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2017 Wyoming Uranium: An Overview

Wyoming Legislature Joint Minerals Committee

June 29, 2017

Casper, Wyoming

Uranium Basics

- Uranium is one of the most common elements on earth.
- Occurs with primary minerals in granites and as secondary deposits within sedimentary formations.
- Used from ancient times in pigments and glazes.
- From the 1940's used in nuclear weapons.
- Since 1950, the primary use is as fuel in nuclear power plants.
- Mined in-situ and open pit.
- 1 pound of uranium = 20,000 pounds of coal.

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Uranium Uses

- Early use was for coloring agent for glass and ceramic glazes.
- In late 1800's/early 1900's used as source for radium for the Curie's experiments on radioactivity.
- Present Day:
  - Nuclear Power
  - Medicine
  - Military

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Wyoming Uranium History

- Wyoming uranium industry started in 1918 near Lusk (prospectors looking for radium for Marie Curie).
- Other discoveries were made in the Great Divide Basin and in Crook County.
- First major discovery in state made in 1951 by Dr. John Love by Pumpkin Buttes.
- First commercial production began around 1953.
- Wyoming has been leading uranium producer in U.S. since 1995.

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Wyoming Uranium

- In Wyoming, Uranium is commonly found in sandstone formations.
- Wyoming is the nation's leader in uranium production.
- Leader in the nation in known reserves.
  - Reserves - @ $30/lb -106 million pounds, @ $50/lb – 350 million pounds.
- There are currently 5 companies actively producing.
  - Lost Creek Mine (Ur-Energy)
  - Ross Mine (Strata Energy)
  - Smith Ranch and North Butte Mines (Cameco Resources)
  - Nichols Ranch (Energy Fuels)
  - Willow Creek Mine (Uranium One)

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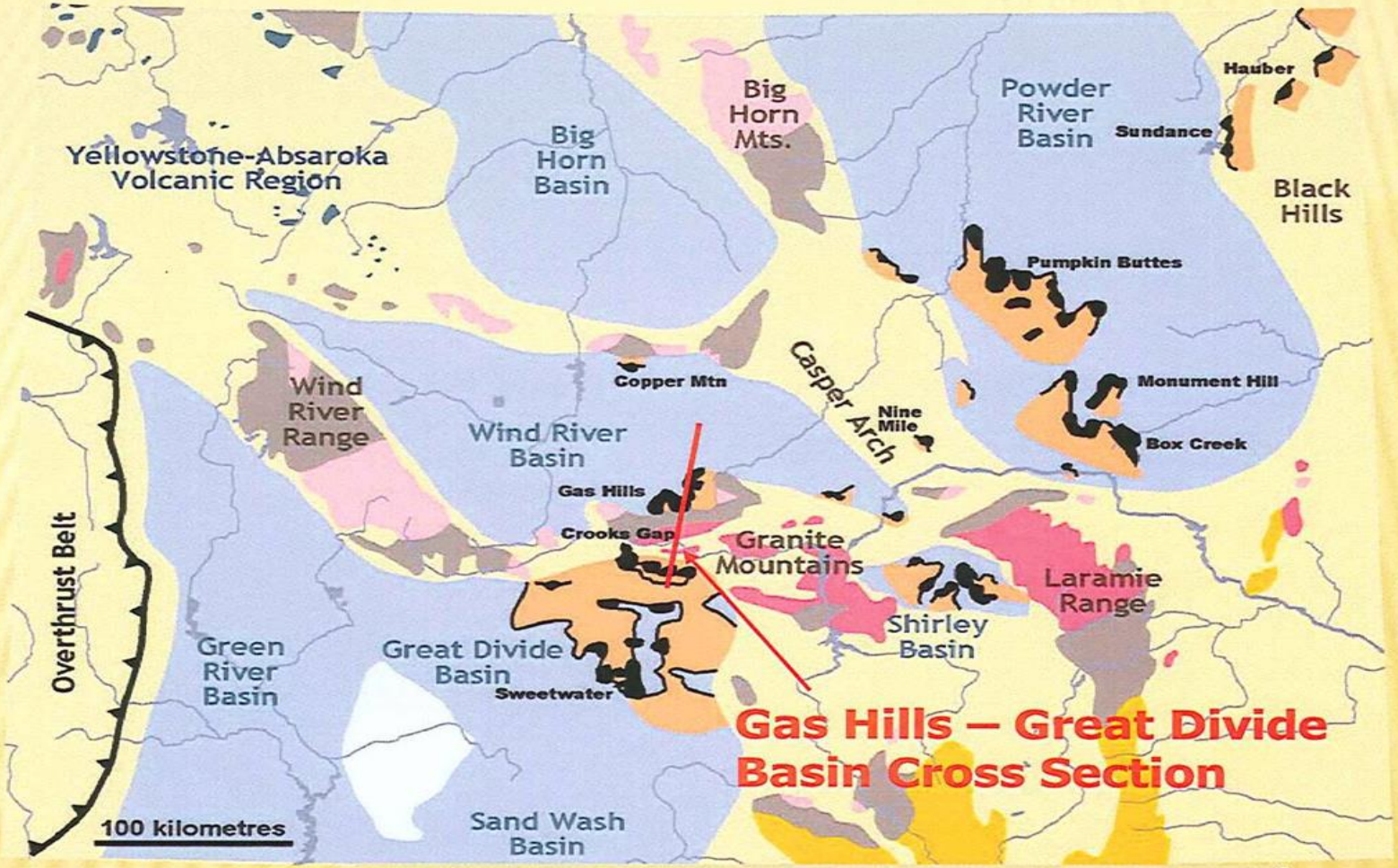
Wyoming Uranium Geology



