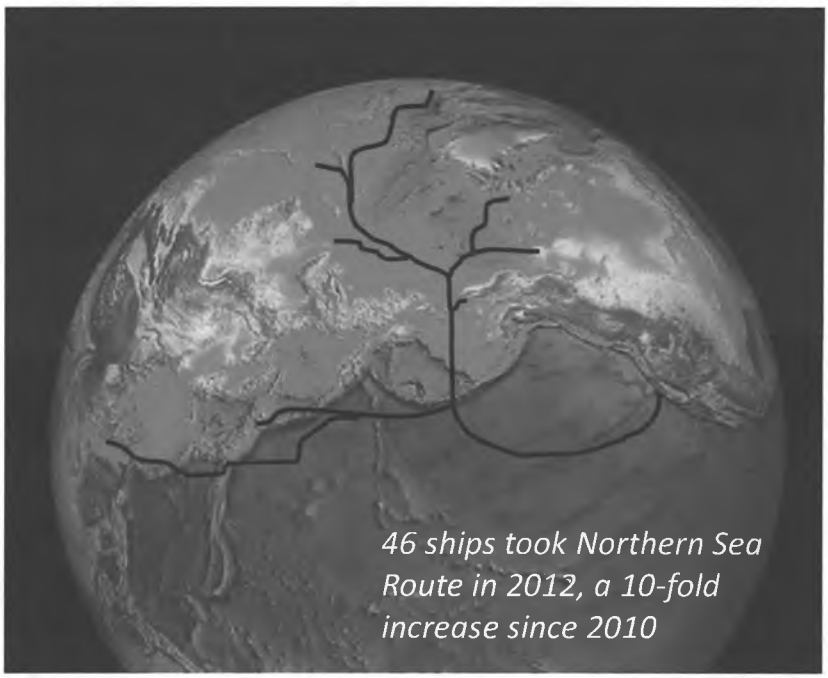
Energy Intensive Industries



Alaska is already situated in close proximity to Asian markets

New markets and shipping routes may open in a seasonally ice-free arctic

Many new mineral discoveries expected to be made in the Arctic

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Alaska as a leader in energy technologies

- Coil drilling technique pioneered in Alaska
- Thermosiphons for extracting heat to maintain pipeline and building foundations in permafrost-rich soil
- Largest battery system in the world in Fairbanks
- Low temperature geothermal (niche renewables)
- Leader in high contribution renewables

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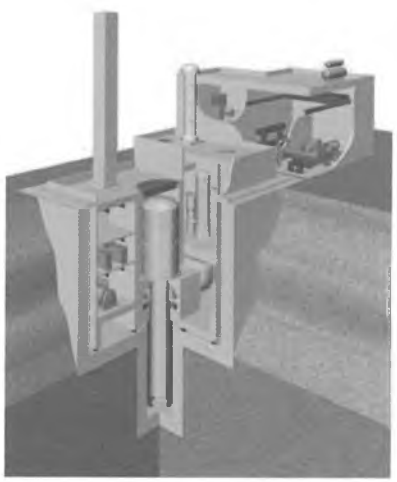
How can the University support the legislative process?

- Assessing technology options
- Data collection and analysis
- Energy analysis to support policy decisions and appropriations
- Scenarios planning as a long-term planning tool



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www.uaf.edu/acep

I skate to where the puck is going to be, not where it has been

- Wayne Gretzky

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ENERGY SOLUTIONS FOR ALASKA

Capital research and development to build and sustain Alaska's economic growth

Partnership to develop statewide energy solutions: Energy technology testing and development, energy analysis and comprehensive fossil fuel research

FY14 capital budget request: $5.5 million (general fund), $3 million (non-general fund)

Total: $8.5 million

There is an energy crisis in Alaska. What are we doing to assist Alaskans to make smart decisions about their current and future energy portfolios? How can we move the state forward by meeting the demand for practical energy solutions to lower the cost of energy, maximize use of our resources, and develop economic opportunities for our residents and industries? How do we know what is practical, what is not, what has been learned and what still needs to be done?

UAF researchers work with a wide range of stakeholders, serving as neutral information brokers capable of impartially assessing a wide range of potential energy options. As pioneers in multidisciplinary energy research, UAF can provide Alaska's community leaders, industries, businesses and residents with a trusted source of analysis, research and technology development. This request significantly expands UAF's capabilities in energy technology testing and analysis, by leveraging resources throughout the University of Alaska system as well as an established national and international research network.

Critical research areas:

- Energy technology testing and development
- Energy analysis
- Integrated fossil fuels program

"ACEP plays a critical role in the state's energy industry, assessing and validating technology for Alaskans and serving as a laboratory where emerging solutions can be researched, improved, and matured for deployment."

— Ethan Schutt, senior vice president land and energy, CIRI

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Funding will expand capabilities for

- Energy technology testing specific to Alaska conditions.
- Addressing barriers to deployment of emerging energy technologies.
- Leveraging existing externally funded programs for fossil-based and renewable energy research, including continued exploration of nuclear generators and advanced energy storage for rural applications.
- Formation of an Energy Analysis Group, drawing on expertise across the university to address timely topics such as getting Alaska's natural gas to market, enhancing oil production, developing stranded energy resources and leveraging emerging security and economic development opportunities to reduce energy costs for Alaskans.
- Fossil fuel research to integrate capacity across the university (e.g., geology, natural resource economics, petroleum engineering, public policy and water research) to allow the university to more effectively address the pressing issues facing the state today.

