



Red Deer  
Polytechnic

Applied  
Research

[rdpolytech.ca/innovation](http://rdpolytech.ca/innovation)

Centres for

Manufacturing &

Energy Innovation



# Land Acknowledgment

Red Deer Polytechnic recognizes that our campus is situated on Treaty 7 land, the traditional territory of the Blackfoot, Tsuu T'ina and Stoney Nakoda peoples, and that the central Alberta region we serve falls under Treaty 6, traditional Métis, Cree and Saulteaux territory. We honour the First Peoples who have lived here since time immemorial, and we give thanks for the land where RDP sits. This is where we will strive to honour and transform our relationships with one another.

**As outlined in our Reconcili-Action Plan 2023-2028, Red Deer Polytechnic is committed to education as reconciliation through action.**



## Open Hearts

We are intent on building meaningful reciprocal relationships between RDP and Indigenous Peoples of Turtle Island, which involves resourcing engagement for long-term, long-lasting relationships.



## Open Doors

We are committed to utilizing the RDP resources and network to create more pathways for Indigenous learners, which is about identifying and addressing barriers to post-secondary participation and learning.



## Open Eyes

We honour and hold space for Indigenous Peoples, recognizing we are not observers of the relationship, but co-authors, participants, and learners acting with critical intentionality.



## Open Voices

We welcome discourse and the sharing of perspectives on our efforts to engage education and reconciliation as it is not just our path forward alone, which means we are invested in listening, growing and co-creating together.

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# Red Deer Polytechnic at a Glance

*RDP is focused on advancing Alberta's economic and social priorities by empowering productivity. Our unique polytechnic experience is centered around innovation ecosystems that foster collaboration between teaching, learning, applied research and industry engagement.*

*At RDP, we see productivity as continually improving and advancing our industries and communities through technology, education, training and applied research. Unbound by tradition, we are a polytechnic where innovation thrives.*



**~11,000**

Total students

**450**

Indigenous students

**6,292**

Domestic credit and trades students

**2,159**

Trades students

# Strategic Drivers



## Strategic Driver #1 Learner Impact

Sustainably grow enrolment by 50 per cent while creating an inclusive culture where learners engage in unique polytechnic experiences that lead to meaningful employment and positive social impact.

## Strategic Driver #2 Program Mix & Delivery

Expand and align programming to meet industry and community demand for the region, province and beyond.

## Strategic Driver #3 Research & Creation

Be nationally recognized in RDP's four Areas of Focus through applied research, scholarship and creative activity.

## Strategic Driver #4 Innovation Ecosystem Spaces

Provide campus environments that foster collaboration and integration between teaching, learning, applied research and industry engagement.

## Strategic Driver #5 Brand Recognition

Be a polytechnic leader that is provincially focused, nationally recognized, and first choice for learners, employees, industry and partners.

## Strategic Driver #6 Enhanced Partnerships

Generate \$200M in investments and partnerships and deliver transformational value for students, businesses and communities.

## Strategic Driver #7 Employer of Choice

Be a Top 100 nationally recognized employer that elevates and supports each employee to collectively strengthen the Polytechnic.



# Applied Research Solving Industry Challenges

The Centres for Manufacturing and Energy Innovation work with industry clients to achieve innovative practical solutions for their real world challenges.

## COLLABORATION

As part of Red Deer Polytechnic's continued pursuit of excellence in applied research, our innovation centres collaborate with business and industry clients to help them reach their goals.

The majority of our clients are entrepreneurs or small and medium sized businesses who don't have the capacity to perform their research and development in-house. They come to us to fill the gap in their R&D capability, and for help in leveraging funding to access more support resources than they would have on their own.

## INDUSTRY ALIGNMENT

RDP's innovation centres help business and industry to develop the skills and knowledge they need to meet the changing realities of Alberta's economy. We do this by meeting them where they are at, assisting them with the technological solutions that are best suited for their operational needs in order to foster commercialization.

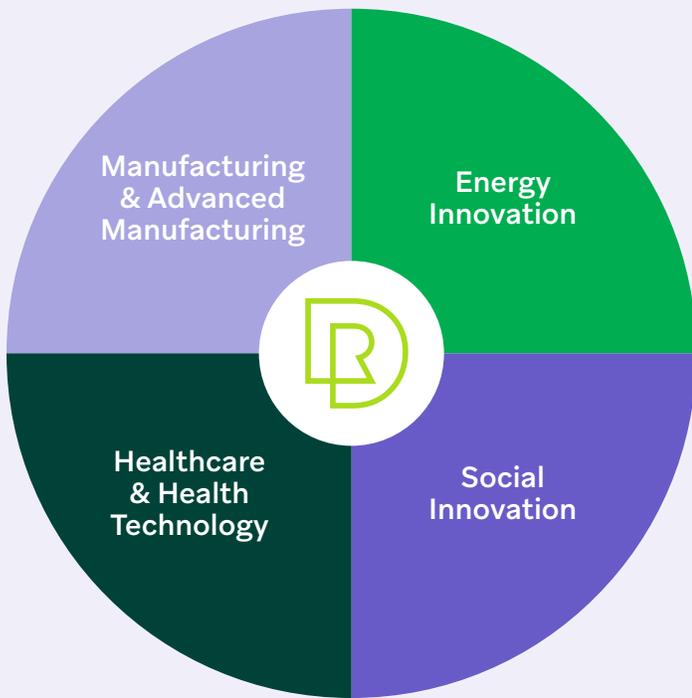
We can offer the training and micro-credentials that our clients require to upskill their workforce and move forward to where they can adapt, adjust, and prosper.

## TECHNOLOGY ADOPTION

Our core business is supporting industry technology adoption. We work closely with organizations in our innovation network to advance applied research in manufacturing and energy innovation, in order to increase digital literacy across the province.

Industry has to be aware of and understand emerging technologies in order to contribute to the innovation conversation. Our services are grounded in what Alberta does best, with an eye toward the future.

# Areas of Focus



Our four Areas of Focus will ensure RDP creates innovation ecosystems that provide exceptional and unique experiences for our learners through programming and applied research that is hands-on and anticipates the needs of industry and our communities.

