

## Global Uranium

# U.S. nuclear: delayed closures could add 26Mlbs to 2021-30 global uranium demand

Industry Overview

## Benefits from delaying 2021-30 nuclear plant closures

What if expected U.S. nuclear retirements over the next 10 years were postponed? With the President Biden's inclusion of nuclear in his clean energy plan, the U.S. Democratic party increasingly embracing nuclear and Republican support, we examine the benefit from hypothetical measures to prolong nuclear plant operating lives. If expected closures in 2021-2030 were delayed to beyond 2030, we estimate an additional 26Mlbs of global uranium (U<sub>3</sub>O<sub>8</sub>) demand over that period. While just a 2% increase, it helps, plus such a shift could lead to increased pressure on utilities to move forward new contracting.

## Biden platform includes nuclear as part of decarbonization

In President Biden's 'Plan for a Clean Energy Revolution and Environmental Justice', nuclear, including the development of small modular reactors (SMRs), is included as a low and zero-carbon technology to help achieve its 100% clean energy target. With this, the Democratic party more broadly embracing "technology-neutral" de-carbonization of U.S. power generation and broad Republican support, U.S. nuclear plants that are planned for closure could receive federal government help to continue operating.

## 12 U.S. nuclear plants expected to close in 2021-2030

In the U.S. there are twelve nuclear reactors expected to shut down between 2021 and 2030. Together, they account for more than 10,000 MW of electrical generating capacity and approximately 4.5Mlbs of annual uranium (U<sub>3</sub>O<sub>8</sub>) demand (assuming an average capacity factor of 91%, a 4.5% product assay and 0.20% tails assay) or just under 3% of 2021E global reactor requirements. Five are currently expected to close in 2021, all earlier than required by the operating licenses. Of these five, only Indian Point 3 (around 0.45Mlbs of annual demand) is beyond the point of what we would consider savable.

## Potential to add 26Mlbs to our uranium demand forecasts

If the 12 scheduled reactor closures were to be postponed to beyond 2030, it would add 30Mlbs of demand to our forecast for 2021-2030. Excluding Indian Point 3, this would be 26Mlbs, or 2% of our current 2021-2030 global demand forecast. While not huge, this shift could lead U.S. fuel buyers to move forward plans for major new contracting: consider that those 26Mlbs are 23% of total U.S. utility inventories at year-end 2019 of 113Mlbs and inventories today are quite likely lower post 2020's supply disruptions.

## U.S. NRC studying 100-year licenses for nuclear plants

The U.S. Nuclear Regulatory Commission (NRC) is reportedly studying the technical implications of extending nuclear power plant licenses to 100 years. New nuclear plant licenses are issued with 40-year operating lives, after which owners can apply of extensions in increments of 20 years. A vast majority of U.S. nuclear plants ever built have received a license extension to 60 years, while 2 have received license extensions to 80 years. Successful license extensions to 100 years would allow all 94 U.S. nuclear plants in operation today to continue operating until at least 2069.

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**Refer to important disclosures on page 5 to 9. Analyst Certification on page 4. Price Objective Basis/Risk on page 3.**

