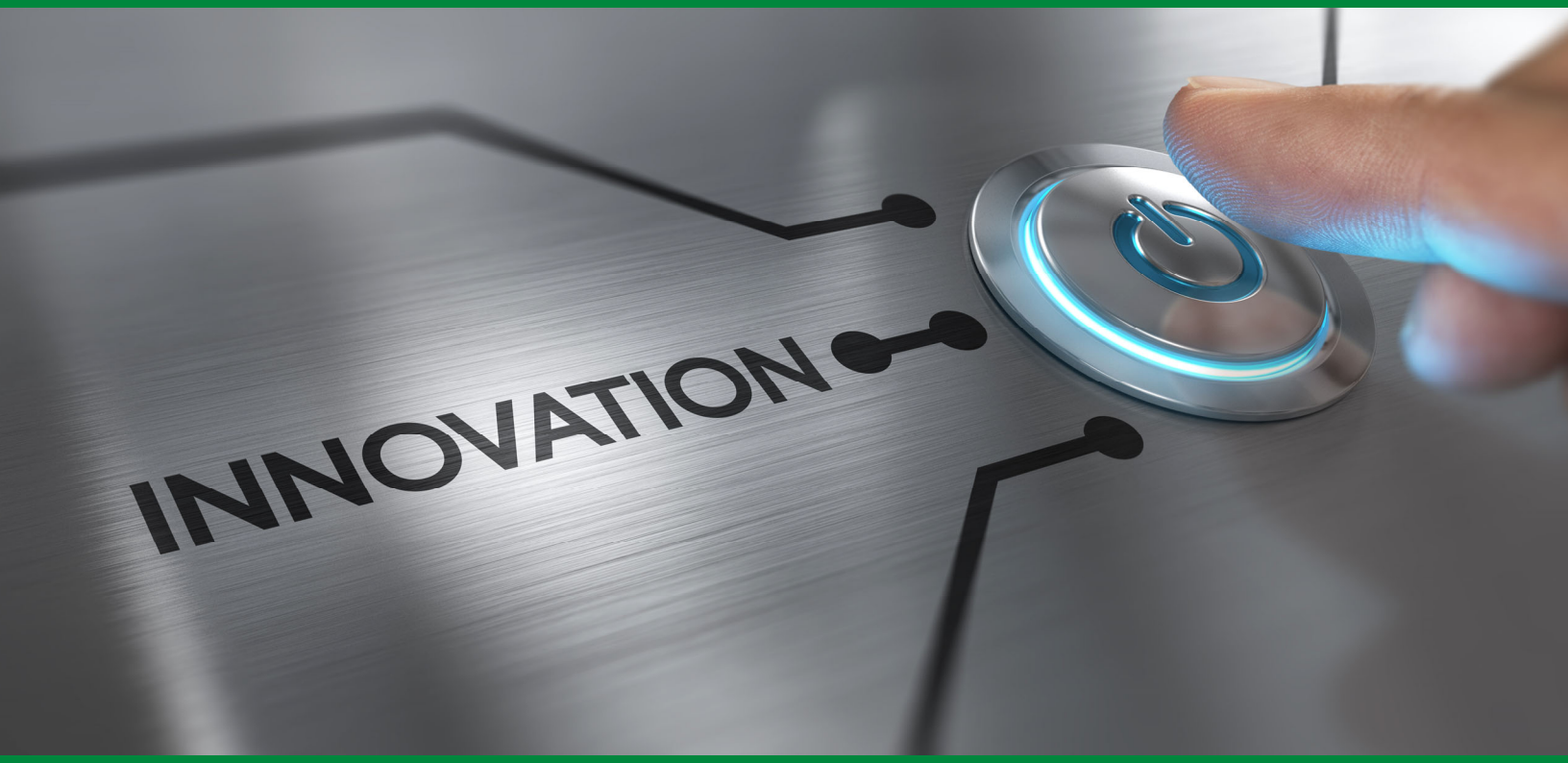
ANNUAL REPORT 2021



International Minerals Innovation Institute

Ten Years of Supporting Innovations That Matter to Mining

Message from the Executive Director

Having been established in January 2012, the year 2021 saw IMII's tenth year in operation of supporting innovations that matter to mining, and the development of innovative people for Saskatchewan's minerals industry.