Learn more

Alaska Center for Energy and Power: www.uaf.edu/acep/

"ACEP was great to work with and made every effort to include the local knowledge gleaned from our people's thousand years of dwelling in the area while providing timely and usable scientific input back to Mary's Igloo Native Corporation so we could make informed modern decisions for our community, shareholders and future generations."

— Dora Hughes, Mary's Igloo Native Corporation

"UAF has identified energy as a key research growth priority. ACEP is leading this charge, serving as a gateway to energy research throughout the system and focusing on areas that most directly meet the immediate needs of the state and its critical industries."

— UAF Chancellor Brian Rogers

Naturally Inspiring.

For more information: 907-474-5922 | www.uaf.edu/alumni/legislative/ | www.uaf.edu/omb/

Header UAF photo by Todd Paris. Bladea photo courtesy of ACEP. | Produced by UAF Marketing & Communications 02/2013

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ACEP's Energy Technology Testing Facilities

provide a unique opportunity to test equipment and new software in a controlled integrated grid system to lower costs to industry and reduce risk to villages and remote locations.

Designed for maximum flexibility, this system is capable of testing a wide range of islanded microgrid and distributed generation scenarios, as well as the performance of individual components. Examples include next generation utility energy storage such as innovative battery systems and flywheel technology, diesel off operation, power electronics development and testing, and model verification.

PERMANENT COMPONENTS

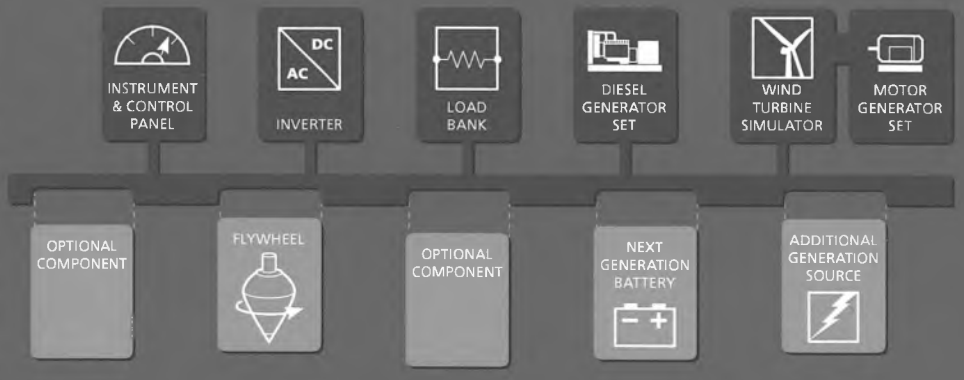
- 100kW wind turbine simulator (3-phase 480 VAC 60 Hz input motor coupled to a 3-phase 480 VAC 60 Hz output induction generator)
- Grid-forming Energy Storage Power Converter (200 kVA 480 VAC 60 Hz)
- MatLab/Simulink model of diesel generator, inverter, battery and primary loads
- Ability to connect with Diesel Engine Testbed to test various arrangements of distribution grid models and interoperability scenarios
- Programmable load bank to simulate actual village or industrial loads (250 kW)
- Lead acid battery bank (336 VDC, 1000 Ah)
- Hybrid system supervisory controller and high resolution data acquisition capabilities

PRIMARY DIESEL GENERATOR

320 kW, electronically controlled Caterpillar Diesel gen-set coupled to a 250 kW/480 VAC programmable load bank that simulates a community load.

IN-HOUSE EMISSIONS ANALYSIS

CO, O_2, NO_x, and SO_2 with planned particulate monitoring equipment.



Alaska Hydrokinetic Energy Research Center

To facilitate development of a hydrokinetic power industry in Alaska, ACEP established the Alaska Hydrokinetic Energy Research Center in Nenana, Alaska, to test hydrokinetic power-generating devices and technology under realistic Alaskan river conditions.

Researchers use the test site to define ways hydrokinetic turbines and aspects of the river interact, including fish, debris, sediment transport and icing. Information collected from these studies will be used by hydrokinetic developers to improve their designs, and by Alaska's permitting agencies to inform their decision making process.

HYDROKINETIC TEST SITE FEATURES

- Permitted location for testing hydrokinetic devices
- Equipment, instruments and experienced engineers to conduct or support testing projects and interpretation of test results.
- An anchoring point installed in the river channel for mooring devices and technology undergoing testing.
- Detailed characterization of river bathymetry, current flow (including power density and turbulence), fish population, bed-load and suspended sediment transport, and riverbed conditions.

SITE SUPPORT SERVICES

Nenana is served by major rail and highway infrastructure and offers a variety of technical services to deploy, recover, and modify or repair devices under test (e.g., welding, tugs, barges, and a dock-operated crane). Major industrial services and an international airport are available in Fairbanks, 60 miles north of Nenana.

From top: UAF photo by Todd Paris; illustration by Roger Hall

DAILY RATES

ETL Rate (per day)*	$4,714
AHERC Rate (per day)**	$5,214

* Rate applies to both pretest setup and test days.
** On-shore mobilization & de-mobilization rate is 50% of daily rate. Daily rate begins when test unit is first deployed. On days when fish researchers are not required, a 35% discount will be applied to the daily rate.

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