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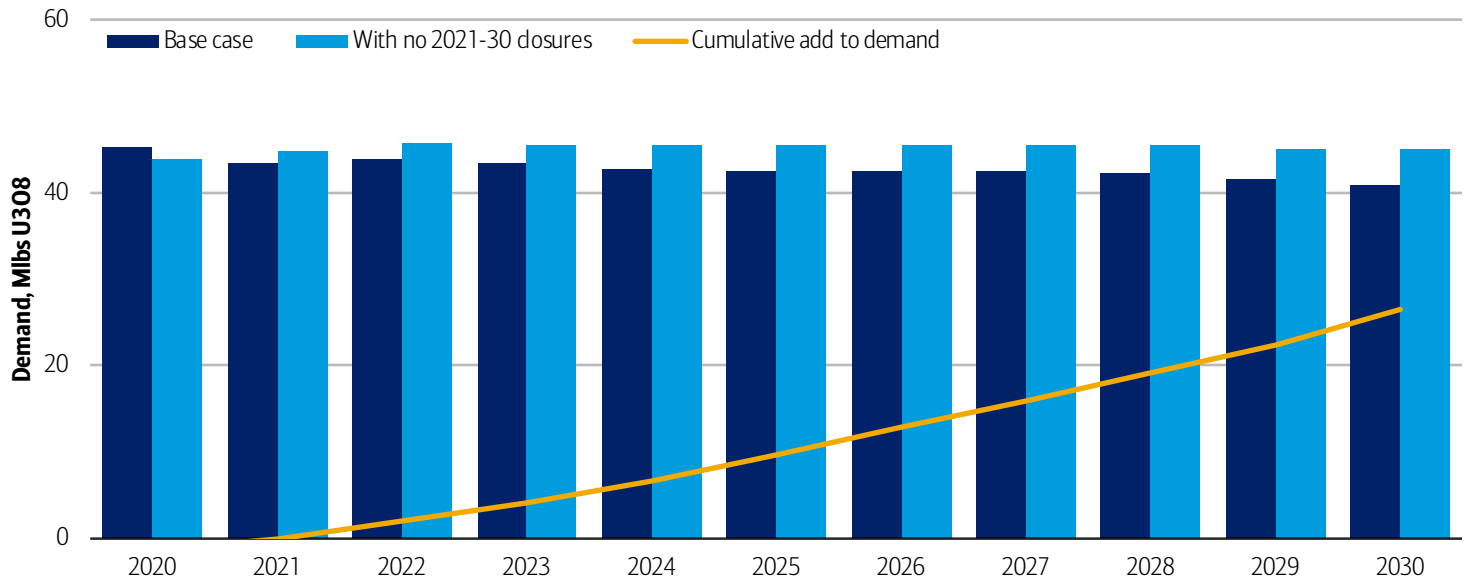
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# 26Mlbs additional demand if no closures

**Chart 1: U.S. uranium (U<sub>3</sub>O<sub>8</sub>) demand under base case and with now shutdowns from 2021-2030**

12 nuclear power plants are expected to close during 2021-2030, while two reactors, Vogtle 3 and 4, are forecast to start-up



Source: BofA Global Research

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## Demand and supply outlook

Note we have slightly adjusted our base case U.S. demand outlook for a smoother and earlier start to the inventory build at Vogtle 3 and 4, which are expected to start-up in 2022 and 2024; and for a slightly lower tails assay assumption (to 0.20% from 0.22%).

**Table 1: Global uranium (U<sub>3</sub>O<sub>8</sub>) demand**

United States is current the largest source of country demand for uranium but China is quickly catching up

