

China Rare Earth Quarterly

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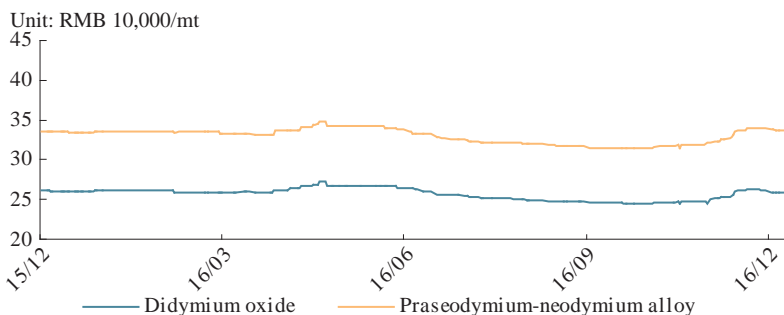
Highlights

Market Outlook: During the first quarter of 2017, Chinese government's crackdowns on illegal activities in the rare earth sector will accelerate the standardizing and upgrading of domestic rare earth market, and this will continue supporting the market, which will restrict output and support price. Stockpiling by China's SRB, in small amounts but by many times, will also inject price support to the market. In addition, export quota of rare earth will keep growing, but the trend of rising volumes and falling values will not change. In general, the rare earth market will see mixed news in Q1 2017, and prices will keep fluctuating during the period.

Demand: Production at domestic permanent magnet industry fell in Q4 2016 on a quarterly basis due to weak demand, with the rate averaging at around 60%. The average operation rate at fluorescent industry was around 10%, 30% at hydrogen storage alloy powder industry, and below 30% at polishing material industry.

Macro Front: China's GDP rose slightly during the last quarter of 2016, with positive impact from supply-side reform. The growth in world's other major economies was moderate, and with stronger-than-expected growth in manufacturing sector.

Price Trends of Didymium Oxide and Praseodymium-Neodymium Alloy



Source: SMM

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Contact us

Hotline:

+86-21-5155-0322

Mail:

service.en@smm.cn

Fax:

+86-21-5155-0345

Address:

8th FL in North Section, Building 9, Lujiazui Software Park, No. 20, Lane 91, E'Shan Road, Pudong New Area, Shanghai, 200127, China.

Hot Topics in Rare Earth Industry in Q4 2016

News of Listed Companies

Shenghe Resources Holdings to Buy Shares of Greenland Minerals and Energy

Shenghe Resources Holdings announced that its one subsidiary Leshan Shenghe plans to buy 125 million of ordinary shares issued by Greenland Minerals and Energy at RMB 23.59 million. After the purchase, Leshan Shenghe will hold 12.51% of issued share of Greenland Minerals and Energy and be the largest single shareholder. Greenland Minerals and Energy involves in mineral exploration and mining. The company's wholly-owned subsidiary GME finished feasibility study report and Environmental Impact Assessment and submit application for exploitation license for Kvanefjeld project. Kvanefjeld project concludes many polymetallic projects, including Kvanefjeld deposit, Sørensen deposit and Zone3 deposit. Resource totals at 1.01 billion mt, which meets JORC code. According to the announcement, total TREO grade of the three deposits is 1.1% with volumes at 11.14 million mt.

Baogang Group to Promote Tailings Pond Development and Utilization

Baogang Group replied Shanghai Stock Exchange's questions on development and utilization of tailings pond, and its position in the group's development plan in one announcement released on November 25, 2016. Although the progress of tailings pond project is affected by administrative approval and market change, the company has been promoting its progress through various measures and work, according to the announcement. Baogang Group will make some adjustment while holding its overall operation plan unchanged. The company started selling ore pulp from 2016, to realize profits it had promised to make, and planned to buy production lines of Baiyun Ebo project to realize development and utilization of tailings pond as soon as possible.

China Minmetals Rare Earth to Buy 100% Stake in Huatai Xintuo

China Minmetals Rare Earth made an announcement on November 9's night, claiming that it intends to buy a 100%-stake in Huatai Xintuo Geological Exploration Technology owned by the actual controller. One subsidiary Huatai Xintuo holds a 42%-stake in it owns two exploration rights for Shengongzhai RE mine and Feitian RE mine in Guangdong's Pingyuan. The company plans to promote acquisition of mining rights those two mines after the completion of the transaction. As of December 6 2016, Huatai Xintuo owns net asset at RMB 309 million and earned net profits at RMB 115 million from August 29 to December 16, 2016 with no revenue was heard. After the completion of acquisition, Huatai Xintuo will help China Minmetals Rare Earth to reverse from losses and create RMB 115 million of net profits. China Minmetals Rare Earth posted losses at RMB 43.07 million in the first three quarters in 2016 in its Q3 report.

Shanghai Prosolar Resources Development to Cut Investment on Rare Earth Project

Shanghai Prosolar Resources Development expected that it will suffer a loss in its business performance in 2016, according to its announcement released on January 20, 2017. Its net profit belongs to shareholders will drop to RMB 110 million or 270.90% from 2015's level at RMB 120 million or 286.44%, waning the company's share price. Average net profit growth was 24.72% in trade industry while that at Shanghai Prosolar Resources Development declined 5778.15% to 5316.86% in 2016. As rare earth prices fell sharply, Chinalco Guangxi Nonferrous Chongzuo Rare Earth Development posted losses in 2016, devaluing shares Prosolar Resources Development holds. So, Shanghai Prosolar Resources Development plans to cut investment in this project.

News in Overseas Market

Iran and Finland Sign MoU on Exploration of Rare Earth Elements

Iranian Deputy Minister of Industry, Mine and Trade Mahdi Karbasian and Head of Geological Survey of Finland inked the Memorandum of Understanding (MoU) during the 1st International Symposium on Mineral Processing held in Alborz province, reported on October 25, 2016. According to the report, Iran has verified more than 300,000 mt of rare earth.

