

# Levelling the Rare Earth Playing Field

We have come a long way from the heady days of 2010-2011 when everyone jumped on the rare earth bandwagon and raising money was simple if you had rare earths in your company name. A lot has changed since then but there is still a lot of noise and mixed messages and fund raising has become a real fight for survival in a very challenging market.

Every project is the next best one outside of China and if one reviews PEA and PFS reports all elements can be sold at projected prices with no context of supply and demand. In an attempt to level the playing field I have developed the attached table to evaluate all the main projects using the same pricing, which I feel is reasonable and defensible. In addition it assumes all La, Nd, Pr, Tb and Dy can be sold and Eu is sold at a 30% discount and Y at 25% off market given the current oversupply situation. Some private projects are not included including ionic clay projects in South America.

Until now most PFS studies look at selling everything that is produced even though this is a near impossibility. This is especially interesting when people talk that they will sell concentrate and use their best guess for market prices of separated elements in the future to build their revenues.

What is noticeable is that in all cases the BIG 4 (Nd/Pr/Dy/Tb) magnetic elements account for >90% of all revenues in every project. The same pricing assumptions were used on all projects with a base of 1,000 TPY REO output to see how composition plays into the project revenues. Some assumptions were made:

1. Projects will sell all the La, Nd, Pr, Tb and Dy
2. They will get 70% of the value of Eu and 75% of the Y

value as most of this will be sold as a concentrate, if possible

3. No value is given for any of the other elements: any sales of these would be a bonus.

I looked at Market Cap, Enterprise Value and cash position to see how the projects compare. The cash position, (based on Sept. 30 reports) as one can see, is a critical issue for a number of projects and their ability to raise in the next 6-12 months will determine their future unless the projects are put on care and maintenance until the market recovers, which could be a VERY long time.

Additional factors considered are CAPEX, OVERALL PROJECT. The Overall Project takes into account grade, location, access to chemicals, labour, power and utilities. In some cases there are good grades but they may as well be on the moon when it comes to access to labour, chemicals and power. CAPEX of over \$500M will be challenging to raise in the current market environment. Additionally some management teams are recognizing that bigger is not necessarily better. Mt. Pass proved this. A plant likes to run at a high percentage of capacity on a sustained basis, particularly solvent extraction to succeed. Any hiccups upstream can create problems in maintaining a balanced solvent extraction operation. In addition the qualification will take time so unlike most projections one does not sell everything at day one.

At the end of the day the project will have to be within 20% of comparable Chinese costs as exported material from China still carries at 17% VAT penalty to be competitive. All customers outside China want a non-Chinese source but when pushed will pay little or any premium and in reality support the black market by buying smuggled material out of China. Sad, but a reality. I believe there is an opportunity to provide longer term stable pricing which after 2010-2011 the market really wants. Lynas it appears is taking this approach. With the demise of Mountain Pass it will be harder for

Molycorp to implement such a strategy for materials produced inside China.

This is a horse race as there is room for 2, maximum 3 projects, with the demise of Mt. Pass. This horse race may become somewhat of a marathon at today's market pricing and investment malaise. After the next few projects begin someone will have to come with significantly different costs to find a place in the market. One can draw your own conclusions as to the horse you want to back but I hope this raises some awareness in a very complicated space.