URANIUM DEMAND ('000 lbs U3O8)	2015	2016	2017	2018	2019	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
<b>Country</b>																
Canada	5,196	4,859	4,859	4,857	4,536	5,182	5,182	4,789	4,789	4,002	4,002	3,418	3,395	3,709	3,404	4,025
% y/y	0%	-6%	0%	0%	-7%	14%	0%	-8%	0%	-16%	0%	-15%	-1%	9%	-8%	18%
China	15,166	22,094	16,224	24,482	25,073	24,371	25,413	22,177	28,241	35,625	29,566	32,298	44,092	38,027	45,575	50,627
% y/y	21%	46%	-27%	51%	2%	-3%	4%	-13%	27%	26%	-17%	9%	37%	-14%	20%	11%
France	23,516	17,213	22,809	23,233	22,196	22,651	22,548	22,340	22,340	22,340	22,340	20,780	23,141	23,281	20,995	19,750
% y/y	3%	-27%	33%	2%	-4%	2%	0%	-1%	0%	0%	0%	-7%	11%	1%	-10%	-6%
Japan	906	1,289	5,161	3,387	3,314	2,423	2,571	6,023	9,001	7,956	8,483	12,373	9,773	9,569	7,833	8,295
% y/y	-3%	42%	300%	-34%	-2%	-27%	6%	134%	49%	-12%	7%	46%	-21%	-2%	-18%	6%
Russia	13,059	14,660	13,207	13,087	14,248	10,927	12,901	13,609	9,446	12,926	12,051	9,845	12,679	12,623	9,498	14,101
% y/y	3%	12%	-10%	-1%	9%	-23%	18%	5%	-31%	37%	-7%	-18%	29%	0%	-25%	48%
South Korea	9,045	6,728	12,335	14,496	7,564	11,171	10,889	12,467	12,590	11,358	11,325	12,865	15,332	9,204	12,183	15,323
% y/y	-30%	-26%	83%	18%	-48%	48%	-3%	14%	1%	-10%	0%	14%	19%	-40%	32%	26%
United States	44,522	51,419	53,188	45,060	51,209	45,228	43,472	43,793	43,388	42,797	42,433	42,433	42,433	42,266	41,597	40,937
% y/y	-19%	15%	3%	-15%	14%	-12%	-4%	1%	-1%	-1%	-1%	0%	0%	0%	-2%	-2%
Other	51,479	51,051	45,383	41,998	39,059	44,124	40,454	40,568	39,095	34,069	38,544	36,433	30,156	41,896	39,502	35,229
% y/y	34%	-1%	-11%	-7%	-7%	13%	-8%	0%	-4%	-13%	13%	-5%	-17%	39%	-6%	-11%
<b>Power Utility Requirements</b>	<b>162,888</b>	<b>169,314</b>	<b>173,166</b>	<b>170,600</b>	<b>167,200</b>	<b>166,077</b>	<b>163,431</b>	<b>165,766</b>	<b>168,890</b>	<b>171,071</b>	<b>168,743</b>	<b>170,445</b>	<b>181,001</b>	<b>180,575</b>	<b>180,588</b>	<b>188,287</b>
% y/y	1.6%	3.9%	2.3%	-1.5%	-2.0%	-0.7%	-1.6%	1.4%	1.9%	1.3%	-1.4%	1.0%	6.2%	-0.2%	0.0%	4.3%
<b>Total inventory related demand / (supply)</b>	<b>29,700</b>	<b>28,500</b>	<b>19,600</b>	<b>21,000</b>	<b>20,000</b>	<b>22,000</b>	<b>15,000</b>	<b>14,000</b>	<b>12,000</b>	<b>9,000</b>	<b>8,500</b>	<b>8,000</b>	<b>7,000</b>	<b>4,000</b>	<b>4,000</b>	<b>4,000</b>
% y/y	-26%	-4%	-31%	7%	-5%	10%	-32%	-7%	-14%	-25%	-6%	-6%	-13%	-43%	0%	0%
<b>Total Underlying Demand ('000 lbs U3O8)</b>	<b>192,588</b>	<b>197,814</b>	<b>192,766</b>	<b>191,600</b>	<b>187,200</b>	<b>188,077</b>	<b>178,431</b>	<b>179,766</b>	<b>180,890</b>	<b>180,071</b>	<b>177,243</b>	<b>178,445</b>	<b>188,001</b>	<b>184,575</b>	<b>184,588</b>	<b>192,287</b>

Source: BofA Global Research, Uxc, LLC

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**Table 2: Global uranium (U<sub>3</sub>O<sub>8</sub>) supply, market balances and prices**

The temporary closures of Cameco's Cigar Lake is driving material supply deficits for 2020E and 2021E

