



# Uranium in Saskatchewan

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## Facts on the Industry for 2013

Attached are fact sheets containing information about the uranium industry in Saskatchewan, prepared by the Saskatchewan Mining Association.

These fact sheets identify the companies, operations and projects involved in the uranium industry, as well as the industry's historical economic impact within the province.

If you have any questions, please contact the appropriate person listed under Industry Contacts. If it is not clear whom you should contact, please call the media and public relations people listed.

*All photos were supplied by AREVA Resources and Cameco Corporation*



# Uranium in Saskatchewan

## Introduction

“Uranium in Saskatchewan” is a series of fact sheets produced annually by Saskatchewan’s uranium mining industry. The information contained has been gathered from corporations producing uranium in the province. The fact sheets represent the combined total of all efforts of the companies and their employees and contractors who produce this valuable source of energy used worldwide to generate electricity.

Saskatchewan is a world leader in uranium production. The uranium industry provides many jobs and promotes investment and economic development in the province. The industry provides all of these benefits in an environmentally and socially responsible manner and is held accountable for its performance. Regular internal and external audits on the environment and safety of operations are ongoing and thousands of air, water and vegetation samples are taken annually. These samples demonstrate, and the government regulatory agencies agree, that the industry is protecting the environment.

These fact sheets illustrate the magnitude of this industry and the benefits that accrue to the people of Saskatchewan.

Cameco Corporation and AREVA Resources Canada are the two uranium producers in Saskatchewan, producing all of Canada’s uranium. For additional information on the Saskatchewan uranium mining industry, please visit the following websites:

**[www.cameco.com](http://www.cameco.com)**

**[www.avevaresources.ca](http://www.avevaresources.ca)**

**[www.saskmining.ca](http://www.saskmining.ca)**



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## Uranium Reserves (as of December 31, 2013)

DEPOSIT	MINING METHOD	MILLIONS OF POUNDS U <sub>3</sub> O <sub>8</sub>	AVERAGE GRADE (% U <sub>3</sub> O <sub>8</sub> )
Cigar Lake	underground	216.7	18.30
Key Lake	open pit	0.7	0.5
McArthur River	underground	360.5	15.76
McClellan Lake	open pit, underground	15.3	18.2
Midwest	open pit	5.8	4.8
Rabbit Lake	underground	20.3	0.56
Cluff Lake	decommissioned	nil	nil
<b>TOTAL URANIUM RESERVES</b>		<b>619.3</b>	

Numbers may not reflect total due to rounding.

- Clean electricity generated worldwide from uranium avoids 2.5 billion tonnes CO<sub>2</sub> emissions annually. *(source: Canadian Nuclear Association)*
- Currently approximately 13% of the world's electricity mix is obtained from Nuclear Power. *(Source: World Nuclear Association)*
- Saskatchewan supplies more than 15% of all uranium used worldwide. *(source: World Nuclear Association)*
- Saskatchewan's known uranium reserves contain approximately four times the energy than in all known Canadian conventional oil reserves (not including the Athabasca oil sands). *(source: Canadian Nuclear Association)*



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## Expenditures for Uranium Mining: 1980 – 2013

(includes capital, exploration, reclamation and pre-development expenditures;  
does not include operating expenditures)

YEAR	MILLIONS OF DOLLARS
1980	186.8
1981	168.7
1982	301.6
1983	382.9
1984	181.2
1985	98.0
1986	90.3
1987	86.5
1988	102.6
1989	60.8
1990	75.1
1991	95.5
1992	52.7
1993	65.5
1994	66.2
1995	158.9
1996	234.2

YEAR	MILLIONS OF DOLLARS
1997	253.8
1998	210.2
1999	232.1
2000	74.7
2001	47.1
2002	54.4
2003	49.4
2004	101.5
2005	215.6
2006	343.2
2007	347.2
2008	403.6
2009	288.3
2010	383.5
2011	752.8
2012	615.0
2013	635.9

1980-2013 TOTAL EXPENDITURES - \$7,415,900,122

Since 1980, the uranium mining industry has spent more than \$7.4 billion on uranium mining projects in Saskatchewan in addition to operating expenditures.