India Launches First Survey on Rare Earth Resources to Reduce Dependency on China

The Indian government has earmarked 12 minerals crucial for the manufacturing of cutting edge defense equipment. The government has no declared domestic reserves for majority of the identified critical minerals, such as rare earth, and it's heavily dependent on the world's biggest producer China. It is learned that India has invited companies to participate in a three-year survey for its deposits of rare earth minerals. The aero geophysical exercise will be conducted over three years for collecting baseline magnetic and spectrometric data. The government will soon finalize the global firm that will conduct the survey over 800,000 sq. km area at a cost of \$ 210 million. By April 2017, aero-geophysical survey over an area of about 2.05 lakh sq. km is planned to be carried out, said Piyush Goyal, Indian Minister for Mines. The government has identified critical minerals that play an important role in aerospace, automobiles, cameras, defense, entertainment systems, laptops, medical imaging, nuclear energy, and smart phone segments. India is totally dependent on imports for seven out of the 12 identified critical minerals. India doesn't have any declared resources for them, except light rare-earths (found along with monazite sands) and beryllium.

Commerce Resource Updates Field Program at Ashram Rare Earth Deposit

Commerce Resource has provided an update on its 2016 Field program at the Ashram Rare Earth deposit in Quebec. According to the announcement, the Field program consists of three main components, including resource definition drilling, environmental baseline data collection, and hydrogeological test work. The drilling and environmental components were completed in mid-September. The Company is now pleased to report that the hydrogeological test program has been successfully completed.

India Finds Rare Earth Minerals in Rajasthan's Barmer

Indian geologists have found a rich new source of strategically important rare earth elements in Rajasthan's Barmer. Analysis of the source rocks show the quantity of rare earth metals—needed in the nuclear and space sectors as well as in wind energy, defence, chemicals and electronics industry—may be of commercial interest. Kerala coast used to be the only deposit of such minerals in India. As India is not very rich in terms of rare mineral deposits, most of its rare earth are imported from China. China dominates the mining and trading of rare earth minerals in world. It supplies 95% of all rare minerals consumed by world. With rising domestic demand in China, Beijing cut supply from 2010, compelling India to survey for new resource. It is confirmed that Barmer has high concentration of the rare earth elements and apart from the 17 elements of rare earth, geologists also found zirconium, niobium, silver, thorium and uranium. Three out of seven dykes have high concentration of the rare earth elements. GSI scientists refuse to talk more about this, but market players are positive on new resources.

Toshiba Develops Rare-Earth-Free Samarium-Cobalt Magnet

According to Nikon Keizai Shimbun, Toshiba has made an announcement on November 10, 2016, claiming that the company has developed a samarium-cobalt magnet that is free from rare earth element dysprosium. Traction motors for hybrid and electric automobiles, railroad rolling stock and the motors for industrial equipment and wind turbines operate at high temperatures, wherein heat-resistant neodymium magnets are generally used, which can reduce dependency on dysprosium. Now, the company is offering a high-iron samarium-cobalt magnet that realizes high level demagnetization resistance at 180°C, satisfying rising demand from engine for E-vehicle and industrial equipment and wind turbines operate. Rare-Earth-Free Samarium-Cobalt Magnet will replace neodymium magnets, which needs enormous dysprosium produced from China. Although samarium also belongs to rare earth elements, it is easier for producers to buy it for it is rich in Australia and US. Toshiba Material Corporation plans to start sampling of the new magnet today and hope to put it into operation as soon as possible.

Baotou Hongbote Technology Acquires Solvay's Nelor Business

Solvay's Rhodia Operations announced to sell its Nelor business in early 2016 and China Baotou Hongbote Technology participated and won the bidding. The two companies finished acquisition on December 14, 2016 and announced that Hongbote Technology owns Rhodia's rare earth inorganic plastic coloration pigments business. The followings are the details of selling assets.

1. Main equipment for production of rare earth inorganic plastic coloration pigments (including material, structure and contact way of producer).
2. All Intellectual property rights of rare earth inorganic plastic coloration pigments (including production technologies, brand, service identifier, copyright, related patent and Internet register domains).
3. Business secret, special confidential knowledge, market special knowledge, customer information and selling network of rare earth inorganic plastic coloration pigments.

Rare Earth Ore

Baiyun Ebo Builds Rare Earth Comprehensive Utilization Expert Consultative Committee

Baiyun Ebo Rare Earth Comprehensive Utilization Expert Consultative Committee was built on October 27, 2016, which was set by Inner Mongolia University of Science&Technology, authorized by Science Technology Department of Inner Mongolia. The committee is composed by experts and scholars from Chinese Academic of Science, Inner Mongolia University of Science&Technology and Shanghai University. The project is 15th item of Catalogue of Industries, Products and Technology Development Encouraged by the State and the domestic investment project of rare earth application, with investment at RMB 300 million and covering 55,000 square meters. The committee will build comprehensive utilization test room for rare and precious metals, three large production lines for ore dressing and experimental practicing base for Inner Mongolia's universities. The project will promote technological achievement transformation and process niobium, scandium and fluorite deeply to extend industrial chain. It will also help enhance rare and precious metals competitive advantage in Botou, even regions across Inner Mongolia, to improve local environment and promotes China's development of new technique, new technology, new production and new material in rare and precious metal industry. The project will bring decent economic benefit and social results.

