

Molybdenum Supply Forecasting

December 2007 Update

Recent Developments – Summer & Fall 2007

The original of this paper was first published in July of 2007 in “Mining Engineering” magazine. Since then there have been significant developments that make an updated to the paper appropriate. The major developments are listed in this section followed by the paper which has been updated to reflect the new information. Another update will very likely be done in the Spring of 2008 after annual reports are published.

2007 Moly Price & Sales Volume: Molybdenum prices have held in the \$31 to \$34 price range for most of 2007. Moly supply for 2007 has evidently grown by over seven percent over 2006, and inventories have not accumulated. So it is apparent that demand for moly in 2007 has increased at a much higher rate than the historic average of about 4.5 percent.

Climax Mine: Freeport has announced that it will reopen the Climax Mine in Colorado. Even if the estimated \$500 million is committed by Freeport to reopen the mine, the final decision to commence production will not be made until market conditions are assessed in 2009 or 2010. The announced planned production rate is 30 million pounds per year beginning in 2010. However, Freeport has announced that the production rate could be doubled to 60 million pounds per year if market conditions warrant. Many market observers, including the author, estimate the odds are very low that the Climax Mine will ever be expanded to the 60 million pound per year rate. The view is that Freeport is “saber rattling” to discourage the opening of other large molybdenum mines. While Freeport has announced it will produce 30 million pounds per year beginning in 2010, the author has assumed it will take two or three years for production to reach the full design capacity.

China: Official Chinese government data indicates that 2007 molybdenum concentrate production will increase by 40 percent over 2006. The explanation is that the mines that were closed in 2005 for environmental and safety concerns are coming back into production. The USGS estimates total Chinese production in 2006 of 90 million pounds. The government of China reported 2006 molybdenum concentrate (MoS₂) production of 60,000 tonnes which equates to about 130 million pounds of Mo (if impurities in the concentrate are minimal). So a 40 percent increase from 2006 to 2007 would mean 2007 production will be about 185 million pounds. If this is accurate, then total world production (and thus consumption) would increase by 20 percent from 2006 to 2007, a figure that is not supported by other industry data. This discrepancy challenges the integrity of the Chinese government data and also points to the fact that forecasting in many commodity markets is becoming less reliable as China and other former Soviet block countries produce a larger world share of those commodities. For this paper, the author has used USGS production data for 2006 Chinese production and increased it by 40 percent for 2007. After 2007, Chinese production is assumed to grow at 4.5 percent per year.

Lucky Jack (Mt. Emmons): In the original of this paper, Lucky Jack was not included in the potential new mines category. It has been included in this revision assuming a smaller, high grade operation. The owner is projecting first production in 2014. It was not included in the original paper due to the difficult permitting that is anticipated. The owner has outlined a plan to mine the higher grade portions of the resource at a much lower production rate, thus decreasing the environmental impact and increasing the likelihood that permits can be obtained.

Tables: The table listing potential new mines has been reformatted so the projects are listed in order of moly equivalent grade.

Introduction

The dramatic increase in molybdenum prices from the low of less than \$2.50/lb in 1999 to over \$40/lb in 2005 certainly caught the attention of molybdenum mine owners and exploration project developers. Between 2005 and early 2007 prices pulled back and stabilized within a trading range of \$25/lb to \$30/lb. This 1,000 percent price increase has motivated most existing producers to expand production and is motivating those with molybdenum prospects to accelerate the development process for earliest possible production. Unknown is how much new production will come from existing mines, how much production will be needed from new mines if demand continues to grow and how many potential new mines might be available to meet future demand. And of course the billion dollar question is whether molybdenum prices will remain high, or will they fall back to the low levels seen during the 1980's and 1990's? This article will attempt to answer these questions in a way that will help molybdenum project developers and financiers plan for the future.

Molybdenum Markets

There are some unique characteristics of molybdenum markets that must be understood before looking at molybdenum production, demand and price data.

By Product Producers: About 55 percent of current molybdenum supplies are generated as a byproduct of copper mining. Many of the large copper mines around the world have small percentages, typically 0.02 to 0.03 percent, of molybdenum in the ore. It is relatively simple and cheap to recover the molybdenum. This means that a large portion of molybdenum supply comes from very low cost producers. During periods of low or declining demand, byproduct producers have been in control of prices. Primary producers have found it difficult to compete in such times since market prices are at or below their marginal cost of production (cash costs). It should be recognized that many of the new copper mines expected to be in production in the next few years will be producing copper from oxide ores using the low cost solvent extraction electrowinning (SX/EW) process. Mines using this process do not recover molybdenum. So even though recent high copper prices have encouraged expansion at existing mines and the opening of new copper mines, a proportionate increase in byproduct molybdenum production is not likely.

Low Price Elasticity: The molybdenum market has shown very low price elasticity in recent years. With the 2004 to 2007 price increases, there has actually been an increase in demand, just the opposite of what classical economics would predict. This is partially because about 80 percent of molybdenum production is used as an alloying additive in steel. Typical molybdenum steel may have only a quarter or one-half percent molybdenum. So even though molybdenum prices are high, these high prices don't translate into a substantial impact on the price of the steel to the consumer. Some consumers in this market have expressed the opinion that large changes in price cause more stress

than the actual price level. Steel makers must bid jobs for future delivery. If the price of molybdenum increases dramatically between the bid date and the production date, the steel maker may be required to absorb the difference. Prices of alternative alloying agents have also increased, but molybdenum is the only element that is suitable for a substantial number of applications.