# Uranium in Saskatchewan

## Economic Impact 2013

- The uranium mining industry spent almost \$379 million on salaries, wages and benefits for its direct employees. Of this, \$110 million was paid to residents of Saskatchewan's north.
- The industry's contractors paid out an additional \$227 million to their employees.
- Income tax remitted on behalf of mining industry direct employees was \$89.6 million. Canada Pension Plan contributions were an additional \$13.3 million and Canada Employment Insurance payments were another \$5.6 million.
- The value of goods and services purchased by the industry was \$1.23 billion. Approximately 70% (\$862 million) of this amount went to businesses based in Saskatchewan and approximately 44% (\$539 million) went to businesses based in northern Saskatchewan.
- Capital expenditures were approximately \$584.6 million, while exploration expenditures were \$44.6 million. Reclamation expenditures were \$6.7 million. Total capital, exploration and reclamation expenditures, excluding salaries, were approximately \$635.9 million.
- Approximately \$6.5 million was spent on licensing fees and \$2.6 million was paid in surface lease fees.
- \$4.3 million was donated to community and charitable organizations and another \$274,000 was given as scholarships and other forms of support to contribute to the education of Saskatchewan's youth.



# Uranium in Saskatchewan

## Production in 2013

OPERATING MINE	PRODUCTION	
	TONNES OF URANIUM	MILLION POUNDS OF U <sub>3</sub> O <sub>8</sub>
Key Lake/McArthur River*	7,731	20.1
Rabbit Lake	1,577	4.1
<b>TOTAL</b>	<b>9,308</b>	<b>24.2</b>

Source: Saskatchewan uranium producers

To convert tonnes of uranium to pounds of U<sub>3</sub>O<sub>8</sub>, multiply tonnes by 2,599.8

Numbers may not reflect total due to rounding.

\*Ore from McArthur River is trucked to Key Lake where it is then fed into the Key Lake mill and processed into yellowcake.

- Canada's uranium is used exclusively for the generation of electricity at nuclear power plants. The end use is strictly enforced by international non-proliferation agreements and Canadian export restrictions.
- Nuclear power's place in Canada's energy mix has grown in importance and by February of 2013 nuclear power supplied 17.08% of Canada's electricity. *(source: Canadian Nuclear Association)* This makes uranium one of Canada's largest, non-carbon emitting sources of energy in use today.
- Canada remains a leading world uranium producer, accounting for 16.7% of world primary production. All of the uranium production in Canada comes from Saskatchewan mines. *(source: World Nuclear Association)*
- Approximately 85% of the uranium shipped from Saskatchewan mines goes to non-Canadian markets for the generation of electricity. *(source: Natural Resources Canada)*



# Uranium in Saskatchewan

## Industry Employment Statistics 2013

- Total employment by the uranium industry, including contractors, is approximately 4,250 people. The uranium industry directly employs approximately 2,600 people in Saskatchewan and industry contractors employ an additional 1,650 people.
- Employment at mine sites, including contractors, is approximately 3,300.
- Approximately 49% of mine site employees, including contractors, are residents of Saskatchewan's north.
- Approximately 45% of mine site employees, including contractors, are of aboriginal ancestry.
- Head office employment accounts for approximately 811 direct employees.
- The uranium industry is responsible for approximately 12,750 jobs in the province (approximately 4,250 direct jobs and an additional 8,500\* spin-off jobs).