Guangdong Confiscates 30 mt of Illegal Rare Earth Minerals

Department of Land & Resources of Guangdong Province held a press conference on December 26, 2016 and introduced work on resources inspections. Guangdong investigated and punished 18,000 cases of illegal land use, covering 27.87 million square meters, and 96 cases of illegal mining, with fines totaling RMB 154 million, confiscating and removing building up to 3.07 million square meters and 2.34 million square meters, respectively. Approximately 2.58 million square meters of land were reclaimed and 30 mt of illegal rare earth minerals were confiscated. The inspection team recommended to take disciplinary measures against 244 people and transferred 19 people to judicial department for criminal sanctions. Department of Land&Resources of Guangdong Province investigated and punished 8 cases directly, supervised 7 cases, transferred 134 clues of illegal cases and authenticated 72 cases for illegal or destructive mining operations in 2016.

China State Council Delegates Rare Earth Exploitation Approval Power to Local Governments

On Dec 20, China's State Council released the Catalogue of Investment Projects (2016) approved by Premier Li Keqiang, canceling and delegating 17 approval rights. Approval rights for rare earth mine exploitation, smelting and separating, newly created vehicles (excluding E-vehicles) and vehicle engine are delegated to local governments.

Rare Earth Demand

Zhongke Sanhuan Signs Supply Contract with Tesla Motors Inc.

Zhongke Sanhuan announced that the company signed Tesla Parts Purchase Contract with Tesla Motors Inc. on October 27, 2016. Tesla Motors Inc. will purchase neodymium-iron-boron magnet from Zhongke Sanhuan from October 27, 2016 with valid time in three years. The trading price will be determined by order volumes. Tesla buys neodymium-iron-boron magnet for drive motor of E-vehicles, which means that Tesla eliminates induction motor drive and started using rare earth direct-driven permanent magnet motor drive, which widely used in new energy industry.

Goldwind US Partners with Viridis Eolia LLC on 1,870 MW Wyoming Project

Goldwind US, a subsidiary of Xinjiang Goldwind Science & Technology, announced that it has entered into an exclusive agreement with Viridis Eolia, LLC, a Wyoming corporation. The Viridis Eolia Master Plan, a planned 1,870-megawatt multi-phase wind project located in Carbon County, Wyoming, will utilize Goldwind's 2.5 MW and 3.0 MW Permanent Magnet Direct Drive (PMDD) wind turbines. Goldwind is expected to deliver goods from 2017-2022 and provides long-term operations and maintenance services for Viridis. This was another achievement in Goldwind's business expansion at abroad, especially in US. With the 6-year delivery time, Goldwind will consume 1,000 mt of neodymium magnet for 1,870 MW wind generator.

China Builds Global First Rare Earth Sulfides Coloring Agent Production Line in Baotou

Baotou Rare Earth R&D Center of Chinese Academy of Sciences built the global first rare earth sulfides coloring agent production line in November 2016, rallying on core technology from Changchun Institute of Applied Chemistry. The center also produced the first batch of goods, indicating that Chinese Academy of Sciences made another achievement in high value-added application fields of rare earth. Rare earth sulfides coloring agent is widely used in many fields, including plastics, oil paint, ink and leather due to high coloring property and innocuity. Its market demand will reach RMB 10 billion.

Chinese Academy of Sciences and Changchun Institute of Applied Chemistry, cooperating with Baotou Rare Earth R&D Center, launched trial operation on 10 mt of goods. After a year of effort, the institution produced the first batch of goods on November 3, with high output, simple operation and safety. The institution developed new operation way for rare earth sulfides coloring agent under moderate conditions and is free from hazardous gas, such as hydrogen sulfide. The production line produces with lanthanum and cerium as raw materials, which inventories are high in north China, satisfying China government's requirements. This will bring enormous economic and social benefits.

Rare Earth Market Review & Outlook

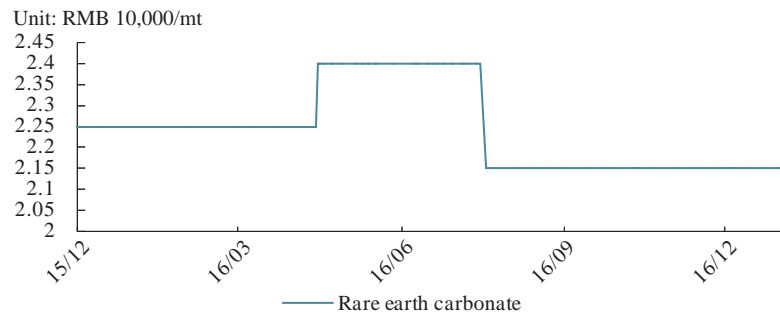
In 2016, rare earth market rose at first and then fell back, and finally inched up at the end of the year. Rare earth prices dived and slid all the way in 1H 2016 with the end of peak demand period. During the second half of 2016, rare earth prices bounced back after price hikes by Baotou Steel Rare Earth for third consecutive month and a series of positive policies and news, such as crackdowns on illegal mining, environmental protection inspections and stockpiling news. Many domestic rare earth producers suspended production due to low price, crackdowns on illegal mining and environmental factor, sending down utilization rate. The rate increased slightly at year's end when downstream stockpiling increased. As of late December 2016, rare earth prices held largely stable or inched down except a small gain of praseodymium, neodymium and cerium.

During the first quarter of 2017, Chinese government's crackdowns on illegal activities and introduction of rare earth price index will accelerate the standardizing and upgrading of domestic rare earth market, and this will continue supporting the market, which restricts output for price concerns. Stockpiling by China's SRB, in small amounts but by many times, will also inject price support to the market. In addition, export quota of rare earth will keep growing, but conditions of rising volumes and falling values will not change. But, the conditions are expected to show signs of easing with price rallying from the bottom and higher pricing power after industry integration. In general, the rare earth market will see mixed news in Q1 2017, and prices will keep fluctuating during the period.

