

2015 ARCTIC ENERGY SUMMIT



Executive Summary

Security and Affordability for a Resilient North

A Designated Project of the Arctic Council's SDWG

ArcticEnergySummit.com



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INSTITUTE OF THE NORTH AND THE ARCTIC ENERGY SUMMIT

The Institute of the North was founded 22 years ago by former Alaska Governor and U.S. Secretary of the Interior Walter J. Hickel to promote the reality, richness and responsibility of the North. Governor Hickel was a proponent of an approach to the Arctic that recognized it as a Commons, with public ownership of much of the land and resources. He believed that as such, governments had a responsibility to manage those resources consistent with the public interest, thus improving economic and living conditions of the peoples of the North.

The biennial Arctic Energy Summit, which is an endorsed project of the Sustainable Development Working Group (SDWG) of the Arctic Council, regards energy resources as a fundamental building block for communities. The outcomes from the Arctic Energy Summit include the identification of best practices, research questions, and potential projects that will advance the application of emerging energy technologies; improve existing energy systems; and foster greater benefits to northern peoples while minimizing environmental, social, cultural, and economic risk.

By convening the Arctic Energy Summit on behalf of the Arctic Council SDWG, the Institute of the North hopes that participants, policy makers and all northerners can better understand existing tools to deliver success in responsible development of renewable and non-renewable energy resources. This year's Summit drew 400 participants from 14 nations - a high-level and diverse mix of subject matter experts, community leaders, government officials, and private sector executives. A rewarding conversation took place that resulted in practical ideas, which were presented to the Arctic Council SDWG. Attendees came away from the Summit with stronger relationships with colleagues in the Arctic region and a greater understanding of the complexity of the issues; the nexus between renewable and non-renewable energy resource development; and community heat, power, and efficiency. We look forward to building upon this dialogue at the 2017 Arctic Energy Summit in Finland.

INSTITUTE OF THE NORTH



Watch videos from the Arctic Energy Summit at <https://vimeo.com/user6064884/videos>





SUMMIT PRINCIPLES

The Arctic Energy Summit focuses on the following principles in its dialogue:

A REGIONAL APPROACH TO ENERGY

- When describing the Arctic, expressions such as “The Last Frontier” or “High North” are often used to describe what many consider a remote and distant region, with an implication of conquering, taking, and leaving. A regional and comprehensive approach, in contrast, demands investment, development, empowerment and taking ownership – on behalf of and with the peoples of the North. Extractive energy resource development typically is related to the creation of wealth for governments, communities, and the private sector. Renewable energy resources are different in that often they are deployed for domestic power and heat. The development of the Arctic must therefore balance the application of energy resources with the external and internal needs of the communities of the north – with the goal of using Arctic energy resources for the benefit of all northern residents.

SUSTAINABLE DEVELOPMENT

- Energy is a fundamental component of sustainable development and is a crucial element of both human development and economic activity, balanced with protection of the environment and respect for traditional ways of living. The Arctic is abundant in energy resources – from oil and gas to wind, solar, hydrokinetic and geothermal – yet residents of the Arctic pay some of the highest energy prices in the world. To take advantage of great energy and resource wealth potential, policy makers, community leaders, academia, and the private sector must work together to develop resources prudently, facilitate access to affordable energy, and develop policies balancing risk mitigation, cultural integrity, and economic opportunity.

RICHNESS, RESILIENCE AND RESPONSIBILITY

- Responsible development and utilization of Arctic energy resources have great potential to spur community and economic resilience. But **richness** includes many types of wealth – energy and resources, ecological, social systems, and cultures. Because of this, and in an effort to achieve balance and security, it is worth highlighting that richness has scales and a direct relationship to responsibility. **Responsibility** is of fundamental concern because of the increase in interest and activity in the Arctic that affects the people of the north, especially indigenous peoples, which means rights-holder interests must be protected and respected. The Arctic Energy Summit acknowledges that there will always be an element of risk in resource development, thus Arctic nations must be committed to responsibility, benefits to communities, and mitigation of acceptable risk. Approaching Arctic energy by recognizing richness and committing to responsibility results in a more **resilient** region. Resilience can be defined as the capacity of a social-ecological system to cope with disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning and transformation. Energy is a foundational element of this system.



EXECUTIVE SUMMARY

Development in the Arctic should encompass and respond to the needs of local peoples, communities, and economies; as well as the global implications of activity in the region. Human security in the Arctic depends on numerous factors, many of which – infrastructure, healthcare, education, and economic opportunity – are impacted by resource development. Careful consideration needs to be taken by regulators and companies before development occurs. However, there should also be a focus on maximizing the potential benefits while eliminating risks to local communities, some of which might be traditional or subsistence-based economies.

Diversification in power generation systems is needed, but developments in diesel and end user technology is far more important to rural communities in the short term than developing alternative generation sources. A wide array of energy production, storage, and transfer technology is under development. This technology seeks to improve the present infrastructure by increasing capacity, production, and inter-modal design. This development would allow for a wide variety of sources to be used in the generation of power, increasing its ability to be used in different environments. All systems are unique to remote communities, which makes it challenging to know how to best stabilize a system while integrating new systems.

The following are highlights from presentations and brainstorming activities, for Arctic nations and the Arctic Council to consider:

OVERALL BEST PRACTICES

- Support the development of community-to-community networks, as well as increasing multi-agency and multi-national exchange
- Energy plans should have vision and be strategic, using a holistic approach that encourages collaboration between the private and public sectors, community, and academic subject matter experts around energy issues
- Maintain consistent policy incentives tailored to promote private investment
- Solicit community input early in the decision-making process and throughout all levels of planning
- Establish a clear system of metrics for making investment decisions, consistent with the public interest
- Use traditional knowledge to complement western science; and demand that scientists share their results with the residents and communities research is conducted in
- Consider effective communication strategies, such as understanding and using local languages
- Designate and train a community or regional energy planner
- Develop pilot projects in communities that will see immediate, local benefit
- Integrate climate change scenarios into existing management
- Establish sovereign wealth funds where possible to create inter-generational wealth and signal to outside investors that there is confidence in the country/state/region and its residents for the long-term

OVERALL RESEARCH GAPS

- How can indigenous peoples find or leverage a place in the regulatory environment/a place at the table?
- How will hybrid governance and fragmentation both challenge and provide opportunities for Arctic cooperation and decision-making?
- How best do communities benefit from resource development projects; and how do cultures change when funding from a project flows into a community?
- How are Arctic energy projects currently or potentially funded? What are and will the roles be for local, state, and federal grant/loan programs, and private capital?
- What will be the comprehensive effects of climate change on Arctic ecosystems and communities?

OVERALL POTENTIAL PROJECTS

- Conduct economic impact assessment of coastal communities and maritime economies related to the effects of increased offshore energy production
- Develop online or in-person network of community project champions to share best practices for energy efficiency and/or renewable energy implementation
- Increase access to energy education and literature by developing a best practices guide, to include community storytelling
- Identify and invest in regional “hubs of excellence” with needed expertise and infrastructure to address specialized issues, such as effective micro-grids, district or centralized heating, weatherization, etc.

On the final day of the Arctic Energy Summit, participants divided into two groups - Renewable Energy and Energy Efficiency; and Oil & Gas - to identify best practices, research gaps, and potential projects. Their findings are below:

RENEWABLE ENERGY AND ENERGY EFFICIENCY

Best Practices

- Plans should use an incremental approach and acquire baseline data before a project begins. Unplanned incrementalism is detrimental to system performance; only with a final goal in mind can incremental additions reap maximum benefit
- Address energy efficiency before larger-scale projects begin
- Instill a sense of community ownership of projects by engaging the community as co-investors
- Do not treat communities as simply testing locations for new technologies
- Emphasize proper utility management and long-term sustainable operations and maintenance. Train local residents in proper maintenance of energy systems by utilizing local vocational training centers and schools
- Diversify existing micro-grids by adding renewables
- Positioning solar arrays off from due south (i.e. southeast or southwest), may better align power production with demand due to Arctic daylight hours and exposure
- In remote communities, take into account the limited construction season and combine work with other local area construction if possible
- Develop overarching regional and local clean energy and energy efficiency policies
- Continuous monitoring and evaluation tracking performance measures
- Place wind turbines out of the sight of traditional reindeer migration areas
- Seed funding provided from government sources can be essential to gain private sector funding in the future

Research Gaps

- Valuation of clean air/carbon reduction
- Role of private sector investment replacing government support for renewable energy projects
- Understanding cultural/social vulnerabilities and resilience
- Geo-tech design tools for climate change
- Impacts of subsidies on project success
- International clean energy market assessment
- Financial capacities of Arctic communities and public and private funds available
- Changing availability of traditional food resources
- Methane flaring in the Arctic
- How wind turbines affect reindeer herds and migration patterns
- Better understanding of benefits of projects beyond the economic framework - in social, cultural and health/well-being

Potential Projects

- International Off-Grid Utility Forum to share best practices and discuss standardization
- Centralized energy case studies that are free, web-based, include best practices, design checklists, and provide models
- Long-term tax credits strategy
- Implement a 1 percent (of the overall construction budget) for renewables/efficiencies in new schools and public buildings
- Model Arctic Council as a possible youth engagement tool
- International agreements on energy efficiency indices
- Demonstration of high penetration hybrid systems (wind, solar, storage, and diesel combined) in remote micro-grids with sophisticated data capture to better understand and document performance and gaps
- Analysis of countries that have already priced carbon – effects on renewable energy and efficiency
- Map out all available renewable energy resources in the Arctic. Possible role for the International Renewable Energy Agency (IRENA) in this
- Development of well-functioning, commercial de-icing equipment for wind turbines

OIL AND GAS

Best Practices

- Community consultation and engagement: early discussions to prevent conflict, make technical information more digestible, and incorporate indigenous knowledge into project planning
- Use hybrid cooperation around the development of regulations (including multiple stakeholders like corporations, indigenous communities, local government, etc.)
- Adaptive, integrated, science-informed, and ecosystem-based approach to oil and gas regulatory systems and governance
- Incorporate climate based scenarios into planning
- Use performance-based standards

Research Gaps

- Oil spills and occupational health (real oil and water testing)
- Incident response
- Cost and benefit analysis of oil and gas development in communities
- Ice mobility
- Geoscience of Arctic basins
- How income from oil & gas lease sales by country compares to the country's income received from individual taxes
- How regulatory regimes can help improve telecommunications infrastructure and development of deep water ports

Potential Projects

- Conflict avoidance agreements
- Reciprocal mitigation projects
- Increased community based monitoring and information exchange
- Technology improvements (satellite coverage, weather and ice forecasting)
- Creation of an "Arctic Council Forum" for communication, data, training, exchange of information, and Polar Code education



THEMATIC SUMMARIES

The following paragraphs are stand-alone statements made by various participants and speakers at the 2015 Arctic Energy Summit, reflective of recurring themes. They are not direct quotes, nor peer-reviewed, but they are illustrative of several best practices and lessons learned from the Energy Summit.

EFFICIENCY AND EMERGING ENERGY TECHNOLOGY

Diesel subsidies to remote communities in Alaska and Canada are a lifeline and considered essential to service, yet through a business lens, this is a disincentive to invest in renewables, and in fact may make renewable development more challenging. In Canada alone, seventy-nine percent of 290 remote, off-grid communities use oil-based fuel as their main electricity source.

The Government of Canada is piloting smart grid equipment in remote communities to better understand demand profiles and to right-size renewable energy systems. The Arctic *can* be competitive in its solar yields, despite long winters, and the high cost of diesel electricity production makes solar PV more competitive. Solar yields from many northern systems are higher than the rated manufacturers' capacities, because of the high amounts of sun in the summer and colder winter temperatures, which reduce PV degradation. For example, The Northwest Territories in Canada deployed solar PV systems in diesel-powered communities equivalent to up to 20 percent of the average electricity load, and is investigating ways to use solar to meet up to 75 percent of the average load, as well as to implement a net metering policy that supports installation of these systems by individuals. Important to the Northwest Territories' strategy was the local coordination with federal program funding.

The high cost of diesel fuel delivery in rural Arctic communities incentivizes broader interest in more efficient energy development. Stable, even load requirements are helpful for economic analysis of hybrid diesel/ solar system use. However, the logistics of getting equipment into position in rural communities can be the largest challenge. Technologies have to be robust to withstand northern conditions.

Ontario Canada's "Reindeer Program" is a net metering/feed-in tariff program for renewable energy to compensate for the avoided costs of using diesel-powered systems. In Canada, market mechanisms are increasingly funding renewable projects rather than strictly grants. There are many loan programs at the Canadian federal and provincial levels for the capital costs of renewable programs, but not in all of in Canada. There is a need for further study of renewable performance so developers and financiers can better estimate the payback and life cycle of systems, and the private sector can better evaluate risk.

Sweden is moving toward renewable energy as a greater proportion of its energy mix relative to fossil fuels. The majority of Sweden's communities are connected to the electricity grid. However, wind power generation is largely located in the north of the country, while consumption is concentrated in the south, requiring further grid development.

Mechanical engineers can only design efficient electricity systems if they receive accurate electricity load estimates from the buildings. Arctic communities face prolonged disruptions to utility distribution due to natural disasters, resource shortages, and power outages. By reducing electricity loads and harnessing natural energies, an energy-wise building can increase "passive survivability" (how long can a building provide comfort during an emergency without power).

RISK MANAGEMENT

Operational safety related to Arctic Ocean shipping includes the implementation of the Polar Code, increased information on ice regimes, education about requirements, and fostering the sharing of best practices (human error is responsible for 75 percent of safety incidents). Internationally qualified and certified training centers are needed for equipment testing, harmonization of methodology, training of personnel, training for emergencies and oil spills, education, and communication.

For offshore oil & gas operations, there is a lack of experience and purpose built ships for Arctic offshore operations, a lack of harmonized safety assessments, a lack of sharing of the testing and methodology needed (e.g., ice model testing used), and also need for training programs (lectures, simulations, and learning in

practice). An exchange of equipment, information, best practices, data, training and methodology among Arctic and non-Arctic nations operating in the region should regularly occur.

TRADITIONAL KNOWLEDGE AND STAKEHOLDER ENGAGEMENT

Traditional knowledge is the product of past generations' failures and successes; it is imperative that outsiders begin to understand that the term itself entails a process. The process begins by becoming acquainted with local traditional knowledge holders, and at the same time getting local stakeholders to consider supporting the project you are proposing. Genuine engagement of the community will result in real exchange of information; this exchange can help operations function in a way that does not hinder local communities' livelihoods or the project. Traditional knowledge requires the re-contextualization of the western scientific outlook of discovery, with a focus instead on learning.