- **Manufacturing & Advanced Manufacturing**

- Integration of digital technologies, automation, and innovative processes across various stages of design, production, and supply chain management leading to more efficient, customized, and sustainable manufacturing processes.

- **Energy Innovation**

- Development, adoption, and implementation of novel and advanced technologies, processes, and strategies aimed at improving the efficiency, sustainability, and environmental impact of energy production.

- **Social Innovation**

- The development and implementation of novel solutions, practices, or initiatives that address and positively impact social challenges, emphasizing collaboration, empowerment, and sustainability to improve the well-being of individuals and communities.

- **Healthcare & Health Technology**

- Integration of experts, practitioners, and interdisciplinary researchers to drive solution-oriented approaches in healthcare training, applied research, and economic diversification, with a focus on the development of products, processes, digital technologies, and communication tools to improve the efficiency, accuracy, and delivery of healthcare services.

# Area of Focus:

## Manufacturing & Advanced Manufacturing

Red Deer Polytechnic supports various sectors, including energy, transportation, aviation, healthcare and agriculture, through our advanced manufacturing capabilities.

Leveraging programs and applied research capacity, such as the Centre for Innovation in Manufacturing - Technology Access Centre (CIM-TAC), RDP is bridging the gap between innovation and commercialization by enabling industry to apply new technology, develop prototypes and refine and optimize designs and processes to remain competitive.



### 2023-24 STATS

69

companies/organizations engaged

57

active applied research projects

\$15M

in investments and revenue

2

new programs launched



# Centre for Innovation in Manufacturing (CIM-TAC)

Red Deer Polytechnic's CIM-TAC is equipped with cutting edge, industry-leading prototype and advanced manufacturing equipment. Our staff are experts in design, simulation, manufacturing, validation, and commercialization of both new and existing products. We help clients to problem solve, engineer designs, create 3D models, and fabricate prototypes in order to bring their ideas to life.

We also support process development and look for opportunities to increase client productivity through automation and robotics. With a focus on early-stage prototyping and product development, design for manufacturing, validation, and manufacturing optimization, the CIM-TAC team is dedicated to serving the needs of business and industry.

The vast majority of Alberta's manufacturers are small and medium-sized enterprises who trail their larger counterparts in technology adoption, as they don't have the capacity to perform in-house research and development and systematically innovate. They need access to a trusted, objective innovation intermediary with cutting-edge equipment and facilities, along with the experts that know how to use them. The CIM-TAC has long been this unique and affordable resource. We help business and industry to develop the skills and knowledge required to meet the changing realities of Alberta's economy. With our guidance, they can accelerate their R&D process and de-risk their path to product market acceptance.

## CIM-TAC Fast Facts:

- **CIM opened in 2009, TAC designation awarded in 2020**
- **Home to Alberta's first commercial 3D printer**
- **Hundreds of projects completed since opening**
- **Portal into the Alberta Innovation Network (AIN)**
- **15,000 square feet of industrially accessible space, expanding to 25,000 square feet in 2026**
- **\$7.6M of advanced manufacturing equipment**
- **Cross-functional teams**
- **APEGA Permit to Practice**
- **Member of Alberta Additive Manufacturing Network**

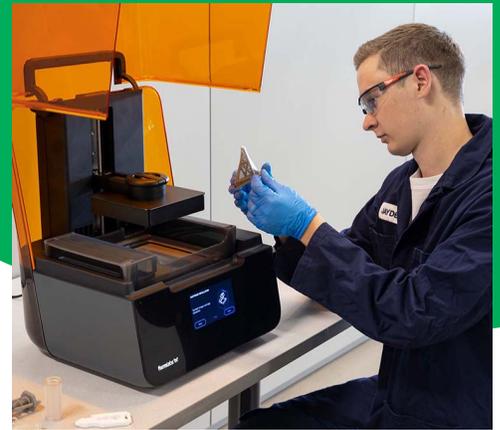
*From idea to scale-up, the CIM-TAC can be your objective innovation intermediary.*

Centre for Innovation in  
Manufacturing (CIM-TAC)  
[rdpolytech.ca/cimtac](http://rdpolytech.ca/cimtac)

### Every project gets customized attention.

The CIM-TAC has worked with a variety of clients on a wide range of projects, including:

- Design, material selection, and pilot scale validation for a large 3D printed part
- Optimizing water usage and cleaning effectiveness of mechanically driven solar panel cleaning devices
- Design, manufacturing assessment, and fabrication of a pediatric wheelchair fitting device
- Increasing machining productivity using data analytics
- Lightweighting of a solar panel tile using simulation and validation testing



INTELLECTUAL PROPERTY  
STAYS WITH THE COMPANY

### We respect your privacy.

The CIM-TAC's staff understand confidentiality and sign NDAs in order to keep trade secrets safe. What's more, all of the intellectual property (IP) generated by our projects remains fully in the client's hands.

Leaving IP with our business partners is the best way to support a strong economy and help generate the employment opportunities that Red Deer Polytechnic graduates need.

# MEASURING THE CIM-TAC'S IMPACT

## ON JOBS AND TRAINING

2023/2024

**2,710**

HOURS OF STUDENT INVOLVEMENT  
IN TAC-DELIVERED SERVICES

**717**

HOURS OF TRAINING  
PROVIDED TO CLIENTS

**126**

LEARNERS AT  
TRAINING EVENTS

## CIM-TAC

# Expansion

Thanks to a **\$12.9 million investment** from the Government of Alberta, the CIM-TAC will expand from 15,000 square feet to 25,000 square feet. Construction will begin in spring 2025 with the new CIM-TAC opening in fall 2026.



## GROWING AND DIVERSIFYING MANUFACTURING IN ALBERTA

This expansion will have a compounding effect across Alberta's economy and provide strategic supports to the province's small and medium enterprises (SME's). Here in central Alberta, manufacturing already has an above average impact on the local economy.

By 2030, the expanded CIM-TAC is expected to generate the following outcomes and economic impacts:

Support growth and development of

# 800

Alberta-based companies

Create

# 1,000

jobs in advanced manufacturing  
directly due to RDP applied  
research outcomes

NEW EQUIPMENT AND  
SERVICES BEING  
ADDED IN FALL 2026

**automation**  
**injection molding**  
**digital twinning**  
**robotics**

Deliver \$25M of applied research,  
resulting in

# 100M

of increased economic value

## Manufacturing

# Equipment



The CIM-TAC is equipped with a diverse range of industry-leading prototype and advanced manufacturing equipment. Our staff are experts in design, simulation, manufacturing, validation, and commercialization of both new and existing products.