\*Spin-off jobs calculation based on information from Saskatchewan Industry and Resources





# Uranium in Saskatchewan

## Environmental Protection 2013

The Saskatchewan uranium mining industry is committed to responsible environmental stewardship. The industry directly employs 83 people whose full-time responsibility is to ensure that all operations meet strict environmental standards set out by both the federal and provincial governments. Twenty-four hours a day, 365 days a year, comprehensive sampling, monitoring and assessment programs are in operation to ensure that the physical environment is protected. All sites are subject to compliance-based monitoring; water and air emissions from the mine and mills are tested on a regular basis to ensure that contaminants, if any, remain within regulatory limits. The industry also performs environmental monitoring to ensure that plants, animals and fish in the surrounding area are not adversely affected.

The industry's long-term goal is to return all operations, as closely as possible, to a natural state suitable for future uses. All uranium mine site operators must issue a letter of credit with the province of Saskatchewan to ensure adequate funds are available for proper decommissioning of each site after the reserves have been mined out.

The uranium mining companies are already working towards this long-term goal. In 2013, approximately \$6.7 million was spent on reclamation.

### **ISO 14001 Certification**

ISO 14001 is a voluntary international set of standards that is recognized in more than 90 countries for maintaining an effective environmental management system where a company can demonstrate its commitment to environmental performance, pollution prevention and continual improvement. It establishes a permanent framework to assist companies in reaching their environmental protection goals. The ISO framework calls for regular independent audits and for re-certification every three years.

Five Saskatchewan uranium operations are currently ISO 14001 certified: McClean Lake (2001), Key Lake (2003), McArthur River (2003), Cluff Lake (2004) and Rabbit Lake (2010). In addition, AREVA Resources' Saskatchewan uranium exploration activities were certified for ISO 14001 in 2004. This certification further demonstrates the commitment of Saskatchewan uranium mining companies in protecting the environment.



# Uranium in Saskatchewan

## Radiation Protection and Worker Safety 2013

The safety of workers is a top priority. The uranium industry directly employs 137 people working full time to ensure safe working environments (including radiation protection) exist for employees. All mine sites are monitored regularly to spot any potential hazards that may develop.

Employees at uranium operations are monitored continuously for radiation exposure by the use of individual radiation dosimeters carried by each employee. These devices record the cumulative radiation dose received. The dosimeters are submitted regularly to independent radiation monitoring agencies. Health Canada maintains a central registry of the results, which are provided to the employer companies, the Canadian Nuclear Safety Commission (CNSC) and to all individual employees. In addition to cumulative exposure monitoring, special personal dosimeters are used that provide immediate feedback of radiation exposure levels. Certain areas in the workplace are also equipped with devices that record and display continuous ambient radiation levels.

The Saskatchewan uranium industry consistently demonstrates that it meets the standards set out by CNSC for radiation exposure. In 2013, the average total effective dose to workers in the industry, including contractors, was approximately 3% of the annual average allowable limit (20 millisieverts) set by regulators. All employees in the industry were below this limit. The highest exposure recorded to any single employee in 2013 was approximately 23.4% of the annual maximum limit (50 millisieverts).

Statistics collected by government agencies show that Saskatchewan's uranium mines are among the safest workplaces in the province, even at times surpassing office jobs.