Development agreements on indigenous (treaty) lands do bring community benefits, as do collective agreements with unionized labor, and efforts by regional governments to minimize adverse social impacts. However, the question is whether with major projects, local communities receive enough benefits to offset downstream environmental and social costs.

There must be a community champion who can help start small with a pilot project and align it with traditional practice. The drivers for this should be a strong community desire for energy independence through ownership of a local, clean energy system. Voting can be a good measure of community engagement, but most of all it is important to have energy development align with community and cultural needs.

In the context of energy development, local sovereignty is the right to be significantly involved in decision-making and to benefit from natural resources.

Large, collaborative, multi-faceted energy projects can be taxing on rural communities. When possible, these should be done sequentially rather than simultaneously to reduce the burden on the community and stakeholders.

The term "security" is not a term used in Arctic communities. They describe it differently, using the words health, wellness, connectedness to environments and community, and economic well-being.

A case study from the Nenets people in Russia described a strong relationship between oil workers and reindeer herders, whereby they engage informally over meals, at the sauna, etc. The main message was that reindeer herders are not averse to oil and gas workers or the industry in general. There is a unique coexistence – reindeer have been able to migrate through gas installations. This adaptive capacity is not infinite, but has thus far been manageable.

CAPACITY BUILDING

In Greenland, the government cannot afford to invest in education that doesn't have a direct economic output, which can be challenging. Greenland residents don't want to be spectators to the country's resource development; this requires engagement, training, and involvement.

With a shift from fossil fuels to renewables, there will be a need for more tech-savvy and highly trained people within communities to work in operations and maintenance.

A hybrid of automated and manned energy systems is needed – this could potentially be a series of hubs for infrastructure with both human and technological capacity. Systems should be easy to operate, with redundancy of systems, and long times between potential failures. It is important to maintain expertise on how to operate and maintain energy systems in the community itself.

OIL AND GAS REGULATORY SYSTEMS

The Arctic is seeing seeds of hybrid offshore energy governance develop. Hybrid governance means that governance is decentralized, comprised of many stakeholders, includes informal arrangements and soft law, and has multiple levels.

In search and rescue governance, legally-binding instruments on search and rescue and marine oil pollution preparedness and response often result in documents which do not require states to do more than they are required to already by their government; they merely formalize means for interactions among countries during a particular event. They take into account best practices, bring in more actors and take into account indigenous communities.

A key term to recognize is “prudent development,” which encompasses a holistic goal including economic, environmental, and social development. To achieve prudent development, Arctic nations must have performance-based standards. Prescriptive standards do not allow for prudent development. Prudent development is enabled by risk management. Risk management alone, though, is not enough – the Arctic needs risk management within the arena of performance-based regulations.

The 2014 Declaration of Protection of the Environment and Biodiversity for Oil & Gas Exploration and Development on the Russian Continental Shelf has been somewhat undermined by recent economic sanctions against Russia. The agreement has been signed by multiple companies such as Rosneft, Gazprom, ExxonMobil, and Statoil, and has cooperation with NGOs like WWF.

In the National Petroleum Council’s analysis of season length and lease terms for different Arctic countries, it was noted that U.S. lease terms do not mirror exploration and development terms; this does not incentivize development. There is a need for exploration-based lease terms in U.S. offshore development.

The International Association of Oil & Gas Producers Joint Industry Program (JIP) is the “poster child” for how industry can work together to combine assets and knowledge, and oil spill response technology. The JIP fosters collaboration between nine companies. It is a collaborative strategy that ensures shared technical expertise, world-class research, and continuously improving arctic oil spill technology. Research to date demonstrates that multiple technologies are available to effectively respond to a spill in Arctic conditions. It is recommended that there be access to all tools in the oil spill response tool box, including in-situ burning and dispersants. States and local governments should be involved in these Joint Industry Programs, so that they can see the private sector’s capability and to help inform regulations.

COOPERATION

The Northern Energy Information Sharing Working Group (NEISWG) brings together Canadian leaders of alternative and renewable energy. It meets quarterly and brings together local, regional and federal government, academia, private sector, and energy champions so that they can learn best practices from one another.

Cooperation among politicians in neighboring Arctic countries is important, as well as talking about the Arctic. The West Nordic Council, for example, facilitates communication between regional leaders – this may be an effective model to emulate.

I don’t think there is any official organization that brings experts from around the world together to talk about pan-Arctic energy issues other than the Arctic Energy Summit... Local regulations don’t cause a barrier to cooperation among countries, so it is very valuable for people from other countries to come together to share this kind of knowledge.



SIDEBARS

SIDEBAR 1:

DR. THOMAS AXWORTHY PRESENTED THE FINDINGS OF THE GORDON FOUNDATION'S RETHINKING THE TOP OF THE WORLD: ARCTIC PUBLIC OPINION SURVEY, VOLUME 2

Dr. Axworthy presented the findings of The Gordon Foundation's survey during the opening plenary of the 2015 Arctic Energy Summit. The report details the findings of a 10,000 respondent public opinion survey from across the eight Arctic countries: Canada, United States, Russia, Finland, Sweden, Denmark, Norway, and Iceland. The survey was conducted in nine languages, including Inuktitut. It asked respondents for their views on a variety of issues related to the Arctic, including around security, environment, and the economy.

Overall, the study found that across the board, issues of climate change and the environment were top of mind for respondents, while economic development and security issues took a lower priority. Between 20-40 percent of respondents, depending on the country surveyed, identified "global warming and climate change" as "the greatest threat facing the Arctic region today," while just 1-6 percent of respondents identified issues related to oil and gas development under that same category. However, when asked how well equipped Canada and the United States were to address climate change, as well as to prevent pollution and environmental disasters, only 19 percent of Canadians and 30 percent of Americans felt their country was "well equipped." This is illustrative of the gap between what respondents felt were the important issues facing the Arctic region and their countries' capacity to address them.

Respondents also called into question the assertion that the Arctic is heading towards another "Cold War," because of a "rush to resources." Overall, respondents from all countries surveyed favored cooperative versus combative methods for resolving their issues. This held true even when respondents were asked if they think cooperation with Russia should be suspended in the Arctic due to the conflict in Ukraine. Only 5-44 percent of respondents favored suspending cooperation; the majority of respondents preferring continued collaboration.

The study is a follow-up to the [Foundation's 2011 report](http://gordonfoundation.ca/publication/789) on public opinion in the Arctic, which allows for tracking of how public opinion has changed in these countries over the past five years. On the majority of issues, public opinion has held relatively stable. The full report is available online at: <http://gordonfoundation.ca/publication/789>.

The Gordon Foundation

SIDEBAR 2:

COLLABORATION AND CAPABILITY OF OIL AND GAS INDUSTRY EMERGENCY PREVENTION

The oil and gas industry collaborates with many stakeholders, especially in the enhancement of safety standards. The International Oil and Gas Producers Association (IOGP) works on behalf of the world's oil and gas companies and organizations to promote safe, responsible, and sustainable exploration and production with a focus on continuous improvement. From its head office in London, IOGP addresses a variety of global and regional bodies including United Nations agencies, the World Bank, the International Organization for Standardization (ISO) (including Arctic standards), the International Regulators' Forum, OSPAR and the Arctic Council (Working Groups EPPR, PAME and CAFF). IOGP has 14 standing committees, one of which is the Arctic Committee, a platform for pan-Arctic collaboration. Joint Industry Projects initiated by IOGP focusing on prevention and oil spill response include the Global Industry Response Group, the Subsea Well Response Project, and Arctic Response Technology. There are now capping stacks stationed at four locations worldwide that can be mobilized at short notice to any area of operation, and industry has a better understanding and capability to effectively prevent incidents and provide alternative oil spill response in ice options.

Systematic management of risk is not only part of the oil and gas industry's culture, it is at the heart of its commitment to prudent operations and underpins industry's license to operate. Appropriate use of risk management is used to prevent incidents and ensure robust response. Risk management objectives are to meet regulations, standards, recommended practice, and to achieve ALARP (As Low As Reasonably Practicable as it pertains to probability of incidents). Risk management leads to tailored solutions. There is not just one Arctic - there are large regional variations in physical and socio-economic environments that require individualized solutions. However, risk management alone is not enough. Risk management should

also be considered in the context of performance-based regulations. Modern, performance based regulations drive continuous improvement.

The Arctic Response Technology (ART) Project is a Joint Industry Program (JIP) between nine petroleum companies and aims to continuously improve response capabilities in ice, building on decades of prior research. The project brings together experts across industry, academia, and independent research centers, and addresses six areas of research: dispersants, environmental effects, remote sensing, in situ burning, trajectory modeling, and mechanical recovery. The project is committed to transparency and research results will be published in peer reviewed journals and are available on the ART JIP [website](#). Progress has been booked in all six research areas and field testing has been an integral part of the research, including experiments carried out at the Poker Flats test basin in Fairbanks, Alaska. Access to all tools in the oil spill response toolbox is required for the most effective response to a spill in Arctic conditions, and pre-approval by regulator(s) of the use of dispersants and in-situ burning is critical.

The U.S. National Petroleum Council's study on "Arctic Potential - Realizing the promise of U.S. Arctic oil and gas resources," is a good model of collaboration between over 250 Arctic stakeholders: government agencies, the oil & gas industry, academia, non-governmental organizations, think tanks, and Native peoples' organizations. The study resulted in a comprehensive and authoritative report, and led to insightful findings and powerful recommendations. Key findings include: the magnitude of the resources - most of which can be developed with existing field-proven technology; understanding of the environment and industry experience and track record; and the notion that adequate Arctic specific regulations are required. Some 90 recommendations have been made, and grouped into the following themes: environmental stewardship; economic viability; government leadership; and policy coordination.

In conclusion, it is clear that solutions to prudent and safe oil and gas operations in the Arctic requires collaboration between many stakeholders. Health, safety, and environment are not areas where individual actors should compete. Major advances have been made toward enhanced safety in the Arctic. As there are many different "Arctics," a "one size fits all" solution is not feasible. The oil and gas industry welcomes engagement with all parties that would like to contribute to further improvements in responsible development in the Arctic.

Resources: <http://www.iogp.org/>, <http://www.arcticresponsetechnology.org/>, <http://www.npcarcticpotentialreport.org/>

International Association of Oil and Gas Producers

SIDEBAR 3: ARCTIC INVESTMENT PROTOCOL

Vision: The Arctic is a complex, diverse environment that represents home for its four million residents, a specialized ecological community, and an emerging global investment opportunity. To balance these dimensions, the World Economic Forum's Arctic Investment Protocol aspires to promote economic growth in the region that furthers community well-being and builds resilient societies in a fair, inclusive, and environmentally sound manner. Responsible Arctic development should adhere to the following objectives:

1. BUILD RESILIENT SOCIETIES THROUGH ECONOMIC DEVELOPMENT

- Take a long term investment view
- Promote the long-term sustainability and economic diversification of projects and communities
- Create job opportunities and skills for residents, developing human capital that can serve to grow and diversify regional economies
- Promote capacity-building for civil societies through economic growth
- Encourage ownership of Arctic projects by Arctic people

2. RESPECT AND INCLUDE INDIGENOUS POPULATIONS AND LOCAL COMMUNITIES

- Respect and mitigate adverse impacts on traditional cultural practices
- Consult with established indigenous governance structures and community organizations, working in



accordance with land-claims and autonomous governance agreements where in place

- Strategically explore investment opportunities with Arctic communities, addressing their concerns and resolving disputes by working to find mutually beneficial solutions

3. PURSUE MEASURES TO PROTECT THE COMPLEX, DIVERSE ENVIRONMENT OF THE ARCTIC

- Investment opportunities should be reviewed by balancing economic benefits with environmental goals, incorporating social and environmental issues into investment analysis
- Recognize the close linkages between society and the biophysical environment in the Arctic and approach impact analysis in a holistic manner. Responsibly engage local Arctic ecosystems through a partnership based management approach
- Pursue technically- and financially-feasible measures that minimize the potential for adverse health and environmental impacts.
- Where project impacts are unknown or difficult to assess, investors and developers should take measures to manage project impacts by implementing strong mitigation procedures and following a quantitative risk- based approach informed by the best available science.

4. PRACTICE RESPONSIBLE AND TRANSPARENT BUSINESS PRACTICES

- Conduct all business in a fair, legal, and transparent manner while actively working against corruption
- Evaluate, report as required, and address impacts on and benefits for communities and environment at all stages
- Develop a mutually acceptable grievance policy for local communities and other Arctic stakeholders

5. CONSULT AND INTEGRATE SCIENCE AND TRADITIONAL ECOLOGICAL KNOWLEDGE

- Pursue rigorous scientific research working towards understanding the impact of investment projects and on the broader effects of commercial activity in the Arctic
- Develop an overall foundation to investment that integrates rigorous science with traditional/local ecological knowledge to ensure adequate environmental and social impact assessment
- Adhere to accepted research norms for baseline data and impact monitoring pursued in conjunction with investments

6. STRENGTHEN PAN-ARCTIC COLLABORATION AND SHARING OF BEST PRACTICES

- Encourage private/public partnerships and collaboration where appropriate
- Recognize that the Arctic is a diverse environment with large geographical, demographic, seasonal and climatic variations which will determine the optimal regulatory framework and approaches across regions and situations.
- Promote cross border dialogue to adopt common standards and best practices to maximize the environmental, social, and financial benefits of development while remaining within the relevant national laws.

This document is a result of a collaborative effort by the members of the World Economic Forum Global Agenda Council (GAC) on the Arctic. It does not necessarily reflect the individual opinions of, or ultimate commitments to be made in all areas by, the members and/or their organizations.

SIDEBAR 4:

STRATEGIC ENERGY MANAGEMENT PRACTICES - BEST PRACTICES SUMMARY

PLANNING AND FEASIBILITY

- Develop an energy policy for public buildings to promote efficient energy use, occupant comfort and high indoor air quality.
- Take advantage of opportunities to incorporate energy efficiency measures into scheduled maintenance during the buildup to retrofit projects.
- Create a position for or hire an energy manager.
- Select initial team members with energy retrofit expertise who can find the maximum potential value of a retrofit and who can help ensure that execution cost is not the only decision-making factor.
- Benchmark the overall energy performance of the building to better understand current energy usage through review of recent utility bills.
- Conduct an energy audit to inspect the facility and collect detailed operational and performance data on specific building systems.
- Assess how delaying improvements to the building could raise costs through increased utility bills, erode occupant satisfaction, and exacerbate operational and enterprise risks.
- Write contracts that align the team around a shared project vision, properly designating responsibilities and compensating performance.