### SUMMARY OF PEERS as of Dec. 1, 2015

	% of concentrate		Revenues 2020 per 1,000TPY	% of Revenues		Mkt Cap (M\$)
	Nd+Pr	Nd/Pr/Tb/Dy		Nd+Pr	Nd/Pr/Tb/Dy	
MOLYCORP	16.4%	16.4%	\$14,029	89.2%	90.5%	\$30.70
LYNAS	23.9%	24.0%	\$19,909	91.4%	93.2%	\$97.04
ALKANE	18.1%	20.4%	\$24,142	57.1%	93.5%	\$79.74
NORTHERN	2.9%	13.5%	\$45,679	4.8%	93.2%	\$61.99
UCORE	17.7%	22.4%	\$33,496	40.1%	94.4%	\$44.35
TASMAN	13.9%	19.0%	\$32,118	33.0%	92.8%	\$22.65
COMMERCE	21.8%	22.4%	\$20,637	80.5%	92.7%	\$18.12
HASTINGS	4.4%	14.3%	\$43,305	7.7%	94.1%	\$20.57
AVALON	20.8%	24.8%	\$33,041	47.9%	94.8%	\$18.61
TANTALUS	20.0%	22.0%	\$23,645	64.5%	94.1%	\$22.65
RER	21.3%	21.7%	\$19,439	83.4%	91.9%	\$19.48
PEAK	22.4%	22.6%	\$19,040	89.5%	92.9%	\$20.26
TEXAS RE	7.2%	13.4%	\$31,042	17.7%	93.0%	\$9.93
QUEST	16.5%	20.3%	\$28,608	43.8%	94.1%	\$6.35
ARAFURA	27.0%	27.4%	\$23,439	87.7%	94.7%	\$15.73
NAMIBIA	0.4%	10.6%	\$42,498	0.7%	91.7%	\$5.33
MATAMEC	17.4%	21.6%	\$30,860	43.0%	93.5%	\$3.65
FRONTIER	20.3%	21.2%	\$20,546	75.3%	91.8%	\$5.46

	Enterprise Value (M\$)	Cash M\$ USD	OVERALL PROJECT	Chance of SUCCESS	COMMENTS
MOLYCORP	\$1,624.70	\$120.0			CHAPTER 11
LYNAS	\$371.94	\$31.7			CASHFLOW POSITIVE
ALKANE	\$69.19	\$10.6			GOLD CASHFLOW
NORTHERN	\$62.39	\$1.4			WAITING CHINESE INVESTMENT
UCORE	\$43.62	\$1.0			REMOTE
TASMAN	\$20.46	\$2.3			METALLURGY TO BE PROVEN
COMMERCE	\$16.67	\$3.2			REMOTE
HASTINGS	\$14.17	\$6.4			REMOTE
AVALON	\$13.29	\$6.4			REMOTE
TANTALUS	\$11.60	\$1.8			RESTRUCTURING
RER	\$11.08	\$8.4			GOOD LOCATION
PEAK	\$10.27	\$10.0			GOOD CASH POSITION
TEXAS RE	\$10.27	\$0.1			CASH PROBLEM
QUEST	\$4.90	\$3.7			KEY INVESTOR
ARAFURA	\$3.89	\$11.8			
NAMIBIA	\$2.96	\$2.7			
MATAMEC	\$2.31	\$2.5			SMALL/METALLURGY TO BE PROVEN
FRONTIER	\$9.41	\$15.9			DELISTING

REVENUES	MKT CAP	EV	CASH	PROJECT	Success
>\$35M	>50M\$	> 50M\$	>10M\$	GOOD	BEST CHANCE
\$25-35M	15-50M\$	10-50M\$	5-10M\$	FAIR	POSSIBLE
< \$25M	<15M\$	< 10M\$	<5M\$	POOR	LONG SHOT

