

# University of Regina

## Supplement to 2019-20 Operations Forecast

### Funding for an Energy Systems and Security Hub

#### **Summary**

In response to an opportunity identified in a recent feasibility study, the University of Regina is proposing funding of \$2.5 million over five years, beginning in the 2019-20 provincial budget, to enable the creation and establishment of an energy systems and security hub. The mission of the hub is to connect the expertise and capacity of a broad cross-section of Saskatchewan stakeholders, including industry, First Nations, governments and the public and to stimulate research, development and deployment of energy systems and security solutions.

#### **Context**

The report *Energy Systems & Security Hub Feasibility Study* was commissioned by the University of Regina (U of R) and completed by Stokes Research Inc. of Regina in early 2017. (This report is available on request.)

Interviews were conducted with a total of 45 individuals working in energy-related academic disciplines from the province's universities, government agencies with relevant mandates, energy-provider crown corporations, research organizations that support the work of the energy industry, and the province's top producers and consumers of energy in the oil, mining, and steel industries.

The principal goal of the study was to inform the U of R on the feasibility of formalizing existing partnerships, and developing new partnerships, in the areas of clean energy and energy security with the creation of an energy systems and security hub. The U of R undertakes research in a critical mass of energy-related areas, pointing to the potential of the U of R as the anchor location for a hub. These U of R research areas include demonstrated capacity in, petroleum engineering, nuclear power, carbon capture and storage, energy systems modelling, biomass energy, water and soil remediation, climate adaptation, wind power, ecological economics, and energy-related public policy. Additional detail pertaining to applicable U of R research capabilities is presented in Appendix 1.

Interviews revealed highly positive feedback regarding the establishment of a cross-sectoral energy systems and security hub, and a willingness to participate in the hub.

Also, some common cross-sector themes emerged from the interviews with respect to R&D interests:

- Emissions reductions: R&D to advance development and deployment of carbon capture and conversion technologies for multiple applications and to reduce methane emissions.

- Energy efficiencies and/or use reduction: R&D that results in energy efficient industrial processes without negatively impacting production; advances in heat recovery, smart grids, distributed generation, and transmission efficiencies.
- Energy policy and economics: Examination of energy policy in Saskatchewan including in the areas of cogeneration, scaling renewables onto the grid, and off-peak usage, and examination of energy economics and long-term assessments of supply of and demand for electricity and natural gas.
- Renewables generation and integration: R&D to determine the best technical and economic way to integrate this type of generation including for remote communities and industrial sites.

### **Proposal**

The University of Regina is requesting funding, beginning in the 2019-20 provincial budget, to support the creation and establishment of an Energy Systems and Security Hub. The hub would be a new office within the University of Regina headed by a director with business development and stakeholder engagement skills who will report directly to the Vice-President (Research). The hub will have an Advisory Committee drawn from industry and other interested parties that will have a major voice in informing the energy research agenda of the University.

The hub is envisioned to connect the expertise and capacity of a broad cross-section of Saskatchewan stakeholders, including industry, First Nations, governments and the public. Foreseeable benefits from the activities of the hub include:

- Identifying the needs of local, national, and international industry to mitigate greenhouse gas emissions by optimizing research, development, deployment, and commercialization opportunities.
- Communicating the identified needs to researchers at the University who can undertake funded projects to address them; promoting and facilitating collaborative activities and expediting project definitions and contracts.
- Advancing governmental objectives of a sustainable low carbon economy that includes growth in clean technology industries and advancements in renewable energy sources.
- Developing technological solutions and the social license required for the continued use of fossil fuels to preserve energy-producer and energy-intensive industries, providing affordable energy sources to the public, and capitalizing on natural resource endowments.
- Addressing technological issues associated with energy security in northern Aboriginal communities and northern industry, and the export of these technologies for global use in remote communities.

Funding requested is \$2.5 million over five years for hub creation and establishment of operations. It is expected that the hub will be successful in attracting further private and public-sector funding and will be self-sustaining after the initial five-year period.

Initial funding would enable:

- Staffing the hub with the Director and an administrative assistant
- The lease and provisioning of office space
- Business travel to build and formalize relationships; promote the hub at conferences and events; and, to connect with potential funders
- Building an online web and social media presence for the hub
- Support of the Advisory Committee's activities and regular meeting of hub stakeholders
- Acquisition of professional services as needed (e.g. technical writing, knowledge mobilization, contracts, marketing and communications).