SCOPING AND DESIGN

- Incorporate occupants and building manager in the design process, and solicit their input on design and operation of the retrofitted building.
- Emphasize integrative design principles to establish team dynamics and working relationships and reveal potential energy savings.
- Reduce capital expenditures and minimize future operating costs by first reducing loads, and then installing efficient, optimally sized systems.
- Analyze a project using energy modeling and life-cycle cost analysis to find which combination of energy-efficiency measures provides the greatest value to the building's owner and occupants.
- Phase a project over multiple stages and years, depending on efficiency and expected life of existing improvements, leasing situations, consideration of future technology/economic conditions that might make currently infeasible measures, and owner cash flow requirements.
- Carefully think through measurement and verification (M&V) systems, and intelligently present them to ensure proper quantification and ability to verify project energy savings.
- Estimate gross and net costs of the retrofit.

- All new public facilities should comply with an Alaska specific minimum energy code such as Alaska Building Energy Efficiency Standard (BEES).
- The equipment should be variable and programmable for changing occupancy needs, yet simple enough to be effectively maintained and operated by local staff.
- Consider offering unused or under-utilized space for post offices, clinics, city management offices or other public uses.

FINANCE

- Consider the full array of financial options available as early in the execution process as possible.
- Secure well-documented support for retrofit value. An Investment Grade Audit (IGA) complete with a life cycle cost analysis of recommended energy conservation and energy efficiency measures is necessary to evaluate economic benefit of any significant retrofit project.
- Many retrofit loans and equity investments require economic analysis tools, such as life cycle cost assessment, that quantify the differential costs of alternative investment options for a given project.
- Take advantage of all government and utility tax, financial, and entitlement related subsidies.

CONSTRUCTION

- Select contractors (ideally early in design) and other service providers with requisite experience in deep energy/sustainability retrofits.
- Utilize specialized construction management strategies to execute retrofit construction and sustainability certification.
- Refrigerators, freezers and boilers in buildings that may sit vacant for several months each year should be shut down where possible. Schools offer the greatest opportunity.
- Implement commissioning during the design process, construction of the retrofit, and on an ongoing basis to ensure systems and equipment were installed and are operating according to design.
- Create and offer building operator training, and building owner education about energy use in buildings.
- Install a building monitoring system. It provides feedback on retrofit measures employed, assists operations and maintenance personnel, provides feedback to engineers to properly size systems and helps to identify opportunities for future projects.
- On a seasonal basis, review automation system settings.
- Develop a continuous energy management plan with the expressed goal of maintaining and prolonging the energy savings from installed measures during the building retrofit.

Alaska Housing Finance Corporation (2015). Strategic Energy Management Practices.

SIDEBAR 5:

THE POLAR CODE – SUMMARY OF KEYNOTE ADDRESS BY MICHAEL KINGSTON

There is no doubt that the maritime world is changing its focus and looking north. The melting ice-cap coupled with huge advances in technology is changing the face of the world's shipping routes. The number of Arctic maritime transits has increased significantly in recent years. For example, in 2010, there were four transits through the Northern Sea Route. In 2013, there were 71 transits. Whilst at present these transits are relatively few in number, they are very much part of future plans for the shipping industry.

The routes are being seriously considered and in some quarters deemed to be inevitable given the seemingly irreversible meteorological circumstances coupled with technological advances. However there remain major concerns for shipping in general not only because of the sheer scale of the physical obstacles and dangers represented by the extreme conditions in the area, but also because of the corporate governance and reputational risks the region presents for companies operating there.

Because of this, apart from those very experienced, marine underwriters very rarely provide insurance cover

for ships in Arctic waters because the sheer lack of information makes it very difficult for them to analyze the risks involved. For instance, Hull & Machinery policies require the vessel operator to inform the underwriter if they are going above 70°N latitude. P&I Clubs do not generally impose navigation limits in or around the Arctic region on their members; however the rules require the clubs to be consulted if a voyage does not fall within a vessel's normal trading pattern. And, of course, polar waters are not a normal trading pattern for most ship operators.

For ships not equipped to operate in Arctic conditions, the extreme cold can cause engine problems and make it difficult or impossible for safety or other equipment to work. Coverage by navigation aids such as GPS is significantly reduced and magnetic compasses are unreliable at such high latitudes, a situation which is not helped by the lack of accurate charts of the area. Also visibility is restricted 90 percent of the time and the weather is highly unpredictable. Violent storms can occur at any time. And the lack of infrastructure in the region means salvage facilities are almost non-existent.

Additionally, there is the issue of crew injury and hospitalization in the Arctic due to remoteness and oil pollution presents huge problems. Although a search and rescue agreement has been signed by the Arctic States not a huge amount of progress has been made in practice. Much work remains to be done on a practical level. Russia has made some progress in relation to location of equipment along the Northern Sea Route area.

The requirement for best practice in such difficult terrain could not therefore be starker.

This process has been assisted by the adoption at the beginning of this year by the International Maritime Organization (IMO) of the Polar Code, a set of rules and regulations which governs the operation of vessels in Polar (Arctic and Antarctic) waters.

The Polar Code includes requirements for navigation, vessel design, ship equipment, operational standards, crew training, search and rescue and environmental protection measures.

Operators will have to prepare and carry a Polar Waters Operational Manual showing how they have prepared and will be able to operate in the extreme conditions prevalent in the area that they are intending to operate explaining how they will deal with a worst case scenario in the conditions that may be incurred. This includes explaining search and rescue plans.

Additionally operators must make reference to an ice regime methodology to show how they have determined operational limitation for their vessel in the conditions expected to be encountered based on recognized ice charting data, be it the Canadian Arctic Ice Regime System (AIRS) methodology, the Russian 'Ice Passport' methodology or an alternative new methodology, POLARIS (Polar Operational Limit Assessment Risk Indexing System) which is being developed by the IMO. The methodology used must be satisfactory to the Administration (Flag State) issuing the required Polar Ship Certificate and it must be stated on the Certificate.

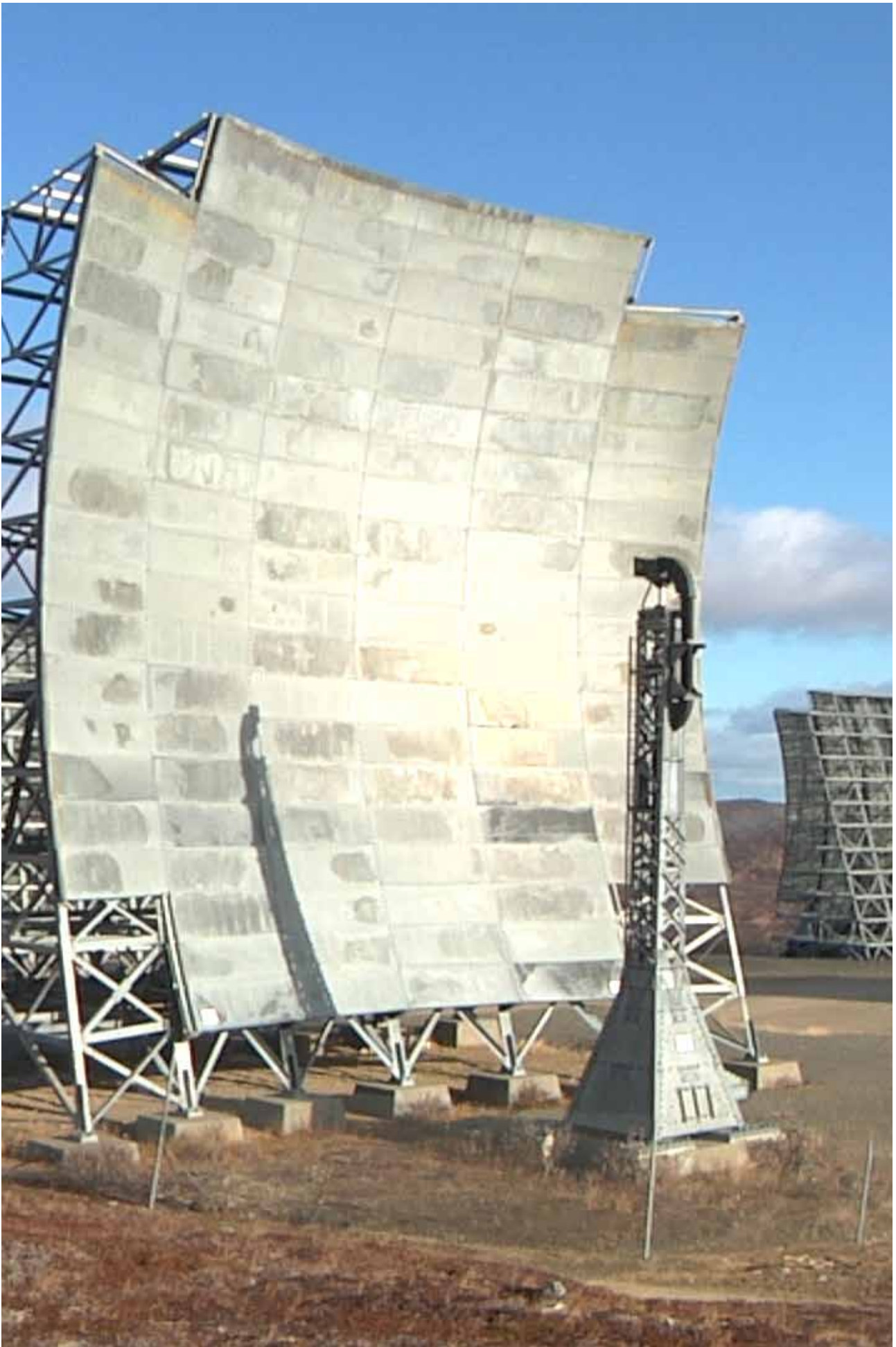
POLARIS provides a standardized approach to evaluate the risks to vessels in the ice conditions expected to be encountered in the Arctic or Antarctic by providing a risk index in any geographical area that the ship is intending to travel.

The Polar Code comes into force in January 2017, by way of amendments to the three 'cornerstone conventions' of the IMO.

The environmental aspects by way of an amendment under the International Convention for the Prevention of Pollution from Ships (MARPOL); the crew training certification aspects under the International Convention on Standards of Training, Certification and Watch (STCW); and the safety aspects under the Safety of Life at Sea Convention (SOLAS 1974). These conventions include the tacit acceptance procedure - which allow the Committees of the IMO to agree amendments which will automatically become law 12 months after a period of 6 months from adoption unless in that 6 month period more than one third of parties i.e. the combined merchant fleets of which constitute not less than 50 percent of the gross tonnage of the world's merchant shipping, have notified their objections to the amendments.

In order to achieve a proper implementation of the Polar Code it is important that everyone understands its requirements and the important knowledge required to determine the inputs for best practice in areas such as hydrography, meteorology, communication, ice charting, and crew training.

But there is a limited amount of expertise in Arctic operations available and it is very important that best practice standards are developed that have the input of all the stakeholders. In the absence of risk data, a best practice regime devised with the input of the various industries, including the insurance industry,



is essential in order to prevent incidents. A proposal for a Best Practice Forum to be set up to achieve this has been made to the Arctic Council's Protection of the Marine Environment Working Group (PAME). This would help to educate all concerned, including Operators, Flag States, Insurers, Financial Markets, and Port State Control about the Polar Code and the required data to be relied upon. Under the U.S. Arctic Council Chairmanship which lasts for two years (until April 2017) Navigational Safety is the number one focus and they are demonstrating great leadership on this issue.

The Polar Code is an example of what we can achieve before a major disaster occurs, but it will only be as good as we make it through education and enforcement. We all have a duty to assist in that process. It is important that all concerned are aware of the rules so that a third party, a rogue operator does not bring the house down for everyone in a sensitive place like the Arctic.

Additionally, the Polar Code only goes so far as it only applies to vessels over 500 tons and it does not cover pollution from fixed structures, an eventuality for which there is no cross – jurisdictional regulation in place. Whilst it does not directly provide solutions to all issues of concern in the Arctic, it will definitely help to prevent accidents if it is enforced and it will help produce an operational culture which will allow best practice to be achieved. But it is going to be up to governments and the various industry sectors, including the insurance industry, to educate everyone about it, and its requirements, including providing funding to help close the knowledge gap.

We either get it right now or we will pay a huge price for our new shipping routes in our failure to protect life at sea and our environment. It is also about having respect for the indigenous communities of the Arctic, and the Arctic Countries.

Michael Kingston is a Partner in DWF LLP's Marine Trade & Energy Group in London



COMPILATION OF SELECTED ABSTRACTS

ADAPTIVE MANAGEMENT – SUZANNE BAN, MICHAEL BAKER, UNITED STATES

Adaptive Management is a discretionary, learning-based approach to structured decision-making that can be used in conjunction with National Environmental Policy Act and other Federal requirements such as the Endangered Species Act and the Marine Mammal Protection Act. Adaptive Management includes the following steps: predict, mitigate, implement, monitor, and adapt. The Adaptive Management process considers appropriate adjustments to federal Actions (i.e., decisions related to the issuance of permits and authorizations under multiple statutes). It also can be used to suggest innovative mitigation and monitoring tools as the results of current mitigation and monitoring procedures, as well as new science, become better understood. Adaptive Management allows resource managers to test assumptions, adjust policy, and incorporate learning into future decision-making and management goals. Adaptive Management strategies can be used to address management challenges related to Arctic marine mammals, and in particular several ice-obligate species. Current management scenarios, as they apply to polar bear, bearded seals, and ringed seals are presented and compared to potential scenarios incorporating Adaptive Management. Reduced sea ice cover presents a threat to Arctic marine mammals. Resource managers face challenges in managing these populations that are experiencing multiple stressors in a changing climate. Because Adaptive Management is based on observation and continuous learning, it allows for the management of highly uncertain systems.

ALAKANUK SCHOOL: A COMPREHENSIVE CASE STUDY IN ENERGY EFFICIENT FACILITIES AND ALTERNATIVE ENERGY IN RURAL ALASKA – TONY SLATONBARKER, PE, SE, COFFMAN ENGINEERS, UNITED STATES

With some of the highest electricity and gasoline prices in the nation, Alaska has the opportunity to economically deploy a variety of renewable energy projects throughout its diverse geographic regions. Coffman will walk attendees through the full process and experience from Alakanuk School (an energy efficient school with alternative energy feasibility studies completed, and installed wind and solar.)

