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## SDWG PROJECT PROPOSAL

<p><b>Project Title:</b></p> <p>Arctic Hydrogen Energy Applications and Demonstrations (AHEAD)</p>	<p><b>Lead Country/Project leader(s):</b></p> <p>Russian Federation (lead) Norway (co-lead)</p> <p><b>Partner/Supporting Countries:</b></p> <p>Germany</p> <p>Canada (anticipated) Denmark (anticipated) Finland (anticipated) Iceland (anticipated) Sweden(anticipated) The United States (anticipated)</p> <p>Russian Association of Indigenous Peoples of the North, Siberia and the Far East (anticipated)</p> <p>China (anticipated) France (anticipated) Italy (anticipated) Japan (anticipated) Singapore (anticipated) South Korea (anticipated)</p> <p><b>Project leader:</b></p> <p>Yury Vasilyev, Executive Director, Arctic Technologies Institute (Moscow Institute of Physics and Technology), Moscow region, Russia</p> <p><b>Co-leads and Partners:</b></p> <p>Oskar Njaa, General Manager for International Affairs, The Bellona Foundation, Oslo, Norway Roman Zaides, Managing Director, DTC Digital Technology Center GmbH, Berlin, Germany</p>
<p><b>Summary of required inputs:</b></p> <p>Lead country will cover costs of Snowflake International arctic station design, construction and development plus secretariat costs. On-site sessions/forums will be hosted by the interested participants, partners to cover the cost of their own participation.</p>	<p><b>Relationship to other AC Working Groups:</b></p> <p>N/A</p>



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<p>Project partners will seek funding for joint educational, popularizing programs and equipment purchase and on-site testing from relevant national agencies and international financial instruments.</p>	
<p><b>Summary of project objectives and main outcomes:</b></p> <p>Design, construction and development of the year-round Snowflake International Arctic Station (IAS) based on fully-autonomous hydrogen energy for finalizing, testing and popularizing solutions in the future environmental life-support technologies, as well as other technologies that improve living conditions in remote areas in the Arctic, such as medicine, biotechnology, clean agricultural technology, telecommunications, robotics, `the Internet of Things` and `smart home / village`, new materials and construction technologies and others.</p> <p>The station is also a vehicle for supporting joint research on climate change, ecology and environmental pollution, including that of the oceans.</p> <p>Functioning as a "living laboratory" IAS will provide a technological and economic foundation to scale up the newly developed solutions for widespread use.</p> <p>Please visit <a href="http://www.arctic-mipt.com">www.arctic-mipt.com</a> where you can find a short video about the AHEAD project and more detailed information.</p>	



**Project Objectives**

Project leaders, co-leaders and partners organize construction of **Snowflake International Arctic Station (IAS)** with autonomous power station on the “Zemlya Nadezdy” (Land of Hope) site in Yamal region (YNAO, Yamalo-Nenets Autonomous Okrug). That works only from wind and solar power and hydrogen energy, which completely eliminates the use of diesel fuel. The IAS creates a unique platform for international cooperation of engineers, researchers, young scientists and high school students working on technologies that can be tested and implemented today or that will become the basis for life in the Arctic in the nearest future.

International cooperation will be based not only on the participation of the Arctic Council’s countries and organizations, that represent the interests of the indigenous communities of the Arctic, but also observer countries that don’t have an access to the Arctic and will be interested in full cooperation reposed on a year-round open area located in the Arctic area.



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The modular structure of the 2,000-square-meter facility allows for gradual expansion.

Main units:

- Two laboratory modules — minilabs and workshops for safely testing and demonstrating technological solutions, small-scale office spaces.
- The main and panoramic modules — teleconferencing, presentations, forums, lectures and seminars; areas for exhibits and shared leisure of guests, a library and a 360° observation deck.
- Central module — a dining hall plus kitchen, a small cafe and a medical room.
- Two residential and a sports module — rooms for comfortable accommodation and individual work, a gym and a sauna.
- Utility module — conversion of hydrogen energy to electricity and heat, autonomous life support systems.
- Hydrogen modules — hydrogen generation and storage.





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Wind power plants, photovoltaic panels, lithium-ion energy storage devices, hydrogen energy equipment (electrolyzers, systems of hydrogen storage in various forms, fuel cells, hydrogen gas piston and steam turbine installations, etc.), a telecommunication tower, and also other container equipment required for power supply of the IAS and the “Land of Hope” village are located in the outside technological street platform next to IAS.

Next to the technological street platform, there is a small garage, workshop and warehouse areas. Within the framework of the project, a special caterpillar passenger and freight vehicles are purchased for the garage to organize a year-round comfortable and operational communication (6-10 hours depending on weather conditions) for employees and visitors of the station with Salekhard and Labytnangi cities, as well as the airport. Over time, it is possible to organize a hydrogen and electric gas stations at the IAS for transferring vehicles to hybrid plants using hydrogen fuel and electrochemical energy storage devices.



