

Arctic Remote Energy Networks Academy (ARENA) Project Proposal Template

2016

Sustainable Development Working Group (SDWG)

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Project Proposal Template



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SDWG PROJECT PROPOSAL TEMPLATE

<p>Project Title: Arctic Remote Energy Networks Academy (ARENA)</p>	<p>Lead Country/Project leader(s): Gwen Holdmann, Alaska Center for Energy and Power Sydney Kaufman, U.S. Department of State POC: Government of Canada Grant Sullivan or other POC: GCI Additional leaders from Arctic Council member States and Permanent Participants</p>
<p>Total Cost of Project: Cost estimate for 14 week pilot project is \$597k</p>	<p>Relationship to other AC Working Groups: ACAP goals also considered.</p>

Objective of Project:

The Arctic Remote Energy Networks Academy project addresses the need for the development of community energy experts to ensure affordable, reliable, renewable source energy solutions for Arctic communities. Its approach integrates web-based seminars with classroom learning and field exposure, and draws from best practices established through the experience of the people living and the organizations operating in the Arctic. Participants will bring back to their home countries knowledge, skills, tools, and a network of collaborators that will facilitate integrating clean energy technologies in their communities and improving management of fossil fuel resources used for power production and heating. A pilot program for this work is planned for the summer of 2016. The project aligns with the Arctic Council Sustainable Development Working Group's goals of advancing sustainable development and building capacity in the Arctic, with a focus of its major activity area on energy and community, including facilitating practical community-based actions.

Rationale for the Project:

As highlighted in the Iqaluit Declaration, the Council recognizes the importance of Arctic communities' access to clean, affordable, and renewable energy alternatives. Further, the Ministers have decided to facilitate initiatives to promote circumpolar collaboration on renewable energy and energy efficiency. This project aims to provide training on the development, operation, and management of remote energy networks incorporating



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renewable resources and associated technologies, and also aligns with the U.S. Chairmanship objective of improving economic and living conditions for Arctic communities.

Background:

Throughout the Arctic, there are many examples of human resourcefulness and creativity in developing and adapting technology to the challenging environment and remoteness of the region. Maximizing the use of locally available renewable resources to provide heat and power is a priority across the region. This is demonstrated by the fact that the region as a whole generates approximately 46% of its electric power from renewable resources – more than double the global average and the highest of any region in the world. Nonetheless, there are disparities in where and how renewable resources have been developed. For remote communities not connected by transmission or pipeline to a larger regional or national network, taking advantage of local renewable resources poses a unique set of technical challenges. Energy for heat and power must either be imported as liquid fuel at high cost, or accessed using renewable resources that must be employed in close physical and temporal proximity to its origin. Effective integration of these resources, achieving the highest locally attainable balance of energy security, environmental health, and economic viability is a challenging problem.

Approximately half of the population of the Arctic, as well as many remote industrial operations, are served by these types of remote energy networks - most of which are reliant on diesel fuel. As a result, one of the largest concentrations of expertise in energy systems to support remote energy networks resides in the Arctic, and each nation has developed unique and often complementary technologies and expertise related to designing, constructing, and operating these types of energy networks.

Activities and Outputs:

In collaboration with researchers and subject matter experts from across the Arctic, the Alaska Center for Energy and Power (ACEP) proposes to host a pilot summer program in 2016, to provide training on the development, operation, and management of remote energy networks (microgrids) incorporating renewable resources and associated technologies (e.g., energy storage systems). This training will integrate both theoretical and practical elements and is divided into three sessions:

- 1) A broadly accessible webinar series beginning April and advertised through existing networks such as the University of the Arctic, and leadership from the Arctic Council member States and Permanent Participants. This webinar series will include a range of topics taught by subject matter experts from across the Arctic and select Observer States with relevant expertise interested in participating as instructors. With partnering institutions, we plan to explore onsite classroom settings with a lead facilitator to allow group participation and facilitate



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a local dialogue in conjunction with the seminar. Through this mechanism, we hope to reach 1000+ participants and create a pan-Arctic dialogue about renewable energy development.