Modified from Boberg, 1981

TSX: URE
NYSE Amex: URG

Wyoming Uranium Production

- Wyoming mines produced and estimated 1.97 million pounds of uranium in 2016 (compared to about 12 million pounds per year in the late 1970's).

- Wyoming accounted for about 78% of American production. US production was 2.92 million pounds in 2016 – Down 37% in three years.

- Currently the industry employs an estimated 300 people in Wyoming (compared to about 5300 in the late 1970's).

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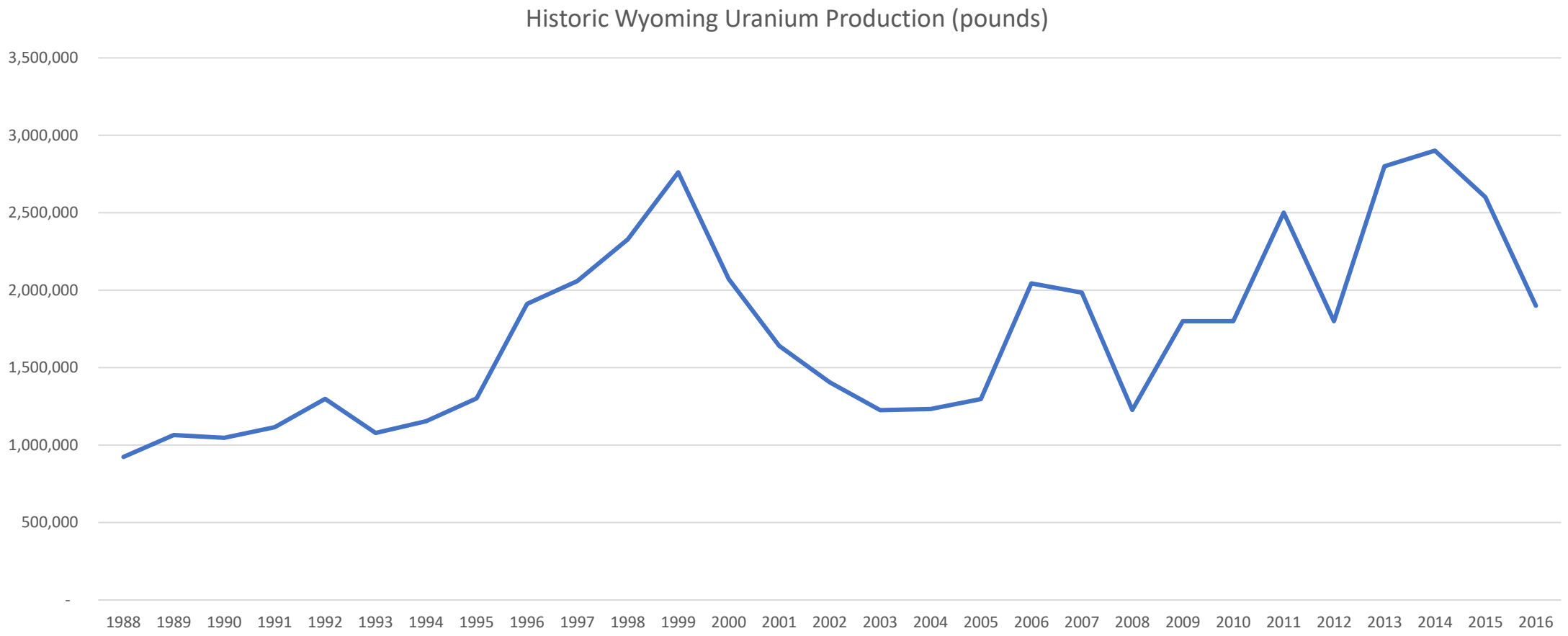