We help clients to problem solve, engineer designs, create 3D models, and fabricate prototypes in order to bring their ideas to life. We also support process development and look for opportunities to increase client productivity through automation and robotics.

With a focus on early-stage prototyping and product development, design for manufacturing, validation and manufacturing optimization, the CIM-TAC team is dedicated to serving the needs of business and industry.

### Hardware

- CNC 5 axis mill Mazak Integrex i200+
- CNC mill HAAS VF-3 SS with Trunion, 5-axis
- CNC mill HAAS EC-400
- CNC HGD 3100 X 6 Hydraulic Wing-Beam Shear
- Techno LC Series 4896 CNC Router
- Flow Mach 200 Waterjet (Pivot+5 axis)
- Accupress 10ft brake
- Jekko Mini Crane (portable)
- Precision Quincy Curing Oven
- Formech Vacuum Former
- Trotek Speedy 400 Laser Cutter
- Faro Laser Scanner
- Creaform HandyScan Black Laser Scanner
- Allrounder 470 C 1500 - 800 Golden Edition
- TF-Truefeed TF01AA Gravimetric Feeder
- Festo Flexible Automation System w/PLC
- 120 ABB Robotic Arms (10)
- 6-AXIS Robot Arm
- ABB Welding Robots
- Augmented Reality Goggles
- Full Welding Facility
- Rockwell Vertical Band Saw
- HydMech Horizontal Band Saw
- Hydraulic Press 100 Ton

### Materials Testing

- Mitutoyo PH-A14 Optical Comparator
- Instron 3366 Tensile Tester and United 135000lbs
- Mitutoyo HR-500 Hardness Tester
- Mitutoyo Crystal Apex Coordinate Measuring Machine
- Keyence VHX-7100 Digital Microscope
- EcoMet 30 Grinder-Polisher
- SimpliVac 20-1500 Epoxy Mounting System

### Software

- VXelements
- Octopuz Robot Simulations
- CorelDRAW
- SolidWorks
- Simplify 3D
- Geomagic Design X
- GibbsCAM
- AutoCAD
- Autodesk Maya
- Rhinoceros
- nTopology
- Altair Suite

### 3D Printers

- Stratasys Fortus 450mc FDM
- Stratasys J850 Digital Anatomy
- Stratasys Origin Two
- ExOne Innovent+ Binder Jet
- Formlabs Fuse 1+ 30W
- Formlabs Form 3
- EnvisionTEC Xtreme 8K
- Markforged Mark Two
- Ultimaker 3

We give you access to the equipment and expertise you need to accelerate your R&D process.



CIM-TAC was home to Alberta's first commercial 3D printer



## Applied Research

# Services

### CENTRAL ALBERTA'S HUB FOR MANUFACTURING R&D

By providing applied research services and access to cutting-edge technologies and expertise, we help businesses optimize their processes, foster innovation, and achieve sustainable growth.

#### *Design for Manufacturing*

CIM-TAC can help you optimize your product designs for efficient and cost-effective manufacturing. Our experts provide guidance from the initial design phase, leveraging their deep understanding of manufacturing processes to ensure manufacturability. We offer expertise in design, simulation, and 3D modelling, utilizing CAD/CAM software and techniques like rapid prototyping and reverse engineering. By focusing on design for manufacturing principles, CIM-TAC helps you lower production costs, improve product quality, and accelerate your time to market, ultimately de-risking your path to product market acceptance.

#### *Advanced Manufacturing*

Our team offers comprehensive support in design engineering and 3D CAD modelling through to proof-of-concept and prototype fabrication. We collaborate on applied research projects, providing expertise in testing and validation, system design, process optimization, and comparative analysis. We can also help you to increase productivity through automation and robotics integration. Partner with CIM-TAC to bring your ideas to life, create functional prototypes, and explore the potential of advanced manufacturing without significant upfront investment.

#### *Design for Circularity*

We help businesses develop products and processes that minimize waste and maximize resource utilization throughout their lifecycle, focusing on creating products that are more durable, repairable, reusable, and recyclable. We assist in analyzing material choices, designing for disassembly and repair, and using innovative processes like 3D printing to reduce material waste. By optimizing existing products and processes for circularity, you can potentially achieve reduced costs, an enhanced brand reputation, and new market opportunities. Working with CIM-TAC provides access to experts and resources to guide you in reducing reliance on virgin materials, minimizing environmental impact, and potentially creating new revenue streams.

- Testing and validation
- System design
- System scaling and benchmarking
- Process optimization
- Comparative analysis for new products
- Market analysis
- Product development and support
- Product testing
- 3D printing
- Rapid prototyping
- Design for Manufacturing and Assembly (DFMA)
- Materials selection
- Augmented reality
- Metal fabrication
- Additive manufacturing
- 3D scanning
- Reverse engineering
- Metrology
- Robotics and automation integration
- Lean manufacturing
- Destructive and non-destructive testing
- Service testing
- Mentorship and coaching
- Digital simulation
- Digital twin creation

**RDP IS DEVELOPING  
A STRATEGY FOR  
EFFECTIVELY**

**SHARING**

**OUR APPLIED  
RESEARCH  
KNOWLEDGE AND  
EXPERTISE**

# Productivity & Partnerships

*Productivity. It's the driving force behind everything we do at RDP. We characterize productivity as continually improving and advancing our industries and communities through technology, education, training and applied research for positive social and economic impact.*

We are committed to collaboration.

The CIM-TAC works closely with our innovation network to advance applied research in manufacturing and to increase digital literacy and adoption in the province. Business and industry clients learn how to navigate emerging technologies, implement new equipment, and adopt the technological solutions that are best suited for their operational needs in order to foster commercialization.