Steps to new energy efficient facility in remote Alaska:

1. Determine if there is a viable facility need.
2. Determine land availability, ownership issues, (long term need).
3. Research cost of similar facilities.
4. Determine size and operation issues of facility.
5. What are energy costs and long-term cost of energy (assuming escalation of petroleum based fuel.)
6. What type of fuel best fit (Fuel oil, electrical grid, Wind, Solar, biomass, geothermal, etc.?)
7. Prepare prefeasibility study with preliminary building layout, economic analysis, construct cost estimate, financing strategy, etc.
8. Water and wastewater requirements.
9. Determine permitting requirements (flood plain, COE, DEC, FAA, Local utility coordination.)
10. Determine O&M costs and verify that personnel are available to perform this work.
11. Backup systems required?
12. Prepare preliminary engineering designs and then revalidate the cost estimates and economics.
13. Once viable project, determine funding source.
14. Provide owner review of project scope and construction work.
15. Start permitting early (sometimes years to get permits and property ownership resolved.)

16. Start construction permitting early.
17. Get good detailed designs and scopes of work and put out for hard bids.
18. Take into account construction season and combining with other construction work if possible.
19. Commissioning and as-building. (Speakers: Walter Heins, lead Commissioning Agent, from Coffman to speak.)

AFFORDABLE ENERGY STRATEGY – GENE THERRIault, ALASKA ENERGY AUTHORITY, UNITED STATES

The Alaska Affordable Energy Strategy (AkaES) is an Alaska Energy Authority-led research and analysis program mandated by the Alaska State Legislature that is investigating how to deliver affordable energy to Alaska communities that will not have direct access to the proposed North Slope natural gas pipeline.

Through collaboration with other state and federal agencies and other stakeholders, the research for the AkaES focuses on the best ways to reduce the total consumer heat and electricity costs, not just the unit prices, for residential buildings, privately owned commercial buildings, and public buildings and facilities. The AkaES research is assessing what is technically, financially, and economically feasible in communities, regions, and statewide. Five broad areas are being researched to reduce consumer energy costs: (1) end-use consumption; (2) generation, transmission, and distribution; (3) transportation; (4) management and ownership; and (5) direct underwriting of energy costs. AEA is using a five-phased research and analysis process for each research area to assess community and regional energy needs and recommend the most cost-effective strategies for improving energy affordability. The five phases for the research areas are: (1) collect baseline data, (2) forecast 20-year horizon, (3) identify strategies to decrease consumer costs, (4) develop and forecast impact of potential policies and legislation, and (5) prioritize policies on cost effectiveness.

AIR SOURCE HEAT PUMPS – VANESSA STEVENS, COLD CLIMATE HOUSING RESEARCH CENTER, UNITED STATES

Air source heat pumps are an emerging cold climate technology. Air source heat pumps (ASHPs) are space-conditioning appliances that use vapor-compression technology to provide both heating and cooling to buildings. Recently several companies have introduced cold-climate ASHPs that can provide space heating at temperatures around zero degrees Fahrenheit. These cold climate models offer a range of options, including models for hydronic distribution systems, air-to-air models for forced air, and ductless mini-splits that distribute heat through individual indoor units. Many of these cold climate ASHPs have been installed in Alaska.

ALTERNATIVE ENERGY – JEN HISCOCK, NATURAL RESOURCES CANADA/CANMET ENERGY, CANADA

Renewable remote microgrids are being developed for Canadian remote communities, remote mines, and remote facilities found in the northern regions of its provinces and territories. The Renewable Energy Microgrid Sector for Canada report has identified a growing number of communities, industry partners and governments with programs intended to achieve community goals of reducing costs of energy and adopt innovative technologies. A number of projects supported across in the Northwest Territories highlights the role solar PV as a reliable solution for residential “prosumers” and how local electricity providers can optimize their power plants to reduce diesel cost during the long summer months in the arctic. Two mines have installed large wind turbines to reduce their environmental impact and energy costs. In addition, modern communication solutions for remote microgrid supervisory control and data acquisition (SCADA) was identified as a key enabler to address the challenges of integrating higher levels of variable renewable energy (wind and solar) in remote and northern microgrids.

ALTERNATIVE ENERGY – LAWRENCE KEYTE, CARLETON SUSTAINABLE ENERGY RESEARCH CENTRE, CANADA

As part of the Canadian High Arctic Research Station's recent Report on the State of Arctic Energy, a series of eight case studies were completed in order to provide a snapshot of renewable energy and energy efficiency projects in operation and under development in Canada's North. Canada's three northern territories are represented in the case studies, as well as Nunavik (northern Quebec) and Nunatsiavut (northern Labrador), along with a wide range of community, government, and private-sector stakeholders. The research reveals a wide diversity of financial and social drivers behind these alternative energy projects, and a range of barriers and outcomes as projects move from development stage to implementation. Regional trends, factors for success, and lessons learned are summarized. Financial factors affecting project outcomes include innovative financing models, independent power producer pricing mechanisms, the effect of carbon pricing, and sustainable local economic development. Social factors include the desire for energy autonomy, affordability, Indigenous-owned projects in some communities, the alignment of energy systems with traditional values, the relation between local energy systems and resilience, and the role of policy in driving successful projects.

BIOREGIONS – GRAHAM HOGG, LATERAL NORTH, SCOTLAND

Lateral North itself is working closely with communities throughout Scotland investigating new energy systems and technologies and how these might affect governance, policy and land reform. Instead of traditional segregation of areas into council areas, Bioregions would see Scotland separated into varying sizes of area all with the same potential productivity of their landscape and seascape. How would this affect governance, policy, local politics, land reform and many other key themes would be one such question looking to be answered. A bioregion approach would include:

- Economics and government fiscal policy
- Applied research resulting in adoption of innovative or emerging energy technology
- Assessment of renewable energy sources, including a development and distribution roadmap
- Best engineering, architecture and design practices for northern energy efficiency and weatherization
- Benefits to local communities from projects; conservation; and value-added energy enterprises
- Scenarios planning and risk assessment of development and transportation of energy resources

Communicating remote challenges to urban minorities



CARBON TRADING – DR. HYO-SUN KIM,
DEPARTMENT OF POLICY, KOREA POLAR RESEARCH INSTITUTE, KOREA

The dramatic increase in energy demand in Asia needs further improvement in energy efficiency and policy development to implement market mechanisms in order to comply with the post-2020 regime. This means that the Asian countries are expected to diversify the sources of energy supply to build partnerships for sustainable energy supply. The Arctic has huge potential to create new business models based on innovative partnerships that bridge the Arctic and Asian countries. In this regard, sharing lessons learned and best practices will support new partnerships for both Arctic and Asian countries. Korea is developing its climate policy and market mechanisms such as emissions trading and a renewable portfolio standard. Institutional coordination is one of the challenges to implementation of market mechanisms in Korea.

CLEAN ENERGY BUSINESS PLAN – CHRIS SAUER,
OCEAN RENEWABLE POWER COMPANY, UNITED STATES

Developing business with a new technology in an unproven market is very hard, and requires much information sharing. Success is your very best marketing tool. Keys to success include:

- Characterizing the project site up front – finding out everything you can about the resource, seasonal variations, water depths, bottom contours, etc. Note: hearsay about sites is almost always wrong!
- Creating a project development road map and dividing it into manageable segments with go/no go decision points. A relatively small amount of money spent early on proper site characterization will help avoid unnecessary expenditures down the road.
- Using your prior experiences with projects as a communication tool to help people understand the project.
- Researching the regulatory environment and likely key issues and addressing them early on.
- Developing an open and honest dialogue with community leaders, fishermen, regulators and other key stakeholders to earn their trust.
- Analyzing the economics of a project, and making sure the project makes sense.
- Determining the best funding sources and engaging with them early.

CLIMATE CHANGE AND ENERGY SECURITY –DR. NOOR JOHNSON,
BROWN UNIVERSITY, UNITED STATES

Different factors are driving the future demand and supply of energy resources in the Arctic, including both non-renewable and renewable options. Interdisciplinary collaboration can illuminate the relationships between seemingly disparate social and environmental factors, such as links between energy production and climate change. Drawing on individual research projects that are part of the Fulbright Arctic Initiative, we examine linkages between climate change and two sources of energy in the Arctic: forest biomass and offshore oil and gas. Rooted in anthropological methods, research on offshore oil and gas development in the Baffin Bay region of Canada considers how different actors think about and weigh relative risks and benefits, and how energy use, needs, and development aspirations shape interest in renewable energy resources as an alternative pathway. While narratives about climate change often emphasize vulnerability of Inuit communities, Inuit are also agents in shaping policies that can contribute to or reduce climate change, including energy policies. The Arctic's renewable energy resources, including boreal and tundra forests, are a source of bioenergy that could help offset regional reliance on fossil fuels. Additional research, which draws on diverse methods from environmental studies, examines the pathways for sustainable forest bioenergy use, taking into account multiple demands and needs for Arctic boreal and tundra forests. The aim of this research is to identify ways of forest biomass utilization that are sustainable in multiple conditions. This research approach considers energy development and climate from an integrated cultural-ecological-political-economic perspective. It demonstrates the benefits of interdisciplinary collaboration to better articulate the linkages between climate change and energy use and to illuminate possible pathways towards more sustainable choices grounded in principles of equity and participatory governance.

COMMUNITY PERSPECTIVES ON EXTRACTIVE INDUSTRIES IN THE ARCTIC –
DR. FLORIAN STAMMLER,
UNIVERSITY OF LAPLAND, FINLAND

This contribution dealt with an impossible task - because firstly there is no agreement on what “a community” is in the Arctic, and secondly people do not have unified perspective on what extractive industrial development in the Arctic means for them. However, what an anthropologist working on local views on extractive industries in the Arctic *can* do is take the reader on a journey through different Arctic regions, peoples, and livelihoods and shed light on the multiplicity and diversity of views - often controversial - that extractive industries generate on the ground at the places of extraction. On the other hand, there are two commonalities that we can identify across all the regions in the Arctic where an encounter of extractive industries with local people occurs: 1) there is no such case where an industrial development project just would not be a big issue for the local society. Industry projects always polarize; they never let people remain indifferent. 2) Related to the previous point - in any group there will be winners and losers from industrial development. 3) The views of local people, practitioners on the land, be they industry workers or may they follow what has been called traditional livelihoods, differs from the views that local and indigenous activists and politicians express. The agenda of such professionals is by far not always compatible with local people’s views. In this contribution besides these three commonalities we looked at three cases from the Russian Arctic: Among the European Nenets reindeer herders and oil development in the Varandei tundra, one most impressive indigenous view was that “life with the ‘oilies’ is more fun than without them”. Among the Yamal Nenets neighbours in Siberia I was impressed by the following saying about their most intense 30 years relationship with Gazprom: “We first thought it’s a disaster, but now we got used to it”. Further on the Russian Far Eastern Kamchatka Peninsula, our reindeer herding host told us about the relation to the Nickel and Gold industry on their pastures a message of tolerance and distance at the same time: “We have our own lives, let them have theirs”. From these cases we can learn that there is no simple answer to the question “What do local and indigenous communities think about extractive industries in their area?” The answer would rather be that industry always matters, and that there is always a good and a bad side to it, also or especially in the Russian Arctic.

CONFLICT AVOIDANCE – MARK BRUNDAGE,
COMMUNITY RELATIONS, EXXONMOBIL ALASKA, UNITED STATES

Through its work at Point Thomson, ExxonMobil has collaborated with numerous stakeholders and local North Slope residents to advance unique initiatives in marine vessel safety and cultural resources management. Since 2014 the Project team has joined with the Marine Exchange of Alaska and subsistence hunting crews from two local villages to improve marine safety and communications technology during the Open Water season. These new capabilities include satellite- and radio-based communication devices as well as real-time vessel tracking software. During the initial permitting phase, the Project also undertook a suite of activities to build its cultural resources management program. The concept of “reciprocal mitigation” – championed by the Alaska State Historic Preservation Office – laid the groundwork for a robust and meaningful effort, and one that included ongoing participation from the local community. Activities ranged from mapping an historic cemetery site using Ground Penetrating Radar to the documentation and analysis of ancient artifacts originally excavated from Barter Island in 1914.

DATA COLLECTION – ERIN WHITNEY,
ALASKA CENTER FOR ENERGY AND POWER, UNITED STATES

A majority of Alaska’s energy projects and systems lack sufficient data collection. While the projects and systems may be instrumented for operational or simple reporting purposes, little data is generated that allows for such things as performance analysis, optimization, and comparative assessment. By implementing a robust data collection and analysis plan, stakeholders can realize such benefits as accurate assessment of the value of investment, comparative analyses between projects and systems, increased accuracy of analyses, and standardized data useful across a broad range of analysis platforms.



**DESIGN – TRACY VANAIIRSDALE,
BETTISWORTH NORTH ARCHITECTS AND PLANNERS, UNITED STATES**

How do we make buildings more energy efficient and what factors help this process to be repeated over and over across the Arctic? Because community buildings are often the primary energy users in remote communities, by making individual buildings more energy efficient, we begin to create communities that require less energy and are thus more sustainable. Factors such as funding requirements, client commitment to sustainability, project specific sustainability goals and others vary with each project. In addition, every building is unique, and design teams of professional architects and engineers also vary with each project. Therefore, there is no one-size-fits-all solution or recipe for success. There are, however, consistent processes and approaches that can be used to produce more sustainable buildings for the Arctic. Bettisworth North will present several case studies of projects that explore what we have done to design and create more sustainable arctic buildings and communities. Our case studies will demonstrate processes, skillsets and design strategies we use, including energy modeling, passive and active strategies and consideration of the human element. The presentation will be enriched with pictures and illustrations to demonstrate that sustainability can be beautiful. Communities use energy brought to into the community either within the buildings they occupy or by the modes of transportation they use. If we reduce the amount of energy buildings need, while still keeping occupants safe, comfortable and satisfied, the community as a whole needs less energy. Communities that are less reliant on commodities not readily accessible or those that may become inaccessible due to financial or physical barriers, are more stable, resilient and sustainable.

