



## *Uranium in Saskatchewan*

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# Uranium in Saskatchewan

## Facts on the Industry for 2017

**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.**



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### **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, 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 Saskatchewan uranium mining industry is one of the top employers of aboriginal people in Canada. 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 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 Orano Canada Inc. 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.saskmining.ca](http://www.saskmining.ca)**

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

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



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### Production in 2017

OPERATIONS	PRODUCTION	
	TONNES OF URANIUM	MILLION POUNDS OF U <sub>3</sub> O <sub>8</sub>
Rabbit Lake	-	-
McArthur River/Key Lake*	6,203.36	16.1
Cigar Lake/McClean Lake**	6,929.29	18.0
<b>TOTAL</b>	<b>13,132.65</b>	<b>34.1</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. The numbers represent uranium production in drums after milling.

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

\*\* Ore from Cigar Lake mine is trucked to McClean Lake Operation where it is then fed into the McClean 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 supplies over 16% of Canada's electricity needs. *(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 uranium producer, accounting for approximately 22% of the world's production. All of the uranium production in Canada comes from Saskatchewan mines. *(source: World Nuclear Association)*
- Uranium exports add approximately \$1.2 billion to the Canadian economy. *(source: Canadian Nuclear Association 2017 Factbook)*





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### **Economic Impact 2017**

- The uranium mining industry spent more than **\$331 million on salaries, wages and benefits** for its direct employees. Of this over **\$107 million was paid to residents of Saskatchewan's north.**
- The industry's contractors paid out an additional \$98.9 million to their employees.
- Income tax remitted on behalf of mining industry direct employees was \$83.7 million. Canada Pension Plan contributions were an additional \$12.3 million and Canada Employment Insurance payments were another \$4.4 million.
- The value of goods and services purchased by the industry was approximately \$555 million. 72.5% (\$402.7 million) of this amount went to businesses based in Saskatchewan and 46.6% (\$259 million) went to businesses based in northern Saskatchewan.
- Capital expenditures were approximately \$110 million, while exploration expenditures were \$45.8 million. Reclamation expenditures were \$2.9 million. Total capital, exploration and reclamation expenditures, including salaries, were approximately \$158.9 million. In the past 20 years, the uranium mining industry has spent more than \$6.5 billion on uranium mining projects in Saskatchewan in addition to operating expenditures.
- Taxes and royalties of \$94.5 million were paid to the province of Saskatchewan.
- Approximately \$5.2 million was spent on licensing fees and \$2 million was paid in surface lease fees.
- Over \$3.1 million was donated to community and charitable organizations and another \$160,000 was given as scholarships and other forms of support to contribute to the education of Saskatchewan's youth.



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### **Industry Employment Statistics 2017**

- Total employment by the uranium industry, including contractors, was 3,051 people. The **uranium industry directly employed 2,197** people in Saskatchewan and industry contractors employed an additional 854 people.
- Employment at mine sites, including contractors, was 2,313.
- Approximately 51% of mine site employees, including contractors, are residents of Saskatchewan's north.
- Approximately 48% of mine site employees, including contractors, are of aboriginal ancestry.
- Head office employment accounted for 665 direct employees.



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### **Environmental Protection 2017**

The Saskatchewan uranium mining industry is committed to responsible environmental stewardship. The industry directly employs 59 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 reserves have been mined out.

The uranium mining companies are already working towards this long-term goal. In 2017, approximately \$2.9 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.

All five Saskatchewan uranium operations are currently ISO 14001 certified: McClean Lake (2001), Key Lake (2003), McArthur River (2003), Cigar Lake (2003) and Rabbit Lake (2010). In addition, Orano Canada's Saskatchewan uranium exploration activities were certified for ISO 14001 in 2004 as is the decommissioned Cluff Lake operation. This certification further demonstrates the commitment of Saskatchewan uranium mining companies in protecting the environment.



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### **Radiation Protection and Worker Safety 2017**

The safety of workers is a top priority. The uranium industry directly employs 108 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 2017, the average total effective dose to workers in the industry, including contractors, was approximately 3.1% 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 2017 was approximately 8.5% 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.