URANIUM SUPPLY ('000 lbs U3O8)	2015	2016	2017	2018	2019	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
<b>Mine Supply</b>																
Africa	19,683	19,067	19,983	22,879	22,890	22,720	20,320	20,820	21,400	21,900	22,900	22,900	22,900	22,900	24,300	21,600
% y/y	-8%	-3%	5%	14%	0%	-1%	-11%	2%	3%	2%	5%	0%	0%	0%	6%	-11%
Australia	14,702	16,333	15,186	16,561	16,518	15,352	12,600	12,600	12,600	12,600	13,400	14,250	15,000	15,750	16,000	16,000
% y/y	14%	11%	-7%	9%	0%	-7%	-18%	0%	0%	0%	6%	6%	5%	5%	2%	0%
Canada	34,632	36,500	34,078	18,189	18,018	10,594	10,594	18,000	18,000	18,000	18,000	17,989	21,989	35,989	18,000	18,000
% y/y	47%	5%	-7%	-47%	-1%	-41%	0%	70%	0%	0%	0%	0%	22%	64%	-50%	0%
Kazakhstan	61,880	63,948	60,817	56,302	59,045	49,725	54,600	57,850	60,238	61,367	61,698	64,798	59,540	58,940	57,340	54,276
% y/y	4%	3%	-5%	-7%	4%	-16%	10%	6%	4%	2%	1%	5%	-8%	-1%	-3%	-5%
Russia	7,943	7,811	7,582	7,551	7,569	7,560	7,960	7,960	7,610	7,910	8,310	8,710	8,710	8,710	8,710	8,710
% y/y	1%	-2%	-3%	0%	0%	0%	5%	0%	-4%	4%	5%	5%	0%	0%	0%	0%
Ukraine	3,120	2,600	1,600	1,742	2,185	2,343	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
% y/y	25%	-17%	-38%	9%	25%	7%	11%	0%	0%	0%	0%	0%	0%	0%	0%	0%
United States	3,264	2,921	2,469	1,495	175	156	150	150	150	150	150	150	150	150	0	0
% y/y	-35%	-11%	-15%	-39%	-88%	-11%	-4%	0%	0%	0%	0%	0%	0%	0%	-	-
Uzbekistan	6,250	6,250	6,250	8,957	9,100	6,750	8,100	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
% y/y	0%	0%	0%	43%	2%	-26%	20%	11%	0%	0%	0%	0%	0%	0%	0%	0%
Other	6,828	6,583	6,537	6,399	6,354	6,680	7,030	7,030	7,706	7,909	8,172	8,515	8,961	9,540	10,330	10,330
% y/y	4%	-4%	-1%	-2%	-1%	5%	5%	0%	10%	3%	3%	4%	5%	6%	8%	0%
<b>Total mine production ('000 lbs U3O8)</b>	<b>158,302</b>	<b>162,013</b>	<b>154,502</b>	<b>140,075</b>	<b>141,854</b>	<b>121,880</b>	<b>123,954</b>	<b>136,010</b>	<b>139,304</b>	<b>141,436</b>	<b>144,230</b>	<b>148,912</b>	<b>148,850</b>	<b>163,579</b>	<b>146,280</b>	<b>140,516</b>
% y/y	9%	2%	-5%	-9%	1%	-14%	2%	10%	2%	2%	2%	3%	0%	10%	-11%	-4%
<b>Secondary Supply</b>																
Russian Govt Stocks	5,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	3,000	3,000	2,500	2,500	2,000
Russian Re-enriched tails/ underfeeding	9,219	11,900	13,900	12,100	11,800	12,000	11,200	10,300	11,000	10,500	9,900	10,200	8,900	8,000	8,200	6,300