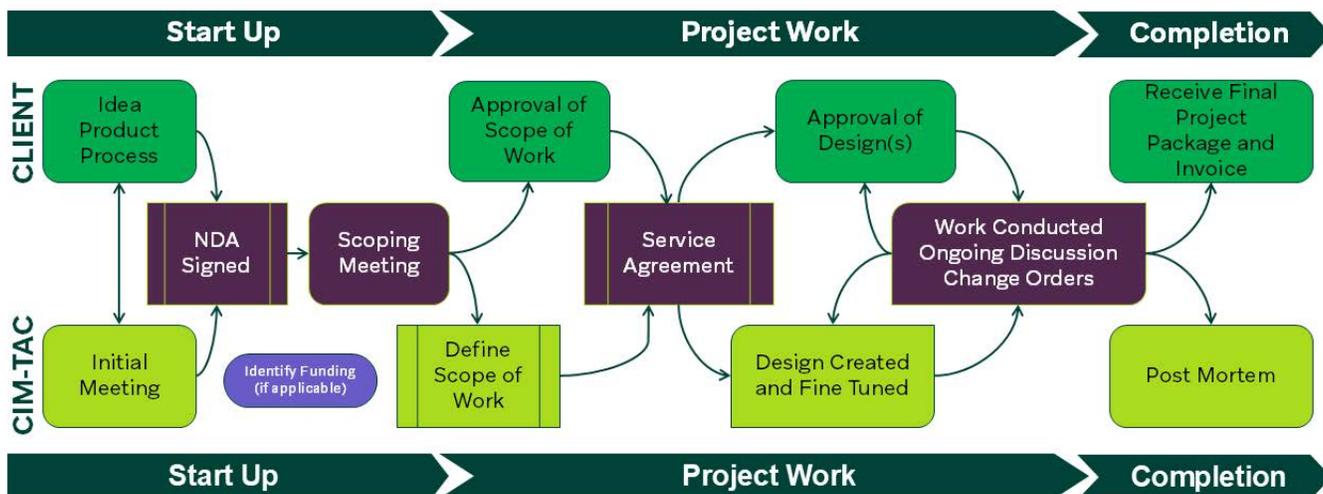
*CIM-TAC is part of a pan-Canadian network of Technology Access Centres (TACs) that make their R&D services accessible to contribute to the development of a more inclusive innovation economy.*



TACs leading applied research across Canada

Since opening, the CIM-TAC has seen an overwhelming demand for our services from across the province and gained a reputation for approachability, relevant technical expertise, and broad industry support capabilities.

We aim to generate innovation and productivity results, while enhancing the competitiveness of our industry partners. With your ideas, our guidance and the right design process and approach, you're on track for something remarkable.



# IMPACT ON CLIENT PROJECTS

CIM-TAC had the opportunity to collaborate with Washbots Canada in the development of an innovative, **modular cleaning solution for utility-scale solar photovoltaic (PV) systems**. This project integrated advanced image analysis, data-driven decision making, and GPS tracking into a lightweight, adaptable design. The resulting automated system optimizes solar panel maintenance, addressing critical issues like energy efficiency losses due to dust accumulation, and enhancing worker safety. Currently, Washbots is field testing this technology in Australia, demonstrating its potential for significant environmental and economic benefits, including reduced greenhouse gas emissions and increased revenue for solar farm operators.

Veterinarians Neil Embleton and Veronica Barkowski approached CIM-TAC to assist in the development of a **novel surgical implant for canine joint repair**. This project involved extensive prototype design, biomechanical analysis, and CNC machining, culminating in a three-part modular implant made of surgical-grade materials. Our engineering expertise and rapid prototyping capabilities were crucial in preparing the device for clinical trials, and ultimately, licensing to a trusted manufacturer. The Simitri Stable in Stride represents a significant advancement in canine joint repair, with the potential to become the dominant surgical technique for stifle instability. The project demonstrates the CIM-TAC's ability to translate innovative medical concepts into tangible, market-ready solutions.

A collaboration with H3alth Technologies directly addressed barriers to medical care with a groundbreaking **medical imaging device designed to improve healthcare accessibility**. This project addressed the challenges of prototyping and manufacturing a complex 3D imaging unit, providing crucial expertise in precision sensor alignment. By providing the necessary manufacturing expertise and problem-solving, particularly in achieving the critical sensor alignment for accurate imaging, the CIM-TAC helped ensure the device's reliability and effectiveness. The resulting system combines advanced 3D imaging, AI, and cloud technology, enabling self-directed health scans in remote and under-served areas, eliminating the need for specialized training or travel.

## PROJECT SHORTS

### RAPID WATER-THAWING DEVICE

CIM-TAC collaborated with the Grande Prairie Regional Innovation Network to design and prototype a rapid water-thawing device for an industry partner. We also connected the client to funding to offset development costs of this innovative agricultural technology.

### STUDENT INTERN HELPS MANUFACTURE STRETCHING STICK

CIM-TAC's student interns play a vital role in client projects. An engineering student led the design for manufacturing of a stretching stick, reducing production costs and enabling the industry client to efficiently ship the product to customers. This experience also provided valuable, real-world learning opportunities for the student.

### EXERCISE EQUIPMENT PROTOTYPE PROJECT

CIM-TAC supported a local entrepreneur in developing a design for a new piece of exercise equipment. The entrepreneur is now prepared to prototype and validate the equipment.

### PET ACCESSORIES HEAT UP

CIM-TAC supported the design for manufacturing and assembly of a heated dog leash housing and components, including development and prototyping of the handle grip through 3D printing. The product has moved to commercialization and is now being sold in pet stores and through the client's website.



# Area of Focus:

## Energy Innovation

Red Deer Polytechnic is building energy innovation programming and applied research capacity to support Alberta's energy sector to develop, scale and integrate innovative technology, and produce the emissions reduction and productivity gains needed for its global competitiveness.

Leveraging its Energy Innovation Centre (EIC) and Alternative Energy Lab, RDP is installing capacity such as rooftop solar photovoltaic panels and combined heat and power units across our campus to advance its goal of achieving net zero energy status by 2031. As important, this capacity provides an innovation ecosystem for teaching and learning and industry focused applied research.



