



## Toward Net-Zero Energy Solutions

### University of Alberta tackling climate change impacts

World-changing innovations in energy are an intrinsic part of the University of Alberta's history – and a strategic priority for the future.

“We're proud to be one of the largest hubs in the world for research in energy,” says Arvind Rajendran, professor in the chemical and materials engineering department at the U of A, where he leads projects focused on carbon capture. “From research fundamentals to translating findings into policy or commercial applications, the University of Alberta has been leading in this field for many decades.”

In fact, its [Future Energy Systems](#) program – Canada's largest energy research cluster with more than 140 researchers and close to 1,000 graduate students – covers the full gamut of the energy landscape: energy grids and storage, hydrocarbon development, geothermal and renewable energy including wind and solar power, biomass fuels, land reclamation and societal aspects.

The university also continues to work on ways to decarbonize existing energy sources and to create more resilient infrastructure that can withstand the impacts of climate change-driven natural disasters such as floods and forest fires.

“The global goal is to accelerate the development of low-carbon and net-zero energy sources, and we are working collaboratively with other stakeholders to achieve Canada's national target of net-zero emissions by 2050,” says Aminah Robinson Fayek, vice-president, research and innovation at the U of A. “From a research and innovation perspective, this means prioritizing our work to help meet these national and global objectives.”

The university has made great strides in a number of high-priority research areas. In hydrogen, for example, [U of A researchers](#) working with scientists at the University of Toronto recently discovered a novel way to produce green and cost-effective hydrogen – with no emissions – using microwave technology. The finding is significant given the growing interest in hydrogen as a green energy source, particularly among oil sands companies that rely on hydrogen to upgrade bitumen into products such as gasoline or diesel fuel.

In the field of biomass, a [U of A professor in Agricultural, Life and Environmental Sciences](#) has led the development of a technology that converts waste fats, such as restaurant grease, into hydrocarbons for use in biofuels for the aviation industry. A spinoff company based on this research is already building a \$30-million plant in Ontario to produce renewable gas and diesel. In addition to monetizing waste, this helps meet new fuel standards nationally.

Wastewater is also of interest at the U of A. [One science professor](#) recently determined how to extract lithium – a critical mineral of limited global supply, which is required for renewable energy technology as well as batteries for cell phones, computers and electric vehicles – from the briny water produced in oil sands and gas operations.

The U of A is advancing research in regulatory policies in energy. [One of its economics professors](#), who was awarded a Canada Research Chair in Energy Economics and Policy, is currently analyzing the design of electricity markets and developing models that can quantify the impact of regulatory policies on energy markets.

“There’s a lot for all of us to do,” says Dr. Robinson Fayek. “We need to coordinate our approach among academia, industry, community and all levels of government. We need to ensure we adopt new technologies across all sectors, look at larger-scale solutions, and consider the environmental and societal impacts and feasibility of these solutions.”

These are monumental challenges, says Dr. Rajendran, and U of A researchers are embracing them. “The university’s focus on innovation and commercialization – backed by an excellent ecosystem of knowledge creation and dissemination – has created this outstanding environment for researchers and scientists,” he says. “If you’re thinking about pursuing a transformative project in energy, the University of Alberta is the place to do that.”

Future approaches in energy solutions research and innovation will bring together multidisciplinary research expertise alongside industry, government, academia and community partners. The U of A’s continued work in this space will accelerate technologies moving from lab-scale to full pilot-scale projects that drive emissions reduction and create jobs of the future – while further expanding the body of knowledge around net-zero energy solutions.

The future of energy is here, and the University of Alberta is leading with purpose.