**DIESEL AND SOLAR TELECOM – BARRY SUGDEN,
NORTHWESTEL, CANADA**

The operation and maintenance of network repeater sites involves significant resources and expenses due to their remoteness. Access to approximately 40 percent of the sites for quarterly maintenance and fuel delivery is via helicopter, which is very costly. Small scale 10-15 KW diesel generators, along with battery storage, is the system of choice for providing our “off grid” power requirements. This arrangement has provided the remote site energy needs for many years, while assuring an incredibly high level of reliability. However, given the financial realities of the telecommunications industry today, with increased competition and shrinking

margins, the need to reduce operating expenses is driving the search for innovative methods to produce power in a more cost effective manner. The price of photovoltaic (PV) equipment has been greatly reduced in recent years, sparking the question of its potential use in Arctic regions. Integrating PV into telecommunications power systems is not new, but is it practical in the Arctic, both technically and financially, given the dramatic variability of available solar resource, cold temperatures, and ice and snow through a large part of the year. In 2012, Northwestel partnered with Yukon's "Energy Solution Center" and "Cold Climate Innovation Center" in a research project to test the viability of adding PV to an existing diesel powered site near the Arctic Circle, with the objective of determining the technical and financial viability of a PV/Diesel hybrid system. In 2013, a 15 kW PV system was installed at an existing mountain top microwave radio repeater site, along with data collection equipment to monitor energy production and site conditions.

ELECTRIC THERMAL STORAGE – NICHOLAS JANSSEN, UNIVERSITY OF ALASKA FAIRBANKS, UNITED STATES

The affordability of heat and electric power in off-grid arctic communities is a staggering challenge for residents and energy providers alike. It is not often obvious how best to match the natural resources of a region with the energy demands of its inhabitants. Renewable resources, such as wind and solar PV come with their unique set of challenges. Wind power is clean, often in abundance, and exempt of fuel cost. Moreover, off-grid diesel powered communities that integrate wind into their generation mix are confronted with the decision of how to use surplus energy during periods of high wind. Typical solutions include generating steam for a district heating loop, use of battery storage systems, or wholly dispelling this otherwise usable energy with resistive load banks. Electric Thermal Storage (ETS) provides a means for this surplus of clean electrical energy to be put to valuable use as stored Domestic Space Heat (DSH). Effective utilization of wind power for DSH depends on the ability of the grid to distribute this energy where it is needed, when it is available, and at the lowest possible cost.

ENERGY EFFICIENCY – KATIE CONWAY, ALASKA ENERGY AUTHORITY, UNITED STATES

More than five hundred energy audits have been performed on public and private commercial buildings in Alaska showing positive economic payback, but few retrofits have been implemented. This stands in contrast to an Alaska residential energy program with an approximate implementation rate of 65 percent. Energy efficiency retrofits are a proven way to reduce the cost of operating a building. If done properly, retrofits improve the lifespan of the building while also returning money to the organization to achieve its primary mission. While economic payback is typically positive, many decision makers choose not to pursue retrofits.

ENERGY EFFICIENCY – LYLE AXELARRIS, DESIGN ALASKA, UNITED STATES

In the Arctic, buildings need to be able to withstand extreme climate conditions and prolonged disruptions due to power outages, resource shortages or long lead times for equipment maintenance. As a result, it is crucial to focus on static solutions that lower energy demands, harness natural energies, and provide passive survivability in the event of an emergency. Mechanical and electrical systems should be simple, efficient and redundant to ensure long-term cost-effective operability and reduced downtimes. In the Arctic, perhaps more so than anywhere else, it is very important to follow Norbert Lechner's three-tiered approach to sustainable design. First and foremost, permanent building elements such as the building envelope, orientation, massing, glazing and programming should be designed to minimize the energy demands that must be met by other building systems. The next step is to meet those demands with passive systems such as daylighting and passive solar. The final step in building design should be the selection of efficient mechanical and electrical systems that are well matched to the availability of maintenance support. In the Arctic, these steps are the best method of providing reliable and affordable building operation. Too much of the focus on energy-efficiency is placed on expensive, high-maintenance mechanical systems. Especially in the Arctic, building designers should incorporate simple, enduring solutions in the basic building design to optimize energy-efficiency.

ENERGY SECURITY – TINA HUNTER, SCHOOL OF LAW, UNIVERSITY OF ABERDEEN, SCOTLAND

Conventional energy security paradigm of resource scarcity as proposed by Klare (2004) assumes that as resources get scarcer change towards renewable sources of energy is inevitable. Global dependence on oil and gas will mean that, rather than renewables, it is more likely the Arctic resources of energy will be developed at greater cost and risk to fuel growing energy demand. Advent of new technologies has already significantly altered both the face and pace of global oil and gas exploration and production (E&P). The shift from energy security conventionally understood as ‘markets and climate’ towards ‘security and geopolitics’ is inherently linked with the new state-of-the-art E&P technology. Yet, technology transfer with attached patterns of dependence linked to it is expected to create new spaces of geopolitical influence and competition built around the ‘big oil’ northern countries through changing markets and suppliers in the ‘new’ energy security paradigm.

ENVIRONMENTAL MANAGEMENT – ERIC FEBBO, WILDLIFE AND COMMUNITY RELATIONS, EXXONMOBIL ALASKA, UNITED STATES

The Point Thomson Project is located along the shores of the Eastern Beaufort Sea on the North Slope of Alaska. The Project will produce gas condensate from a primarily offshore reservoir accessed via onshore directionally drilled wells. The Project also establishes the critical infrastructure needed to develop approximately 25 percent of the North Slope’s known natural gas reserves. A number of design elements, initiatives and mitigations have been implemented to help monitor and protect sensitive marine and terrestrial animals, and maintain and reclaim valuable habitat, while at the same time ensuring worker safety. The protection of polar bears is a key focus area. A ground surveillance radar system is being tested for early bear detection near our facilities that consists of auto-cueing, all weather radar, and integrated dual cameras for various light conditions. Additionally, a maternal den detection program, including use of Forward Looking Infrared (FLIR) technology and other novel den detection techniques are being utilized and evaluated. The goal is to limit negative interactions with polar bears by improving our early detection capability. The Project has also piloted satellite-based remote sensing for caribou and the use of unmanned aerial systems for tundra hydrology and vegetation surveys. Additionally, reclamation and revegetation of new and abandoned gravel sites using tundra sod made available from gravel mine overburden removal has been undertaken. The Project is also committed to local community socioeconomic benefit, including capacity building with native corporations and hiring. Alaska contractors, and in some cases those from the North Slope have been utilized to execute these scopes of work helping to improve their future opportunities in these and other areas.

GAS RESERVOIR MANAGEMENT – JENNIFER BLAKE, PROCESS SAFETY TECHNICAL AUTHORITY, BP ALASKA, UNITED STATES

The objective of this research was to assess the technical feasibility of gas production from the upper C sand of the Prudhoe Bay Unit L Pad gas-hydrate-bearing reservoir on Alaska’s North Slope over a 50-year period. CMG STARS simulator was used to perform the numerical modeling. The modeling efforts were exclusively focused on the depressurization mechanism. Sensitivities on vertical heterogeneity, relative permeability curves, well completion type, and drainage area were run to determine the impact on long-term production profiles. The two heterogeneity models reflected varying degrees of vertical heterogeneity.

GROUND SOURCE HEAT PUMPS – ROBBIN GARBER-SLAGHT, COLD CLIMATE HOUSING RESEARCH CENTER, UNITED STATES

Ground source heat pumps (GSHPs) are a proven technology in climates with balanced heating and cooling needs. Newer units can operate to provide heat in colder climates that lack of balanced heating and cooling loads, this creates a potential deficit of energy in the ground. The thermal degradation of the soil over time can lead to decreased efficiency of the heat pump. Few long-term studies have been conducted on GSHP efficiency in cold climates; the longest known Alaskan study monitored a heat pump for two years. The Cold Climate Housing Research Center is now monitoring a GSHP in Fairbanks, Alaska. GSHPs use electrical energy

to create heat, while this can be cost effective at the building level, it may not save energy on a larger scale. New GSHP technology has made it feasible to use a GSHP in heating- dominated climates such as Alaska. As the technology moves north, researchers are exploring its performance characteristics in cold climates, the conditions necessary for efficient long-term operation, and the criteria to use heat pumps to save cost and energy for both the building they heat and on a larger scale.

HYBRID GOVERNANCE - DR. JESSICA SHADIAN, SENIOR FELLOW, BILL GRAHAM CENTRE FOR CONTEMPORARY INTERNATIONAL HISTORY, UNIVERSITY OF TORONTO, CANADA AND JIM GAMBLE, EXECUTIVE DIRECTOR, ALEUT INTERNATIONAL ASSOCIATION, ALASKA, UNITED STATES

As the Arctic's ice recedes, maritime and coastal traffic, whether in the form of destination shipping, innocent passage or for tourism, can be expected to dramatically increase. At the same time, Arctic climate change is affecting Inuit coastal communities' abilities to hunt and travel on ice with the same certainty and predictability as traditionally existed. These factors become more complex in that there is the reality of winter darkness, the fact that extreme and unexpected Arctic weather happens at all times of the year, and the presence of seasonal and other forms of ice will continue into the future. The prospect that an emergency will take place in the Arctic seas or along its coasts is almost a certainty. In a region where little, if any, infrastructure exists a well-coordinated regional approach to Oil Spill Preparedness and Response and Search and Rescue (understood here as Arctic Emergency Preparedness and Response) is an obvious necessity. To address the challenges created by these changes, the Arctic Council states' have passed a number of binding declarations. Most noteworthy are the 2011 Agreement on Cooperation in Aeronautical and Maritime Search and Rescue in the Arctic (SAR) and the 2013 Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response



in the Arctic (Oil Spill Agreement). While these initiatives are an important first step, the agreements fail to sufficiently account for the fact that the said activities will be played out on the doorstep of many Arctic indigenous communities. Though the Oil Spill Agreement acknowledges the threat of oil pollution to the livelihoods of local and indigenous communities, the agreement is among the eight Arctic states and does not directly include the participation of local communities (the agreement is guided on the assumptions of traditional Westphalian law). The SAR agreement does not make any mention of Arctic indigenous or other local communities and, as such, it goes even further to ignore the simple fact that any search and rescue effort will set out on its mission from a number of indigenous communities along the Arctic's shores; communities which not only hold a deep connection with an inherent sense of responsibility to the lands, waters, and resources of where they live but in many cases they further have rights to or outright own (through domestic and international law) these same land, waters, and resources. Arctic coastal indigenous communities also maintain invaluable traditional knowledge about local ice flows, animal migration routes, and rely on the Arctic environment for sustenance, culture, identity, as well as overall human wellbeing.

HUMAN SECURITY – DR. GUNHILD HOOGENSEN GJØRV, UNIVERSITY OF TROMSØ, NORWAY

This examines the linkages between security, geopolitical and governance challenges in relation to Arctic extractive industries. The approach has a multi-level focus, exposing and acknowledging the tensions and interactions between different levels of analysis (or rather, different levels of human interaction), from the individual, to community, state, and international. The interaction between state and non-state actors in the Arctic region are examined, exploring the relevance and power of non-state actors on the ways in which security, geopolitics, and governance are understood. It also examines the power of the normalized discourses of state-based geopolitics, where states are positioned in opposition to one another and heightening national security concerns, at times working in contradiction to interactions/cooperation taking place at community or individual levels. It asks for a conversation that more extensively takes a comprehensive, complex and nuanced look at the multiplicity of actors involved in Arctic affairs, recognizing the role of non-state actors as well, including industry (particularly extractive), the relations of industry to the state as well as to local communities, and the power/role of local communities themselves.

INDIGENOUS WORKFORCE DEVELOPMENT – TERRI MITCHELL, UKPEAGVIK IÑUPIAT CORPORATION, UNITED STATES

The Iñupiat people of Northern Alaska have been stewards of the Arctic for centuries. The reason for their survival is the cultural ability and openness to adapt and change. The current environmental and economic changes in the Arctic are two-fold for the Iñupiat; environmental and social. Climate change has opened the Arctic to oil and gas exploration. While the last generation lived a subsistence-based lifestyle, the younger generations have to change how they hunt, and understand the land but also how to make a living more in keeping with the western world. They have to learn how to interact with the oil and gas industry that is descending on their world while keeping their culture alive as it is rapidly evolving to keep pace with the Arctic as it changes. Stewardship is a vital cultural value for the Iñupiat. Under the Alaska Native Claims Settlement Act of 1971, 220,000 acres of surface title around Barrow, Alaska were conveyed to the Ukpeagvik Iñupiat Corporation (UIC) with shareholders comprised of the Iñupiat people of Barrow. UIC was one of the first corporations that openly supported offshore drilling. Drilling would happen with or without them so to have a voice in how it would happen they had to support the industry but with certain stipulations. One stipulation was that jobs would be available for their shareholders by the industry in fields protecting the environment. One way that UIC has found to help their younger generation learn to live in a world that now includes a work day, typically far from home, and a growing oil and gas infrastructure in their communities is a workforce development program. This program trains shareholders to be the marine mammal observers, subsistence advisers, vehicle inspectors, and communication center operators required for the oil and gas work being done in the Arctic. This program teaches job skills while simultaneously actively ensuring that the Iñupiat people keep their culture intact and remain the stewards of the Arctic. There is a way to move forward with oil and gas exploration and production while maintaining traditional values and ways. To remain stewards of the Arctic one must adapt and change as the Iñupiat of Alaska always have.



INTEGRATING RENEWABLES –DAVID LOCKARD, ALASKA ENERGY AUTHORITY, UNITED STATES

Reliable powerhouses that are well-designed and constructed and include renewable energy provide rural Alaska residents with security in the areas of space heating, communications and health care. They also provide the best opportunity to mitigate the cost of powerhouse fuel and operations and improve the affordability of rural utility bills. The first step in upgrading a powerhouse to integrate renewable energy is to ensure that the diesel plant, controls, and distribution system are in good condition, optimized for energy efficiency, and appropriate for the intended integration. Generally, this requires re-designing and upgrading this equipment. If the renewable integration involves a dispatchable electric load for frequency control, and/or if significant excess renewable energy will be available, it may warrant installing an electric boiler in a district heating loop or public facility such as a school or water plant. The switchgear, programmable logic controller, protective relaying, and other controls should be designed to provide reliable power within industry-accepted tolerances for voltage, frequency, and power quality. The gensets should be optimized for efficiency, which includes heat recovery as well as generation efficiency. In some cases marine manifolds on the engines or stack heat recovery are appropriate. Maintenance-related measures such as used oil blending should be considered. Transformer specifications and distribution voltages should be reviewed to determine if improvements are warranted.