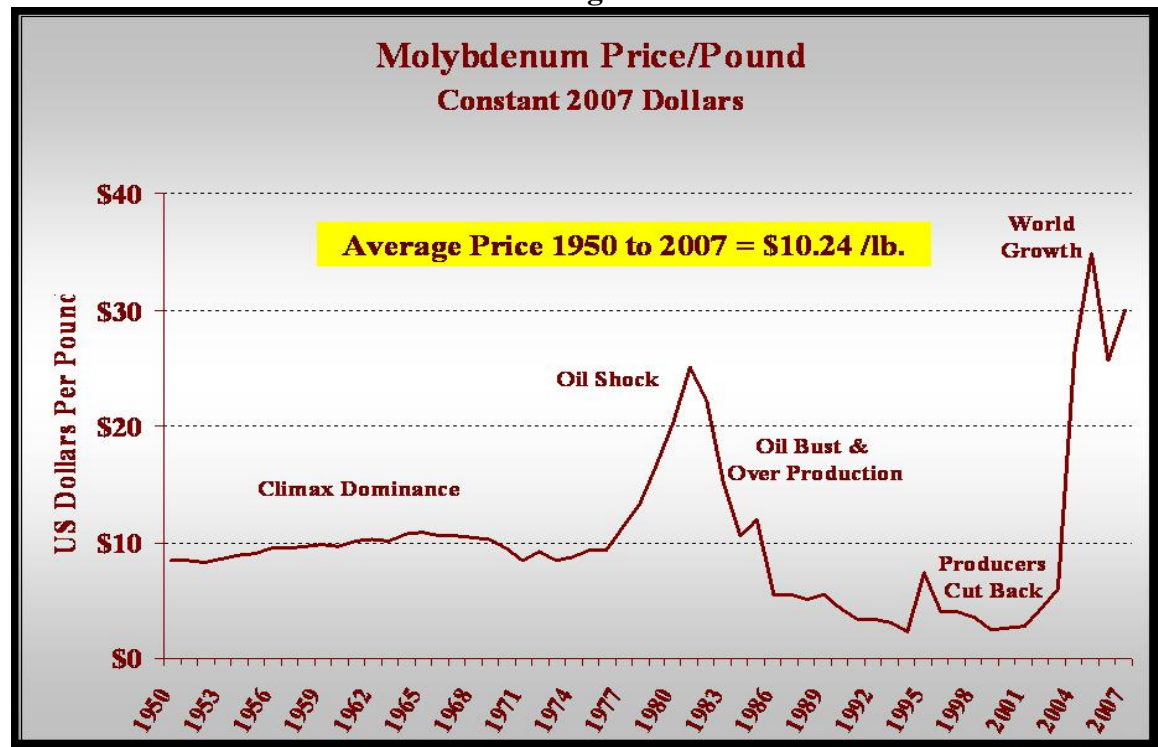
No Futures Market: Currently, there is no futures market for molybdenum. The prices you see in periodicals are based on actual sales for the prior week. There are a few molybdenum traders around the world that will inventory the metal, so this gives the market some stability. When commodity futures are available, current prices tend to be influenced by the expectations for future supply and demand. There tends to be some buffering of short-term supply shortages or surpluses and commodity markets are more efficient. For example, molybdenum prices have been somewhat more volatile and markets less efficient than copper markets. This may change soon as there is the possibility of a London Metal Exchange (LME) OTC molybdenum market in the near future.

Mo vs. MoS₂: We see MoS₂ grades quoted by some producers and project developers. In fact, some Chinese production figures are quoted in tonnes of MoS₂. Mo is 60 percent by weight of pure MoS₂ (Atomic weights: Mo - 95.94, S - 32.06). Also be aware that the price quoted in magazines or newspapers is usually Molybdenum Oxide. The quoted price is only for the contained Mo by weight. This article will always use pounds of Mo for price and production statistics.

Historical Data

The best source of free historical information on most commodities is the Minerals Information Team of the U.S. Geologic Survey (USGS). World molybdenum production and price data is collected and updated monthly, and data is available going back to early in the 20th Century. Figure 1 shows molybdenum price between 1950 and 2007 in constant 2007 U.S. dollars. The Consumer Price Index was used to adjust real prices to 2006 dollars. The following section will look at some major time frames to see what may have influenced prices during those times.

Figure 1



1950 to 1980: Climax Molybdenum dominated markets up until about 1980. The Climax Mine in Leadville, Colorado, produced about 50 percent of the world supply during this period. In 1976, the Henderson Mine, also owned by Climax, began producing and reached full production in 1981. Prices were stable until the late 1980's as Climax based its pricing primarily on the cost of production at the Climax Mine. Prices rose above the stable trend in 1977 primarily in response a supply shortage and the belief at the time that demand would continue to increase at about 7 percent per year as it had over the period between 1962 and 1976. The oil boom of 1979 gave a boost to molybdenum demand as steel makers were asked to produce large amounts of molybdenum steel for drilling and pipelines. The supply shortage encouraged copper producers to add molybdenum circuits and new primary mines opened. The boom didn't last and there was a glut of drilling rigs for many years following the boom causing low demand for molybdenum from that market segment.

1986 to 2001: The high prices of 1977 to 1983 encouraged new production from both primary and byproduct mines and demand fell to levels in 1986 where byproduct producers dominated the market. The Climax Mine ceased production and was put on "care and maintenance" in 1986. Because byproduct producers' costs were so low, molybdenum prices fell to levels well below the historical average of about \$10/lb (2006 dollars). During this period, Cyprus Minerals purchased Amax (parent of Climax Molybdenum), so Cyprus then controlled the Climax and Henderson Mines. The Climax Mine was reopened for a short period in 1995 during a period of price strength. In 1999, Phelps Dodge bought Cyprus. Phelps Dodge had a number of byproduct producing mines in Arizona and New Mexico. It recognized that high production of molybdenum was hurting the market. So in 2001, Phelps Dodge reduced production of molybdenum (along with reductions in copper production) at most of its mines, hoping to see higher prices. Kennecott and Chile's Codelco also reduced production of molybdenum.

2004 to 2007: A world boom in steel production occurred in 2004 and 2005. Chinese steel production increased, the demand for pipeline steel and drill steel was strong and the use of molybdenum in the production of low-sulfur diesel fuel has been expanding. These effects on the demand side, along with production cutbacks and constraints in molybdenum refining (roaster) capacity, sent the price of molybdenum to more than \$40/lb in mid-2005. Late in 2005, it was thought the high prices could not last as additional roaster capacity came on stream and production increased. The expectation was that prices would pull back and average about \$15/lb in 2006. This did not happened and prices were steady at the \$25/lb level throughout most of 2006 and into 2007.