IMII was created through a collaborative effort between the provincial government, minerals companies and post-secondary institutions to build innovation capacity for the mining sector. IMII has stewarded 50 projects worth more than $20 million in its first 10 years in both education and training and research and development initiatives. These two pillars have been foundational to IMII's strategy since its creation.

Notwithstanding the challenges presented during the second year of the COVID pandemic, progress was made towards IMII's strategic plan pillars and objectives. Key wins and successes from 2021 include:

- ⇒ The selection of the two finalists, ANAX Power and Growing Greener Innovations, in the Alternative Energy Systems (AES) Innovation Challenge.
- ⇒ The introduction of a two-year pilot project with SIMSA (Saskatchewan Industrial and Mining Suppliers Association), co-funded by PrairiesCan for an "Industrial Concierge" to provide personalized advice to SIMSA members (SMEs) to support digital innovation, carbon reduction, and ESG (Environment Social Governance) initiatives in the supply chain for IMII's minerals industry members.
- ⇒ Advancing innovation in diversity, inclusion, and education with four new projects to help increase the representation of Indigenous people and women in the mining and minerals industry's digital transformation.
- ⇒ The development of micro-credentials to provide digital skills training to address the technology shift the mining sector is experiencing with Saskatchewan Polytechnic. This pilot project was funded by IMII and the Saskatchewan Ministry of Immigration and Career Training and contributed to the creation of the Surge micro-credentials program by the Polytechnic.
- ⇒ The awarding of $87,000 in scholarships to five recipients.

IMII is carrying forward project commitments for the period 2022 to 2024 of approximately $1.7 million and has reserved nearly $1 million for future initiatives that meet the innovation needs of its minerals industry members.

In 2022, IMII will look to build on the opportunities to deliver new technologies for its minerals company members arising from DEMOday and the conclusion of the AES Innovation Challenge, and to help attract and build the workforce of the future for minerals industry.

"Member support, and in particular industry member support, was instrumental to the achievements IMII realized in 2021," says Al Shpyth, Executive Director. "As a steward for the minerals industry and its innovation ecosystem, I'm pleased we were able to increase our program and project activities in 2021 with and for our members."

Al Shpyth

Innovation Steward

Drive the Innovation Value Chain and Transform Innovative Ideas into Practice

Alternative Energy Systems Innovation Challenge

The Alternative Energy Systems Innovation Challenge was launched in 2020 to seek innovative energy solutions and technologies that can be demonstrated at a mine site in Saskatchewan.

Anax Power Inc. and Growing Greener Innovations Inc. (GGI) are the two finalists competing in the Innovation Sprint phase and sharing the $500,000 prize. The Sprint phase will conclude in 2022 and the winner advanced to a field trial at a minerals company member operation.

The Challenge is supported by IMII members BHP, Cameco, Mosaic, and Nutrien, the Challenge Dialogue System Network, and PrairiesCan.

Tackling Energy Innovation and GHG Emissions

On behalf of its industry members, the IMII with support from PrairiesCan, commissioned and released two reports on energy innovation and technologies that may be applicable to Saskatchewan minerals industry and its effort to reduce greenhouse gas (GHG) emissions in the medium and long term.

In the medium-term (5 – 10 years), a study by March Consulting Associates concluded that small modular reactors and combined heat and power systems are the clean power options with the better application for Saskatchewan mining operations with demand for both electricity and heat.

In the longer-term (10 – 20 years), a study by PreScouter concluded that the most promising decarbonization technologies for development and deployment in Saskatchewan mining operations may come from the hydrogen ecosystem, small modular reactors and carbon capture utilization and storage systems (CCUS).