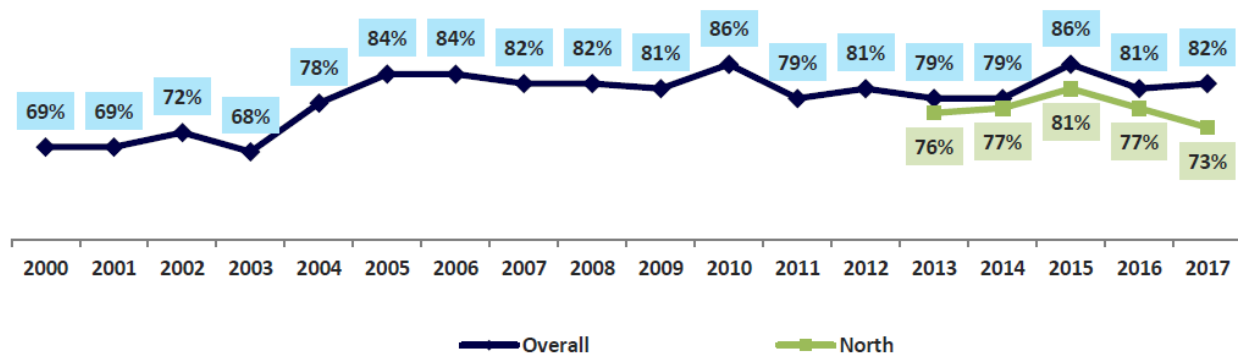


## Uranium in Saskatchewan

### Public Support for the Uranium Mining Industry 2017

*Public opinion poll conducted by Fast Consulting.*

#### Public Support 2000 – 2017

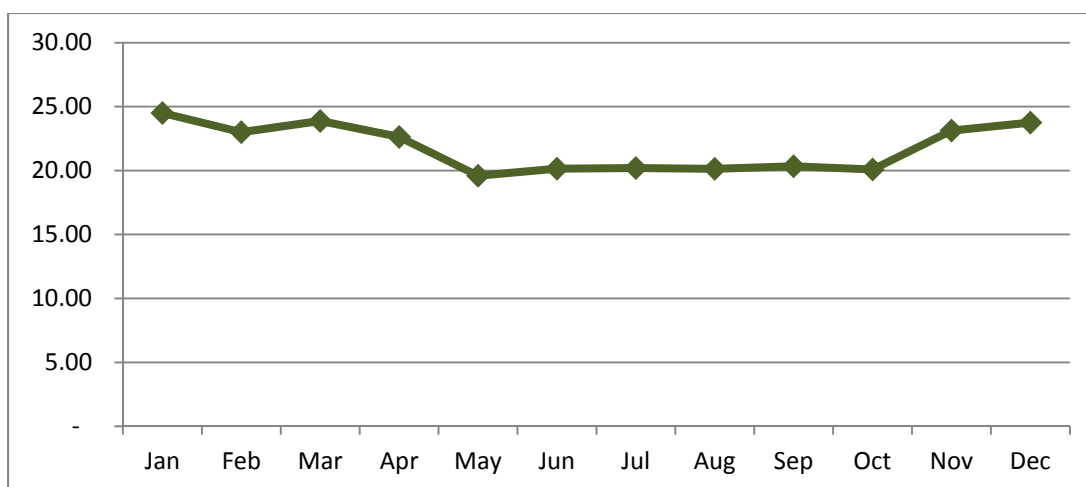


- This poll is taken in November of each year.
- Results from the 2017 survey confirm a high level of support for the continuation of uranium mining in the province—82% of respondents support uranium mining in the province, including 37% who strongly support the industry. This is echoed in the North, where 73% support the industry (38% strongly support). Support is high across all age groups and all regions of the province.
- The high level of public support for uranium mining in Saskatchewan is not new. Although surveys show fluctuations in support levels, the rise and fall is within a relatively limited range. The current level of support is consistent with the long-term trend monitored since 1990.