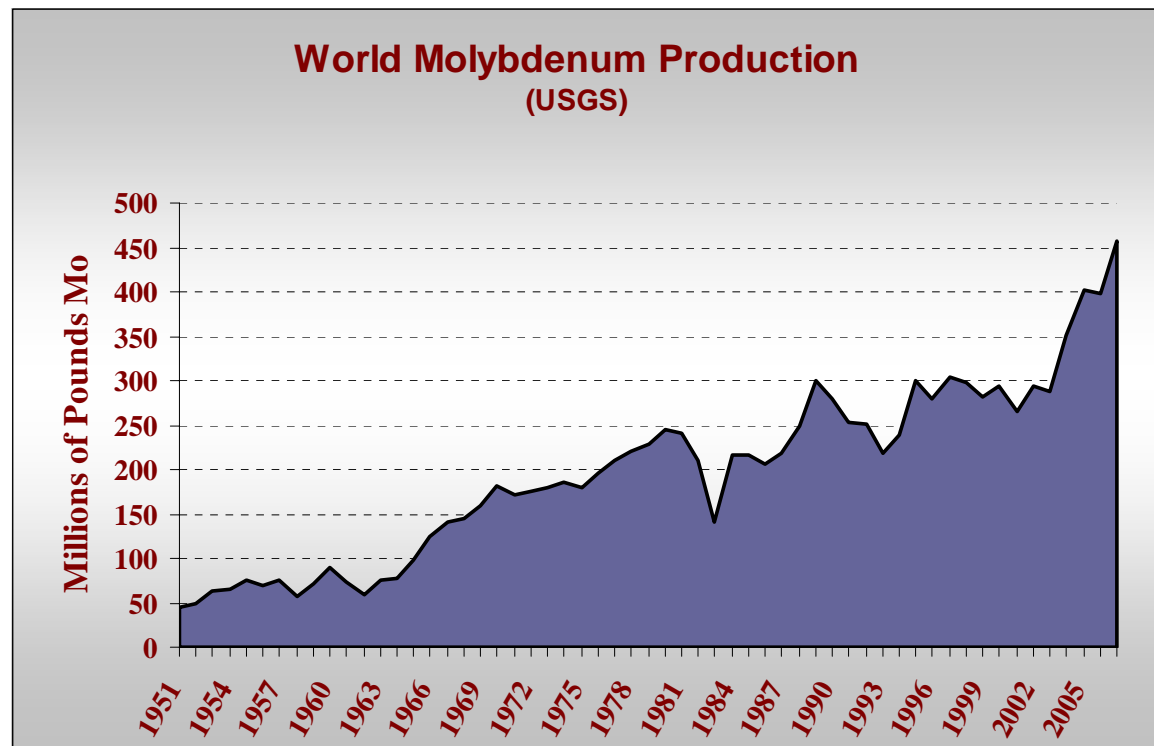
In 2006 and 2007 there have been production problems in Chile, Mexico, and China that were not foreseen. At Chuquicamata in Chile, the main conveyor was damaged by a rock slide. In Mexico, there were a number of strikes. In China, a number of small mines were temporarily closed due to environmental and safety issues. So there has actually been a slight reduction in overall supply in 2006, compared with 2005, thus keeping supplies short and prices stable.

Figure 2

Figure 2 shows molybdenum production during the same period as the price chart. USGS data was used through 2004. The USGS estimates for 2005 and 2006 have been adjusted slightly by the author to reflect data gathered on a mine by mine basis. Molybdenum consumption for each year varies a bit from production, but not enough to be significant when looking at long-term trends. The estimate for 2007 is based on the best information available from all sources as of November of 2007.

If just the 1990 to 2006 period is considered, it would look like there has been a huge increase and breakout from a trading range of around 300 million pounds per year. But a look at the trend since 1950, shows that the recent growth has not broken out of the long-term trend of about 4.5 percent per year. Of course, the 4.5 percent average growth rate has not been

smooth. Between 1963 and 1981, a period of almost 20 years the growth rate averaged 7.7 percent. From 1981 to 1983, there was a 42-percent drop. From 1989 to 1993 there was a 27-percent drop. And, from 2003 to 2007 there was a 58 percent increase.



Supply & Demand Forecast

Figure 3 is a forecast for production or announced production expansion at existing mines for the next 20 years. No new mines are included in the forecast. Table 2 is a tabulation of the mines included. The data was gathered from several public sources including 10k's, annual reports, company Web sites, mining data Web sites, USGS data, and industry periodicals. As a check, the total production defined in such reports for 2005 was compared with the total world production reported by the USGS. A total of 402 million pounds was found versus 408 million pounds reported by the USGS.

It should be recognized that published forecasts of current reserves or mine life are typically not an accurate reflection of the future production from a mine. More often, mine life is extended through improvements in mining methods, the discovery of new ore zones, or both. For example, Thompson Creek has redesigned the open pit based on a projected life of mine molybdenum price of \$10/lb (*Pay Dirt Magazine*, February 2007). Previous planning used a price of \$5/lb. This will allow higher strip ratios and the inclusion of lower grade ores that would have previously been considered waste. Many producers have published such plans and they have been included in the forecast for future production and mine life used in Figure 3. Where there is no production forecast or reliable reserve published by a particular source such as China or other countries where reserve reports are not available, the author assumed there would be a 4-percent annual growth in production.