The IMII believes that innovation is key to fostering new energy technologies and advancing existing ones and expects the release of these public reports contributes to the development and deployment of additional low carbon technologies in the province. While focused on Saskatchewan's principal minerals products, the information in these reports will be of interest to other mining and minerals sectors and governments.

A copy of the reports can be found at :

Applications of Clean Power Generation Technologies to Saskatchewan Minerals Industry (imii.ca)

Reducing GHG in Uranium and Potash Mining: 2030-2040 (imii.ca)

Research, Development & Demonstration and Education & Training

Enable Sustainable Innovation

Advancing Technology Research

From scaling bars to AI algorithms to a real time location system, Saskatchewan's academic institutions are conducting applied research to develop and improve technologies for the minerals industry.

University of Saskatchewan Associate Professor Travis Wiens has been working with the mining industry to develop a prototype mine roof testing device. Wiens and his team have completed the electronic, hardware, and software design for a compact scaling-bar-mounted device capable of recording a scaling bar impact and transmitting the information to the user on a phone or tablet.

Saskatchewan Polytechnic (SaskPoly) conducted applied research to develop the Real-Time Location System that was a prototype system comprised of commercial of the shelf (COTS) hardware, open source software packages, software and firmware customized for system configuration and operation, and SaskPoly designed mounting brackets. The complete prototype system has 2 subsystems: nodes and a hub.

Nutrien and the University of Western Ontario are collaborating to derive a quantification of mining induced micro seismicity in Saskatchewan potash mines. The purpose is to gain a better understanding of what "normal" and "abnormal" micro seismic patterns are in potash mines, and whether they have any predictive value with respect to mining activity.

Over the past two years Saskatchewan Polytechnic's Digital Integration Centre of Excellence (DICE), Saskatchewan's first and only Technology Access Centre (TAC), has been working with Cameco on an applied research project that uses artificial intelligence and machine learning to advance their uranium mining processes. The DICE team confirms the effectiveness of their data assumptions by working collaboratively with Cameco's engineers and geologists on recommended areas to test and drill in a production environment. Data from these tests are used to improve outcomes and this reiterative process continuously refines the accuracy of the model to enhance the jet boring recipe.

No matter the research project, they all achieve one objective – to develop highly qualified people for the minerals industry.

Innovating Teaching and Learning

As mining's digital transformation evolves, the need for an increasingly digital workforce has become a priority. From reskilling the current workforce to developing the future workforce, five diverse and innovative projects kicked off in 2021.

Saskatchewan Polytechnic created the Surge micro-credentials program to provide digital skills training to address the technology shift the mining sector is experiencing. This pilot project was funded by IMII and the Saskatchewan Ministry of Immigration and Career Training.

Surge Micro-credentials (surgemicrocredentials.com)

Morris Interactive developed a 10-week digital skills training program specific to potash mining and potash supply chains. Rather than Indigenous students having to leave the Nation to train for a job that will eventually separate them from their community, students will train on the Nation with Elders and community members there to provide support. The Indigenous mentorship program will help smart, technology-driven students build a career that enhances their lives and the lives of their communities.

Morris partnered with Cowessess First Nation to develop the curriculum with support from Mosaic. The curriculum involves interactive activities and games to aid the students in their learning as well as teaching them work ethics and communication skills. The first pilot of the program takes place in January 2022.

About Digital Transformation — Morris Interactive

Saskatchewan Polytechnic in collaboration with the School of Continuing Education is creating a new initiative and program that is specifically designed to provide responsive training opportunities to support the minerals industry requirements. The School of Continuing Education will mobilize and operate a roving resource centre and provide free of charge supplementary activities designed to improve basic information, communications and technology skills, and STEM subject awareness among the residents of Saskatchewan's Indigenous communities located in regional and remote parts of the province. The intent of the bootcamps is to provide age appropriate content to engage students in STEM activities and inspire students to think about careers in STEM.