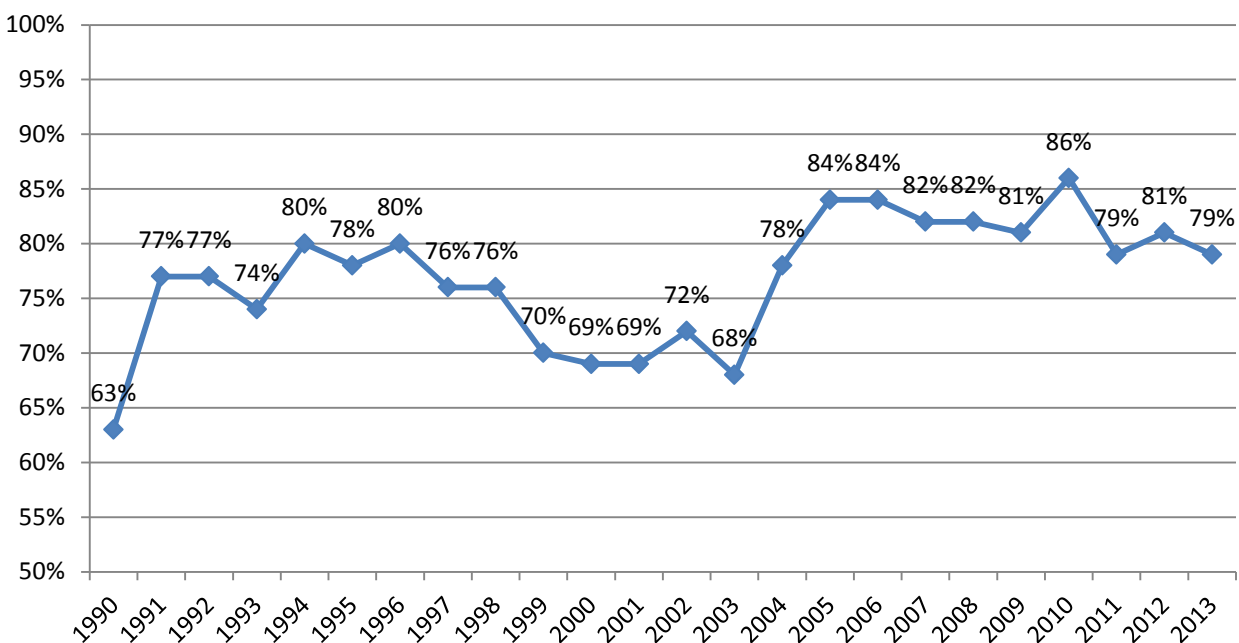


# Uranium in Saskatchewan

## Public Support for the Uranium Mining Industry 2013

*Information on this page is taken from a public opinion poll conducted by Fast Consulting in 2013.*

### Public Support 1990 – 2013



- Public support for the uranium mining industry is generally consistent across all age groups and all regions of the province (poll is taken in November or December of each year).

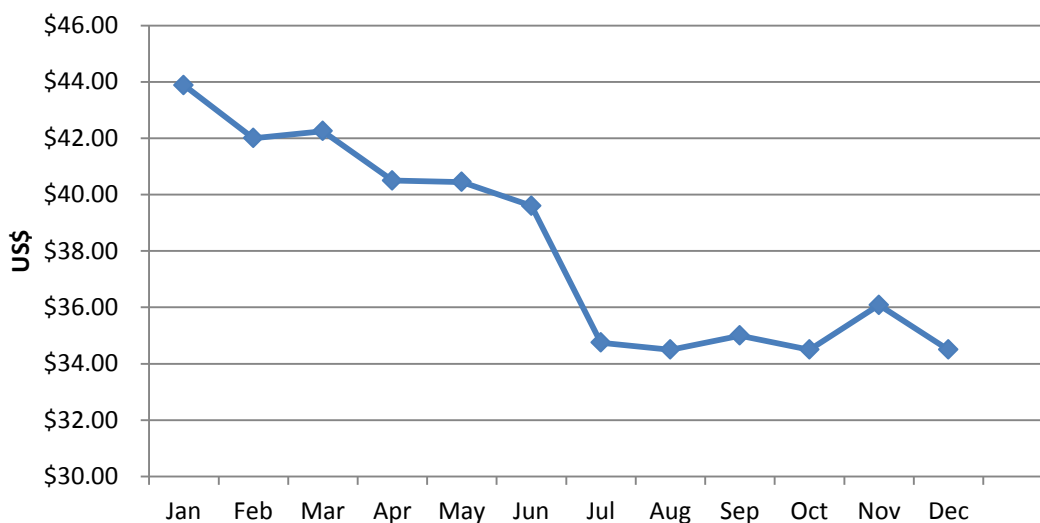


# Uranium in Saskatchewan

## Saskatchewan Uranium Exploration Activity 2013

According to the Saskatchewan Ministry of Energy and Resources, total 2013 uranium exploration expenditures in the Athabasca Basin are estimated to have reached \$122.2 million. This is greater than the 2012 actual expenditures of \$116 million.