MICROGRIDS – WILLIAM GALTON, ABB, UNITED STATES

The next innovation in microgrid technology will address the high reliability needs of critical power applications. Critical power users cannot afford even a momentary interruption or degradation of power; such users can be identified in a number of different industries, including data centers, hospitals, mining, oil and gas refineries, and emergency response operations, as well as remote power systems. In addition to the proper management of distributed energy resources (DER) within a microgrid that allow for safe islanded operation, these mission-critical sites require that their microgrids feature truly seamless transitions from the grid-connected to islanded and from islanded to reconnected modes of operation. A microgrid-enclosed data center would be a radical departure from the standard data center infrastructure design, which typically includes a complex network of backup generators, UPS units, and transfer switches. The critical power microgrid may deliver the same ultra-high reliability of power through a simplified distribution system by seamlessly integrating a number of distributed energy resources within the microgrid onto a common bus or redundant pair of busses while smoothly managing the disconnection and reconnection at the Point(s) of Common Coupling (PCC) between the microgrid and main grid.

NORDIC EXCELLENCIES MODELS, PROJECTS AND POLICIES ON THE EDGE OF ENERGY INNOVATION IN THE NORDIC REGION - FEDERICA SCARPA ARCTIC PORTAL, ICELAND

Participants to the project, in collaboration with NORDEN, have conducted an extensive work of research, first to outline the “Energy Profiles” of each and every Nordic Countries in order to understand the energy “baseline”, and then to identify the “Nordic Excellence: models, projects and policies on the edge of energy innovation in the Nordic region”. With the support of our partners located in the Nordic area, the project has collected the most innovative models, projects, solutions and/or policy approaches regarding “secure and affordable energy for resilient communities” in the Nordic region with special emphasis on to “clean” and “green” energy and clean energy business.

The selection has emphasized different typologies of “energy solutions”, ranging from “wind farms” to mobile applications, and has highlighted the applicability of these solutions in similar contexts. In addition, the research participants have given priority on projects and best practices that address the business of clean and efficient energy solutions. With the support of an interactive map, created for the purpose, “Energy Profiles” of the Nordic Countries and the selected projects representing the “Nordic Excellence: models, projects and policies on the edge of energy innovation in the Nordic region” are available at the Arctic Portal in its energy portlet at <http://arcticportal.org/> or <http://portlets.arcticportal.org/nordic-energy>

OIL & GAS DEVELOPMENT AND INDIGENOUS COMMUNITIES’ SOCIAL SECURITY – DR. MARIA TYSIACHNIOUK, CENTER FOR INDEPENDENT SOCIAL RESEARCH, RUSSIAN FEDERATION AND PROFESSOR LAURA HENRY, BOWDOIN COLLEGE, UNITED STATES

Security in the Arctic and sub-Arctic not only encompasses military and geopolitical concerns, but also environmental sustainability and social resilience, including how oil extraction affects indigenous communities and their ability to continue traditional practices such as hunting, fishing, and reindeer herding. This research will analyze how companies shape social security in the region through varied benefit-sharing arrangements with indigenous communities on Sakhalin Island in the Russian Federation. Russia is home to many previously isolated indigenous communities, notably in the Arctic and sub-Arctic regions. These communities must co-exist with the expansion of the oil and gas industry on the ground. Today the country has become increasingly isolated due to international sanctions. As such, the oil industry is affected by changing relationships within multinational consortia, challenges in acquiring necessary technologies, and diverse responses to global norms such as “corporate social responsibility,” which were imported to Russian in the recent past. The research examines the material results of these interactions and highlights the perceptions of indigenous people, ultimately assessing both intended and unintended consequences of oil development for indigenous people.

The case investigated by this research examines the behavior of companies within two transnational oil and gas consortia, Sakhalin 1 and Sakhalin 2, in the period 2013-2015. Both consortia involve transnational corporations of Russian and foreign origin, that interact with indigenous communities, both collectively, as part of the consortium, and individually. In terms of foreign investments Sakhalin-1 is the largest oil and gas project in Russia. In addition to oil extraction, the project includes three offshore fields: Chayvo, Odoptu and Arkutan Dagi. Sakhalin-1 is an international consortium in which the operator is Exxon Neftegas Limited, a company that owns a 30 percent stake in the project. Exxon Neftegas Limited is a subsidiary of the Exxon Mobil transnational corporation of U.S. origin. The Russian company Rosneft entered into a strategic partnership for development and the implementation of further projects with the company Exxon Mobil and is represented in the consortium through two subsidiaries. In addition, the consortium includes the Japanese company SODECO (30%) and the Indian state oil company ONGC Videsh Ltd (20%). For the Sakhalin-2 project, the consortium the operator is Sakhalin Energy that is headquartered in Yuzhno-Sakhalinsk. Sakhalin Energy was founded in 1994 by three companies: Royal Dutch Shell, Mitsui Co.Ltd and Mitsubishi Korporeyshen in order to develop the Piltun Asokhski and Lunskeye oil deposit on the north eastern shelf of Sakhalin Island. In 1994 Sakhalin Energy signed a production sharing agreement with the Russian government and the Sakhalin Oblast administration. In 1996 it began the first phase of the project Sakhalin-2, and in 1999, first oil was produced. The second phase began in 2003. In 2006 Gazprom, Shell, Mitsui and Mitsubishi signed an agreement on

the entry of Gazprom into consortium with Sakhalin Energy as the main shareholder because Gazprom Sakhalin Holdings B.V. in 2007 bought 50.1 percent of shares, a controlling stake. Prior the purchase Shell Sakhalin Holdings B.V., a subsidiary of Royal Dutch Shell, had owned the controlling stake, but after Gazprom joined Shell was left only a 27.5 percent-1 share. Therefore since 2007 Shell has not participated in the decision-making processes for the consortium, yet it still receives benefits from oil extraction. In addition two Japanese companies are part of the consortium: Mitsui Sakhalin Holdings B.V. (a subsidiary of Mitsui Co. Ltd, holding 12.5%) and Diamond Gas Sakhalin (a subsidiary of Mitsubishi Corporation, with 10%). The companies have different approaches to corporate social responsibility and embrace different kinds of benefit sharing. According to the governance literature, several modes of interaction between resource extracting companies and local communities exist including the shareholder mode (Simpson 2007), the partnership mode (Warhurst 2001), the CSR mode (Shever 2010), and the paternalistic mode (Ardichvili 2001). In each type, compensation and economic support for local communities are delivered differently. Most transnational corporations in the oil and gas sector have declared their commitment corporate social responsibility, including benefit-sharing arrangements that provide communities with different forms of compensation, and the protection of indigenous rights to land and access to traditional resources. However, local implementation of these arrangements is highly variable. A company's engagement with indigenous communities depends on a variety of factors including the companies' internal CSR policies, level of participation in global CSR initiatives and standards, and interactions with the regional government.

OIL AND GAS POTENTIAL AND THE REGULATORY PROCESS IN RUSSIA - AYTALINA IVANOVA, NORTHEASTERN FEDERAL UNIVERSITY, RUSSIAN FEDERATION

This lecture starts with a rough overview of the main Russian federal legislation governing extractive industries. The focus is on those aspects of the laws that regulate the industry's impact on local and indigenous people and its mediation. The federal laws in Russia are superior to any other legal documents, and regulate how much of the tax revenue from extractive industries goes to the Federal Centre, to the region, and the municipality. The most important rules stipulated here are as follows: 18 percent of the tax revenue goes to the region and 2 percent to the Federation. The regions have the right to collect 100 percent of the property tax of organizations. As for revenue tax of individuals, 70 percent goes to individuals and 30 percent to the municipality of somebody's residence. The differences in wealth of a region depends thus on the kind and amount of resource that is extracted there. However, the main message suggested here is that understanding oil and gas governance in Russia means understanding not only the Federal laws, but the regulatory process and practice. Examples of this are given from the region of Yakutia - Russia's largest administrative unit that also hosts the world's coldest inhabited place on earth and abundant diamond, coal, and gas resources. Rather than relying on regulatory documents alone, I show how contemporary legal studies must consider the historical events and the social consequences of the laws for the people living in extractive industries areas. This orientation was promoted by the founding fathers of the sociology of law, Ehrlich and Muromtsev in their theory of legal consciousness (or living law), long before the extractive industries entered the Russian Arctic. Analyzing the latest developments in the regional legislation of extractive industries with this approach, the emphasis lies on the practical implementation of the laws, including civil society participation in the regulatory processes in the field.

RURAL INJUSTICE – DR. ANNE WINTHER, UNIVERSITY OF STIRLING, SCOTLAND

Scottish rural communities face continuing decline with multiple socio-economic difficulties: poor housing, lack of rural employment, aging populations, declining services, and poor transport and connectivity. There is compelling evidence that community renewable energy developments can aid in addressing some of these problems and facilitate sustainable development. However, even though Scottish rural communities are juxtaposed to some of the best renewable energy resources in Europe, a review of existing energy developments and three case study communities demonstrate the benefits of renewable energy are not being shared fairly with rural communities. Renewable energy is the key future economic resource for rural communities, for fulfilling the community's energy needs, for creating employment directly or indirectly and for creating community income. Initiating, funding and managing investment projects are significant

challenges for communities. Sustainable development

Principles may be compromised if communities cannot maximize the energy opportunities from their local resources. Injustice arises from: existing land tenure arrangements; the socially and environmentally acceptable opportunities for electricity generation already being exploited and unavailable for community development; lack of community capacity and capability to act on opportunities; and insufficient responsibility being placed on landowners for delivering community energy and sustainable development. Energy injustice in rural Scottish communities reflects existing inequalities in social structures and in the distribution and control of natural resources and renewable energy developments.

SMALL MODULAR NUCLEAR REACTORS – VLADIMIR KUZNETSOV, INTERNATIONAL ATOMIC ENERGY AGENCY, AUSTRIA

Small modular nuclear reactor (SMR) application for power in the Arctic can supply both electricity and heat to remote and rural consumers, while being environmentally friendly. Nuclear power, under proper safety conditions, is one of the cleanest industries. Most communities and industrial facilities in the Arctic require no more than 10 MW of power; only a few of isolated local power systems may require up to 100 MW. Since remote regions having little developed construction and engineering infrastructure, it is efficient to use factory-fueled transportable SMRs, which can be both floating and land-based. For both types of SMRs, there are various capacity levels and advantages and shortcomings of floating and land-based plants depending on their siting. Possible ways to transport SMRs, as well as SMR replacement after the end of its fuel cycle or reactor lifetime, are also considered in this research. An assessment of competitiveness conditions is provided for SMRs compared to fossil-fuel plants of equal capacity. Radioecological safety issues, including environmental impact of SMRs, need to also be considered.



SPILL RESPONSE – CRAIG BARKLEY LLOYD, ALASKA CLEAN SEAS, UNITED STATES

For the oil spill response community, collaboration is the key to success and survival in the Arctic. Remote and harsh locations, environmental sensitivity, abundant wildlife, and cultural significance of the region factor into every action. Driven by issues related to natural resource exploration, global climate change, loss of sea ice, and increased shipping traffic, the Arctic region is receiving more attention today than ever before. Arctic communities are relatively small, geographically isolated and widely spaced; there is no road access and communications infrastructure is limited through improving. The people of this region maintain a delicate balance between traditional culture and modern lifestyle. With an increase in resource exploration, economic growth and regional development, outside organizations are taking more notice of the area. To be successful, knowledgeable people must come together to identify and overcome obstacles. For over 35 years, Alaska Clean Seas (ACS) has been working on the North Slope as the premier Arctic oil spill response organization in the world. Seeking community, academic and regulatory partners, ACS's external outreach programs have enabled the company to build a level of trust in the spill response community that allows for consensus-building and successful problem solving. For years, ACS has been involved in committees and working groups such as the Sensitive Area Working Group; North Slope Marine Mammal Response Work Group; the Research and Development Committee; Industry/Agency North Slope Spill Response Project Team; Joint Industry Program; and the Global Response Network. Through information sharing, the concerns of the community and agency partners have been balanced against scientific and operational knowledge. These programs have produced Technical Manuals, follow up reports, procedures and best practice guidelines which enhance overall readiness and standardize the approach to responding to spilled oil. Additionally, ACS has established programs to incorporate traditional knowledge, improve understanding of local issues, and benefit from the local community including the Village Response Team and internships for Alaska Natives.

SUCCESS IN RURAL COMMUNITY ENERGY PLANNING – JOEL NEIMEYER, THE DENALI COMMISSION, UNITED STATES

Good community energy planning in rural Alaska communities is often incomplete and does not provide sufficient information for local leaders to make informed decisions on energy solutions for their community. There are many consumers of energy in rural settings including power plants, schools, sanitation facilities, commercial and other nonresidential buildings, and residences. Often the energy used by these different consumers is not readily available to the local city or tribe. In addition, atypical to most areas, rural Alaska buildings generally consume more energy for heat than for electricity. Obtaining heat usage data is complicated and an inexact science. Many agencies at the federal, state, regional, tribal, and local levels are working on opportunities to lower the cost of energy. These opportunities are largely based upon lowering energy use, but without knowledge of how energy is consumed in the community, local leaders do not have the necessary information to select appropriate solutions and technologies. The Denali Commission has approached the energy planning question based upon our prior work in developing health clinics in rural Alaska. The Commission's health facilities program provided approximately \$300 million that was matched with an equivalent amount of leveraged funding from other sources to build over 120 state-of-the-art rural clinics that were "rightsized" to the local community's health needs. The health facilities program developed a business plan model and site plan checklist to evaluate prospective clinic projects. In addition, a technical assistance team was assembled to provide assistance to applicant organizations. These two elements are key to success to a community scale energy plan. A third element must be developed: a web-based platform that allows the many building owners to input their energy use data. If we are to get school districts, power providers and sanitation system owners (generally the three largest users of energy) to readily provide their energy use data we need to make the process simple.