Market Movements & Analysis

Rare Earth Market Overview in 2016

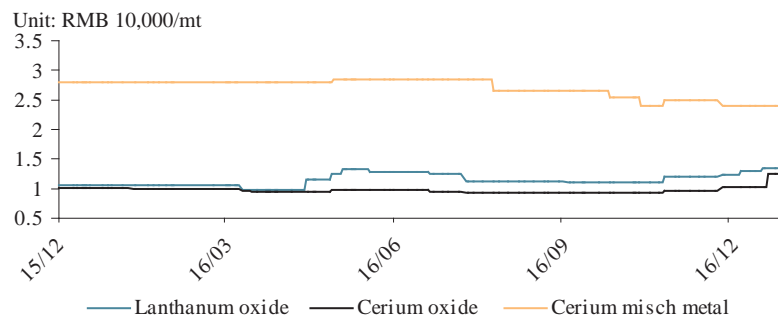
Figure 1: Price Trend of Rare Earth Carbonate



Source: SMM

Rare earth ore prices held stable during Q4 2016 (from October to December). SMM survey finds that rare earth separators were wary of buying raw materials as surging prices of supplementary materials squeezed their profits over the quarter, with limited purchases. Meanwhile, some SOE separators suspended production after using out export quotas during the last quarter. In general, spot supply of rare earth ore was limited, while downstream was also low, leaving prices largely stable during Q4 2016.

Figure 2: Price Trends of Lanthanum Oxide, Cerium Oxide and Cerium Misch Metal



Source: SMM

Lanthanum and Cerium Products Annual Price Review

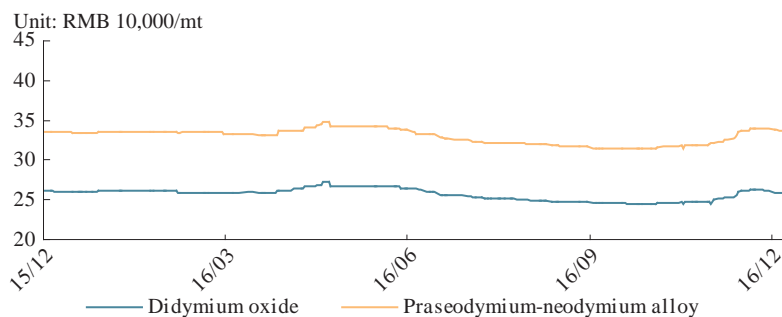
First quarter (January - March): mainstream offers for cerium misch metal were stable during the period, with offers between RMB 26,000-27,000/mt (including tax). Downstream demand from hydrogen storage alloy, rare earth spheroiditic agent and steel markets was weak, and oversupply cast a shadow over the market for the whole quarter. Suppliers cut offers from high to promote sales, with deals mainly traded at relatively low prices. By late March, mainstream traded prices for cerium misch metal were between RMB 24,000-25,000/mt, with some even reported at RMB 23,000/mt (including tax). Downstream buying interest was low despite price cut, so trading volumes were low during the first quarter of 2016 while prices were at lows.

Second quarter (April - June): offers for cerium misch metal were lowered during the quarter amid the sluggish trading sentiment to near traded prices. Offers were heard at RMB 24,000-25,000/mt (including tax), and RMB 20,000-21,000/mt (excluding tax). Cerium misch metal producers faced high inventory pressures after poor sales during Q1 2016, and they were forced to cut prices for sales to ease liquidity pressures. Again, offers were largely stable, but traded prices were lower, with deals at RMB 22,000-23,000/mt (including tax) and RMB 18,000-19,000/mt (excluding tax).

Third quarter (July - September): the cerium misch metal market remained sluggish, and supply remained higher than demand during the period. With the weather turning warm, hydrogen storage alloy and rare earth spheroiditic agent markets entered the low-demand period, and demand waned further. Hence, inventories at producers were consumed slowly due to no brisk inquiries or stockpiling demand. Mainstream offers were unchanged at RMB 24,000-25,000/mt (including tax), but traded prices were only at RMB 22,000-23,000/mt. Deals were largely traded at lows, growing pessimism among suppliers. Market prices had already fallen to a low level, but absence of positive news and weak demand left sluggish market unchanged. Buyers asked for lower prices, and cerium misch metal market remained under downward pressures.

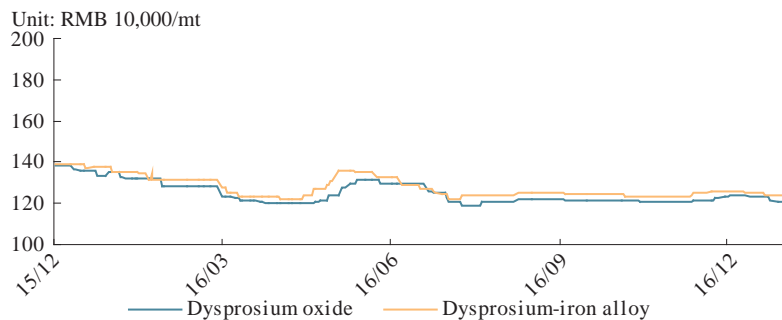
Fourth quarter (October - December): downstream demand did not improve in early quarter. The cerium misch metal market remained in supply surplus, and deals were rarely heard, with offers stabilizing at lows. Producers reported few new orders, and took a wait-and-see attitude while supplying goods to regular buyers, with ex-works prices at RMB 23,000-24,000/mt (including tax, by acceptance) and deals at RMB 21,500-23,000/mt. The market finally improved in mid December with stockpiling by SRB and year-end stockpiling. Market inquiries grew, and trading volumes were up significantly. Offers for cerium misch metal (chlorination) were up to RMB 24,000-25,000/mt (including tax).