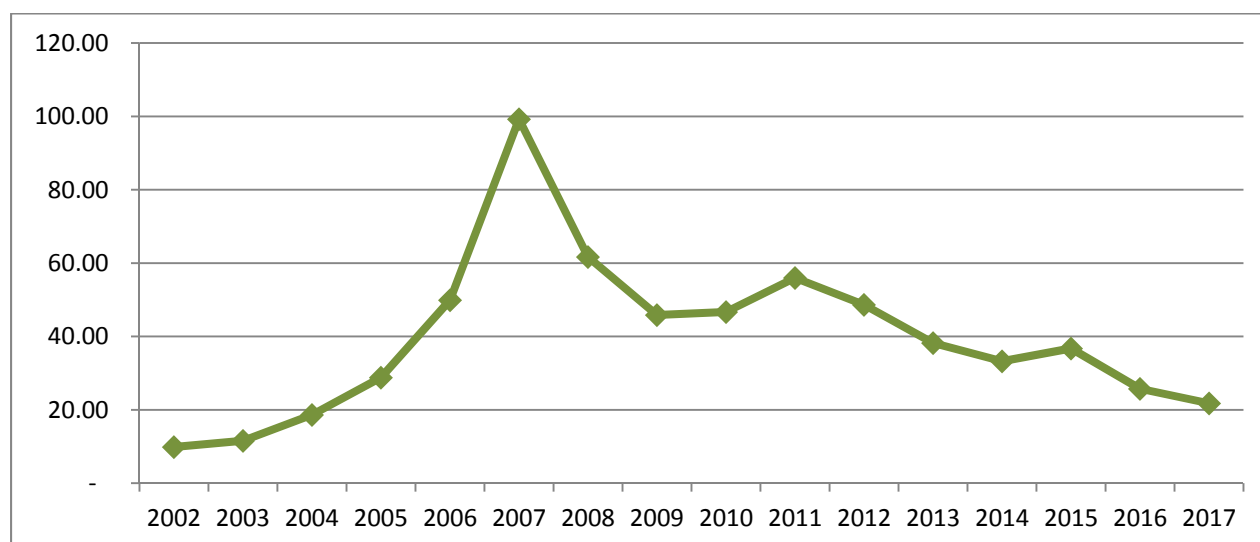
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### **2017 Monthly Average Uranium Spot Price (\$USD)\***



2017 was a challenging year as the spot price remained low.

### **Average Annual Uranium Spot Price (\$USD)\* 2002-2017**



*\* Industry average prices are calculated from the month-end prices published by independent market consultants Ux Consulting and TradeTech.*



## Uranium in Saskatchewan

### Uranium Proven and Probable Reserves (as of December 31, 2017)

Reserves are the economically mineable part of a measured or indicated resource for which at least a preliminary feasibility study demonstrates that economic extraction is justified.

DEPOSIT	MINING METHOD	MILLIONS OF POUNDS U <sub>3</sub> O <sub>8</sub>	AVERAGE GRADE (% U <sub>3</sub> O <sub>8</sub> )
McArthur River	underground	359.1	9.63
Cigar Lake	underground	197.9	14.91
McClellan Lake	to be determined	0.7	0.38
<b>TOTAL URANIUM RESERVES</b>		557.7	

*Numbers may not reflect total due to rounding.*

### Uranium Measured and Indicated Resources (as of December 31, 2017)

Resources do not have demonstrated economic viability but have reasonable prospects for economic extraction.

DEPOSIT	MINING METHOD	MILLIONS OF POUNDS U <sub>3</sub> O <sub>8</sub>	AVERAGE GRADE (% U <sub>3</sub> O <sub>8</sub> )
McClellan Lake	to be determined	15.3	2.15
Millennium (proposed)	underground	75.9	2.39
Midwest (proposed)	open pit	51.1	2.19
Tamarack (proposed)	underground	17.9	4.42
<b>TOTAL URANIUM RESOURCES</b>		160.2	

*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 11.5% of the world's electricity mix is obtained from nuclear power (446 operable nuclear reactors worldwide). Canada's 19 nuclear power reactors provide 16.6% of the country's electricity. *(Source: World Nuclear Association)*
- It is estimated that if coal and natural gas power plants were replaced with nuclear power plants global CO<sub>2</sub> emissions would drop by 22.2% from 2014 levels. *(source: Canadian Nuclear Association)*



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### **McArthur River Operation 2017**

- OWNERSHIP:** Cameco Corporation (70%)  
Orano Canada Inc. (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 25 million lbs of uranium concentrate ( $U_3O_8$ ) annually on average
- Key Lake and McArthur River jointly produced 16.1 million lbs  $U_3O_8$  in 2017
- RESERVES:** Proven and probable reserves of 359.1 million lbs  $U_3O_8$  with an average grade of 9.63%  $U_3O_8$
- FUTURE PLANS:** Due to continued uranium price weakness, it was announced at the end of 2017 that production would be temporarily suspended by the end of January 2018. As a result of the suspension, and the time required to restart the mine and mill, no additional production is expected from the operation in 2018.