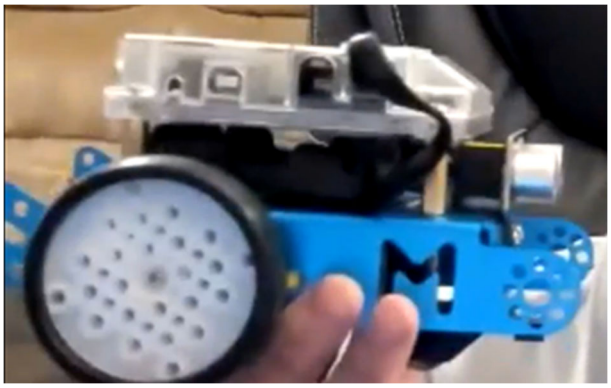
Digging into your future with one-day learning experiences (saskpolytech.ca)

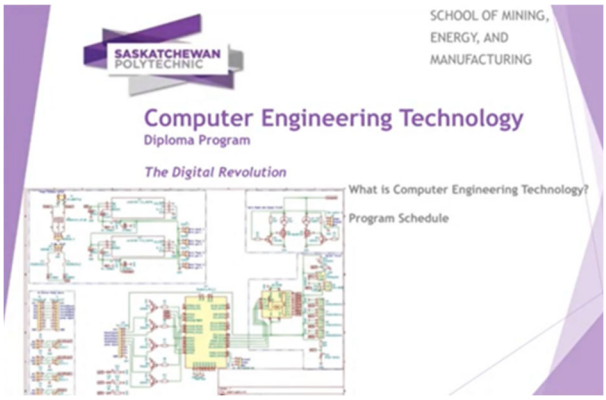
Our future growth relies on competitiveness and innovation, skills and productivity...
and these in turn rely on the education of our people.

Julia Gillard

Saskatchewan Polytechnic in collaboration with the School of Continuing Education will equip on and off-reserve teachers with resources, materials, and professional development opportunities to allow them to incorporate Information, Communication, and Technology (ICT) and Science, Technology, Engineering, and Math (STEM) into lesson plans for Indigenous youth in culturally relevant and appropriate ways. The School of Continuing Education will mobilize and operate a roving resource centre and provide free of charge supplementary activities designed to improve basic ICT skills and STEM subject awareness among the residents of Saskatchewan's Indigenous communities located in regional and remote parts of the province.

[Diggin' Digital: ICT and STEM Teacher Resource Hub (saskpolytech.ca)]





The Mining Matters "Building Mineral Literacy with STEM: Teacher Training Project" provides in-service teacher training, resources, and programs for on and off-reserve teachers and students in Saskatchewan. Teacher training during the year of the project will involve the delivery of a series of professional development workshops and the implementation of curriculum-linked educational kits in classrooms. Students and teachers will be able to participate in a series of *Mining Rocks Earth Science* experiential educational programs, planned in partnership with communities.

[Discovering Rocks and Minerals in Saskatchewan (miningmatters.ca)]

Qualified & Representative Workforce

Operationalize Equity, Diversity and Inclusion

MentorSTEP was a two-year pilot project with the University of Saskatchewan designed to support Saskatchewan Indigenous women to pursue STEM (Science Technology, Engineering and Math) and related careers that support Saskatchewan's mining industry. MentorSTEP student participants included both high school students from within the Saskatoon Tribal Council, and students at the University of Saskatchewan. Student participants were supported via both mentorship relationships and internship positions.

MentorSTEP embedded the Indigenous worldview in their circle-mentorship model where mentorship is equal and shared among more than two people, with each participant bringing learning and teaching into the relationship. Mentorship circles were created with two students, (one high-school, one university) and up to three mentors from university and industry. This brought a sense of listening and learning to better understand issues facing Indigenous women interested in pursuing STEM careers and eventually enter the mining industry.

Accomplishments:

- 7 high schools, 16 university students, 33 mentors inclusive of 8 university and 5 industry supervisors for interns, and 11 high school contacts/supporters/drivers participated in the project.
- 16 summer internships were placed.
- MentorSTEP led directly to Mitacs awarding the University of Saskatchewan four of its pilot MitacsINDRA (Indigenous Research Assistantships).
- Through a holistic lens that considers both STEM+ training and internships, MentorSTEP's successes and results indicate that restructuring support for Indigenous students in STEM in Saskatchewan will lead to a larger, more confident and resilient group of students ready to make a difference in Saskatchewan's mining industry.