Figure 3

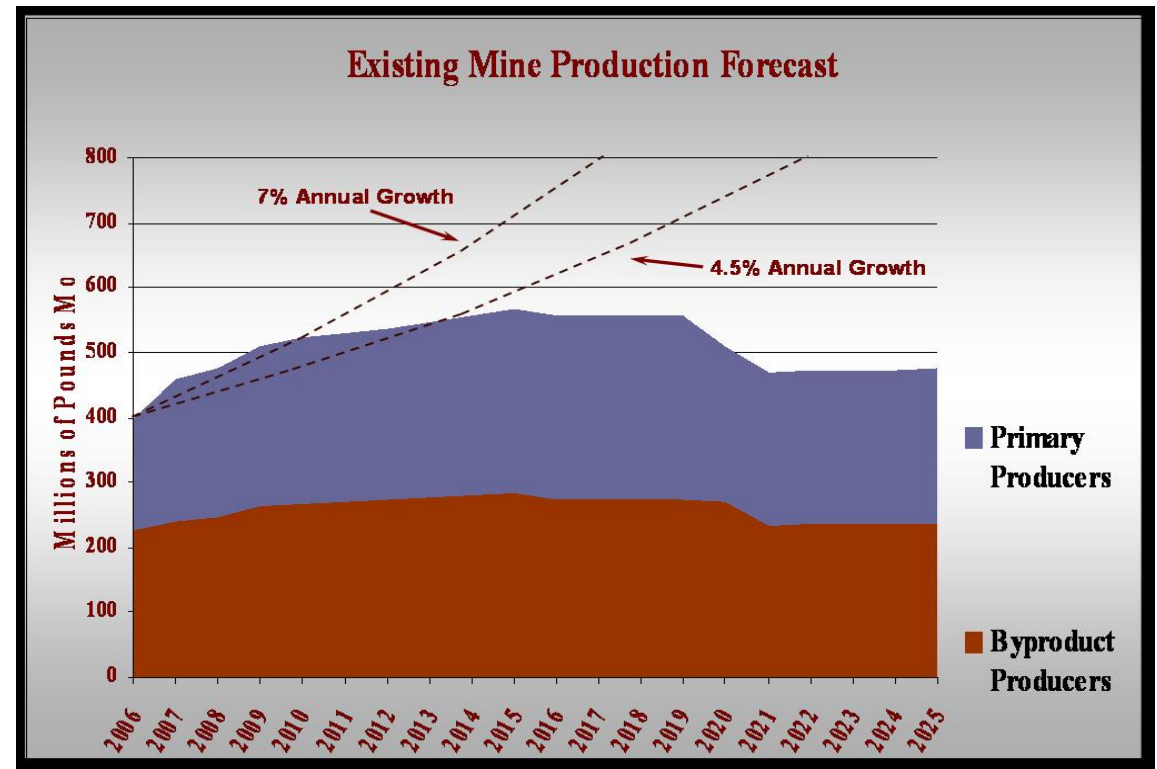
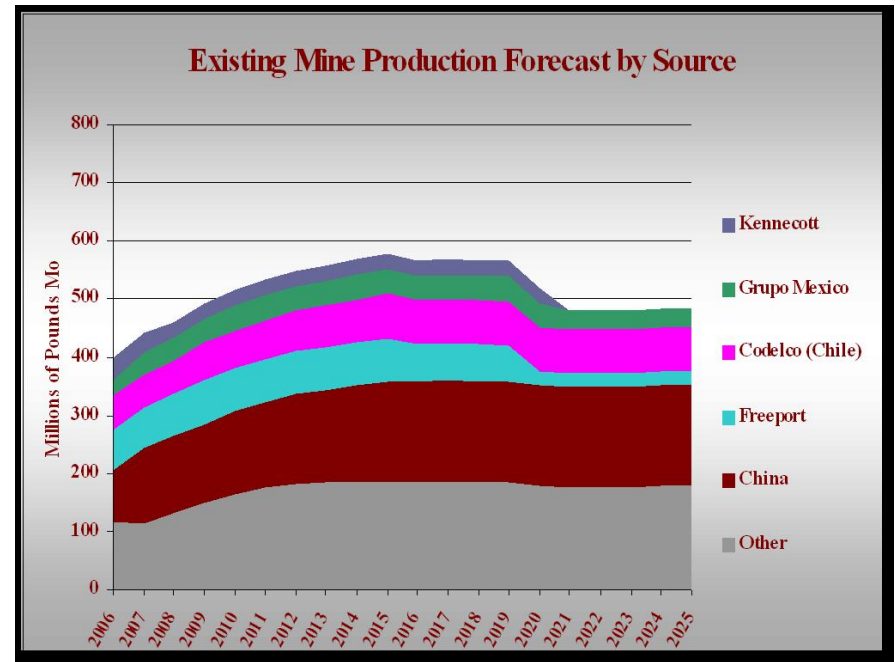


Figure 4

One of the conclusions one might draw from Figure 3 is that demand would need to drop by 40 percent or so to reach a level where byproduct producers will again be dominant in setting prices. It is evident from the chart that 2007 production (and thus demand because inventories are not building) has grown at a very high rate, much higher than the historical average of about 4.5 percent. The increase is almost entirely due to reopening of mines in China that were close for environmental and safety reasons in 2005. However the data source is suspect for Chinese production. In any case, substantial production from new mines will be needed early in the next decade.

Figure 4 is the same chart showing the share of the market held by the major producers. Note that currently, more than 50 percent of production is generated by Phelps Dodge, Codelco, Grupo Mexico and Kennecott. Note also that China produced about 23 percent of supply in 2006. Since China production and reserve data is unavailable or unreliable at best, the overall reliability of the forecast suffers.



A look at Molybdenum Demand: It is beyond the scope of this article and the expertise of the author to look into the details of all the market segments of molybdenum consumption to develop a forecast of molybdenum demand growth. However, after reading a number of articles on the subject, it seems that even authors who have expertise in molybdenum market segment consumption tend to fall back to a conclusion for overall demand that is based on the historical growth rate of approximately 4.5 percent a year. Apparently it is next to impossible to forecast demand in many market segments because it would require information on the future plans of all steel producers around the world – information that the producers are reluctant to share as it would likely end up in the hands of competitors. A market specialist at Phelps Dodge recently forecast 2007 growth at between 4 and 5 percent (*Pay Dirt Magazine* Feb. 2007). But it can be gleaned from late 2007 data that the Phelps Dodge forecast was grossly underestimated.