Western enricher Sales (USEC/URENCO)	11,940	9,500	10,045	9,205	7,905	6,875	6,160	5,100	4,560	3,820	3,100	2,820	2,400	2,460	2,520	2,820
Commercial inventory	11,100	7,000	14,500	31,800	23,800	29,500	16,500	15,000	10,000	10,000	10,000	8,000	6,000	6,000	3,500	2,500
US Gov't stocks (US DOE + TVA inventories)	8,091	6,055	4,716	3,647	3,075	3,075	2,020	1,490	1,992	0	5,127	3,937	4,123	802	1,978	0
MOX + Reprocessed uranium	11,681	10,290	10,046	9,418	9,630	7,100	7,293	7,264	6,741	6,346	5,480	5,735	5,350	5,826	5,241	4,125
<b>Total secondary supply ('000 lbs U3O8)</b>	<b>57,031</b>	<b>48,745</b>	<b>57,207</b>	<b>70,170</b>	<b>60,210</b>	<b>62,550</b>	<b>47,173</b>	<b>43,154</b>	<b>38,293</b>	<b>34,666</b>	<b>37,607</b>	<b>33,692</b>	<b>29,773</b>	<b>25,588</b>	<b>23,939</b>	<b>17,745</b>
% y/y	-7%	-15%	17%	23%	-14%	4%	-25%	-9%	-11%	-9%	8%	-10%	-12%	-14%	-6%	-26%
<b>Total Supply ('000 lbs U3O8)</b>	<b>215,333</b>	<b>210,758</b>	<b>211,709</b>	<b>210,245</b>	<b>202,064</b>	<b>184,430</b>	<b>171,127</b>	<b>179,164</b>	<b>177,597</b>	<b>176,102</b>	<b>181,837</b>	<b>182,604</b>	<b>178,623</b>	<b>189,167</b>	<b>170,219</b>	<b>158,261</b>
% y/y	4%	-2%	0%	-1%	-4%	-9%	-7%	5%	-1%	-1%	3%	0%	-2%	6%	-10%	-7%
<b>Surplus (Deficit) before inventory draw ('000 lbs U3O8)</b>	<b>11,645</b>	<b>5,944</b>	<b>4,443</b>	<b>-13,155</b>	<b>-8,936</b>	<b>-33,147</b>	<b>-23,804</b>	<b>-15,602</b>	<b>-13,293</b>	<b>-13,970</b>	<b>-5,405</b>	<b>-3,841</b>	<b>-15,378</b>	<b>-1,408</b>	<b>-17,869</b>	<b>-36,526</b>
surplus/(deficit) % of total demand before inventory draw	6%	3%	2%	-7%	-5%	-18%	-13%	-9%	-7%	-8%	-3%	-2%	-8%	-1%	-10%	-19%
Surplus (Deficit) before all inventory impacts ('000 lbs U3O8)	41,345	34,444	24,043	7,845	11,064	-11,147	-8,804	-1,602	-1,293	-4,970	3,095	4,159	-8,378	2,592	-13,869	-32,526
surplus/(deficit) % of total demand	21%	17%	12%	4%	6%	-6%	-5%	-1%	-1%	-3%	2%	2%	-4%	1%	-8%	-17%
Surplus (Deficit) after inventory drawdown ('000 lbs U3O8)	22,745	12,944	18,943	18,645	14,864	-3,647	-7,304	-602	-3,293	-3,970	4,595	4,159	-9,378	4,592	-14,369	-34,026
surplus/(deficit) % of total demand	11%	6%	10%	10%	8%	-2%	-4%	0%	-2%	-2%	3%	2%	-5%	2%	-8%	-18%
<b>Spot Price (US\$/lb U3O8)</b>	<b>37.16</b>	<b>26.42</b>	<b>22.06</b>	<b>24.54</b>	<b>25.89</b>	<b>29.60</b>	<b>35.30</b>	<b>37.00</b>	<b>41.00</b>	<b>43.00</b>	<b>45.00</b>	<b>46.13</b>	<b>47.28</b>	<b>49.69</b>	<b>50.91</b>	<b>50.91</b>