### 2023-24 STATS

**14**

companies/organizations engaged

**4**

active applied research projects

**\$1.1M**

in investments and revenue

**5**

students employed as applied research staff





# Energy Innovation Centre

**The Energy Innovation Centre creates solutions for industry through applied research and education in alternative and renewable energy and power systems.**

Established in February 2019, the Energy Innovation Centre (EIC) at Red Deer Polytechnic is a research centre focused on adoption and deployment of alternative and renewable energy systems. As a physical and virtual hub, the EIC supports and validates alternative and renewable energy systems through both simulation and lab testing. Industry, regional businesses, students, and residents can explore emerging clean technologies and their impact on the creation of a sustainable energy plan.

The EIC houses the Alternative Energy Lab (AEL), which was designed to simulate real-world systems associated with alternative and renewable energy production units. Real-time, applied learning opportunities allow researchers and students to build familiarity and confidence with the alternative and renewable energy systems that can support the net zero goals of industry and our community.

We collaborate with regional and provincial utilities, builders, industries, and manufacturers to develop net zero solutions. This can be done through applied research projects, data sharing for best practices, and public policy development.

**We use our expertise and facilities to improve our understanding and capacity of emerging technologies while also contributing to energy literacy in the communities we serve.**

The EIC connects investments in high efficiency and alternative energy systems on campus to applied research, and teaching and learning opportunities for students and the community. We support RDP's Green Campus Master Plan, whose goal is a net zero campus by 2041. The advances made through this work can then be translated to other commercial buildings.



### A Living Lab

As part of RDP's larger Green Campus Master Plan, the Alternative Energy Lab (AEL) was purpose-built to provide a physical and virtual platform for exploring alternative and renewable energy systems. Since opening it has become a living laboratory for data management, big data integration, and machine learning. It provides the foundation for EIC's applied research, recognized academic programming using real data and case studies, and work integrated learning .



### Sustainable Energy

There has been a steady increase of emerging technologies related to energy use and alternative energy resources. As well, use of artificial intelligence, machine learning, and the Internet of Things to manage complex power, control, and energy systems is increasing on a daily basis. The expertise of EIC personnel and the flexible configuration of the AEL make it possible for us to adapt to new systems and technologies as they emerge, ensuring research, demonstration, and training activities remain current and relevant.



### Supporting Future Workforce Needs

Industry has to be aware of and understand these emerging technologies in order to contribute to the energy conversation. The EIC can provide tailored training for industry to use as either pre-employment training or to support upgrading for their current employees. What's more, as industry's future employees RDP students benefit from hands-on experiential education through our applied research projects and by training in our leading-edge facilities.

### Data Sharing

We facilitate partnerships, contribute to development and awareness, provide learning opportunities and spaces, offer applied research services, and collect and distribute performance data to support information sharing and continuous learning

*The EIC offers industry practical solutions that are grounded in real-world experience.*



## MOVING APPLIED RESEARCH BEYOND THEORY

Your energy challenges are not just theoretical. We can deliver practical results based on applied research done in real-world circumstances.

Our expertise spans the integration of diverse sustainable energy systems, optimization of battery energy storage, and leveraging data-driven innovation to improve energy system performance. We provide practical, hands-on solutions through our state-of-the-art facilities and collaborative projects.

### **Integration of Sustainable Energy Systems**

The EIC possesses significant expertise in the integration of diverse sustainable energy systems, helping industry partners combine technologies like solar PV, wind, geothermal, and CHP effectively. Our services include comprehensive analysis and simulation and real-world testing in our Alternative Energy Lab to determine the optimal energy source mix for specific needs. We can develop practical integration solutions, offering feasibility studies, power system simulations, and third-party validation.

### **Battery Energy Storage**

Recognizing the critical role of battery energy storage, the EIC conducts applied research focused on optimizing battery storage systems for various applications, enhancing grid stability and energy independence. Our initiatives include evaluating the performance and circularity of different battery technologies, such as exploring second-life uses for EV batteries. We also analyze the economic and practical implications of deploying battery storage, helping organizations assess return on investment and optimal sizing strategies.

### **Data Driven Innovation**

The EIC is at the forefront of data-driven innovation in the energy sector, leveraging data from on-campus installations and industry collaborations to develop valuable insights. Our expertise in data analytics allows us to provide third-party technology validation and support sound business decisions by analyzing energy data for optimization and return on investment assessment. The EIC empowers partners to harness the power of data for informed decision-making in their energy transition strategies.

### **Applied Research services include:**

- Energy analysis
- Validation, optimization and prototyping of new energy technologies
- Power and control systems equipment testing
- Financial modelling
- Workshops and micro-credentials.
- Integration of renewable energy systems studies
- Data analytics
- Power system simulation

# PROJECT SPOTLIGHTS

## CICAN LIVING LAB PROJECT

Under the Colleges and Institutes Canada (CICan) Living Lab project, the EIC is piloting a demand-based HVAC control strategy to improve energy efficiency and reduce emissions in the Alternative Energy Lab. Currently, the HVAC system runs continuously, consuming 80 per cent of the building's total energy, estimated at 658 GJ annually. Proposed changes are projected to reduce electricity use by 40 per cent, natural gas consumption by 25 per cent and GHG emissions by 10.5 metric tons of CO<sub>2</sub>e per year. The project has successfully engaged more than 50 students, 12 faculty members, 15 industry representatives and 7 community partners.

## CONNECTED BUILDINGS

From air quality based HVAC control, the EIC will be expanding to full micro-grid and connected buildings. Connected buildings integrate IoT-based air quality sensors, AI-driven Building Management Systems (BMS), and sustainable energy solutions for optimized performance. Solar power, battery storage, and microgrids enhance energy efficiency by harnessing renewable energy, storing excess power, and enabling grid independence. Smart BMS dynamically adjusts HVAC, lighting, and energy loads based on real-time data, reducing waste and improving sustainability. Microgrids with AI-driven energy management ensure resilience, lower costs, and support a carbon-neutral future.



**4,200 solar panels**  
across the RDP campus



**partner sites have**  
joined the **Data**  
**Sharing Alliance**

## STUDENT RESEARCH: IMPACT OF ELECTRIC VEHICLES ON THE GRID

A student intern in the EIC led a study examining the potential impact of increased electric vehicle adoption on Red Deer's electrical grid. This research provides valuable insights for the region's energy planning and infrastructure development.