There are indications the growth rate during the next 10 years or so may be higher than the historical average due to the potential for higher levels of world economic growth, pipeline construction demand, atomic waste storage container demand, and increased use of molybdenum in petroleum refining. China's economy continues to expand at an 11-percent rate. China has more than 400 tonnes of annual steel production capacity, as much as all of North American and Europe combined, and more is planned. For years, economic pundits have forecast a burst in the China bubble, but we have yet to see it. This article will use a 4.5 percent overall growth forecast as a base case and then look at a 7-percent growth rate for comparison.

Potential New Molybdenum Production: It is evident that a substantial amount of new molybdenum production will be needed if demand grows at the historical average of 4.5 percent a year. What molybdenum projects are available to meet this demand? Table 1 is a list of the existing molybdenum mines. Table 2 lists the potential new molybdenum projects the author has identified to date. The yellow shaded entries on Table 2 show companies where the molybdenum project is the primary asset of the company.

There are more than 280 known primary molybdenum or byproduct molybdenum byproduct properties around the world. Of these 280 projects, the author has identified about 40 that have that have published measured, indicated or inferred molybdenum resources. These projects are included in Table 2. The resource numbers shown in Table 2 most often include only measured and indicated resources, although in a limited number of cases, inferred resources have been included.

The author has ranked the potential new projects according to type (byproduct surface, primary surface, primary underground), and within each type, by moly equivalent ore grade. A copper price of \$1.50/lb and a molybdenum price of \$10/lb are used to calculate Mo equivalent grade (\$5/lb was used for the lone tungsten project). Other factors will come into play when determining which projects may make it into production. These include reserve size, location, management capability, the availability of financing and permitting. However, when evaluating whether a particular project has relative merit, the place to start is resource quality, including grade, reserve size, location and whether the resource can be surface mined.

Tables 3 and 4 show estimated future production by year for existing mines and potential future mines based on the owners' published expectations. Since many of the potential new mines are controlled by companies that have yet to secure financing for development, these companies tend to present their projects in the most favorable light and thus publish optimistic schedules for production. The author has in most cases used the companies' forecasts for future production, but in some cases the published production schedule has been delayed a year or two.

If prices for molybdenum remain at current levels, it can be assumed that most, if not all the potential new mines are economic and have a

Notes on Production Forecasting Accuracy

Because of the reporting requirements imposed on U.S. and Canadian companies, we can use current production figures and reserve data to forecast future production for those companies. In fact, some of these companies provide forecasts of mine life and expected future production. However, production figures out of China and the former Soviet Union countries are much more difficult to forecast as the available reports of production and reserves are not as reliable. This was not so much of a problem 15 years ago when production from these sources was small. However, in 2005, these countries provided over 20 percent of world production. So the lack of accuracy in this segment is becoming a big factor in the accuracy of world production data.

Numbers on paper or lines on a chart can lead the reader to all kinds of conclusions that may not be justified by the accuracy of the underlying data. The author has made an effort to draw conclusions that are appropriate based on the accuracy of the underlying data.

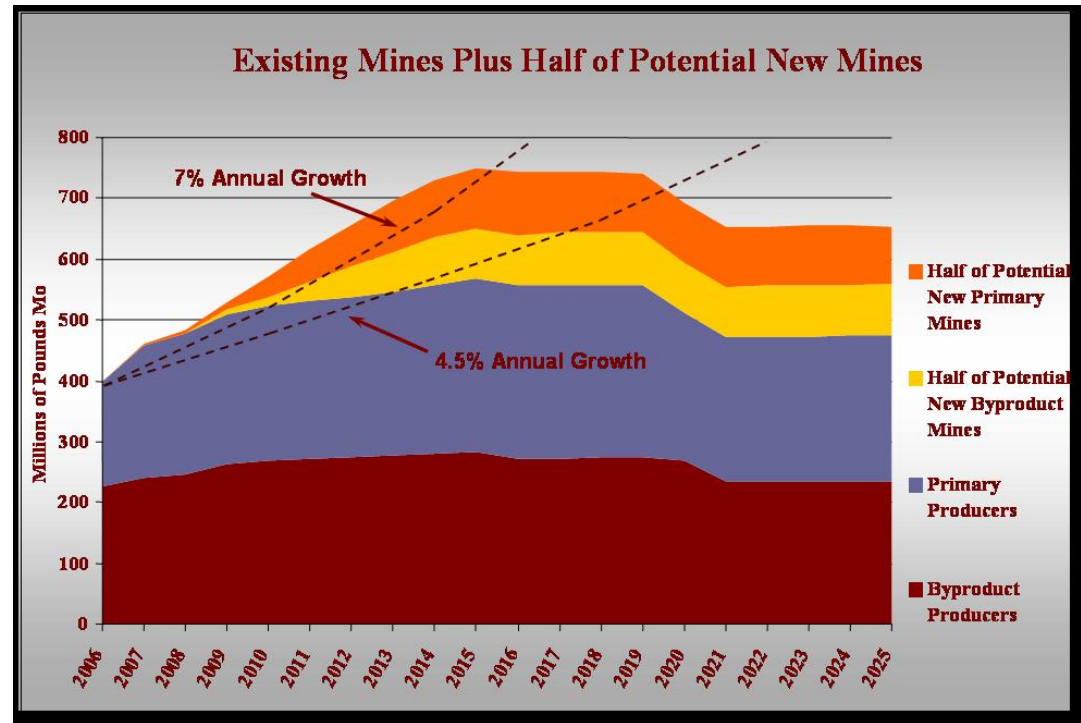
The USGS provides total production figures by country. When company reserve information is not available in a particular country, the USGS data for the country is used for year 2005. To forecast Chinese and former Soviet Union countries' future production, this article assumes a four percent growth rate in supply from these sources. Codelco (Chile) is another supplier whose production is difficult to forecast. Codelco has announced it will increase its copper production from about 1.8 Mt (2 million st) in 2005 to 3 Mt (3.3 million st) in 2015. Much of the new production will come from oxide copper deposits, so there will not be a proportionate increase in molybdenum production. This article assumes that 50 percent of the new copper production will generate new molybdenum production from Codelco.