Source: BofA Global Research, UxC, LLC

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## Price objective basis & risk

### Cameco Corporation (YCCO / CCJ, US\$12.42 / C\$15.91, B-1-7)

Our US\$15.75 (C\$21.00) PO is based on 1.2x our NPV, and 15x 2022E & 2023E EV/EBITDA (all 3 equally weighted). We use a CADUSD FX rate of 1.33. The 1.2x P/NAV is above the longer term avg around 1x but below peak of 1.35x. We think 1.2x is justified given Cameco's world-class tier one assets in favorable jurisdictions (Canada, U.S.) partially offset by the fact one of those tier-one assets has been voluntarily idled indefinitely and the other is temporarily so. The 15x multiple is above its historical 10x-12x avg since the 2011 Fukushima accident, but at bottom end of the pre Fukushima/GFC range of 15x-40x+. We think the overhang from Fukushima is gone given recent supply cuts by major producers and growing demand outside Japan.

Downside risks: 1) slower-than-expected global energy demand growth, 2) continued



push-out of a Japanese nuclear fleet restart, 3) any worsening in sentiment toward nuclear or more favorable sentiment toward alternative power fuel sources, and 4) any production problems at Cameco's only operating mine, Cigar Lake.

Upside risks: 1) additional potential mine disruptions that may further improve supply-demand dynamics, 2) better pace of reactor development in key future demand countries (China, Japan, and India), 3) more stringent carbon emissions restrictions in key countries, encouraging nuclear power as an environmentally friendly base line energy source, 4) a material rise in NatGas prices making nuclear power generation competitive in the U.S.

## **Analyst Certification**

I, Lawson Winder, CFA, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

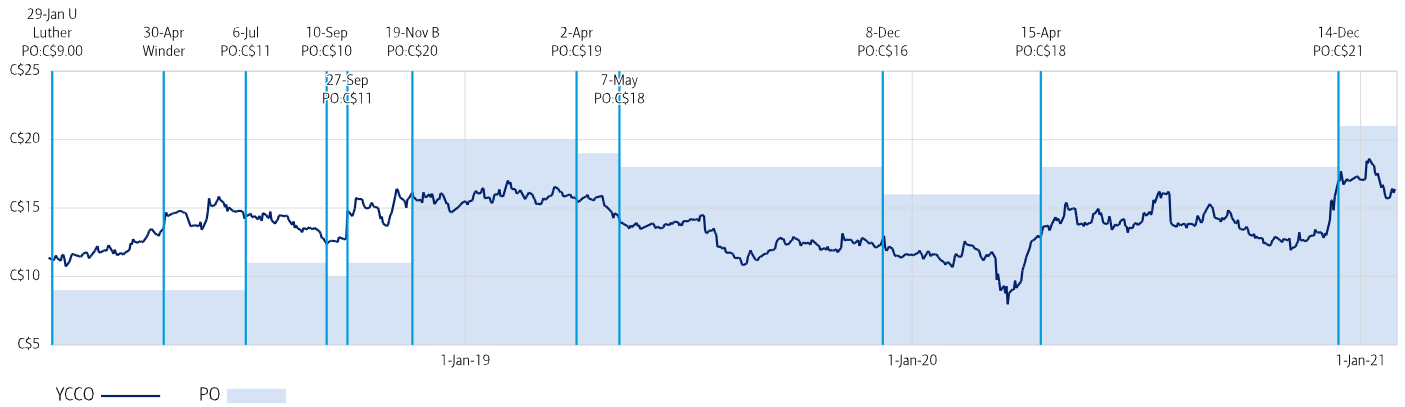
## Canada Metals and Mining Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
<b>BUY</b>				
	Agnico Eagle Mines	AEM	AEM US	Michael Jalonen, CFA
	B2Gold Corp	YBTO	BTO CN	Lawson Winder, CFA
	B2Gold Corp	BTG	BTG US	Lawson Winder, CFA
	Barrick Gold	GOLD	GOLD US	Michael Jalonen, CFA
	Cameco Corporation	YCCO	CCO CN	Lawson Winder, CFA
	Cameco Corporation	CCJ	CCJ US	Lawson Winder, CFA
	Centerra Gold	YCG	CG CN	Michael Jalonen, CFA
	Eldorado Gold	EGO	EGO US	Michael Jalonen, CFA
	Endeavour Mining	YEDV	EDV CN	Lawson Winder, CFA
	First Quantum Minerals	YFM	FM CN	Lawson Winder, CFA
	Franco-Nevada	YFNV	FNV CN	Michael Jalonen, CFA
	Franco-Nevada	FNV	FNV US	Michael Jalonen, CFA
	Kinross Gold	KGC	KGC US	Michael Jalonen, CFA
	Kirkland Lake Gold Ltd	YKL	KL CN	Michael Jalonen, CFA
	Kirkland Lake Gold Ltd	KL	KL US	Michael Jalonen, CFA
	Lundin Mining	XLPRF	LUMI SS	Lawson Winder, CFA
	Lundin Mining Corp	YLUN	LUN CN	Lawson Winder, CFA
	Newmont Corporation	NEM	NEM US	Michael Jalonen, CFA
	Osisko Gold Royalties	YOR	OR CN	Michael Jalonen, CFA
	Osisko Gold Royalties	OR	OR US	Michael Jalonen, CFA
	Pan American Silver	PAAS	PAAS US	Lawson Winder, CFA
	SSR Mining Inc.	SSRM	SSRM US	Michael Jalonen, CFA
	SSR Mining Inc.	YSSRM	SSRM CN	Michael Jalonen, CFA
	Wheaton Precious Metals	WPM	WPM US	Michael Jalonen, CFA
<b>NEUTRAL</b>				
	Hecla Mining	HL	HL US	Michael Jalonen, CFA
	Yamana Gold	AUY	AUY US	Michael Jalonen, CFA
	Yamana Gold	YYRI	YRI CN	Michael Jalonen, CFA
<b>UNDERPERFORM</b>				
	Alamos Gold	YAGI	AGI CN	Lawson Winder, CFA
	Alamos Gold	AGI	AGI US	Lawson Winder, CFA
	Hudbay Minerals	YHBM	HBM CN	Lawson Winder, CFA
	HudBay Minerals	HBM	HBM US	Lawson Winder, CFA
	IAMGOLD	YIMG	IMG CN	Michael Jalonen, CFA
	IAMGOLD Corp.	IAG	IAG US	Michael Jalonen, CFA
	New Gold Inc.	YNGD	NGD CN	Michael Jalonen, CFA
	New Gold Inc.	NGD	NGD US	Michael Jalonen, CFA
	Royal Gold	RGLD	RGLD US	Michael Jalonen, CFA