## TRAINING AND UPSKILLING THE WORKFORCE

More than 250 power line technicians from Fortis came to the EIC for a training overview of solar photovoltaic systems. The sessions covered everything from how to mount the panels to system design and maintenance, giving them relevant knowledge in solar energy systems, what they are, how they are connected, and safety requirements.



### 2023 Green Gown Awards

**Awarded for our efforts in energy innovation and emission reduction**

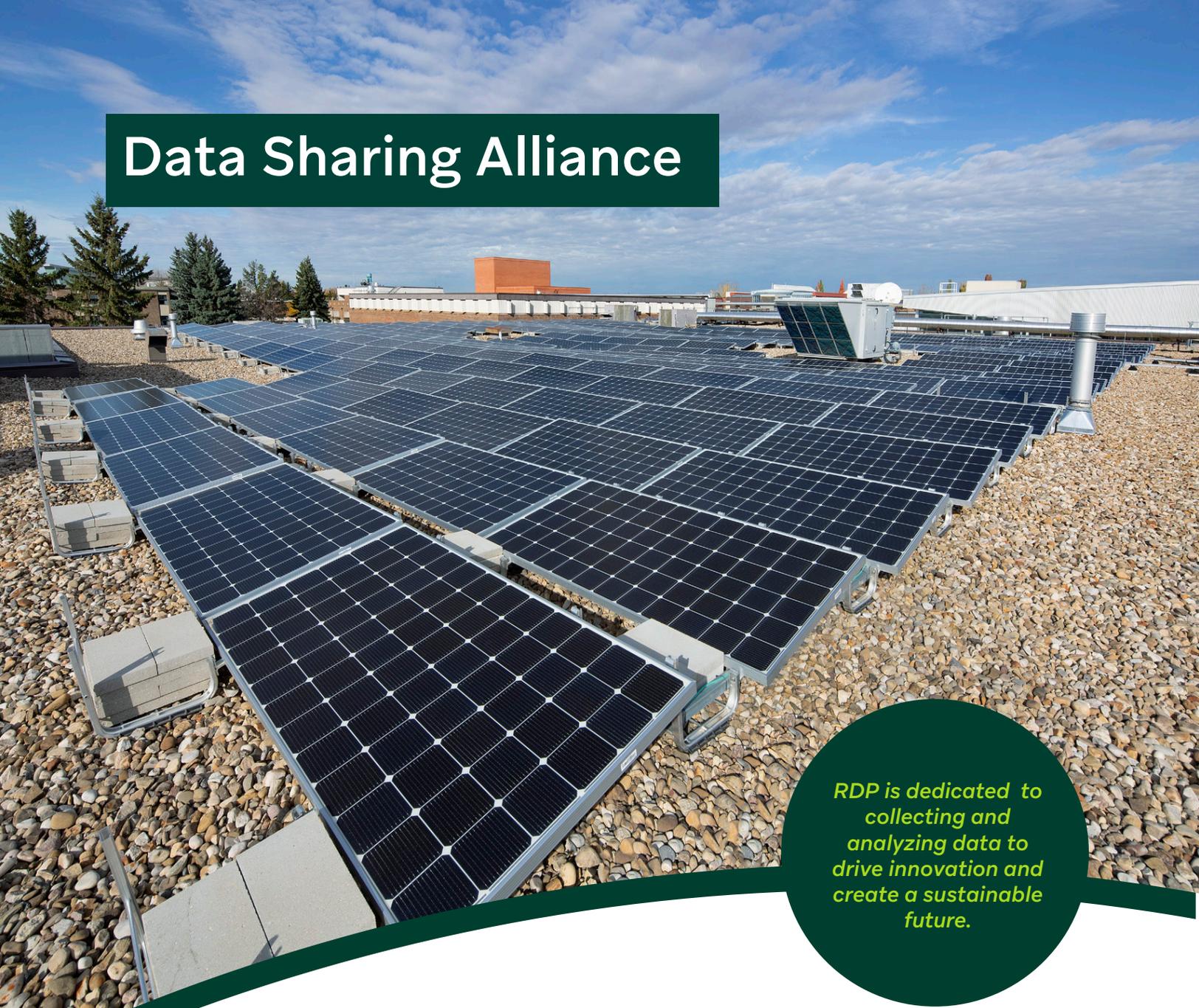
### 2023 Blue Skies Award

**For taking exemplary measures to improve the air quality in the region**

### 2023 Excellence in Sustainable Development Silver Award

**Awarded by Colleges and Institutes Canada**

# Data Sharing Alliance



*RDP is dedicated to collecting and analyzing data to drive innovation and create a sustainable future.*

## COLLABORATING WITH INDUSTRY TO ACHIEVE PRACTICAL SOLUTIONS

As an applied research project hosted in the Energy Innovation Centre, the DSA collects solar panel data on campus and from partner sites across Alberta for analysis. An energy meter is installed in a logical sequence on partner PV systems, and information is then transmitted via ethernet to the database.

Our current focus is gathering data using remote energy meters in order to build a valuable database to understand actual peak energy generation. We can also create performance models using this data to compare actual output to theoretical output, creating the foundation needed to optimize solar energy in Alberta.

### BENEFITS TO OUR DSA PARTNERS

- Up-to-date analysis on the performance of their solar installations
- The ability to compare their system performance to other locations in Alberta
- Predictive analysis of future output, provided by RDP's researchers

# Impact of Electric Vehicles on Central Alberta's Grid

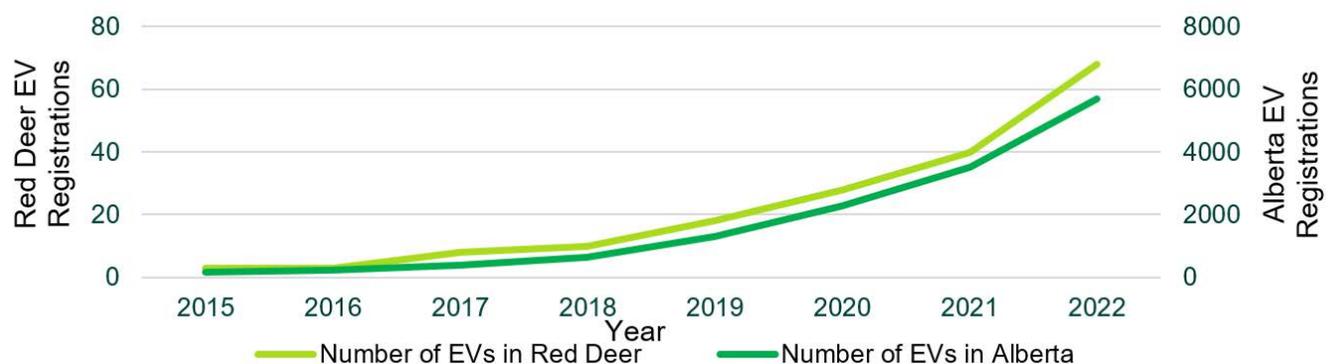
## Looking at EV adoption in Canada, Alberta and Red Deer