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Uranium and the Wyoming Economy

- Severance Taxes
- Ad Valorem Taxes
- Sales tax revenue to state and local governments
- Property tax revenue to local governments
- Royalty and Lease payments to state government
- Royalties/other payments to land and mineral owners
- Other payments to DEQ and other agencies
- Jobs – direct and indirect

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Wyoming Uranium Industry Value - 2016

Production in pounds	1,969,204
Severance Tax	$1,855,274.00
Ad Valorem Tax on Production	$3,636,424.00
Ad Valorem Tax on Real and Pers. Prop.	$1,460,780.97
State Royalties	$282,357.00
Sales Tax	$876,102.00
Payroll Including Benefits	$24,943,200.00
TOTAL	**$33,054,137.97**
No. of Employees	280
Source: Wyoming Mining Association Industry Survey	

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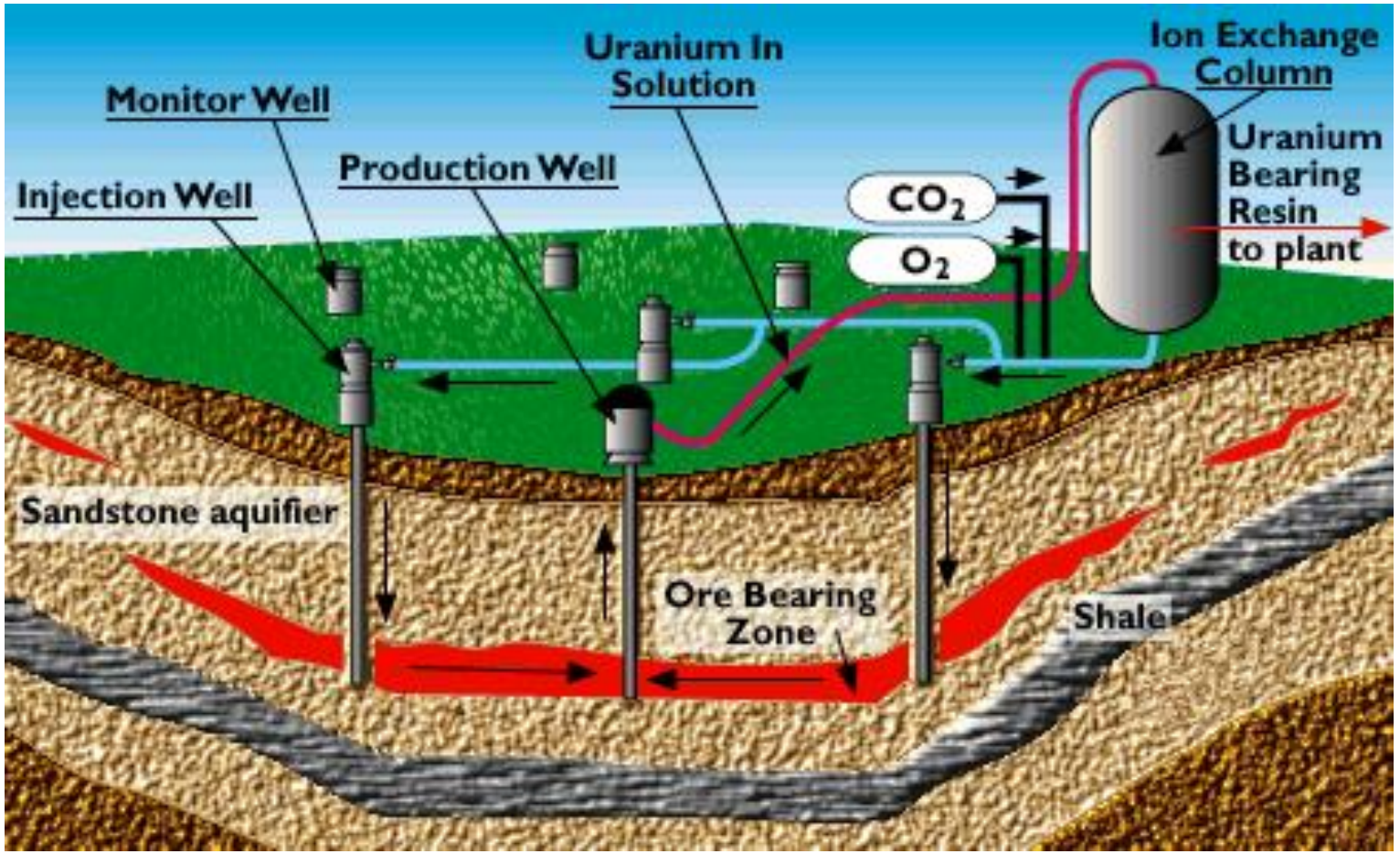
The In-Situ Mining Process