## Disclosures

### Important Disclosures

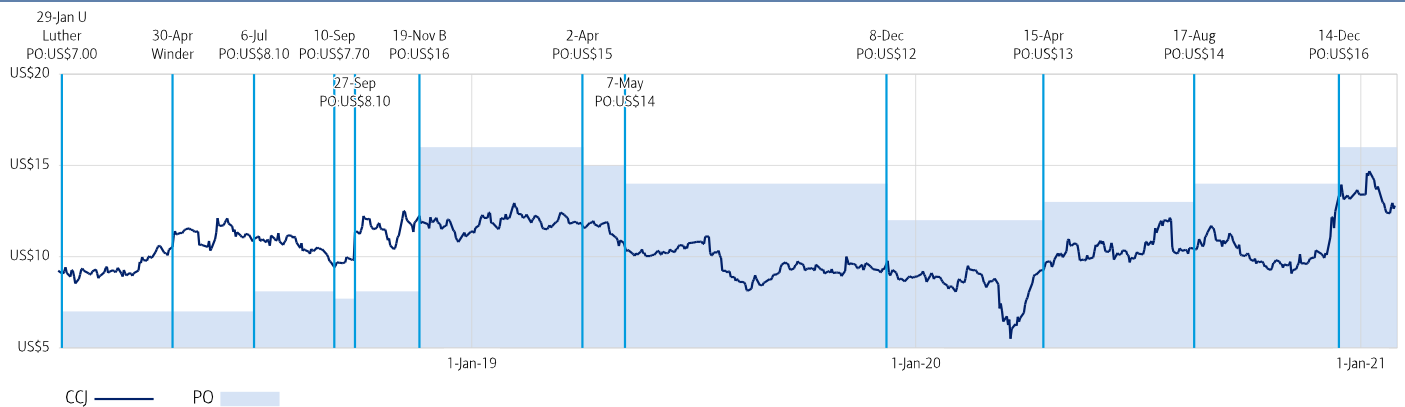
**Cameco Corp (YCCO) Price Chart**



YCCO — PO  
 B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

**Cameco Corp. (CCJ) Price Chart**



CCJ — PO  
 B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

**Equity Investment Rating Distribution: Non-Ferrous Metals/Mining & Minerals Group (as of 31 Dec 2020)**

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	75	66.96%	Buy	35	46.67%
Hold	15	13.39%	Hold	8	53.33%
Sell	22	19.64%	Sell	7	31.82%

**Equity Investment Rating Distribution: Global Group (as of 31 Dec 2020)**

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1863	56.90%	Buy	1185	63.61%
Hold	686	20.95%	Hold	426	62.10%
Sell	725	22.14%	Sell	358	49.38%

\* Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.



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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster*
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

\* Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

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