Jocelyn Peltier-Huntley has initiated a 4-year study at the University of Saskatchewan on how to transform the experiences of men and women into solutions to advance equity in the Saskatchewan mining industry by activating workplace allies. The study is being undertaken to address the persistent under-representation of women in engineering in the mining industry. The ultimate goal of this work is to put recommendations into action and create tools to aid with sustainable, equitable, and inclusive cultural shifts in Saskatchewan mining and engineering which are welcoming of all people.

Activating Allies - PhD Project — Jocelyn Peltier-Huntley (jocelynpeltierhuntley.ca)

Supporting Students on Their Education Journey

In 2019, IMII created the iMpowered scholarship to support college, polytechnic and university women and Indigenous students. The scholarship is for students with a direct financial responsibility for their family, are enrolled in science, technology, engineering, mathematics or computer science programs, and intend to seek a career in the minerals industry. The scholarship may be used to cover any costs associated with their efforts to attain a higher education, such as childcare, tuition, books and transportation.

iMpowered Scholarship Program

In 2021, two scholarship winners were announced, each receiving $12,500.

- Lovely Es Amuan is looking to become a mining engineer. She is enrolled in her first year of the Mining Engineering Technology program at Saskatchewan Polytechnic.
- Nicole Launders is also in her first year in the Mining Engineering Technology program at Saskatchewan Polytechnic. Nicole and her family moved here from the UK in 2012 and became fascinated with mining equipment and processes while working at Fortis Mining and Engineering.

IMII also awarded two scholarships of $25,000 to 2020 winners Xiaoying (Sharon) Wang and Michelle Low. Sharon is an international student studying the Geomatics/Surveying Engineering Technology program at Saskatchewan Polytechnic. Michelle is enrolled in the Mining Engineering Technology program.

MINING FUTURES AWARD

In 2019, IMII created the Mining Futures award to help undergraduate students currently enrolled in one of three Mining Engineering Options at the University of Saskatchewan cover most of the costs for tuition, books, instruments, and fees. The award is valued at $12,000 per year.

Paige Perras was announced the winner for the 2021-2022 academic year.

Paige is in her third year of chemical engineering, enrolled in the mining option.

Paige is co-president of the chemical student society.

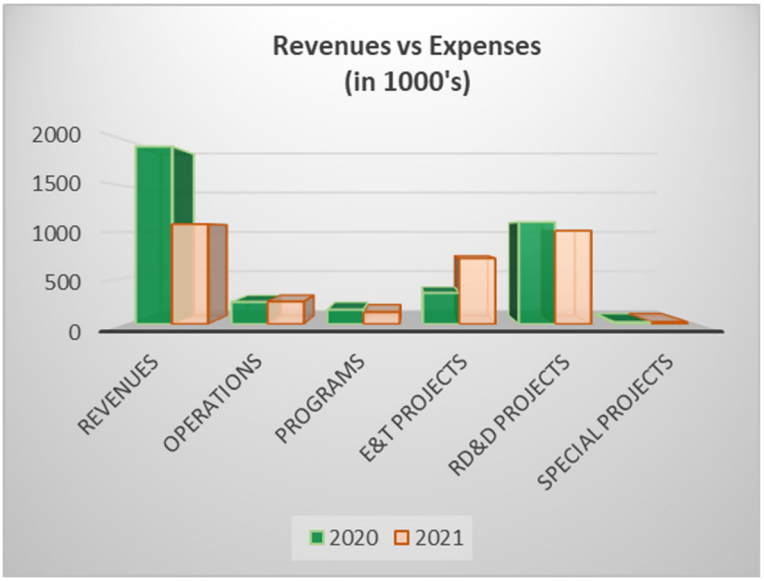
L to R: Paige Perras, Al Shpyth (photo courtesy of the University of Sas-

Operate & Govern IMII Consistently

Maintain Robust and Transparent Processes to Deliver Good Performance

Audited statements can be found on our website at www.imii.ca/communications/publications.