Many factors, including consumer interest, automaker investments and government incentives, drive rising interest in EVs. The federal government has published draft regulations requiring all new passenger vehicles and light trucks sold in Canada after 2035 to be electric, zero-emission vehicles. The regulations will begin gradually, with a 20% requirement by 2026.

The federal government has also implemented incentive programs as a complement to regulations to encourage the adoption of EVs. As of 2021, purchasing a new zero-emission vehicle is eligible for a federal rebate of up to \$5,000. To date, the federal government has invested more than \$1 billion CAD to support zero-emission vehicle adoption, which includes initiatives like the Zero-Emissions Vehicle Infrastructure Program.

At the provincial level, the Municipal Climate Change Action Centre (MCCAC) in the Electric Vehicle Charging Program provides municipalities in Alberta with rebates for public charging station installations to help local charging infrastructure. Albertan Utilities has also recognized the growing demand for EV charging solutions. For example, some utilities have actively engaged in initiatives to support the deployment of charging infrastructure across their service area.

<b>CANADA</b>	152,696 EVs 26.2 million vehicles	<b>0.60%</b>
<b>ALBERTA</b>	5,680 EVs 3.6 million vehicles	<b>0.15%</b>
<b>RED DEER</b>	68 EVs 82,576 vehicles	<b>0.08%</b>



# EVs and the Grid

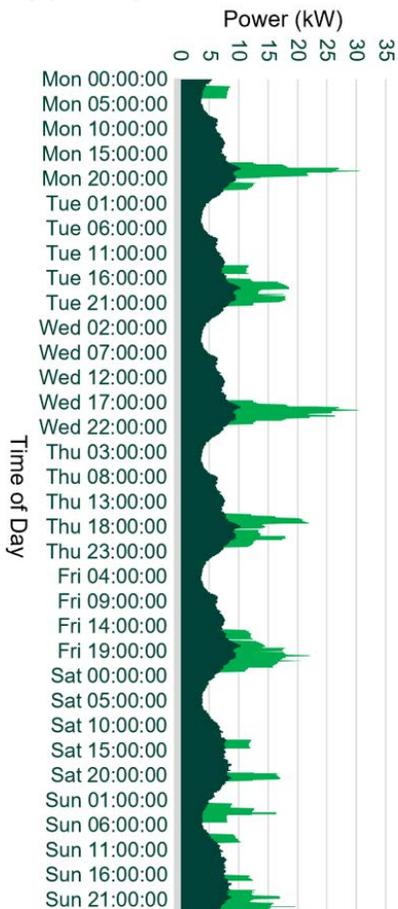


## Impact of Charging Patterns on Residential Energy Demand

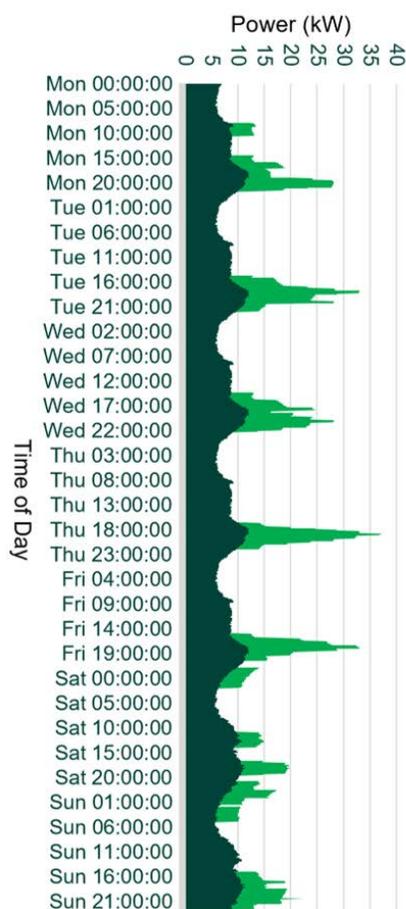
Charging electric vehicles places a previously unseen demand on residential grids. Before transport electrification, peak power loads typically resulted from a combination of various home appliances and lighting. EV charging introduces a new element to this dynamic that requires a significant amount of power as a frequent load. If numerous residents attempt to charge their EVs simultaneously during peak hours, it may strain the grid's capacity and necessitate infrastructure upgrades to handle the increased load.

These graphs show the summer and winter results for 6 EVs. As more energy is required to recharge an EV in the wintertime, peak power demand can be significantly higher.

### Summer



### Winter



Residential transformer sizes have varying capacities, typically with values of 25kVA, 37.5kVA, 50kVA, and 75kVA. The peak power demands projected by the scenarios in this analysis may overload the transformers in many areas.

Peak loading will be highly dependent on the variables, including the number of homes connected to the transformer, the transformer size, the level of EV ownership, the size of the charger used within the home, and the driving and charging habits of the vehicle owner.



# Heat Pump Performance IN ALBERTA

## Building a heat pump knowledgebase for Alberta's climate

Heat Pumps are mechanical devices that use a refrigeration cycle to move heat from one area to another. They are used to both heat and cool indoor space. They use electricity as their source of energy, and do not burn natural gas.