Figure 3: Price Trends of Didymium Oxide and Praseodymium-Neodymium Alloy



Source: SMM

Figure 4: Price Trends of Dysprosium Oxide and Dysprosium-Iron Alloy



Source: SMM

Praseodymium, Neodymium, Dysprosium, Terbium and Gadolinium Products Annual Price Review

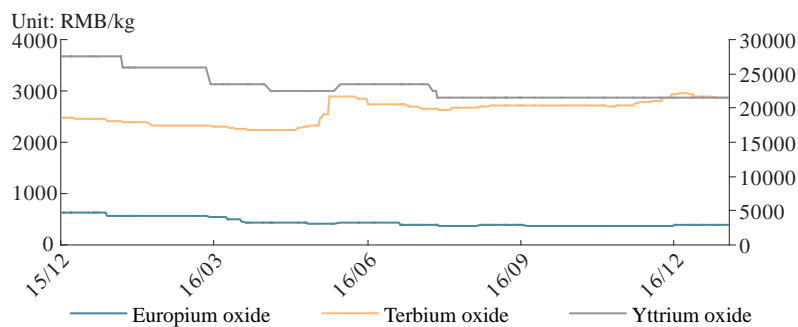
First quarter (January - March): rare earth separators showed low production enthusiasm after the 2016 Chinese New year holiday, and market inquiries increased as supply fell short of demand, with offers up for praseodymium, neodymium, dysprosium and gadolinium. China's Ministry of Industry and Information Technology (MIIT) held the industry conference with six major rare earth groups in late January to implement the annual rare earth stockpiling plan set for the 12th 5-Year Plan. But, the conference failed to boost market sentiment as market demand did not improve, with limited impact from the policy. Prices for praseodymium and neodymium products dropped during the whole quarter. Mainstream offers for didymium oxide were at RMB 258,000-262,000/mt (including tax), down RMB 1,000/mt from January's, RMB 330,000-335,000/mt (including tax) for praseodymium-neodymium alloy, down RMB 3,000/mt from January's. Prices for dysprosium oxide and gadolinium oxide were down, and up slightly for dysprosium-iron alloy and gadolinium iron alloy.

Second quarter (April - June): Trading sentiment improved in early Q2 with the starting of first deliveries of goods for SRB's stockpiling, and rare earth prices lurched higher. Until late May, downstream producers became unwilling to buy goods at inflated high prices. Meanwhile, the arrival of off-demand season further reduced market demand. As SRB's stockpiling bid failed, market prices started falling back with absence of market demand and positive policy. Producers after building up goods for optimistic outlook came under big inventory pressures, and those, facing tight liquidity pressures, cut offers to move goods. Mainstream offers for didymium oxide were between RMB 258,000-260,000/mt (including tax), down RMB 4,500/mt from April's, and RMB 340,000-345,000/mt (including tax) for praseodymium-neodymium alloy, down RMB 6,000/mt from April's. Market prices fell to the lowest of the year, adding to market pessimism.

Third quarter (July - September): market demand was weak, and SRB's bid failure resulted in a strong wait-and-see attitude across the whole industry. China Minmetals Rare Earth reported a loss of more than RMB 40 million according to its half-year financial report, and magnetic materials producers also reported a year-on-year drop in financial reports. China's Ministry of Land and Resources issued the rare earth ore mining quota for 2016 to control capacity. Over the whole quarter, prices for didymium oxide, neodymium metal, dysprosium oxide, gadolinium oxide, dysprosium-iron alloy and gadolinium iron alloy kept falling. By late September, offers for didymium oxide were at RMB 245,000-248,000/mt (including tax), and RMB 315,000-318,000/mt for praseodymium-neodymium alloy.

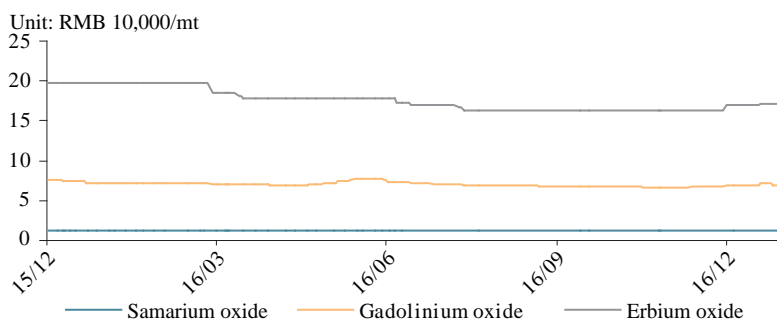
Fourth quarter (October - December): rare earth market remained sluggish. Market expectations over peak demand in September and October failed to materialize, and buyers generally made purchases on an as-needed basis. Trading volumes were limited, and with low traded prices. Turning point in praseodymium and neodymium products market arrived after Baotou Steel Rare Earth released its list price for the second time in mid October. The company raised prices for three months in a row from mid October. This, coupled with crackdowns on illegal mining, SRB's stockpiling and year-end purchase increases, bolstered up prices in the praseodymium and neodymium, dysprosium and gadolinium markets. By late December, offers for didymium oxide were at RMB 258,000-260,000/mt, and RMB 334,000-340,000/mt for praseodymium-neodymium alloy. In general, rare earth prices were largely stable in Q4 2016 compared with 2015 Q4's, or even fell slightly.