- 2) Through a rigorous application process., a selected group of approximately 20 fellows will come to Alaska for 3 weeks to engage in a more in-depth education and knowledge exchange among a peer group. Arctic State and Permanent Participant will have an opportunity to nominate candidates., with a designated selection committee comprised of subject matter experts from around the Arctic making final decisions based on criteria that will include the candidates' current knowledge and skill set, their potential to guide or shape future development in their home communities or region, and geographic and cultural diversity. There may be an opportunity for the Observer State representatives to also nominate candidates from Arctic communities. Selected participants will receive full fellowships to support their studies, including travel and in-state costs. In addition to classroom and laboratory work, the fellows will travel across Alaska to visit a number of operating projects to provide opportunities for hands-on learning and interaction with practitioners. Each fellow will bring with them a local case study to provide relevance to their training and serve as the basis for an individual or group capstone project. Fellows will select one of the two emphasis tracks provided within the onsite program (*Remote Energy System Project Management and Remote Energy System Technology, Design, and Operation*).
- 3) Fellows may also elect to participate in an optional 1-3 week internship with an Alaska utility company or business, dependent on their interests and needs.

Anticipated Outcomes:

1. Creating avenues for sharing knowledge between practitioners in the Arctic region to foster and increase the region's global leadership in integrating renewable energy in remote energy networks.
2. Establishing and strengthening community and organizational relationships for knowledge sharing and collaboration.
3. Expand the *Arctic Adaptation Exchange Portal* developed in partnership with University of Alaska/Fairbanks during the Canadian Chairmanship to include an online resource drawing from lectures, field trips, and student projects, providing broad pan-Arctic access to the information shared and facilitating its adaptation / extension via the SDWG to multiple local scenarios.
4. Development of action plans for highly place-relevant capstone projects that can be implemented by students and their host organizations / countries.

Deliverable:



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By the end of the 10th Arctic Council Ministerial meeting that will conclude U.S.'s Arctic Council Chairmanship (2015-17), the proposed program will have delivered:

- Synthesis report outlining curriculum, lessons learned, and a framework template for future clean energy training programs through the Sustainable Development Working Group (potentially to be hosted by Chair country).
- Archive of training webinars available to the general public to multiply the benefits of the program.

Integration of Traditional and Local Knowledge:

Sharing Traditional and Local Knowledge (TLK) throughout rural Arctic communities is key for the success of this project. For example, awareness of local environmental conditions, historical trends, land and resource use priorities are critically important for developing relevant and acceptable solutions. To maximize the probability of incorporating these insights, space will be reserved within the student selection committee, instruction team, and student class specifically for representation of the Permanent Participant members. This will ensure that the program brings together TLK from a wide array of Arctic communities to facilitate appropriate integration of clean energy technologies throughout the region.

Relationship with other Arctic Council Working Groups:

The project is strongly aligned with the priorities and recent activities of the Arctic Council and would build on previous Council work related to the Arctic adaptation exchange portal, renewable energy, black carbon, and broader climate change discussions by creating a class of clean energy champions who can promote energy projects from within communities across the Arctic.

The overarching effort will also promote the goals of addressing the impacts of climate change and contribute to the goals of the Arctic Contaminants Action Program (ACAP) by reducing black carbon emissions the result from diesel consumption for electricity and home heating in rural Arctic communities.

Timetable and Project Completion:

- Summer 2015: Formulate partnerships and identify stakeholder needs and assets
- November, 2015: Secure funding, formalize partnerships with subject matter experts and select program staff, circulate preliminary information about opportunity.
- December 2015: Finalize curriculum, establish logistic and administrative support, issue request for applicants
- January 2016: Finalize leads for initiative under the Arctic Council
- February 2016: Review / select applicants, assign mentors, publish course materials
- April-June, 2016: Conduct webinar series



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- July 2016: Fellows arrive in Fairbanks and participate in onsite program
- Fall 2016: Review program, document lessons learned, follow-up with participants
- Winter 2017: Draft a Synthesis Report for submission to SDWG

The goal of this pilot program is to launch a continuing effort that can be revisited annually to foster capacity building in fellows throughout the Arctic and the greater global community. Future training courses could place greater emphasis on other topics of importance to the region (e.g., energy efficiency, waste heat recovery).