Finally, because forecasting supply, demand, and prices of any commodity is certainly not an exact science, the author would appreciate hearing from any reader who detects errors in this article, or has information that will improve the accuracy of the information. After publication, this article along with updates will be posted on the website of Western Troy Capital Resources (www.western Troy.com).

good probability of coming on stream. In fact, most of the potential new mines are very likely economic at prices substantially below \$15/lb. However, it should also be recognized that the process for bringing any new mine production is filled with difficult hurdles and challenges. Another factor is that the first projects to obtain financing will likely bump other large projects back at least a few years. Once a few large projects are committed, the remaining large projects will find it more difficult to secure financing.

Figure 5

Figure 5 adds potential new mine production to existing mine production. Rather than passing judgment on individual potential new mines, the author has chosen to account for the uncertainty of specific projects by showing half of the potential new mine production listed in Table 4. Also shown on Figure 5 are demand growth rates of 4.5 and seven percent. The growth curves for future demand shown in Figure 5 are very smooth. The reader needs to go back and look at Figure 2 to see that production (and consumption) has been anything but smooth. There have been decades-long periods of greater than 7 percent growth and a few large decreases in demand.



Conclusions

It is evident that molybdenum supply and demand balance may be maintained for at least a few years if demand grows at the historical average of around 4.5 percent per year. Existing producers should be able to meet market demand. If growth rates are higher than 4 percent, shortages will send prices higher than even the current levels of about \$30 per pound. So molybdenum prices may hold way above \$10/lb, and possibly even above \$20/lb for this period. This assumes there will be no large supply increases out of China or the former Soviet Union.

It would take a drop in demand of 30 to 40 percent in order for byproduct producers to become dominant in setting molybdenum prices. So even if oversupply conditions develop in the short term, it is unlikely we will see prices below \$10/lb for the foreseeable future.

The mines in the Huludau District in China that were closed in 2005 for environmental and safety concerns are coming back on stream and this is shown in the tables and charts as a substantial increase in production in 2007.

At current prices, most all of identified potential new mines will be economic and could come into production by 2015 or sooner. However, the financial community will likely not support any project that requires \$25/lb molybdenum prices for the life of the potential mine. They will look favorably on projects that can make good money at prices somewhere near the historical average of about \$10/lb and have cash costs substantially below \$10/lb so they can survive the inevitable periods of oversupply. There is a race among the junior molybdenum companies to see who can get financed first. Once a few large projects are financed, the supply of molybdenum should be able to meet demand and securing financing for the larger potential primary molybdenum mines will be more difficult. Of course potential byproduct mines may have less difficulty in securing financing as there will be less molybdenum price risk. Also, those projects that are controlled by large mining companies will have less difficulty in securing financing.

The potential new sources to watch are the Climax Mine in Colorado, Mt. Hope in Nevada, Bugdainsky in Russia, and Spinefex in Australia. These are all large potential producers that could come on stream between 2009 and 2011. If all four of these mines come on stream along with a number of the byproduct and smaller projects, and demand does not grow at a rate above four percent, an oversupply condition will develop between 2010 and 2017.

A good case can be made for the view that, because of high economic growth rates in China, India and other third world countries, we may be experiencing a quantum shift in world economic growth and thus the conventional assumption that molybdenum demand will grow at only the historic average of 4.5 percent is likely very low. We may be in the beginning of one of the long periods of much higher than average growth rates that molybdenum markets have experienced. So a growth rate of seven percent or higher is not out of the question over the next 10 to 20 years. Figure 5 shows that if demand grows at seven percent, and only half of potential new mines come in on schedule, there will not be enough molybdenum supply to satisfy demand after 2015.

After 2020, all bets are off. If, as in the past, one of the 30 to 40 percent decreases in demand occurs, molybdenum prices below \$5/lb are a real possibility. On the other hand, if we experience even the average of 4.5 percent growth in demand, it is unlikely known sources will produce enough molybdenum to meet growing demand and prices are likely to remain above \$20 per pound for many years.

Table 1: Existing Molybdenum Producers

<u>Property</u>	<u>Company</u>	<u>Country</u>	<u>Tonnes Reserves</u>	<u>Grade %Mo</u>	<u>Grade %Cu</u>	<u>Mo Equiv. Grade</u>
<u>Byproduct Producers</u>						
Sierrita	Freeport	US - Arizona	1,062,000,000	0.030%	0.260%	0.069%
Bagdad	Freeport	US - Arizona	619,000,000	0.020%	0.350%	0.073%
Chino	Freeport	US - New Mexico	72,600,000	0.020%	0.700%	0.125%
Cerro Verde	Freeport	Peru	1,392,000,000	0.020%	0.490%	0.094%
Toquepala	Grupo Mexico (SCC)	Peru	2,174,000,000	0.032%	0.731%	0.142%
Cuajone	Grupo Mexico (SCC)	Peru	1,935,000,000	0.019%	0.636%	0.114%
La Caridad	Grupo Mexico (SCC)	Mexico	480,000,000	0.028%	0.400%	0.088%
Cananea	Grupo Mexico (SCC)	Mexico	480,500,000	0.028%	0.572%	0.114%
Mission	Grupo Mexico (Asarco)	US - Arizona				
Bingham	Kennecott (Rio Tinto)	US - Utah	641,000,000	0.047%	0.530%	0.127%
Chuquicamata, etc.	Codelco	Chile				
Los Pelambres	Antofagasta PLC	Chile	1,487,000,000	0.018%	0.660%	0.117%
Highland Valley	Teck Cominco	Canada - BC	318,000,000	0.008%	0.430%	0.073%
Antimina	Anglo/Xstrata/Teck/BHP	Peru	450,000,000	0.031%	1.180%	0.208%
Collahuasi	Anglo/Xstrata	Chile	1,800,000,000	N/A	0.900%	
Continental Pit	Montana Resources	US - Montana	364,000,000	0.027%	0.340%	0.078%
Agarak/Zangezur	Adarak/Zangezur	Armenia				
Erdenet	Erdenet Mining Corp.	Mongolia	1,300,000,000	0.013%	0.460%	0.082%
Gibraltar	Taseko	Canada - BC	194,000,000	0.100%	0.310%	0.147%
Robinson	Quadra	US - Nevada	146,000,000	0.030%	0.690%	0.134%
Mineral Park	Mercator Minerals	US - Arizona	437,000,000	0.040%	0.374%	0.096%
Sarcheshmeh	National Iranian Copper	Iran	1,000,000,000	0.030%	0.737%	0.141%
Huckleberry	Imperial Metals	Canada - BC		0.014%	0.552%	0.097%
Shorskoye	Celtic Resources Holdings	Kazakhstan	20,000,000	0.970%	0.057%	0.979%
Total/Average			14,572,100,000			0.113%
<u>Primary Producers (Surface)</u>						
Ruyang/Luanchuan/Huludau	Jinduicheng Molybdenum Corp.	China	900,000,000	0.100%		0.100%
Thompson Creek	Thompson Creek Mining	US - Idaho	98,800,000	0.098%		0.098%
Endako	Thompson Creek Mining	Canada - BC	276,000,000	0.051%		0.051%
Almalyk	Almalyk	Uzbekistan				
Zhirekensky + Kyrgystan		Russia Kyrgystan				
Total/Average			1,274,800,000			0.089%
<u>Primary Producers (Underground)</u>						
Henderson	Freeport	US - Colorado	151,000,000	0.210%		0.210%
Questa	Molycorp (Chevron)	US - New Mexico	125,000,000	0.330%		0.330%
Ashdown Mine	Golden Phoenix	US - Nevada	132,000	2.900%		2.900%
Total/Average			276,132,000			0.266%