### "Land of Hope"

"Land of Hope", the main population of which is the Nenets, is located in the foothills of the Polar Urals, in the places called the Baidara tundra. The ancient word "trading post" was used to specify the villages where nomadic reindeer herders changed and sold their goods. The trading post "Land of Hope" performs similar functions today. More than 700 people are registered here, but no more than 50 permanently reside.





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The Nenets who roam the tundra and mountains come to the trading post for medical care, for food and other necessary goods.



"Land of Hope" is the place of life of the ancient Nenets clan of Nerkgagi. Today, a prominent representative and the head of this clan is Anna Nerkgagi, a well-known writer, and a public figure.



Anna Nerkgagi is engaged in the upbringing of foster children, she has founded a peasant farm "Land of Hope". Every summer, with the support of the Yamal Government, the regional children's tent camp "Land of Hope" takes place on the territory of the peasant farm.

Therefore, the special attention of the organizers of the IAS will be drawn to the harmonious combination of a high-tech station with the life and traditions of the indigenous people living in the "Land of Hope", while all the energy and life support systems of the IAS are built taking into account the necessary capacities to ensure the entire village of the "Land of Hope" and the surrounding territory.



Thus, guests at IAS can not only work together to test, implement and popularize various technological solutions for a person living and / or working in the Arctic, but also get acquainted with the customs and culture of the northern peoples. It is possible to organize special school / student educational tours, as well as attracting the attention of journalists covering life in the Arctic. On the basis of the IAS, they can produce educational and popular science films, organize international media broadcasts by the younger generation.



**Goals and objectives of the AHEAD project in the field of hydrogen energy for carbon-free and comfortable living in the Arctic territories.**

Goals

- Development of regional and international recommendations on the carbon-free energy supply and transport in the Arctic region.



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- Identification of best practices and best available technologies for carbon-free energy supply of settlements and industrial facilities with a high autonomy level (based on the use of renewable energy and hydrogen energy).
- Identification of best practices and best available technologies for carbon-free local and special transport (based on electric and hydrogen).
  - Exchange of experience and development visions regarding the organization of carbon-free energy supply of settlements and industrial facilities as well as local, special transport in the Arctic region.

### Objectives

1. The study of international standards regulating the energy supply of the Arctic territories.
2. Development of a methodology for the study and evaluation of practices and technologies for carbon-free energy supply of settlements and industrial facilities with a high degree of autonomy.
3. Development of a methodology for studying and evaluating the practices and technologies of local and special carbonless transport for circumpolar conditions.
4. Collection from the Arctic Council member-countries examples of the implementation of practices and technologies for carbon-free energy supply of settlements and industrial facilities with a high level of autonomy. Expert assessment and identification of best practices and technological solutions.
5. Maintaining joint visits of the Arctic Council member-countries to facilities where were implemented best practices and carbon-free energy technologies settlements and industrial facilities with a high degree of autonomization for their more detailed study.
6. Study on the basis of the analyzed practices of flexible (Plug & Play) integration of distributed energy resources to ensure incremental development of autonomous energy supply in remote areas.
7. Development of the expert-analytical report with the international recommendations on the carbon-free power in the territories of the Arctic region.
8. Holding an international conference in Russia in 2022 to exchange experiences and development visions regarding the carbon-free energy supply and transport in the Arctic region.
9. Development of proposals and recommendations for decarbonization of energy supply in the Arctic territories, making these proposals to the Arctic Council.

### **Timetable and Project Completion**

#### until June 22, 2020

- a large-scale discussion with international partners and preparation for SDWG meeting on June 22, 2020 in Iceland
- preliminary constructional and technological design of the IAS

#### June 22, 2020

- project presentation at SDWG meeting in Iceland

#### until May 30, 2021

- implementation of the preliminary design and its coordination, the collection of the necessary initial permits, the implementation of design and survey work, the preparation and start of the plan implementation for the international partners' participation in the project, ordering and manufacturing of key building and technological elements of the IAS

#### until May 30, 2022



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- delivery of all IAS elements, construction and installation, preparation for launching the IAS in test regime  
until December 31, 2022
- test operation of the station  
Spring 2023
- greeting international partners at the IAS
- launching technological and educational projects at the IAS, turning the station into scheduled operation and development of new cooperative international programs

### **Costs**

The preliminary project budget is approx. 10-12 mln. euros

Lead country will cover costs of Snowflake International arctic station design, construction and development plus secretariat costs.

On-site sessions/forums will be hosted by the interested participants, partners to cover the cost of their own participation.

Project partners will seek funding for joint educational, popularizing programs and equipment purchase and on-site testing from relevant national agencies and international financial instruments.