

ALBERTA is blessed with a beautiful natural environment and abundant globally valuable natural resources. We will protect our air, land and water while responsibly developing these natural resources.

Investing in the science of solutions

- Alberta is a global leader in oil sands and heavy oil research and at the forefront of technologies such as gasification, carbon capture and storage, water use and management, oil sands tailings management and alternative fuels.
- Through collaboration across the private sector, governments and research organizations, Alberta invests in developing technologies to unlock the oil sands in a manner that both limits environmental impacts and enhances economic development.
- By expanding research, technology and innovation capabilities, Alberta's oil sands will provide cleaner, reliable, affordable fuels for generations to come.
- Alberta's investments in oil sands research and advanced technologies have been directed towards increasing production and reserves, enhancing exports and environmental protection in both surface mining and underground (in situ) recovery.
- The goal is to build innovation capacity for the timely commercial adaption of cleaner technologies here in Alberta, and share these advances with energy producers worldwide.
- In 2008, Alberta made an unprecedented \$2-billion investment to address greenhouse gas emissions, to advance CCS research and projects. This includes projects that will:
 - green oil sands supply at the upgrading stage (Quest Project and Alberta Carbon Trunk Line);
 - green electricity production at Alberta coal-fired electricity plants (Project Pioneer);
 - create a pipeline system to transport CO₂ (Alberta Carbon Trunk Line); and
 - produce clean energy with in situ coal gasification (Swan Hills Synfuels Project).
- The Climate Change and Emission Management Fund is part of Alberta's strong commitment to clean energy technology. The Climate Change and Emission Management Corporation, which administers the fund, directed \$71 million – of the \$187 million collected to date – towards 16 clean technology projects.

History of oil sands research

- In 1929, Dr. Karl A. Clark was issued a patent for a hot-water extraction process for separating oil from oil sands, leading to methods used today. During the 1960s, new research led to better understanding of the resource. The Great Canadian Oil Sands – now Suncor – commercial surface mining plant started in 1967.
- In 1974, the Alberta government established the Alberta Oil Sands Technology and Research Authority (AOSTRA) to work with industry to develop technologies for accessing the 80% of oil sands buried too deeply to be mined.
- In 2000, based on the success of AOSTRA, the Government of Alberta broadened its focus on energy research with the creation of the Alberta Energy Research Institute (AERI) to explore more opportunities and technologies related to energy and greenhouse gas emission research.
- In 2010, energy-related research continued to evolve and advance with the creation of Alberta Innovates – Energy and Environment Solutions, which combines the Alberta Energy Research Institute with the Alberta Water Research Institute, and places more emphasis on research in environmentally responsible and sustainable practices for energy research and development.
- To date, the Government of Alberta and private industry have each invested more than \$1 billion in oil sands research. These combined efforts are expected to continue to advance scientific and technological solutions that will both reduce the environmental footprint of oil sands development, and increase economic recoveries.

Committed to technology development

- Albertans' willingness to work towards new technologies has turned the oil sands into a success story that holds the key to continental energy security. Innovations to improve energy efficiency, find better materials and reduce greenhouse gas emissions and tailings are ongoing.
- As large industrial emitters comply with greenhouse gas emission reduction laws, money collected from emitters that do not comply is deposited into the Climate Change and Emission Management Fund, which will be invested into technology to improve energy efficiency and further reduce GHG emissions. Companies have paid \$187 million to the fund (April 2010). To date, \$71 million has been invested in 16 projects.
- \$156 million will be invested in Alberta technology as part of the Canada EcoTrust for Clean Air and Climate Change. To date, \$81.5 million has been invested in clean energy projects.
- Three Nobel laureates from Alberta have been recognized for contributions on the capture and storage of carbon dioxide in suitable geologic formations. This expertise is helping to put Alberta at the forefront of CCS technology and others such as gasification, water use and management, oil sands tailings management and alternative fuels.

Energy research initiatives

- *Alberta Innovates* is the province's strategic hub for research and technology innovation.
 - It coordinates the efforts of provincial corporations such as *Alberta Innovates – Energy and Environmental Solutions*, *Alberta Innovates – Technology Futures*, the province's post-secondary institutions that make up Campus Alberta and international collaborations.
- *Alberta Innovates – Energy and Environmental Solutions* will build on successes of the Alberta Energy Research Institute, the Alberta Water Research Institute and partners in industry, research and academia. This will support solutions to the challenges facing Alberta and also strengthen the development of world-class research and innovation in Alberta and increase the development and retention of highly qualified people in the province.
- Alberta has allocated \$32 million to support clean energy research being driven by the University of Alberta, including a \$25-million research partnership between the university and the Helmholtz Association of German Research Centres with an emphasis on the oil sands.
- The Alberta Government is investing \$25 million into Carbon Management Canada, a national, university-led research network housed at the University of Calgary that is developing insights, technologies and policies to reduce emissions in Canada's fossil fuel energy sector.
- New recovery technologies are funded through the Innovative Energy Technology Program, a \$200-million Alberta government royalty credit.
- At the National Institute for Nanotechnology at the University of Alberta, supported by the Governments of Canada and Alberta and the university, the science of small, or nanotechnology, is being used to explore and develop innovations to accelerate improvements in the environmental and economic performance in the energy sector. For example, a coating for the insides of pipes to improve efficiency and reduce energy inputs is in production.
- Examples of research areas and programs:
 - Geothermal heat as a lower-emission alternative to natural gas.
 - Water treatment to reduce use of fresh water and enhance water recycling systems.
 - Solvents, combustion biological processes and electrical heating for in situ recovery processes to reduce energy consumption, emissions and water use.
 - The AERI/Alberta Research Council Core Industry Research Program; a \$4-million per year effort to improve the application of in situ thermal processes.
 - Use of petroleum coke – a by-product of the upgrading process – to produce synthetic gas to generate power and hydrogen. This could transform oil sands operators from a net consumer of natural gas to a net supplier.
 - The Hydrocarbon Upgrading Demonstration Program – an initiative to demonstrate upgrading integrated with gasification and carbon capture and storage.
 - A \$1.8-million fund to develop new methods of reclaiming disturbed sites to full forest.