SUSTAINABLE PATHWAYS –PETER LARSEN, LAWRENCE BERKELEY NATIONAL LABORATORY, UNITED STATES

Rural Alaska is exposed to the highest energy costs in the United States. Nearly 200 communities predominantly rely on expensive and unpredictably-priced diesel fuel for almost all electricity generation. Demand-side

resources, including energy efficiency, and renewable sources of electricity appear to be viable options in many communities, but these resources are currently under-utilized. The U.S. Department of Energy (DOE) Office of Indian Energy Policy and Programs is partnering with the Regulatory Assistance Project (RAP) and Lawrence Berkeley National Laboratory (LBNL) to assist local utilities and policymakers identify new (or improvements to existing) options intended to lower the economic cost of meeting rural Alaska's energy needs. Efforts are underway to review and/or identify the following: status, intent, and past performance of statewide grant and support initiatives; long-term planning practices (local, regional, statewide); resource selection criteria—including the consideration of renewable electricity resources and demand-side options; requirements and capabilities of utility staff to manage changing technology; existing and new opportunities for joint-action initiatives, sources of low-cost capital, and coordinated resource investments; opportunities for strengthening investments in low-cost energy efficiency; ways to strengthen and streamline project-related grant assistance; other strategies and successful practices already occurring in rural Alaska communities; and options for using more local renewable energy resources.

TIDAL ENERGY – YULY SHPOLYANSKY, RUSSIAN FEDERATION

Since 1968, on the coast of Arctic Ocean in Motovsky Bay, Russia's pioneer tidal power plant (TPP) named "Kislogubskaya," has successfully been working in the power grid of "Kolenergo." It is the world's first ever TPP built using a floating method, opening new horizons in the construction and development of TPP around the world. Later on, this floating method was given its well-deserved name of "Russian." But this method of building is not the only matter of significance in the Kislogubskaya project. Freeze-resistant concrete ($F > 1000$) designed particularly for this TPP provided almost 100 percent anti-corrosion protection. This and other unique technologies enabled the thin-walled (wall width of only 15 cm) powerhouse structure to remain undamaged for half a century in the harsh conditions of the Arctic. The project is acknowledged to be "the most long-lasting construction in the Arctic region." Currently the floating power unit "Malaya Mezenskaya," with a new orthogonal turbine is attached to the existing structure of Kislogubskaya TPP. This turbine is ideally suited for low heads, large water discharges, and two-way operational modes. It is estimated that by using orthogonal turbines on a future mega TPP Mezenskaya in the White Sea, savings may reach up to \$10 billion. Also a new air-orthogonal turbine has been created and tested on the pressure stand, which was installed in the Barents Sea in 2013. Based on the experience of building Kislogubskaya TPP, a northern machine-building factory "Sevmash" has built one of the world's biggest artificial ice-resistant island-platform. This floating platform was installed in 2011 on an oil and gas deposit in the Pechora Sea. Its name is "Prirazlomnaya." This structure is basically a perfect prototype for future powerful TPPs such as Mezenskaya and Tugurskaya. The results of research being made on Kislogubskaya marine scientific base by "Rushydro" enables work on creating autonomous free flowing tide-wind-wave energy complexes, which is important for development of northern shipping routes, oil and gas deposits of Arctic shelf, and providing energy supplies for coastal settlements of far north.

TIDAL ENERGY – NICHOLAS DEMIDENKO, STATE OCEANOGRAPHIC INSTITUTE, RUSSIAN FEDERATION

The Kislogubskaya pilot tidal power plant, situated on the Arctic shoreline, provides ecologically safe and reliable power and is acknowledged in Russia as being one of the first plants of its type in the world. A distinctive feature of the Kislogubskaya plant is that it is the only Russian power structure that works in an ocean environment exposed to tidal conditions and an Arctic climate. Tides are the source of renewable and ecologically clean energy, with an energy potential comparable with that of rivers and wind. In Russia there are several sites, which are suitable for the construction of powerful tidal schemes, for example: the Arctic shoreline of the Barents Sea and Mezen bay in the White Sea. The average monthly height of the tides in these areas is approximately 3 meters on the Kola Peninsula to 7 meters in the Mezen Bay.

Tidal waves in bays and river estuaries carry large masses of water and present the most effective way of utilizing tidal power through the construction of low-head tidal barrage. These separate a limited basin area from the sea. Field studies established that during times of abrupt changes in the tidal discharge rates, there was bottom erosion of 2 to 3 cm/day. However, when design and operational condition were followed, all

processes became balanced after two years and erosion ceased. Also, it was shown that the tidal plant was associated with less sedimentation transport in comparison with natural conditions and inside the basin, deformation of the lower part was almost absent. Tidal plants offer the advantages of being non-polluting, and not causing a loss of land or the need for resettlement, as would be the case with the conventional hydro reservoir. Also, in the event of failure of a barrage, there is no threat to life or property. Beyond these inherent advantages, it has been necessary to study other environmental impacts. Optimization of the ecological situation in the tidal basin is possible by adopting some engineering-technical measures. Recommendations include: tidal power units should work only in the most ecologically safe design mode; in the littoral zone, it is beneficial to create artificial biotopes in the form of synthetic seaweed, which will not react to the desalination and will attract mobile forms of hydrobionts; cold aerated water should be supplied to the hollows which are deficient in oxygen; this is done by pipeline from the gulf, which extends to the dam on the sea side; centres can be created to develop mariculture. The design of the Mezenskaya scheme is currently under way. This plant will be sited in the Mezen bay of the White Sea, which is the most promising area for tidal energy in Russia. The tidal range at the entrance to Mezen bay is 5.4 m and it is 7.5 m near the shore. The Mezen tidal power plant (TPP) will have a capacity of 8000 MW with an annual production of 38 TWh. The Severnaya scheme in the Dolgaya Bay, on the Kola Peninsula of the Barents Sea, is almost complete. The surface area of this bay is 5 km² and there are regular semi-diurnal tides with a range of 4.3 m. Experimentation at Dolgaya Bay will help decisions to be made relating to the construction of Mezenskaya project. Severnaya tidal power plant is being designed as a pilot power plant where new technical solutions for tidal schemes are sought to decrease considerably the construction costs. These solutions include the new hydropower unit with orthogonal multi-storied turbines and a new design of floating concrete units that will house this power unit.

**TRADITIONAL KNOWLEDGE – DR. HAJO EICKEN,
INTERNATIONAL ARCTIC RESEARCH CENTER – UNIVERSITY OF ALASKA FAIRBANKS,
UNITED STATES**

Locals are often first responders to disasters. Preparation for emergencies may catalyze the integration of different forms of information and knowledge. Here, we explore the potential role of traditional knowledge and community-based sea-ice observations in identifying hazards and informing emergency response in coastal hydrocarbon and maritime activities is explored. Working with Iñupiaq experts, we developed an observational framework and a database to record, archive, disseminate and analyze community-based sea-ice observations in coastal Alaska. Observations are based on ice uses, recording ice conditions, weather, ocean state and animal behavior relevant to hunters and community members. Daily logs have been archived since 2006, with key variables extracted for sub-categories pertaining to weather and ice observations, ice related activities and potential hazards. Expert workshops have explored complementary traditional and scientific knowledge and identified information gaps on currents and ice movement along Alaska's north shore in the context of search and rescue and spill response. We explore opportunities and challenges in building an interface (relationships, protocols, technologies) between traditional knowledge, environmental sciences and engineering to help ensure that local expertise and traditional knowledge – which have much to contribute to safe operations – are drawn on but not misappropriated in the context of hydrocarbon exploration and development.

**TRADITIONAL KNOWLEDGE – JON ISAACS,
AECOM, UNITED STATES**

The value of Traditional Knowledge (TK) in contributing to scientific research and fish and wildlife management has been long recognized. Well-known examples include the observations of Inupiat whaling captains on bowhead whale spring migrations leading to more accurate estimates of population levels, and University of Alaska Fairbanks collaboration with Inupiaq hunters to better understand the characteristics of sea ice. Yet the limited application of TK in research/management of upstream oil and gas activities has frustrated Inupiaq stakeholders; government and industry decision makers can be equally frustrated in trying to apply TK. TK is observation-based on past/contemporary use of the Arctic environment. It provides insight on physical and biological environment characteristics and trends, how indigenous residents use their environment and harvest resources, and focus areas of scientific inquiry, permit monitoring and enforcement. However, some view TK as anecdotal and difficult to confirm, problematic in identifying reputable sources and obtaining consensus, and difficult to translate into concrete and justified management requirements.

Successful application of TK, where it hasn't worked will be discussed, and reasons why will be addressed. Potential opportunities such as focusing future research, considerations for scheduling/conducting resource exploration, and incorporation into Adaptive Management and Conflict Avoidance will be discussed. The value of Traditional Ecological Knowledge and its application to scientific research and resource management has been a topic of discussion for several decades. Strides have been made in recognizing its importance and utilization. However, challenges and frustration still exist among all stakeholders in how to best apply TK.

**TRAINING – DR. PETER WEBLEY,
CENTER FOR STUDY OF SECURITY, HAZARDS, RESPONSE AND PREPAREDNESS – UNIVERSITY OF
ALASKA FAIRBANKS, UNITED STATES**

Connecting directly with those research scientists developing state of the art tools and techniques provides the next generation of homeland security and emergency managers (HSEM) with the increased capacity to make the most appropriate decisions. In 2013, the University of Alaska Fairbanks (UAF) set up the Center for the Study of Security, Hazards, Response and Preparedness (C-SSHRP). C-SSHRP brings together all relevant aspects at UAF, from its teaching capabilities, world-leading research and facilities, to its outreach and links into the local community, federal, state and regional organizations. In April 2014, C-SSHRP was the host for the Arctic Collaborative Workshop that brought together military and civilian arctic experts from Canada, Denmark, Netherlands, Norway and the US. The workshop increased the understanding and awareness of the Arctic and its existing and potential partnerships, the changing environmental conditions and limitations on response operations and logistics.

**TRANSMISSION – DAVID NEWMAN,
CENTER FOR COMPLEX SYSTEMS STUDIES – UNIVERSITY OF ALASKA FAIRBANKS, UNITED STATES**

We depend on a web of complex critical infrastructure such as power transmission networks, communication systems, transportation networks, and others. These infrastructure systems display a number of the characteristic properties of complex systems. Important among these characteristics, they exhibit infrequent large cascading failures that often obey a power law distribution in their probability versus size. This power law behavior suggests that conventional risk analysis does not apply to these systems. It is thought that much of this behavior comes from the dynamical evolution of the system as it ages, is repaired, upgraded, and as the operational rules evolve with human decision making playing an important role in the dynamics. One of the important outcomes is the realization that “improvements” in the system components and operational efficiency do not always improve the system robustness, and can in fact greatly increase the risk, when measured as a risk of large failure. Similarly, increasing the penetration of sustainable resources such as wind and solar generation can have both positive and negative impacts on the reliability of the system depending on how they are incorporated. Understanding the strengths, weaknesses, and intrinsic limitations of these critical infrastructures as a whole is of great importance to the engineers that build and operate them, to the policy makers that govern them and of course to the users who rely on them.

**WIND AND STORAGE – KORD CHRISTIANSON,
TDX POWER, UNITED STATES**

Fast-acting dispatchable loads (thermal, pumps, heat pumps, etc.) can be used to operate and control high-wind-penetration wind-diesel systems on remote or isolated “islanded” grid systems without the use of electrical energy storage. In 1999 Tanadgusix (TDX) Power installed a Vestas V-27 wind turbine (225kW) on the island of St Paul, Alaska to provide electric power and heat for a 80,000 square foot facility near the airport. This system operates in wind-only mode over 20 percent of the time, wind-diesel ~60 percent, and diesel-only less than 20 percent of the time. The recent addition of a 15-minute electric energy flywheel has increased wind-only mode operation to over +35 percent. TDX won a \$1.2 million Department of Energy Microgrid award that will further renewable penetration into the community.

WIND ENERGY AND REINDEER HERDING – DR. ANNA SKARIN,
SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES, SWEDEN

Wind power is an important part of the renewable energy production in Sweden. A large proportion of wind power capacity is built in the northern part of Sweden, which is also the reindeer herding area. Today Sweden has reindeer herding over half of the land area and the number of conflicts and court cases between the state, planners, and reindeer herders has increased significantly. Today there are few studies of the effects of wind power in operation on reindeer and reindeer herding, and there is no fundamental objective criteria to easily evaluate the potential negative effects and mitigation measures. Such knowledge is necessary at an early stage, in order to avoid controversial expansion options, as well as to facilitate assessment of the effects on a more objective basis. In a recent publication in *Landscape Ecology*, we have assessed how reindeer responded to wind farm construction in an already fragmented landscape, with specific reference to the effects on use of movement corridors and reindeer habitat selection. We analyzed data from calving and post-calving ranges from the predevelopment years compared to the construction years of two relatively small wind farms. During construction of the wind farms, use of original migration routes and movement corridors within 2 km of development declined by 76 percent. In addition, we have preliminary results from both this area and winter herding ranges showing the reindeer use during the wind farm operation years. Our first results points towards possible adverse effects on reindeer habitat use in relation to the wind farm in operation.



2015 ARCTIC ENERGY SUMMIT AGENDA

SUNDAY, 27 SEPTEMBER

WELCOME EVENT – UNIVERSITY OF ALASKA ENERGY SHOWCASE: “DISCOVER THE ENERGY OF THE ARCTIC AND ITS PEOPLE.”