Similar to other training programs, a tuition fee can be used in the future to cover the costs of education. This fee may be covered by industry partners or government entities that see value in having trained individuals in the communities where they plan to deploy projects. Many of these funding sources are looking for proven concepts, which the SDWG pilot project would provide.

APPENDICES:

Appendix 1: ARENA 2016 Pilot Program Budget Outline

Appendix 2: Work Plan for Program Design Effort

Appendix 3: Draft Curriculum Topic Overview for Webinar Series and Onsite Program



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APPENDIX 1: ARENA 2016 PILOT PROGRAM BUDGET OUTLINE

ARENA Pilot Project Budget \$597K and Status (2 November 2015)

Includes: program design, syllabus development, webinar production and distribution, onsite program logistics, travel and accommodation expenses, program literature, and program management.

In-hand funding and in-kind resources:

- \$130K (Canada – for program design)
- \$117K (University of Alaska)

Needed: \$350K



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APPENDIX 2: WORK PLAN FOR PROGRAM DESIGN

Timeline: November 1st, 2015 – March 30th, 2016

Task Budget \$130k

In order for this program to be successfully implemented and draw from expertise across the arctic, support staff will be required. The primary goals for this task include:

Task 1 Engagement with Arctic Council member States and Permanent Participants.

Identify co-leads from among the Arctic Council member States and Permanent Participants for this initiative and seek their input in program design and desired outcomes. We will also seek nominations of candidates from the Arctic Council member States and Permanent Participants for the fellowship program.

Task 2 Broader Stakeholder Engagement.

Formulate partnerships and identify stakeholder needs and assets by reaching out to the broader community of stakeholders and potential contributing organizations, including Observer. The goal is to achieve the broadest possible engagement in order to assure a successful outcome, and foster long-term support for ARENA beyond implementation of this pilot program.

Task 3 Curricula Development.

Curricula will be developed with input from a curricula committee comprised of designated subject matter experts from each Arctic country with an interest in this area. This committee will also recommend instructors and seminar leads, and ultimately serve as the review and selection committee for participating fellows.

Task 4 Collateral Material Development and Advertising.

Develop materials and a basic website describing ARENA and the fellowship opportunity, create an application package, and materials to disseminate in support of the program. The program will be advertised by leaders within the Arctic Council member States and Permanent Participants and through existing networks such as the University of the Arctic.

Task 5 Finalize Logistics for Webinar Series and Onsite Fellowship Program.

Manage logistics for implementing the pilot program, including final program design and scheduling participants who will help teach within the developed framework, either during the webinar series or the in-person fellowship. A substantial amount of logistics will need to be managed for all participants, including visas, housing, travel, etc.

Timeline and Deliverables



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	Months to complete	Expected date of completion	Deliverable
Task 1 <i>Engagement with Arctic Council member States and Permanent Participants</i>	3 months	January 31, 2016	Create final ARENA project description for January meeting of SDWG (if not before)
Task 2 <i>Broader Stakeholder Engagement</i>	2 months	December 15, 2015	List of key stakeholders and possible participants from across the Arctic
Task 3 <i>Curricula Development</i>	5 months	Outline developed by December 31, 2015; finalized with input from stakeholders March 31, 2016	Written ARENA curriculum
Task 4 <i>Collateral Material Development and Advertising</i>	2+ months	December 31, 2015 application open; support materials developed in spring	Application package and informational material developed
Task 5 <i>Finalize Logistics for Webinar Series and Onsite Fellowship Program</i>	5 months	March 31, 2016	Logistics plan for program and itinerary for participants



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APPENDIX 3: DRAFT CURRICULUM TOPIC OVERVIEW

Webinar Lecture Series (PRELIMINARY)

The webinars will build a common framework and foundation for participants selected as fellows for the onsite program, but will also appeal to a broader, more diverse audience. They are intended to establish a shared set of expectations with regard to renewable energy development for remote grids, and will serve as a compendium of considerations for renewable energy integration for remote microgrids. Topics under consideration include:

- Introduction to Remote Microgrids and Energy Efficiency / Conservation
- Remote Energy Networks in the Arctic
- Utility Management and Perspectives
- Community Perspectives and Best Practices in Project Development
- Renewable Resources in the Arctic – Resource Assessment and Economics of Firm Renewables Including Hydropower and Geothermal
- Renewable Resources in the Arctic – Biomass Energy
- Renewable Resources in the Arctic – Resource Assessment, Economics, and Realities of Solar Energy
- Renewable Resources in the Arctic – Wind Energy
- The Role of Subsidies and Policies in Incentivizing or Dis-incentivizing Renewable Energy Development
- Preliminary Design and Economics of Remote Arctic Energy Systems
- Strategies for Low and Medium-Contribution Renewable Energy
- Strategies for Achieving High-Contribution Renewable Energy
- The Role of Energy Storage
- Integrated Energy Perspectives – Heating Requirements, Distribution Options and Grid Integration Perspectives
- Emerging Technologies – Non-Commercial but Potentially Game-Changing

For continuity and integration purposes, there will be an overall ‘host’ for the entire series. The host will introduce topics and speakers each week, and will share questions with the speakers based on email (or similar) inquiries submitted by participants related to the published topic and content abstract. Each webinar will include at least one topic-specific case study or alternative perspectives from a location other than that of the main lecturer. A single subject matter expert will be the main ‘lecturer’ for each webinar.



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These individuals will be chosen from throughout the Arctic region, but subject matter experts from outside the region can be involved to share complementary knowledge and experience.

Webinars will be pre-recorded, to allow for the creation of computer-generated graphics and illustrations highlighting projects from across the Arctic, and to accommodate the variations in time zone for viewers. Opportunities for participant interaction will be provided via meeting spaces where groups can gather to view and discuss the content together, threaded discussion streams, and pre-arranged call-in sessions for live interaction with presenters and other participants. Supporting textual material will be downloadable.

Onsite Program (PRELIMINARY)

The Onsite Program will be conducted as a three-week residential program hosted at the University of Alaska site in Fairbanks. Approximately 20 ARENA Fellows from across the Arctic will participate in a series of informational and experiential learning activities, selecting the emphasis track that is best aligned with their interests, expertise, and responsibilities.

As a means of facilitating practical application of the items learned, Fellows will complete "capstone" projects they have defined during the application process. Each Fellow will have a mentor with whom they interact throughout the onsite program.

A Certificate will be presented to those completing the Onsite Program. Arrangements can be made to accrue Continuing Education Units (CEUs), subject to a nominal fee for administrative expenses.

All Onsite Program participants will comply with UAF policies.



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Track 1: Remote Energy System Project Management

Week 1 Topics:

- Plenary Session: Introduction to ARENA Onsite Program
- Lab Safety Training / Local Energy Sites Tour
- Remote Energy System Project Management
- Energy System Project Economics
- Energy Assessment
- Energy Policy Case Studies

Week 2 Topics:

- Field Trip to Alaska Energy Authority and Native Corporation(s) in Anchorage
- Field Trips to Alaska Remote Energy Network Site(s)

Week 3 Topics:

- Energy Project Plan: Design Stage (Interactive Project Example)
- Energy Project Plan: Construction Stage (Interactive Project Example)
- Energy Project Plan: Post-Construction Stage (Interactive Project Example)
- Field Trip to Denali Park and Nenana Hydrokinetics Test Site
- Round-Table Discussions & Program Closeout

Track 2: Remote Energy System Technology, Design, and Operation

Week 1 Topics:

- Plenary Session: Introduction to ARENA Onsite Program
- Lab Safety Training / Local Energy Sites Tour
- Introduction to Power Systems Integration (PSI) Lab
- Renewables: Integration of Variable Energy Resources
- Energy Storage, System Stability, and Protection
- Power Electronics

Week 2 Topics:

- Field Trip to Alaska Energy Authority and Native Corporation(s) in Anchorage
- Field Trips to Alaska Rural Village(s) and Energy Systems

Week 3 Topics:

- Control Systems: Programming and Tuning
- Load Management: System Stability and Grid Frequency Control
- Hybrid System Operation and Data Collection: PSI Lab Demo of Scenarios
- Field Trip to Denali Park and Nenana Hydrokinetics Test Site
- Round-Table Discussions: Takeaways