Revenues and Expenses



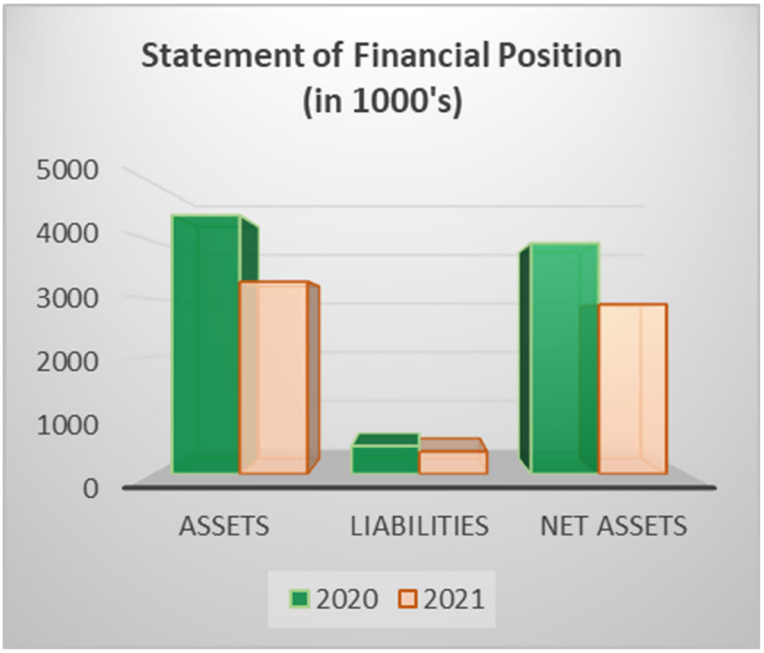
IMII recognized the salaries cost of running the E&T and R&D programs separate from Operations costs in 2021 and provided a comparison of costs for 2020.

IMII funded nine education & training and diversity & inclusion projects.

IMII funded thirteen research, development, and demonstration projects.

As a result, IMII drew down its cash and net assets by approximately $1.1 million.

Financial Position



$2.7 million of IMII's net assets at the end of 2021 was committed to fund approved projects and initiatives for 2022 to 2024.

- $725,794 for education and training/ diversity and inclusion commitments
- $824,460 for research, development and demonstration commitments
- $965,900 for future initiatives
- $210,000 held as a windup reserve

IMII Membership

An innovative solution is often a combination of ideas, from conception to delivery. Collaborating with industry, supply chain, academia, and government brings together unique perspectives to drive innovation bring value add to your innovation resources.

Members

- BHP
- Cameco Corporation
- Mosaic Company
- Nutrien Ltd.
- Innovation Saskatchewan
- Ministry of Advanced Education
- Hatley Engineering and Applied Technologies
- Saskatchewan Mining Association
- Saskatchewan Industrial & Mining Suppliers Association
- Canadian Light Source
- Prairie Agricultural Machinery Institute
- Saskatchewan Research Council
- Women in Mining and Women in Nuclear Saskatchewan
- Carlton Trail College
- Cumberland College
- First Nations University of Canada
- Genome Prairie
- North West Regional College
- Northlands College
- Parkland College
- Saskatchewan Indian Institute of Technologies
- Saskatchewan Polytechnic
- University of Regina
- University of Saskatchewan
- Saskatchewan Literacy Network
- Saskatoon Regional Economic Development Authority

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University of Regina, Kathy McNutt

University of Saskatchewan, Baljit Singh

On behalf of the Board of Directors, I want to recognize the contributions of our industry members and project partners. Without the support and participation of industry, government, and academic and research members, IMII could not advance innovations that matter to mining or help develop the innovative people required by the minerals industry.

Arnfinn Prugger, Board Chair