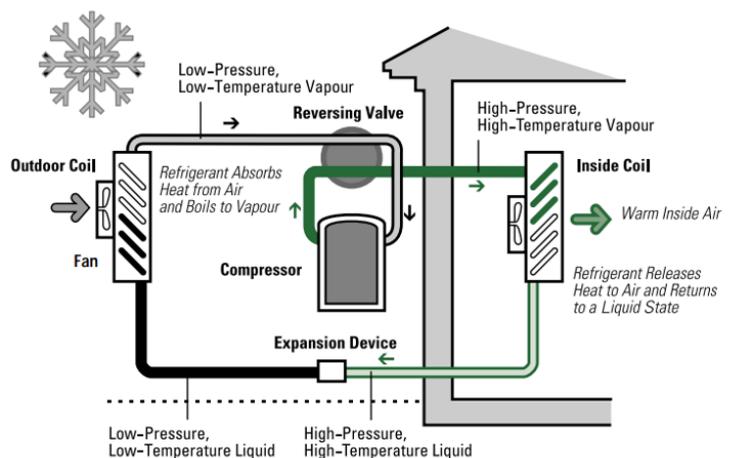
Heat pumps are popular for their energy efficiency, with coefficient of performance at 3:1.

The typical types of heat pumps being used in Alberta are:

- Cold Climate Air Source
- Ground Source or Geothermal
- Air Source – Hybrid, which use natural gas or electric resistance as a back-up heat source

Our industry partner EQUUS, a local rural utility operator, needed a heat pump knowledge base for their member pool. EQUUS wanted to determine the current limitations to the widespread adoption of heat pumps.

EIC staff performed a technology review and operation literature review, as well as a gap analysis study. We analyzed rural property load profiles and historical weather to determine the potential grid impacts of heat pump adoption for EQUUS. The grid impact investigation found that there is a quantifiable relationship between weather and power consumption. We looked at the rural electrical load relationship and the addition of electrification equipment, in order to identify performance gaps and limitations.



Heat Pump Operational Cycle

## Barriers to Heat Pump Adoption in Alberta



Consumer Knowledge and Confidence



Low Temp Operational Challenges



Potential Expensive Retrofitting



Limited Availability of Qualified Installers



High Initial Capital Investment



Policy Considerations

## Advancements in Heat Pump Technology

### Inverter or Variable Speed Advancements

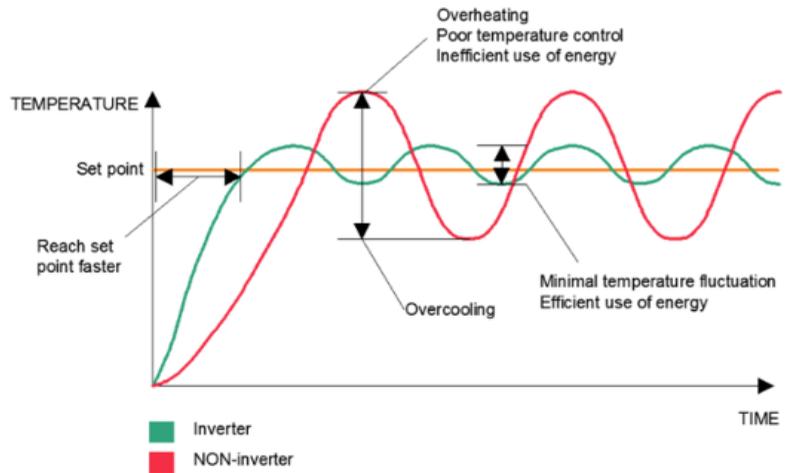
- Reaches set point quicker.
- Minimal Temperature fluctuation.
- Reduces overheating or cooling.

### Refrigerant advancements

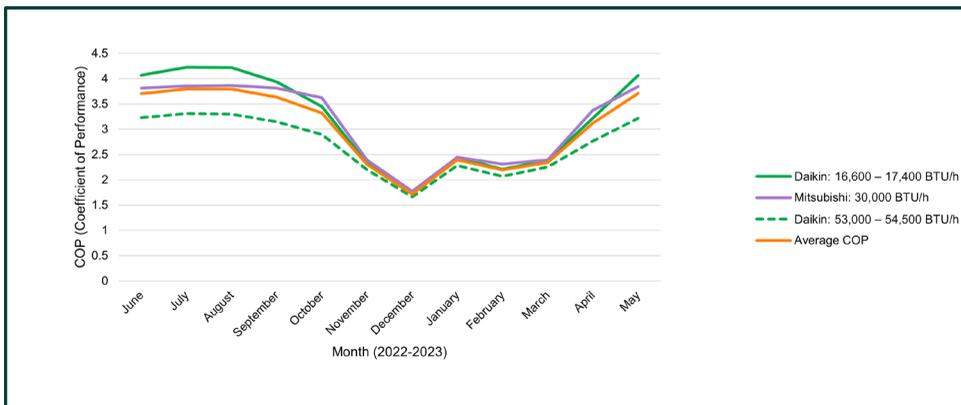
- R-32
- Natural Refrigerants – CO<sub>2</sub>, R-290 (Propane)
- Offering higher efficiency and lowers the environmental impact.

### Demand Based heating and cooling

- Smart controls and machine learning for heating and cooling control of unoccupied spaces.



## Heat Pump Efficiency and Weather



Coefficient of Performance (COP) measures a heat pump's efficiency. It is the ratio of output heating or cooling energy to the input energy.

A COP of 3:1 means the heat pump generates three units of heating or cooling energy for every unit of energy it uses. As the outdoor temperature drops, the efficiency of the heat pump lowers.

## Promising Future for Heat Pumps in Alberta

The research revealed that the grid can accommodate heat pumps. On average, there will be 8-11 days of thermal lock out annually that would need to be heated with an auxiliary heating source. This information provides the groundwork for future research looking at waste heat recovery, alternative energy storage, and other phase change opportunities.

### Integration of energy advisors and building modeling:

- Essential for correct sizing and installation of Heat Pumps
- Considers building as systems, supporting project success in planning stages
- Allows for energy label assignment, meeting government Greener Homes Incentives

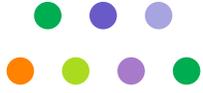
### Potential New Program Development:

- Specialized training for installation professionals
- Building Sciences and Building as a System Program
- Energy Advisors and Building performance modeling

### New Areas of Research :

- Waste heat recovery for thermal lockout periods
- Thermal energy storage and phase change energy systems
- Data Sharing Alliance – Heat Pump Study





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