Table 2: Potential New Molybdenum Producers

<u>Property</u>	<u>Company</u>	<u>Country</u>	<u>Tonnes Reserves</u>	<u>Grade % Mo</u>	<u>Grade % Cu</u>	<u>Mo Equiv. Grade</u>
<u>Potential Future Byproduct Mines</u>						
Los Chancas	Southern Copper	Peru	200,000,000	0.070%	1.000%	0.220%
Los Verdes	Virgin Metals	Mexico	10,500,000	0.124%	0.460%	0.193%
MacLeod Lake	Western Troy	Canada - QC	28,200,000	0.071%	0.498%	0.146%
Magistral	Inca Pacific Resources	Peru	113,500,000	0.050%	0.490%	0.124%
Sierra Gorda	Quadra Mining	Chile	215,000,000	0.066%	0.380%	0.123%
Relincho	Global Copper Corp	Chile	174,000,000	0.024%	0.590%	0.113%
El Pachon	Xstrata	Argentina	723,000,000	0.014%	0.650%	0.111%
Quellaveco	Anglo American	Peru	761,000,000	0.023%	0.570%	0.109%
Rio Blanco	Monterrico Metals	Peru	1,257,000,000	0.023%	0.570%	0.108%
Agua Rica	Northern Orion	Argentina	731,000,000	0.033%	0.500%	0.108%
Pashpap	Northern Peru Copper	Peru	101,000,000	0.049%	0.350%	0.102%
Rosemont	Augusta Resource	US - Arizona	398,000,000	0.016%	0.550%	0.099%
Toromocho	Peru Copper	Peru	1,200,000,000	0.019%	0.528%	0.098%
Esparanza	Antofagasta PLC	Chile	786,000,000	0.012%	0.530%	0.092%
Vizcachitas	Los Andes Copper	Chile	144,000,000	0.015%	0.510%	0.092%
Berg	Terrane Metals Corp.	Canada - BC	238,000,000	0.031%	0.400%	0.091%
Petaquilla	Tech, Inmet, Petaquilla	Panama	1,115,000,000	0.015%	0.500%	0.090%
Costancia	Norsemont Mining	Peru	320,000,000	0.013%	0.510%	0.090%
Galeno	Northern Peru Copper	Peru	765,000,000	0.014%	0.490%	0.088%
Pebble West	Northern Dynasty	US - Alaska	4,500,000,000	0.033%	0.362%	0.087%
Northern Dancer*	Largo Resources Ltd.	Canada - BC	164,000,000	0.031%	0.103%	0.083%
Red Bird	Torch River Resources	Canada - BC	81,500,000	0.065%	0.070%	0.076%
Spinefex	Moly Mines Ltd.	Australia	470,000,000	0.060%	0.090%	0.074%
Bahuerachi	Tyler Resources	Mexico	250,000,000	0.008%	0.400%	0.068%
Total/Average			14,745,700,000			0.096%
<u>Potential Future Primary Surface Mines</u>						
Climax	Freeport	US - Colorado	87,000,000	0.250%		0.250%
Malmbjerg	Quadra	Greenland	217,000,000	0.134%		0.134%
Mt. Hope	General Moly	US - Nevada	1,000,000,000	0.110%		0.110%
Hall-Tonopah	General Moly	US - Nevada	150,000,000	0.090%		0.090%
Lucky Ship	New Cantech Ventures	Canada - BC	29,100,000	0.090%		0.090%
Creston	Creston Moly Corp	Mexico	177,094,000	0.080%	0.055%	0.088%
Storie	Columbia Yukon	Canada - BC	100,500,000	0.077%		0.077%
Bald Butte	United Bolero	US - Montana	105,000,000	0.071%		0.071%
Ajax	Tenajon Resources	Canada - BC	345,000,000	0.070%		0.070%
Ruby Creek	Adanac Moly Corp	Canada - BC	206,375,000	0.063%		0.063%
Cannivan Gulch	United Bolero	US - Montana	300,000,000	0.060%		0.060%
Bugdainsky	Norilsk	Russia				
Total/Average			2,717,069,000			0.097%
<u>Potential Future Underground Mines</u>						
Lucky Jack	US Energy/Kobex	US - Colorado	22,500,000	0.701%		0.701%
Kingsgate	Auzex	Australia	5,000,000	0.300%		0.300%
Pebble East	Northern Dynasty	US - Alaska	4,500,000,000	0.033%	0.678%	0.135%
Davidson	Thompson Creek Mining	Canada - BC	75,500,000	0.177%		0.177%
Red Mountain	Tintina Mines Ltd.	Canada - Yukon	187,000,000	0.160%		0.160%
MAX (Trout Lake)	Roca Mines Inc.	Canada - BC	43,000,000	0.133%		0.133%
Total/Average			4,833,000,000			0.139%