### Uranium Spot Price (US\$), 2013



The spot market price of uranium fluctuated between January 2013 and December 2013 (US\$43.88 per pound and US\$34.50 per pound). The 2013 average spot price (US\$38.17 per pound) is lower than the 2012 average spot price (US\$48.40 per pound).

Many companies are currently exploring for uranium in the Basin. The majority of these companies are publicly traded and are operating in joint ventures with one or more other companies. Most of the activity is in the eastern part of the Basin where the major known deposits are located. However, following new exploration successes, activity is increasing in the western portion of the Basin.



# Uranium in Saskatchewan

## Cigar Lake Project 2013

**OWNERSHIP:** Cameco Corporation (50%)  
AREVA Resources (37%)  
Idemitsu Uranium Exploration Canada Limited (8%)  
TEPCO Resources Inc. (5%)

**OPERATOR:** Cameco Corporation

**DISCOVERED:** 1981 by AREVA Resources

**OPERATION:** Cigar Lake is the world's second-largest known high-grade uranium orebody.

The uranium ore slurry will be trucked about 80 kilometres to AREVA's McClean Lake mill for processing.

**PRODUCTION:** Ore production began in 2014 as part of the commissioning process

Full production is expected by 2017 based on current information

Planned annual production of 18 million lbs  $U_3O_8$  after ramp-up

**RESERVES:** Proven and probable reserves of 216.7 million lbs  $U_3O_8$  with an average grade of 18.3%  $U_3O_8$

**PLANS FOR 2014:**

- ❖ Commissioning the mine production systems
- ❖ Complete the installation of all infrastructure required to begin production
- ❖ Mine entered production in 2014
- ❖ Produce the first packaged pounds from AREVA's McClean Lake mill



# Uranium in Saskatchewan

## Cluff Lake Mine 2013

- OWNERSHIP:** AREVA Resources (100%)
- OPERATOR:** AREVA Resources
- DISCOVERED:** 1971
- OPERATION:** 1980 – 2002; 22 years of successful operation; Cluff Lake received ISO 14001 environmental management certification in 2004.
- CAPACITY:** The mill had a rated capacity of 5.2 million lbs.  $U_3O_8$  (2,000 tonnes uranium). The mill has been demolished and the site is being returned to a natural state.
- PRODUCTION:** Total production since the beginning of operation in 1980 to the end of 2002 was 62.5 million lbs.  $U_3O_8$ . The reserves are now depleted and the major decommissioning work is complete.
- NOTES:**
- ❖ Cluff Lake ceased uranium production at the end of 2002 after 22 years of operation
  - ❖ Active decommissioning work began in 2004 and is now completed. Decommissioning included backfilling the Claude pit, dismantling the mill and covering the area with soil, covering the tailings management area, and re-sloping and covering the waste rock piles
  - ❖ AREVA will continue its environmental monitoring program through four visits per year, called campaign monitoring
  - ❖ Approximately 800,000 trees and shrubs have been planted on the mine site since Cluff Lake was decommissioned. These trees and shrubs will ensure that the site will gradually return to the natural landscape from which it came



# Uranium in Saskatchewan

## Key Lake Operation 2013

**OWNERSHIP:** Cameco Corporation (83%)  
AREVA Resources (17%)

**OPERATOR:** Cameco Corporation

**DISCOVERED:** 1975 by Uranerz Exploration and Mining Limited

**OPERATION:** In operation since 1983, Key Lake is the largest uranium milling operation in the world.

Key Lake currently processes uranium ore mined at McArthur River.

**PRODUCTION:** Key Lake and McArthur River are currently licensed to produce up to 18.7 million lbs of uranium concentrate ( $U_3O_8$ ) annually on average, not to exceed 21 million lbs  $U_3O_8$  in any given year.