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### **Key Lake Operation 2017**

- OWNERSHIP:** Cameco Corporation (83%)  
Orano Canada Inc. (17%)
- OPERATOR:** Cameco Corporation
- DISCOVERED:** 1975 by Uranerz Exploration and Mining Limited
- OPERATION:** In operation since 1983, Key Lake is the largest high-grade uranium milling operation in the world  
  
Key Lake processes uranium ore mined at McArthur River.
- PRODUCTION:** Key Lake and McArthur River are currently licensed to produce up to 25 million lbs of uranium concentrate ( $U_3O_8$ ) annually  
  
Key Lake and McArthur River jointly produced 16.1 million lbs  $U_3O_8$  in 2017
- RESERVES:** 0.7 million lbs.  $U_3O_8$  with an average grade of 0.52%  $U_3O_8$
- FUTURE PLANS:** Due to continued uranium price weakness, it was announced at the end of 2017 that production would be temporarily suspended by the end of January 2018. As a result of the suspension, and the time required to restart the mine and mill, no additional production is expected from the operation in 2018.



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### **Cigar Lake Operation 2017**

- OWNERSHIP:** Cameco Corporation (50%)  
Orano Canada Inc. (37%)  
Idemitsu Uranium Exploration Canada Limited (8%)  
TEPCO Resources Inc. (5%)
- OPERATOR:** Cameco Corporation
- DISCOVERED:** 1981 by Orano Canada
- OPERATION:** Cigar Lake is the world's second-largest known high-grade uranium orebody and the world's highest grade uranium mine
- Uranium ore slurry is trucked about 80 kilometres to Orano's McClean Lake mill for processing
- PRODUCTION:** Ore production began in 2014
- Commercial production was achieved in 2015 with 11.3 million pounds milled and drummed by year end.
- Cigar Lake and McClean Lake jointly produced 18 million pounds  $U_3O_8$  in 2017
- RESERVES:** Proven and probable reserves of 197.9 million lbs  $U_3O_8$  with an average grade of 14.91%  $U_3O_8$
- FUTURE PLANS:** Plan to produce 18 million pounds  $U_3O_8$  in 2018



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### **McClean Lake Operation 2017**

<b>OWNERSHIP:</b>	Orano Canada Inc. (70%) Denison Mines Inc. (22.5%) OURD Canada Co. Limited (7.5%)
<b>OPERATOR:</b>	AREVA Resources Canada
<b>DISCOVERED:</b>	1979 by the Canadian Oxy – INCO Joint Venture
<b>OPERATION:</b>	<p>McClean Lake has the only mill in the world able to process high-grade uranium ore without dilution</p> <p>Although over 15 million pounds <math>U_3O_8</math> of reserves remain in various deposits on site; mining at the Sue area stopped in 2010</p> <p>The McClean Lake mill processes 100% of the Cigar Lake mine ore</p>
<b>CAPACITY:</b>	McClean Lake mill has a licenced processing capacity of up to 24 million pounds $U_3O_8$
<b>PRODUCTION:</b>	Cigar Lake mine and McClean Lake mill jointly produced 18 million lbs of $U_3O_8$ in 2017
<b>RESERVES:</b>	15.3 million lbs $U_3O_8$ stockpiled at an average grade of 2.15% $U_3O_8$
<b>FUTURE PLANS:</b>	Plan to produce 18 million pounds $U_3O_8$ in 2018



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### **Rabbit Lake Operation (Suspended) 2017**

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

**OPERATOR:** Cameco Corporation

**DISCOVERED:** 1968 by Gulf Mineral Resources

**OPERATION:** Rabbit Lake began operations in 1975 and was the longest-operating uranium production facility in North America. The operation was placed in a safe care and maintenance state in 2016 due to continued uranium price weakness.

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

More than 202 million pounds of uranium concentrate ( $U_3O_8$ ) have been produced from five different orebodies at the site

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

**PRODUCTION:** The Rabbit Lake operation was placed in care and maintenance in the spring of 2016.

**FUTURE PLANS:** Continue to be in a state of safe and sustainable care and maintenance.

Maintain facilities, manage ongoing treatment and release of site water effluent and sustain environmental monitoring and reclamation activities.