* Primary Mineral is Tungsten

Table 3: Forecast of Existing Molybdenum Mine Production

Millions of Pounds Mo

	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
<u>Byproduct Producers</u>																				
Sierrita	20	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Bagdad	10	10	10	10	10	10	10	10	10	10										
Chino	1	2	2	2																
Cerro Verde	0	3	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Toquepala	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cuajone	8	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
La Caridad	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Cananea		6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mission		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bingham	37	34	27	27	27	27	27	27	27	27	27	27	27	27	27					
Codelco	60	57	55	65	66	68	70	72	74	76	76	76	76	76	76	76	76	76	76	76
Los Pelambres	22	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Highland Valley	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4					
Antimina	17	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Collahuasi	7	8	10	12	13	14	15	16	17	17	17	17	17	17	17	17	17	17	17	17
Continental Pit	6	7	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10
Agarak/Zangezur	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Erdenet	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Gibraltar	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Robinson	0	0	0	1	1	1	1	1	1	1										
Mineral Park	0	0	4	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Sarcheshmeh	5	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	9	9	9	10
Huckleberry	0	1																		
Shorskoye	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Sub Total	227	240	246	264	267	270	273	278	281	283	272	273	273	273	270	234	235	235	235	236
<u>Primary Producers (Surface)</u>																				
Ruyang/Luanchuan/Ht	90	142	148	153	160	166	173	180	187	194	194	194	194	194	194	194	194	194	194	194
Thompson Creek	17	10	17	26	24	22	20	18	18	18	18	18	16	14	12	12	12	12	12	12
Endako	12	10	11	11	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Almalyk	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Zhirekensky +	7	7	7	7	7	8	8	8	9	9	9	10	10	11	11	11	12	12	13	13
Kyrgystan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sub Total	127	170	184	199	208	214	219	224	232	239	240	240	239	237	236	236	237	238	238	239
<u>Primary Producers (Underground)</u>																				
Henderson	37	40	40	40	40	40	40	40	40	40	40	40	40	40						
Questa	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5					
Ashdown Mine	0	2	2	2	2	2														
Sub Total	42	47	47	47	47	47	45	45	45	45	45	45	45	45	5	0	0	0	0	0
Total Existing Mines	397	457	477	510	522	531	537	547	558	568	557	558	557	556	511	471	472	473	474	475

Table 4: Potential New Molybdenum Mine Production

Millions of Pounds Mo

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Potential Future Byproduct Mines																				
Los Chancas						3	5	7	7	7	7	7	7	7	7	7	7	7	7	7
Los Verdes			1	2	2	2	2	2	2	2	2	2	2							
MacLeod Lake						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Magistral					2	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Sierra Gorda						2	4	6	6	6	6	6	6	6	6	6	6	6	6	6
Relincho						1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
El Pachon												5	10	14	14	14	14	14	14	14
Quellaveco							3	5	5	5	5	5	5	5	5	5	5	5	5	5
Rio Blanco							5	10	12	12	12	12	12	12	12	12	12	12	12	12
Agua Rica						8	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Pashpap							1	3	3	3	3	3	3	3	3	3	3	3	3	3
Rosemont				3	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Toromocho								5	10	14	14	14	14	14	14	14	14	14	14	14
Esparanza									5	5	5	5	5	5	5	5	5	5	5	5
Vizcachitas					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Berg								2	5	5	5	5	5	5	5	5	5	5	5	5
Petaquilla				2	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Costancia							1	1	1	1	1	1	1	1	1	1	1	1	1	1
Galeno								2	4	4	4	4	4	4	4	4	4	4	4	4
Pebble West						0	5	10	20	20	20	20	20	20	20	20	20	20	20	20
Northern Dancer*						2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Red Bird							3	5	5	5	5	5	5	5	5	5	5	5	5	5
Spinefex				8	16	24	24	24	24	24	24	24	24	24	16	16	16	16	16	16
Bahuerachi						1	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Sub Total				15	30	66	100	130	157	161	161	166	171	173	165	165	165	165	165	165
Potential Future Primary Surface Mines																				
Climax					10	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Malmberg						7	15	20	20	20	20	20	20	20	20	20	20	20	20	20
Mt. Hope					8	17	25	35	35	35	35	33	31	31	31	31	31	31	31	31
Hall-Tonopah					4	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Lucky Ship				1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Creston					6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Storie							3	5	5	5	5	5	5	5	5	5	5	5	5	5
Bald Butte								3	6	6	6	6	6	6	6	6	6	6	6	6
Ajax										5	10	10	10	10	10	10	10	10	10	10
Ruby Creek				2	14	14	10	11	11	9	9	8	7	8	9	9	9	9	6	0
Cannivan Gulch								3	6	6	6	6	6	6	6	6	6	6	6	6
Bugdainsky				5	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Sub Total				5	13	59	95	122	146	152	155	160	157	154	155	156	156	156	156	153
Potential Future Underground Mines																				
Lucky Jack								0	8	12	15	15	15	15	15	15	15	15	15	15
Kingsgate		2	3	3	3	3	3	3	3	3	3	3	1							
Pebble East						0	5	10	20	20	20	20	20	20	20	20	20	20	20	20
Davidson					1	2	4	5	5	5	5	5	5	5	5	5	5	5	5	5
Red Mountain								7	10	13	17	20	20	20	20	20	20	20	20	20
MAX (Trout Lake)		3	5	5	5	5	5	5	5	5	5	2								
Sub Total		5	8	8	9	10	24	33	54	62	68	64	61	60	60	60	60	60	60	60
Total Potential New Producti	5	13	36	99	170	246	308	363	378	388	388	388	387	387	380	381	381	380	378	371