Key Lake and McArthur River jointly produced 20.1 million lbs  $U_3O_8$  in 2013 which exceeded planned production by 4%.

**RESERVES:** 0.7 million lbs.  $U_3O_8$  with an average grade of 0.5%  $U_3O_8$

Mining no longer occurs at Key Lake

**PLANS FOR 2014:**

- ❖ Continue work to renew mill facilities, work towards securing tailings management capacity, and seek regulatory approval to increase annual production capacity to 25 million pounds  $U_3O_8$



# Uranium in Saskatchewan

## McArthur River Operation 2013

**OWNERSHIP:** Cameco Corporation (70%)  
AREVA Resources (30%)

**OPERATOR:** Cameco Corporation

**DISCOVERED:** 1988 by Cameco Corporation

**OPERATION:** The McArthur River operation is the world's largest, high-grade uranium mine.

The mine began operations in December 1999.

McArthur River uranium ore is processed at the Key Lake operation.

**PRODUCTION:** McArthur River and Key Lake are currently licensed to produce up to 18.7 million lbs of uranium concentrate ( $U_3O_8$ ) annually on average, not to exceed 21 million lbs  $U_3O_8$  in any given year.

McArthur River and Key Lake jointly produced 20.1 million lbs  $U_3O_8$  in 2013 which exceeded planned production by 4%.

**RESERVES:** Proven and probable reserves of 360.5 million lbs  $U_3O_8$  with an average grade of 15.76%  $U_3O_8$

**PLANS FOR 2014:**

- ❖ Continue developing the mine by expanding the freeze plant, improving the dewatering system and improving the electrical distribution systems
- ❖ Increase ventilation by sinking a fourth ventilation shaft in the northern end of the mine
- ❖ Continue advancing exploration drift tunnels
- ❖ Continue underground exploration drilling activities
- ❖ Seek regulatory approval to increase production to 22 million pounds  $U_3O_8$





# Uranium in Saskatchewan

## McClellan Lake Operation 2013

- OWNERSHIP:** AREVA Resources (70%)  
Denison Mines Inc. (22.5%)  
OURD Canada Co. Limited (7.5%)
- OPERATOR:** AREVA Resources
- DISCOVERED:** 1979 by the Canadian Oxy – INCO Joint Venture
- OPERATION:** McClellan Lake has the newest and most technologically advanced uranium mill in the world. The operation began producing yellowcake in 1999 using ore from the now completed JEB, Sue C, Sue A, Sue E and Sue B open pit mines. The JEB pit has now been converted into a tailings management facility. In 2001, McClellan Lake received ISO 14001 environmental management certification. In 2008, McClellan Lake became the first uranium mine in North America to obtain OHSAS 18001 international health and safety management certification.
- CAPACITY:** Initially 6 million lbs.  $U_3O_8$ ; annual licensed capacity increased to 8 million lbs.  $U_3O_8$  (3,077 tonnes uranium) in 2001.
- PRODUCTION:** Mill has been put into a care and maintenance mode as of June 2010.
- RESERVES:** 15.3 million lbs.  $U_3O_8$  stockpiled with an average grade of 18.2%  $U_3O_8$ .
- PLANS FOR 2014:**
- ❖ Restart the McClellan Lake mill to begin processing uranium ore from Cigar Lake. An upgrade of the mill is under way so that it can process 100% of the Cigar Lake ore.
  - ❖ Expansion of the JEB Tailing Management Facility (currently in the licencing phase with the CNSC)



# Uranium in Saskatchewan

## Midwest Project 2013

**OWNERSHIP:** AREVA Resources (69.16%)  
Denison Mines (25.17%)  
OURD Canada Co. Limited (5.67%)

**OPERATOR:** AREVA Resources

**DISCOVERED:** 1978 by Esso Minerals Limited

**OPERATION:** The federal and provincial governments granted environmental assessment approvals for the project in 1998 based on underground jet boring techniques. The new project description, to develop the orebody as an open pit mine, requires an additional environmental assessment, which is under way. Mining would last about five years. The ore will be trucked on a dedicated haul road about 16 km to the McClean Lake mill for processing. An expansion of the mill will be required to process the additional ore. Treated mine water will be pumped to McClean Lake for discharge into the Sink/Vulture Treated Effluent Management System.