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### **Cluff Lake Operation (Decommissioned) 2017**

<b>OWNERSHIP:</b>	Orano Canada Inc. (100%)
<b>OPERATOR:</b>	Orano Canada Inc.
<b>DISCOVERED:</b>	1971 by Orano Canada
<b>OPERATION:</b>	1980 – 2002; 22 years of successful operation; Cluff Lake received ISO 14001 environmental management certification in 2004
<b>CAPACITY:</b>	The mill had a rated capacity of 5.2 million lbs. $U_3O_8$ (2,000 tonnes uranium). The mill was demolished and the site returned to a natural state
<b>PRODUCTION:</b>	Total production from the beginning of operation in 1980 to the end of production in 2002 was 62.5 million lbs. $U_3O_8$ . The reserves are now depleted and the decommissioning work is complete
<b>NOTES:</b>	<p>Cluff Lake ceased uranium production at the end of 2002 after 22 years of operation</p> <p>Most of the physical decommissioning work was performed between 2004 and 2006, and fully was completed in 2013. Decommissioning included backfilling the pits, dismantling the mill and other buildings, including the camp. It also entailed covering the tailings management area, and re-sloping and covering the waste rock piles</p> <p>Orano continues its site environmental monitoring program through four visits per year, called campaign monitoring. To date the post-decommissioning environmental performance objectives set for Cluff Lake are being achieved</p> <p>Approximately 800,000 trees and shrubs have been planted at the former mine site since Cluff Lake was decommissioned. These trees and shrubs ensure that the site returns gradually to the natural landscape from which it came</p> <p>Orano anticipates a public hearing with the Canadian Nuclear Safety Commission in 2019 in advance of the expiry of the Cluff Lake decommissioning licence in July 2019.</p>



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### **Midwest Project (Proposed) 2017**

- OWNERSHIP:** Orano Canada Inc. (69.16%)  
Denison Mines (25.17%)  
OURD Canada Co. Limited (5.67%)
- OPERATOR:** Orano Canada Inc.
- DISCOVERED:** 1978 by Esso Minerals Limited
- OPERATION:** The Midwest Project, located 17 kilometres from the McClean Lake mill, received environmental assessment approval in 2012
- RESOURCES:** 51.1 million lbs  $U_3O_8$  with an average grade of 2.19%  $U_3O_8$
- FUTURE PLANS:** Orano and its joint venture partners have deferred the development decision for the Midwest Project until market conditions improve



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### **Millennium Project (Proposed) 2017**

- OWNERSHIP:** Cameco Corporation (70%)  
JCU Exploration (Canada) Co. Ltd. (30%)
- OPERATOR:** Cameco Corporation
- DISCOVERED:** In 2000 by Cameco and joint-venture partners of the Cree Extension Project
- OPERATION:** A proposed underground uranium mine development project located 36 kilometres north of the Key Lake operation
- Once in operation, uranium ore mined at Millennium would be processed offsite at a licensed milling facility
- RESOURCES:** 75.9 million lbs  $U_3O_8$  of indicated uranium resources with an average grade of 2.39%  $U_3O_8$
- FUTURE PLANS:** No work is planned. Further progress towards a development decision is not expected until market conditions improve.



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### **Cameco Corporation**

Cameco Corporation, with its head office in Saskatoon, Saskatchewan, is one of the world's largest uranium producers, a significant supplier of conversion services and one of two Candu fuel manufacturers in Canada. The company's competitive position is based on controlling ownership of the world's largest high-grade reserves and low-cost operations. Cameco's uranium products are used to generate clean electricity in nuclear power plants around the world. Cameco's shares trade on the Toronto and New York stock exchanges.

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### **Orano Canada Inc.**

Headquartered in Saskatoon, Saskatchewan, Orano Canada Inc. (formally AREVA Resources Canada Inc.) is a leading producer of uranium, accounting for the processing of 18 million pounds or over half of the uranium concentrate produced in Canada in 2017. Orano Canada Inc. has been exploring for uranium, developing uranium mines and producing uranium concentrate in Canada for more than 50 years. Orano Canada Inc. is the operator of the McClean Lake uranium mill and a major partner in the Cigar Lake, McArthur River and Key Lake operations. The company employs nearly 480 people in Saskatchewan, including over 130 in Saskatoon.

Orano Canada is a subsidiary of the multinational group Orano, which transforms nuclear materials so that they can be used to support the development of society, first and foremost in the field of energy. The group offers products and services with high added value throughout the entire nuclear fuel cycle, from raw materials to waste treatment. Its activities, from mining to dismantling, as well as in conversion, enrichment, recycling, logistics and engineering, contribute to the production of low carbon electricity. Orano and its 16,000 employees bring to bear their expertise and their mastery of cutting-edge technology, as well as their permanent search for innovation and unwavering dedication to safety, to serve their customers worldwide.

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