Figure 5: Price Trend of Europium Oxide, Terbium Oxide, Yttrium Oxide



Source:SMM

Figure 6: Price Trends of Other Rare Earth Products



Source:SMM

Analysis on Rare Earth Exports

China Major Rare Earth Product Exports in Q4 2016

1) Rare Earth Smelting and Separation Products

Table 1: Export Statistics of Major Chinese Rare Earth Products

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Rare earth metals	900.10	1331.13	1115.92	1393.22	1160.43	1283.16	858.09	912.30
Rare earth oxides	6153.83	5742.23	6390.45	5674.26	6001.03	6392.27	4277.15	3566.39
Single rare earth salts	3495.77	777.02	3326.18	570.53	4001.17	578.55	1642.10	328.23
Other rare earth salts	68.94	32.37	80.81	89.24	77.68	61.34	352.06	85.13
Rare earth permanent magnet	7127.05	33491.99	8718.46	37961.18	8507.17	38388.29	5695.70	24134.48
Rare earth pyrophoric alloy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel-hydrogen batteries (10,000 units)	12073.39	10043.33	12365.74	10558.89	12260.70	11076.09	7215.43	6506.81

Source: China Customs

Table 2: Export Statistics of Rare Earth Oxides

Unit: USD/mt

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Cerium oxide	570.15	506.5719	1087.919	1054.4703	1020.776	1300.0156	1237.767	9926.698
Lanthanum oxide	3687.166	694.9953	3337.696	626.9258	4361.391	829.9334	3241.702	6783.037
Neodymium oxide	112.08	458.1872	145.735	594.8124	102.392	413.7601	136.073	5358.71
Yttrium oxide	404.571	215.6547	462.127	312.8948	438.422	204.3474	484.564	1958.858
Europium oxide	1.771	16.0458	1.325	16.129	1.8	16.165	2.098	162.633
Dysprosium oxide	26.831	737.6393	8.611	319.5573	18.614	413.7557	32.021	6549.383
Terbium oxide	7.684	262.6782	9.372	364.3117	9.979	410.3086	14.62	6012.997
Praseodymium oxide	65.111	308.6202	63.066	301.9624	66.232	317.7134	40.351	1903.749
Other rare earth oxides	1278.468	2541.8329	1274.603	2083.1967	1317.925	2486.2706	1300.071	21535.506

Source: China Customs

2) Permanent Magnet Materials and Nickel-Hydrogen Batteries

Table 3: Exports of Rare Earth Permanent Magnets and Nickel-Hydrogen Batteries

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Rare earth permanent magnets	5599.295	29330.3131	6985.602	33621.4738	7333.308	34393.7769	7025.853	329706.984
Nickel-hydrogen batteries (10,000 units)	120733.949	10043.329	123657.379	10558.8879	140327.355	11076.0921	120778.95	103878.417

Source: China Customs

3) Single Rare Earth Salts

Table 4: Export Statistics of Single Rare Earth Salts

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Lanthanum carbonate	2060	309.4531	1206.91	171.7276	964	131.0359	650.525	2191.857
Cerium carbonate	960.47	163.3978	1415.11	157.3919	1230.201	151.7686	1566.95	2244.002
Neodymium carbonate	1	2.5	0.25	1.3169	0	0	0	0
Yttrium carbonate	0	0	0	0	0	0	6.12	10.902
Cerium hydroxide	20.105	10.8175	52	21.8114	35.85	19.1195	33	176.795
Other cerium compounds	118.614	44.9613	140.303	56.0827	312.1	87.8956	205.29	812.514
Lanthanum fluoride	0	0	2	0.7865	0	0	0	0
Neodymium fluoride	0.15	2.371	4.95	40.6691	3.7	25.62	5.9	260.347
Dysprosium fluoride	0.005	0.1749	0	0	0	0	0.065	13.395
Lanthanum chloride	261.26	20.4052	472	37.7111	190.9	17.5007	64	54.916
Praseodymium chloride	0	0	0	0	0	0	0	0
Neodymium chloride	0	0	0.5	3.8706	0	0	0	0
Yttrium chloride	0.01	0.0324	0	0	0.2	0.084	3	10.67
Other lanthanum compounds	69.38	203.5607	24.9	53.7675	104.41	127.8065	143.02	1168.621
Other neodymium compounds	0	0	0	0	0	0	0	0
Other terbium compounds	0	0	0	0	0	0	0	0
Other yttrium compounds	4.773	19.345	7.252	25.3918	5.023	17.7149	2.161	88.144

Source: China Customs

4) Other Rare Earth Salts

Table 5: Export Statistics of Other Rare Earth Salts

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Other rare earth fluorides	53.082	27.3954	79.205	81.6497	57.897	57.3152	117.989	720.455
Other rare earth chlorides	15	1.0578	0	0	0.025	0.1055	312	210.339
Mixed rare earth carbonates	0.06	0.0025	0	0	0	0	0	0
Other rare earth carbonates	0.8	3.9176	1.6	7.592	0.8	3.9224	0.8	38.584
Other rare earth salts	53.082	27.3954	79.205	81.6497	57.897	57.3152	117.989	720.455

Source: China Customs

5) Rare Earth Metals

Table 6: Export Statistics of Rare Earth Metals

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Neodymium metal	146.14	744.0901	94.72	481.6673	72.12	357.6411	78.82	3731.609
Dysprosium metal	2.095	57.3323	2.075	55.8522	2.005	50.4643	2.27	576.917
Lanthanum metal	594	267.7782	579.32	249.2249	384.3	166.5704	516.8	2250.94
Cerium metal	65	33.2127	124.25	58.7223	135	61.1401	105.25	505.919
Praseodymium metal	4	28.2848	13.6	91.4309	8.1	53.1838	8	510.627
Terbium metal	0.13	6.4449	0.17	9.1327	0.38	20.1756	0.225	121.857
Yttrium metal	5.355	21.77	9.945	38.6903	6.858	28.0814	4.73	199.078
Other rare earth metals	80.377	168.1694	68.139	157.4038	83.701	170.5284	66.412	1329.49
Battery grade misch metal	3	4.05	0	0	0	0	0.02	0.191
Other misch metals	0	0	223.7	251.0994	467.968	375.3721	399.3	3020.023