REVENUES BASED ON 1,000 TPY						
	TPY REO	1000				
	SALES %	PRICE/KG	RER	LYNAS	MOLYCORP	BAIYUN OBO
La	100%	\$3.00	\$888.00	\$765.00	\$996.00	\$690.00
Ce	25%	\$2.00	\$217.00	\$233.70	\$245.50	\$250.00
Pr	100%	\$80.00	\$3,760.00	\$4,320.00	\$3,520.00	\$4,960.00
Nd	100%	\$75.00	\$12,450.00	\$13,875.00	\$9,000.00	\$13,875.00
Sm	0%	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00
Eu	70%	\$125.00	\$437.50	\$350.00	\$87.50	\$175.00
Gd	0%	\$6.00	\$0.00	\$0.00	\$0.00	\$0.00
Tb	100%	\$600.00	\$600.00	\$120.00	\$180.00	\$600.00
Dy	100%	\$350.00	\$1,050.00	\$245.00	\$0.00	\$350.00
Ho	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Er	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tm	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Yb	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lu	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Y	75%	\$6.00	\$36.00	\$0.00	\$0.00	\$0.00
<b>REVENUES PER 1,000 TPY (K\$)</b>			\$19,438.50	\$19,908.70	\$14,029.00	\$20,900.00
		Nd+Pr	\$16,210.00	\$18,195.00	\$12,520.00	\$18,835.00
		Nd/Pr/Tb/Dy	\$17,860.00	\$18,560.00	\$12,700.00	\$19,785.00
		Nd+Pr%	83.4%	91.4%	89.2%	90.1%
		Nd/Pr/Tb/Dy%	91.9%	93.2%	90.5%	94.7%

REVENUES BASED ON 1,000 TPY						
	TPY REO	1000				
	SALES %	PRICE/KG	PEAK	ALKANE	NORTHERN	QUEST
La	100%	\$3.00	\$846.00	\$585.00	\$39.00	\$424.03
Ce	25%	\$2.00	\$232.00	\$183.50	\$17.00	\$159.01
Pr	100%	\$80.00	\$3,840.00	\$3,200.00	\$400.00	\$2,826.86
Nd	100%	\$75.00	\$13,200.00	\$10,575.00	\$1,800.00	\$9,717.31
Sm	0%	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00
Eu	70%	\$125.00	\$262.50	\$87.50	\$350.00	\$103.06
Gd	0%	\$6.00	\$0.00	\$0.00	\$0.00	\$0.00
Tb	100%	\$600.00	\$300.00	\$1,800.00	\$7,800.00	\$2,826.86
Dy	100%	\$350.00	\$350.00	\$7,000.00	\$32,550.00	\$11,542.99
Ho	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Er	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tm	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Yb	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lu	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Y	75%	\$6.00	\$9.00	\$711.00	\$2,722.50	\$1,008.00
<b>REVENUES PER 1,000 TPY (K\$)</b>			\$19,039.50	\$24,142.00	\$45,678.50	\$28,608.12
		Nd+Pr	\$17,040.00	\$13,775.00	\$2,200.00	\$12,544.17
		Nd/Pr/Tb/Dy	\$17,690.00	\$22,575.00	\$42,550.00	\$26,914.02
		Nd+Pr%	89.5%	57.1%	4.8%	43.8%
		Nd/Pr/Tb/Dy%	92.9%	93.5%	93.2%	94.1%

REVENUES BASED ON 1,000 TPY						
	TPY REO	1000				
	SALES %	PRICE/KG	HASTINGS	NAMIBIA	TANTALUS	TASMAN
La	100%	\$3.00	\$48.00	\$14.10	\$720.00	\$299.57
Ce	25%	\$2.00	\$30.00	\$3.90	\$180.00	\$110.95
Pr	100%	\$80.00	\$720.00	\$64.00	\$4,000.00	\$2,254.24
Nd	100%	\$75.00	\$2,625.00	\$240.00	\$11,250.00	\$8,347.72
Sm	0%	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00
Eu	70%	\$125.00	\$87.50	\$463.75	\$0.00	\$328.23
Gd	0%	\$6.00	\$0.00	\$0.00	\$0.00	\$0.00
Tb	100%	\$600.00	\$6,600.00	\$6,840.00	\$0.00	\$3,867.42
Dy	100%	\$350.00	\$30,800.00	\$31,815.00	\$7,000.00	\$15,348.17
Ho	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Er	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tm	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Yb	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lu	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Y	75%	\$6.00	\$2,394.00	\$3,057.30	\$495.00	\$1,561.23
<b>REVENUES PER 1,000 TPY (K\$)</b>			\$43,304.50	\$42,498.05	\$23,645.00	\$32,117.53
		Nd+Pr	\$3,345.00	\$304.00	\$15,250.00	\$10,601.95
		Nd/Pr/Tb/Dy	\$40,745.00	\$38,959.00	\$22,250.00	\$29,817.55
		Nd+Pr%	7.7%	0.7%	64.5%	33.0%
		Nd/Pr/Tb/Dy%	94.1%	91.7%	94.1%	92.8%