Numerous economic benefits related to the creation of the Energy Systems and Security Hub were identified in the feasibility study:

- Increased ability to leverage and attract funding from governmental and other funding sources, and to undertake additional and more significant research, development, and demonstration through the pooling of hub participant resources.
- Cost-efficiencies in both the energy producing and major energy consuming industries through cross-sectoral collaboration.
- Maintenance of industry revenues and decreased penalties associated with the potential carbon levy through innovation in energy-producing and major energy-consuming industries
- Continued use of cost-effective fossil fuels through innovation in conventional resource production and energy generation.
- Capitalization on Saskatchewan's energy and resource endowments, and maintained industry investment and production levels in the province's key engines of economic growth.
- Advances in cost-efficient renewables technologies with industry applicability and grid compatibility
- Growth in green businesses and the green economy.
- Optimization of energy consumption costs for industrial and residential users through efficiencies in energy production, transmission, and conservation
- Provision of more cost-effective and reliable sources of energy to northern and Aboriginal communities and northern industry, and solutions applicable to global remote communities.
- Maintenance and expansion of the Government of Saskatchewan's revenue base.

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## Appendix 1: U of R Research Applicable to an Energy Systems and Security Hub

The following outlines the extensive list of research areas that the University of Regina operates in, research themes that cover a range including capture of industrial emissions, improved efficiencies to reduce the energy penalty of production, increased production and processing methods, energy policy, and adaptation to climate change.

### Energy Research:

- Heavy and Tight Oil Production and Enhanced Oil Recovery (cold heavy oil production with sand (CHOPS); steam assisted gravity drainage (SAG-D); CO<sub>2</sub> and cyclic CO<sub>2</sub> injection; solvents)
- Nuclear (small modular reactors and SMR licensing)
- CO<sub>2</sub> capture, utilization and storage (amine solubility, kinetics, regeneration; catalyst enhanced capture; syngas to liquids)
- Oil Reservoir Characterization, Well Drilling
- Well Integrity
- Biomass, Biofuel & Bioenergy
- Hydrogen Energy
- Natural Gas Processing & Purification
- Renewable energy (wind and solar)
- Microgrids

### Environmental Research:

- Climate modeling, impact assessment, and adaptation planning
- Waste management, treatment and site remediation
- Air pollution control and management
- GIS application in hydrological systems
- Erosion and sediment transport in rivers
- Groundwater contamination
- Tailings
- Water treatment protection and planning
- Traffic engineering, safety, and intelligent transportation

### Materials Research:

- Fracture Mechanics
- Metallurgy, microstructures, welding
- Vessels, piping, and liquefied petroleum gas (LPG) transportation vehicles
- Polymers: membranes and structured packing
- Porous media
- Biotechnology (proteins and cells)
- Agricultural fiber and reclaimed material
- Geomaterials
- Mine Waste Management
- Civil Infrastructure.
- Corrosion inhibition and control
- Non-destructive testing and evaluation

Electronics Research:

- Remote sensing
- Microelectromechanical Systems
- Digital chip design
- High temperature superconductors
- Fibre optic sensors
- Image processing
- Robotic sensor systems – vision, touch, sonar
- Industrial electrical protection and coordination

Industrial Research:

- Noise and vibration
- Risk assessment
- Manufacturing system and supply chain management
- Systems optimization
- Robotics
- Computer integrated manufacturing, inspection, assembly
- Lean, Just in Time, Agile manufacturing

The Centre for the Study of Science and Innovation Policy (CSIP), a new creation of the Johnson-Shoyama Graduate School of Public Policy, has energy policy as a cornerstone of the Centre's research themes. In partnership with the Sylvia Fedoruk Centre for Nuclear Innovation, CSIP works to increase public awareness of the challenges and options associated with energy issues, and to inform decision making in energy-related policy areas.

The U of R also performs research through the Faculty of Arts regarding the social and economic impact of energy and resource-based economies, and the corresponding implications for urban, rural, and Aboriginal communities.

Research relative to the impact of climate change is another area of specialization at the University, wherein the U of R operates the Prairie Adaptation Research Collaborative (PARC).

Further, the U of R possesses several labs and pilot plants with applicability to an energy systems and security hub, including a carbon capture pilot plant, hydrogen and syngas pilot plant, catalyst manufacturing pilot plant, gasification unit, environmental design lab, hydraulics lab, petroleum lab, robotics lab, renewable energy lab, and water and wastewater lab.