Source: China Customs

6) Rare Earth Flints

Table 7: Export Statistics of Rare Earth Flints

Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000	Quantity/mt	Value/USD 10,000
Finished flint	0	0	0	0	0	0	0	0
Unprocessed flint	0	0	0	0	0	0	0	0

Source: China Customs

7) Exports to Japan

Table 8: Rare Earth Products Exports to Japan

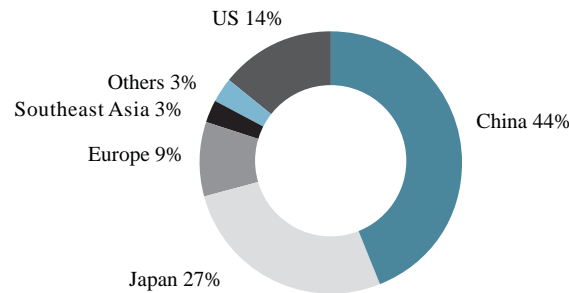
Product	2016 Q1		2016 Q2		2016 Q3		2016 Q4	
	Quantity/mt	Value /USD	Quantity/mt	Value /USD	Quantity/mt	Value /USD	Quantity/mt	Value /USD
Rare earth metals	936.01	1280.98	1052.19	1307.38	773.43	987.46	609.48	718.05
Rare earth oxides	1298.05	2213.20	1615.87	2037.04	1372.46	1521.14	1629.48	2195.49
Rare earth salts	869.05	179.83	1627.69	248.06	1129.16	208.84	1308.38	226.48
Rare earth permanent magnet	1279.61	4362.19	1470.18	4846.01	1083.84	3883.31	1432.49	4723.36
Rare earth pyrophoric alloy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel-hydrogen batteries (10,000 units)	661.49	1093.10	531.44	754.72	508.16	770.87	618.47	934.94

Source: China Customs

Production at Rare Earth Processors

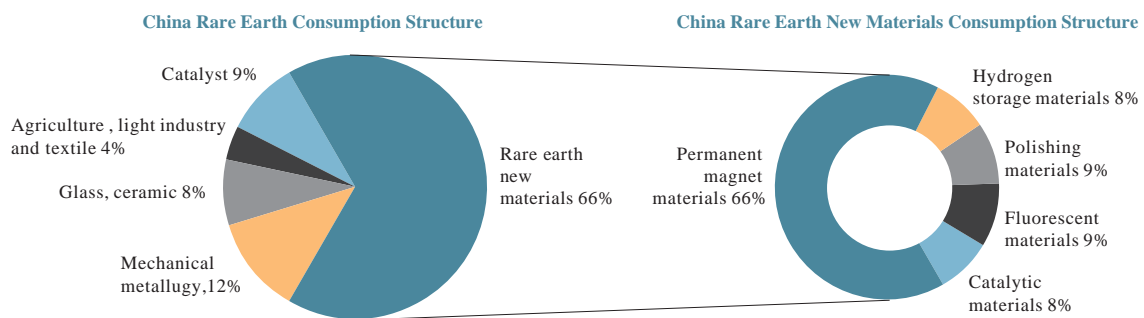
SMM undertook surveys of major rare earth processors in China in Q4 2016. These surveys, covering main rare earth consumers – fluorescent materials, magnetic materials, polishing powder and hydrogen storage materials enterprises – reveal overall production conditions in China's rare earth processing sectors.

Figure 7: World Rare Earth Consumption Structure



Source: ACREI

Figure 8: China Rare Earth Consumption Structure



Source: ACREI

1. Survey of Major Chinese Rare Earth Magnetic Materials Producers

Operating rates in rare earth magnet material industry fell in Q4 compared with Q3, due mainly to weaker demand in the peak demand season compared to the same period of years past.

The average operating rate at eight companies with patented technologies in the sector was 60% in Q4.

Most of those surveyed expect operating rates to slide in Q1 2017, citing the low demand season.

Table 9

Enterprise	Q4 Operating Rates
Beijing Zhongke Sanhuan Hi-Tech Co., Ltd.	0.75
Ningbo Yunsheng Co., Ltd.	0.50
Yantai Zhenghai Magnetic Material Co., Ltd.	0.70
Ningbo Jinji Strong Magnetic Material Co., Ltd.	0.70
Advanced Technology & Materials Co., Ltd.	0.70
Beijing Qinghua Yinna Hi-Tech Development Co., Ltd.	0.50
Anhui Earth-Panda Advance Magnetic Material Co., Ltd.	0.50
Beijing Jingci Magnet Co.	0.50
Average Operating Rate	0.60

Source: SMM

2. Survey of Major Chinese Fluorescent Materials Producers

Average operating rate in fluorescent material industry stayed around 10% in Q4 2016, based on SMM's survey of major companies in operation.

Jiangmen Kanhoo Industry and Shaanxi Rainbow Fluorescent Materials – leaders in the industry – held operating rates around 30%.

Operating rate at Xiamen Topstar New Material was stable at 40% as it produces largely for its own use. Operating rates at other SMEs were below 20%, and some SMEs have closed.

Most of those surveyed remain bearish over market outlook for Q1 2017. Emerging luminescent materials have bitten into market share of LED, with an increasing proportion of rare earth fluorescent powder expected to be substituted.