Hosted by UAF’s Alaska Center for Energy and Power (ACEP) and Institute of the North

Twelve speakers presented in total with U.S. Senator Lisa Murkowski giving welcoming remarks. All presentations were recorded and have been posted on ACEP’s YouTube channel: https://www.youtube.com/playlist?list=PLJ_aYEKT8q8xVeSBUFPkqJrv483EGlIxU

Speakers:

- Gwen Holdmann, Director, Alaska Center for Energy and Power
- Jim Johnsen, President, University of Alaska
- Evon Peter, UAF Vice Chancellor for Rural, Community and Native Education, Neetsaii Gwich’in and Koyukon Tribal Chief of Arctic Village, Seat Holder on Arctic Council
- Dr. Daniel White, UA Vice President for Academic Affairs and Research
- Dr. Jeremy Kasper, Director of Alaska Hydrokinetic Energy Research Center, Alaska Center for Energy and Power
- Dr. Peter Webley, Associate Research Professor, UAF Geophysical Institute
- Dr. Erin Whitney, Research Assistant Professor, Alaska Center for Energy and Power
- Teisha Simmons, Director, UAF Interior Alaska Campus
- Dr. Tom Marsik, Assistant Professor, UAF Bristol Bay Campus
- Dr. Daisy Huang, Assistant Professor, Alaska Center for Energy and Power
- Dr. David Newman, Professor, UAF Department of Physics
- Dr. Richard Wies, Associate Professor, UAF Institute of Northern Engineering

MONDAY, 28 SEPTEMBER

TRADITIONAL AND LOCAL WELCOME

- Chief Victor Joseph, President, Tanana Chiefs Conference, United States
- Karl Kassel, Presiding Officer, Assembly, Fairbanks North Star Borough, United States

INTRODUCTION AND WELCOME

- Nils Andreassen, Institute of the North, United States
- Rex Rock, President & CEO, ASRC, Alaska, United States

SECURITY AND AFFORDABILITY FOR A RESILIENT NORTH

- Minister Ragnheiður Elín Árnadóttir, Ministry of Industries and Innovation, Iceland
- Admiral Robert Papp, Special Representative for the Arctic Region, U.S. Department of State, United States

PRESENTATION OF ARCTIC PUBLIC OPINION POLL – PRIORITIES AND PERSPECTIVES

- Tom Axworthy, Munk Gordon Arctic Security Program, Canada
- Sen. Lesil McGuire, Alaska State Legislature

(PANEL) OIL AND GAS RESOURCE POTENTIAL AND REGULATORY SYSTEMS

Moderated by **Ted Rockwell**, Circumpolar Solutions, United States

- Aytalina Ivanova, North-Eastern Federal University, Yakutsk, Russian Federation
- Professor Hari Osofsky, University of Minnesota Law School, United States
- Dr. Jessica Shadian, Aarhus University, Denmark
- Dr. James Kendall, Alaska Director, Bureau of Ocean Energy Management, United States

(WORKSHOP) ADDRESSING BARRIERS TO CLEAN ENERGY INNOVATION

Moderated by **Sydney Kaufman**, Bureau of Energy, State Department, United States

- George Roe, Program Manager, Alaska Center for Energy and Power, United States
- Sean Skaling, Director, Alaska Energy Authority, United States
- Scott Haase – National Renewable Energy Lab, United States
- Dennis Meiners – Intelligent Energy Systems

(TECHNICAL SESSION) ALTERNATIVE ENERGY IN REMOTE COMMUNITIES

Moderated by Dr. **Brian Hirsch**, Deerstone Consulting, United States

- Jen Hiscock, Natural Resources Canada/CanmetEnergy, Canada
- David Lockard, Alaska Energy Authority, United States
- Dr. Eric Bibeau, University of Manitoba, Canada
- Greg Porter, Chenega Energy, United States

PLENARY - DEVELOPING HUMAN CAPACITY WITHIN THE ENERGY SECTOR

Moderated by **Mike Black**, Alaska Native Tribal Health Consortium, United States

- Peter Christianson, NUNAOIL A/S, Greenland
- Terri Mitchell, Environmental Division Manager, UIC UMIAQ, United States
- Dr. Peter Webley, Deputy Director, Center for the Study of Security, Hazards, Response, and Preparedness, University of Alaska Fairbanks, United States
- Rob Cooke, Polar Knowledge Canada

(PANEL) EFFECTIVE MICROGRID IMPLEMENTATION AND OFF-GRID SOLUTIONS

Moderated by **Marc Mueller-Stoffels**, Alaska Center for Energy & Power; **Rob Roys**, Huntley and Associates, United States

- William Galton, Microgrid Project Manager, ABB, United States
- Rob Cooke, Polar Knowledge Canada
- Peter Larsen, Research Scientist, Lawrence Berkeley National Laboratory, United States
- Barry Sugden, Manager, Infrastructure Planning, Northwestel, Canada

(WORKSHOP) INTEGRATING TRADITIONAL KNOWLEDGE INTO OIL & GAS DEVELOPMENT

Moderated by **Jon Isaacs**, AECOM, United States

- Dr. Hajo Eicken, IARC, UAF, United States
- Richard Glenn, ASRC, United States
- Charlie Hopson, Barrow, United States
- Robert Suydam, North Slope Borough, United States

(TECHNICAL SESSION) COMMERCIAL AND PUBLIC BUILDING DESIGN FOR AFFORDABILITY AND RETURN ON INVESTMENT

Moderated by **Dena Strait**, Bettisworth North, United States

- Ingemar Mathiasson, Northwest Arctic Borough, United States

- Lyle Axelarris, Design Alaska, United States
- Tony SlatonBarker, Coffman Engineers, United States

(PANEL) SUSTAINABLE DEVELOPMENT AND REGIONAL ENERGY PLANNING

Moderated by **Nils Arne Johnsen**, Arctic Director, Ramboll, Norway

- Prof. David Newman, Director, Center for Complex Systems Studies, University of Alaska Fairbanks, United States
- Valeria Ruzakova, International Institute for Energy Policy and Diplomacy, Moscow State Institute of International Relations, Russian Federation
- Sonny Adams, Energy Program Manager, NANA, United States
- Lawrence Keyte, Carleton Sustainable Energy Research Centre, Canada
- Unnur Brá Konráðsdóttir, West Nordic Council, Iceland, Greenland and Faroe Islands

(WORKSHOP) POLICY AND IMPLEMENTATION FOR ENERGY EFFICIENCY GAINS

Moderated by **Katie Conway**, Alaska Energy Authority, United States

- Scott Waterman, Alaska Housing Finance Corporation, United States
- George Roe, on behalf of PNWER, United States and Canada

(TECHNICAL SESSION) TECHNICAL AND STAKEHOLDER ENGAGEMENT SOLUTIONS FOR ENHANCING OIL AND GAS OPERATIONS

Moderated by **Joshua Kindred**, Alaska Oil and Gas Association, United States

- Jennifer Blake, Process Safety Technical Authority, BP Alaska, United States
- Eric Febbo, Wildlife and Community Relations Supervisor, ExxonMobil, United States
- Suzanne Ban, Michael Baker, United States
- Ivan Meshkov, International Institute for Energy Policy and Diplomacy, Moscow State Institute of International Relations, Russian Federation



TUESDAY, 29 SEPTEMBER

REVIEW OF DAY ONE

- Björn Dahlback, Swedish Polar Research Institute, Sweden

PLENARY – ASSESSING, UNDERSTANDING AND COMMUNICATING RISK AND SECURITY ISSUES

Moderated by **Anni Reissell**, Arctic Futures Initiative, IIASA, Finland

- Michael Kingston, Associate Partner, DWF, United Kingdom
- Mark Brundage, Community Relations Lead, ExxonMobil, United States
- Reko-Antti Suojanen, Managing Director, Aker Arctic Technology, Finland
- Bruce Harland, Crowley Maritime, United States
- Dr. Gunhild Hoogensen Gjørsv, Professor, International Relations, University of Tromsø, Norway

(PANEL) TRANSNATIONAL OIL AND GAS KNOWLEDGE – THE FLOW OF TALENT AND FINANCIAL RESOURCES

Moderated by Dr. **Rasmus Gjedssø Bertelsen**, Barents Chair in Politics, University of Tromsø, Norway

- Craig Barkley Lloyd, President and General Manager, Alaska Clean Seas, United States
- Dr. Kathrin Keil, Institute for Advanced Sustainability Studies, Germany
- Professor Tina Hunter, School of Law, University of Aberdeen, Scotland
- Karin Berentsen, Kaisa Consulting, Norway
- Halldór Jóhannsson, Arctic Portal, Iceland

(WORKSHOP) NATURAL GAS DEVELOPMENT AND COMMUNITY BENEFITS

Moderated by **Charlie Kofinas**, Alaska LNG, United States

- Ella Ede, Statoil, United States
- Senator Peter Micciche, Alaska State Legislature, United States

(TECHNICAL SESSION) RENEWABLE ENERGY PROJECTS IN REMOTE COMMUNITIES

Moderated by **Gwen Holdmann**, Alaska Center for Energy & Power, United States

- Karen Petersen, UAF Cooperative Extension Service, United States
- Kord Christianson, TDX Power, United States
- Lars Andersson, Head of Wind Power Unit, Swedish Energy Agency, Sweden
- Dr. JP Pinard, Kluane Wind Project, Canada
- Federica Scarpa, Arctic Portal, Iceland

PLENARY – UNDERSTANDING COMMUNITY PERSPECTIVES

Moderated by **Tony Penikett**, former Premier, Yukon Territory, Canada

- Sara Fisher-Goad, Executive Director, Alaska Energy Authority, United States
- Dr. Florian Stammer, Research Professor, Arctic Anthropology, Arctic Centre, Finland
- Anders Oskal, International Centre for Reindeer Husbandry, Norway
- Graham Hogg, Lateral North, Scotland

(PANEL) COLLABORATION, CAPABILITIES OF OIL AND GAS INDUSTRY EMERGENCY PREVENTION, PREPAREDNESS & RESPONSE

Moderated by **Robert Blaauw**, Arctic Program Director, Shell; Chair, Arctic Committee, International Oil and Gas Association IIP, Netherlands

- Richard Glenn, Executive Vice President, ASRC; Member, National Petroleum Council, United States

- Mitch Winkler, Head of Arctic Technology Program, Shell, United States
- James Hall, Chairman of ART JIP, Exxon Mobil, United States

(TECHNICAL SESSION) EMERGING ENERGY TECHNOLOGIES

Moderated by Dr. **Jeremy Kasper**, Director, Alaska Hydrokinetic Energy Research Center, United States

- Lynn Trahey, Joint Center for Energy Storage Research Center, Argonne, United States
- Vanessa Stevens and Robbin Garber-Slagh, CCHRC, United States
- Tien Nygun, Quantum Energy, United States

(PANEL) CLEAN ENERGY POLICY

Moderated by **Chris Rose**, REAP, United States

- Aleksander Moss, Commercial Section, U.S. Embassy, Copenhagen
- Mark Glick, Director, Hawai'i State Energy Office, United States
- Bernard Moulins, Commercial Analyst, ENERCON, Canada
- Chris Sauer, Ocean Renewable Power Company, United States

(WORKSHOP) AEC RESPONSIBLE RESOURCE DEVELOPMENT WORKING GROUP

Moderated by **Lori Davey**, Alaska Business Delegate, Arctic Economic Council, United States

- Dr. Anni Reissell, Arctic Futures Initiative, IIASA, Finland
- Tara Sweeney, Arctic Economic Council

(TECHNICAL SESSION) HUMAN SECURITY AND SOCIAL IMPACT OF ENERGY INDUSTRIES

Facilitated by Dr. **Gunhild Hoogensen Gjørsv**, Professor, International Relations, University of Tromsø, Norway

- Dr. Bjarni Már Magnússon, Assistant Professor, International Law, Reykjavik University, Iceland
- Dr. Maria Tysiachniouk, Centre for independent Social Research, Russian Federation
- Dr. Noor Johnson, Brown University, United States
- Dr. Anna Skarin, Swedish University of Agricultural Sciences, Sweden

PLENARY KEYNOTE SPEAKER

- Michael Kingston, Marine Trade and Energy, DWF LLP

WEDNESDAY, 30 SEPTEMBER

PLENARY – SECURING AND LEVERAGING INVESTMENT FOR NORTHERN ENERGY PROJECTS

Moderated by **Mead Treadwell**, President, PT Capital, Alaska, United States

- Chris Henderson, Lumos Energy, Canada
- Dr. Hyo-Sun Kim, Department of Policy, Korea Polar Research Institute
- Eric Hanssen, Alaska Native Tribal Health Consortium, United States
- Eero Hokkanen, Gaia Consulting, Team Arctic Finland
- Greg Poelzer, University of Saskatchewan, Canada

ARCTIC INVESTMENT PROTOCOL

- Michael Perkinson, Guggenheim Partners

MAXIMIZING BENEFITS FROM RESOURCE DEVELOPMENT

Facilitated by **Lance Miller**, Senior Vice President, Natural Resources, NANA, United States

- Anne Merrild Hansen, Arctic Fulbright; Associate Professor, Aalborg University, Denmark

ARCTIC INVESTMENT PROTOCOL

Facilitated by **Michael Perkinson**, Guggenheim Partners, United States

- Peter Webb, Shell, Netherlands
- Randall Hagenstein, Nature Conservancy, United States
- Tara Sweeney, ASRC
- Jim Gamble, Aleut International Association

FINANCING CLEAN ENERGY PROJECTS IN REMOTE ARCTIC COMMUNITIES

Facilitated by **Gene Theriault**, Deputy Director, Alaska Energy Authority, United States

- Chris Sauer, Ocean Renewable Power Company, United States
- Margaret Wren, Aboriginal Affairs and Northern Development Canada

FINANCING TOOLS FOR ENERGY EFFICIENCY MEASURES

Facilitated by **Tim Leach**, Alaska Housing Finance Corporation, United States

- Peter Beardsley, Nortech, United States
- Amund Beitnes, Senior Investment Manager, Nordic Environment Finance Corporation, Norway

PUBLIC INVESTMENT IN ENERGY INFRASTRUCTURE PROJECTS

Facilitated by **Jim Nordlund**, State Director, USDA Rural Development, United States

- Ted Eschenbach, TGE Consulting, United States
- Peter Christiansen, NUNAOIL, Greenland

PLENARY – ARCTIC ENERGY FOR ARCTIC RESIDENTS

Chaired by Governor **Bill Walker**, State of Alaska, United States

- Governor Mika Riipi, County of Lapland, Finland
- Vladimir Vasiliev, External Relations, Sakha Republic
- Gudmundur Baldvin Gudmundsson, Chairman, Akureyri City Council, Iceland

CONCURRENT WORK SESSIONS (FACILITATED, INTERACTIVE REVIEW OF FINDINGS FROM SUMMIT)

REMOTE HEAT AND POWER & CLEAN ENERGY

Facilitated by **Gwen Holdmann**, ACEP, **Rob Cooke**, Polar Knowledge Canada and **Chris Rose**, REAP

OIL AND GAS

Facilitated by **Jon Isaacs**, AECOM and **Gary Isaksen**, ExxonMobil

REPORT OUT IN PLENARY

PLENARY – STRATEGIC PLANNING IN THE ARCTIC: A SYSTEM DESIGN APPROACH

Moderated by **Evon Peter**, Vice Chancellor, University of Alaska Fairbanks, United States

- Jack Hebert, CEO and Founder, Cold Climate Housing Research Center, Alaska, United States
- Jónas Ketilsson, Deputy Director General, National Energy Authority, Iceland
- Joel Neimeyer, Federal Co-Chair, Denali Commission, United States

CLOSING

- Tommy Flakk, Ministry of Foreign Affairs, Norway
- René Söderman, Arctic Official, Finland
- Nils Andreassen, Executive Director, Institute of the North



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