REVENUES BASED ON 1,000 TPY						
	TPY REO	1000				
	SALES %	PRICE/KG	ARAFURA	AVALON	COMMERCE	FRONTIER
La	100%	\$3.00	\$592.20	\$447.00	\$727.67	\$787.26
Ce	25%	\$2.00	\$237.65	\$166.50	\$234.70	\$220.69
Pr	100%	\$80.00	\$4,656.00	\$3,360.00	\$3,939.16	\$3,704.78
Nd	100%	\$75.00	\$15,900.00	\$12,450.00	\$12,667.98	\$11,758.32
Sm	0%	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00
Eu	70%	\$125.00	\$358.75	\$437.50	\$453.36	\$506.51
Gd	0%	\$6.00	\$0.00	\$0.00	\$0.00	\$0.00
Tb	100%	\$600.00	\$480.00	\$3,600.00	\$749.18	\$868.31
Dy	100%	\$350.00	\$1,155.00	\$11,900.00	\$1,772.31	\$2,532.56
Ho	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Er	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tm	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Yb	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lu	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Y	75%	\$6.00	\$59.40	\$679.50	\$92.19	\$167.15
<b>REVENUES PER 1,000 TPY (K\$)</b>			\$23,439.00	\$33,040.50	\$20,636.56	\$20,545.59
		Nd+Pr	\$20,556.00	\$15,810.00	\$16,607.14	\$15,463.10
		Nd/Pr/Tb/Dy	\$22,191.00	\$31,310.00	\$19,128.64	\$18,863.97
		Nd+Pr%	87.7%	47.9%	80.5%	75.3%
		Nd/Pr/Tb/Dy%	94.7%	94.8%	92.7%	91.8%

REVENUES BASED ON 1,000 TPY						
	TPY REO	1000				
	SALES %	PRICE/KG	MATAMEC	TEXAS RE	UCORE	US RE
La	100%	\$3.00	\$426.60	\$112.34	\$299.36	\$226.42
Ce	25%	\$2.00	\$137.60	\$77.12	\$145.07	\$94.34
Pr	100%	\$80.00	\$2,936.00	\$1,577.39	\$2,824.69	\$3,018.87
Nd	100%	\$75.00	\$10,320.00	\$3,928.97	\$10,592.57	\$12,735.85
Sm	0%	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00
Eu	70%	\$125.00	\$402.50	\$27.09	\$268.65	\$3,301.89
Gd	0%	\$6.00	\$0.00	\$0.00	\$0.00	\$0.00
Tb	100%	\$600.00	\$2,760.00	\$3,823.79	\$3,684.37	\$3,396.23
Dy	100%	\$350.00	\$12,845.00	\$19,541.56	\$14,507.22	\$13,207.55
Ho	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Er	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tm	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Yb	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lu	0%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Y	75%	\$6.00	\$1,032.30	\$1,954.06	\$1,174.39	\$933.96
<b>REVENUES PER 1,000 TPY (K\$)</b>			\$30,860.00	\$31,042.32	\$33,496.32	\$36,915.09
		Nd+Pr	\$13,256.00	\$5,506.36	\$13,417.26	\$15,754.72
		Nd/Pr/Tb/Dy	\$28,861.00	\$28,871.71	\$31,608.84	\$32,358.49
		Nd+Pr%	43.0%	17.7%	40.1%	42.7%
		Nd/Pr/Tb/Dy%	93.5%	93.0%	94.4%	87.7%