**RESERVES:** 5.8 million lbs.  $U_3O_8$  with an average grade of 4.8%  $U_3O_8$ .

### PLANS FOR 2014:

- ❖ In 2012 the Canadian Government and Province of Saskatchewan approved the Midwest mine's environmental assessment. This project is on hold until market conditions improve.



# Uranium in Saskatchewan

## Rabbit Lake Operation 2013

**OWNERSHIP:** Cameco Corporation (100%)

**OPERATOR:** Cameco Corporation

**DISCOVERED:** 1968 by Gulf Mineral Resources

**OPERATION:** Rabbit Lake began operations in 1975 and is the longest-operating uranium production facility in North America.

The operation consists of the Rabbit Lake mill and the Eagle Point underground mine, located 16 kilometres north of the mill.

More than 190 million pounds of uranium concentrate ( $U_3O_8$ ) have been produced from five different ore bodies at the site.

**CAPACITY:** The mill has an annual licensed capacity of 16.9 million lbs  $U_3O_8$

**PRODUCTION:** 4.1 million lbs  $U_3O_8$  was produced in 2013.

**RESERVES:** Provable and probable reserves of 20.3 million lbs  $U_3O_8$  with an average grade of 0.56%  $U_3O_8$

**PLANS FOR 2014:**

- ❖ Production was 8% higher in 2013 than in 2012. This was due to increased efficiency.
- ❖ In 2014, the plan is to continue evaluating options to expand existing tailings capacity, which currently has sufficient capacity to support the milling of Eagle Point ore until about 2018.



# Uranium in Saskatchewan

## Cameco Corporation

Cameco is one of the world's largest uranium producers accounting for about 15% of the world's production from its mines in Canada, the US and Kazakhstan. Our leading position is backed by about 443 million pounds of proven and probable reserves and extensive resources. Cameco holds premier land positions in the world's most promising areas for new uranium discoveries in Canada and Australia as part of an intensive global exploration program. Cameco's fuel services division, based in Ontario, Canada, is also a leading provider of processing services required to produce fuel for nuclear power plants.

Cameco Corporation owns and operates the Rabbit Lake mill and is operator and majority owner of the Key Lake mill and McArthur River mine. The company is also majority owner and operator of the Cigar Lake uranium project.

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Website: [www.cameco.com](http://www.cameco.com)



# Uranium in Saskatchewan

## AREVA Resources

AREVA Resources Canada Inc. has its headquarters in Saskatoon. AREVA is one of the world's largest producers of uranium and has been active in Canada for 50 years.

AREVA Resources is the operator and majority owner of the McClean Lake and Midwest uranium projects and owns and operates the decommissioned Cluff Lake mine. The company is also part owner of the Cigar Lake, McArthur River and Key Lake uranium projects. It conducts uranium exploration in Saskatchewan and Nunavut. AREVA Resources' uranium production is sold to electric utilities worldwide.

AREVA Resources Canada is a subsidiary of the AREVA group. AREVA is a world leader in nuclear power. The group's offer to utilities covers every stage of the nuclear fuel cycle, reactor design and construction, and operating services. Its expertise and uncompromising dedication to safety make it a leading industry player.

AREVA also invests in renewable energies to develop, via partnerships, high technology solutions.

Through the complementary nature of nuclear and renewables, AREVA's 45,000 employees contribute to building tomorrow's energy model: supplying the greatest number of people with energy that is safer and with less CO<sub>2</sub>.

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# Uranium in Saskatchewan

## Industry Contacts

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