- In-situ is a Latin word that literally means “in the place.”
- Unlike conventional mining methods, in situ recovery (ISR) removes the ore while leaving the rock “in the place.”
- ISR utilizes a series of EPA Class III wells to inject native groundwater, fortified with oxygen and baking soda into the ore zone. This solution is commonly referred to as lixiviant.
- The lixiviant dissolves uranium as it is drawn through the ore zone by a pump in a nearby production well.
- The pump in the production well collects the uranium laden water and sends it to the processing plant where the uranium is removed by ion exchange.
- The water is then refortified with oxygen and baking soda and sent back to the ore zone to recover more uranium. The native groundwater continues in this cycle until uranium extraction is complete.

Advantages of In-Situ Mining Process

- Significant advantages over conventional mining.
- The environmental impact is minimal, as there is little surface disturbance and the affected water is restored at the conclusion of mining.
- Lower cost than conventional mining.
- Safe and proven, resulting in minimal employee exposure to health risks.

The In-Situ Process



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Cameco’s Smith Ranch operation near Glenrock.

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Nuclear Power

- US is the largest producer of nuclear power - 99 nuclear reactors and four under construction.
- Nuclear power represents 20% of the nations electricity generation (11% globally) with no greenhouse gases.
- 450 reactors online globally, 60 under construction, 160 planned and over 300 proposed.
- Clean energy – no emissions.

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Uranium Demand

- Worldwide demand – 2010 production was 140 million pounds, consumption was 180 million pounds. Consumption expected to grow to 260-280 million pounds by 2025.

- Wyoming has the reserves, companies and technology in place.

- The potential to be a major supplier to meet future demand.

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Ongoing issues

- Low prices (UxU308 weekly spot price as of June 19, 2017 was $20) – price per pound too low for economic production.
- Global over-production.
- Competition from Federal Government uranium dumping.
- Regulatory issues.

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Wyoming Agreement State Program

- Wyoming Legislature passed legislation to stand up an “Agreement State Program” with the Nuclear Regulatory Commission in 2014.
- Sought to remedy duplicative permitting of uranium in Wyoming by state and federal agencies which had significant cost and scheduling impacts.
- Under state primacy the same information/diligence is required.
- Agreement State Program shifts regulatory costs from State to industry through a fee schedule – industry pays for the program.

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Wyoming Agreement State Program Benefits

- Expeditious permitting
- Faster response to market conditions
- Greater potential tax revenues
- More direct control of economic drivers
- Same protection of safety and environment

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Reclamation

- The In-Situ Reclamation Process.
- Surface restoration.
- Affected groundwater restoration.
- All uranium operators, conventional and ISR, are currently required to operate, remediate and decommission as per the requirements of Uranium Mill Tailings Recovery and Control Act (UMTRCA). The standards are high and assure that the taxpayers won't be left holding the bag.

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