Table 10

Enterprise	Q4 Operating Rates
Jiangmen Keheng Industry Co.,Ltd.	0.3
Shaanxi Rainbow Fluorescent Material Co., Ltd.	0.25
Jiangsu Tiancai Technology Material Co., Ltd.	0.15
Fujian Changting Golden Dragon Rare-earth Co., Ltd.	0.30
Quzhou Aoshi Te Lighting Co., Ltd.	0.30
China Minmetals Rare Earth Co., Ltd.	0.10
Xiamen Topstar New Material Co., Ltd.	0.4
Changshu Jiangnan Fluorescent Material Co., Ltd.	0.05
Jiangxi Hetai New Light Source Material Co., Ltd.	0.10
Average Operating Rate	0.10

Source: SMM

3. Survey of Major Chinese Hydrogen Storage Materials Producers

Average operating rate at rare earth hydrogen storage material sector was around 30% in Q4 2016, unchanged from Q3, according to SMM's survey of seven major companies in operation.

Operating rates were around 60% at large producers, versus 30-40% at medium producers and 10%-20% at smaller ones. Many other companies have halted production.

Most of those surveyed see growth in hydrogen storage materials demand along with higher new energy vehicle output. Meanwhile, substitution of hydrogen storage batteries by lithium batteries will partially offset of the growth in hydrogen storage materials utilization. Most market players see no turnaround in market conditions in Q1 2017.

Table 11

Enterprise	Q4 Operating Rates
Baotou Sande Battery Materials Co., Ltd.	0.60
Xiamen Tungsten Co., Ltd.	0.60
Gansu Rare Earth New Material Limited-Liability Company	0.45
Sihui City Double Win Industry Co., Ltd.	0.45
Inner Mongolia Xiaoke Hydrogen Storage Alloy Co., Ltd.	0.35
Beijing Harmofinery Technology Co., Ltd.	0.15
Anshan Kingpowers Advanced Materials Co., Ltd.	0.09
Average Operating Rate	0.30

Source: SMM

4. Survey of Major Chinese Polishing Powder Producers

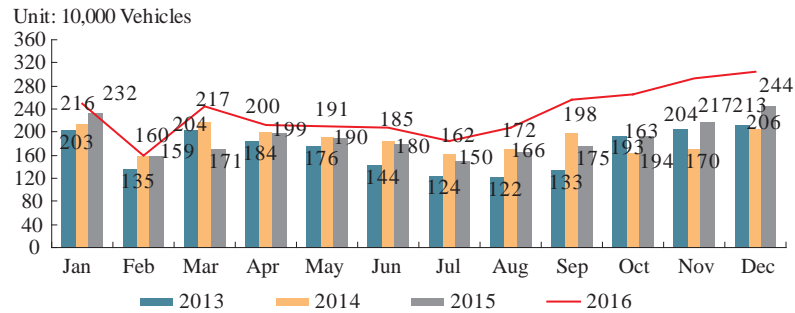
Average operating rate in polishing powder industry was below 30% in Q4 2016, SMM's survey found. Operating rates at large companies, such as Zibo Linzi Xinfangyuan Chemical and Baotou Tianjiao Seimi Polishing Powder were around 50%, compared with 30% at Lanzhou Debao Chemical. Operating rates at medium companies were below 40%, while many small companies have closed.

Most companies in our survey samples expect operating rates to remain stable in Q1 2017 against soft demand.

End-User Markets

1. New Energy Auto Sector

Figure 9: China Automobile Sales Volume



Source: CAAM

According to the China Association of Automobile Manufacturers (CAAM), China produced 517,000 electric vehicles in 2016, up 51.7% YoY. Electric automobile sales were 507,000 vehicles, up 53% YoY.

Commercial new energy automobile output was 172,000 vehicles, up 36.8% YoY; sales were 170,000 vehicles, up 37.7% YoY. Sales of pure electric commercial vehicles rose 50.7% YoY to 152,000 vehicles. Sales of plug-in electric hybrid passenger vehicles fell 19.3% YoY to 19,000 units.

On the heels of the subsidy cheating in 2016, relevant policies were adjusted accordingly. But Chinese government did not change support for the new energy automobile industry and considered the new energy vehicle industry as a pillar industry in the future.

The Industry & Information Technology Minister Miao Wei said that the Ministry of Industry & Information Technology (MIIT) has made the Medium to Long-Term Development Plan for the Automotive Industry. According to the plan, domestic new energy vehicle production will reach 2 million units by 2020, and the proportion of new energy vehicles in the new automobile sales will reach 20% by 2025. But subsidies are also lowered. Based on current situation, at least 20% growth is expected.

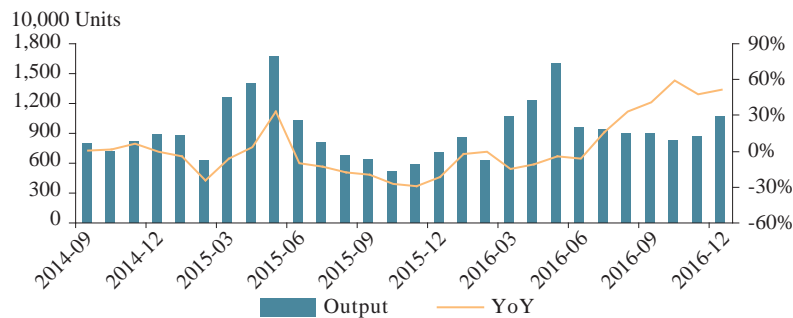
CAAM data show China's automobile output and sales hit an all-time high in 2016 and remained the highest in the world for eight years in a row.

China's automobile output and sales were 28.12 million and 28.03 million vehicles, respectively, in 2016, up 14.5% and 13.7% YoY, with growth up 11.2 percentage points and 9.0 percentage points compared with 2015.

Supply-side reform in China's automobile industry was enhanced in 2016, helped by preferential purchase tax policy, pushing of reform and innovation and macroeconomic policy. Product structure adjustment and upgrading accelerated, with growth of output and sales speeding up. Noticeable growth in economic benefit of China's automobile industry played an important role in macroeconomy.

2. Air-Conditioner Industry

Figure 10: China Air-Conditioner Output

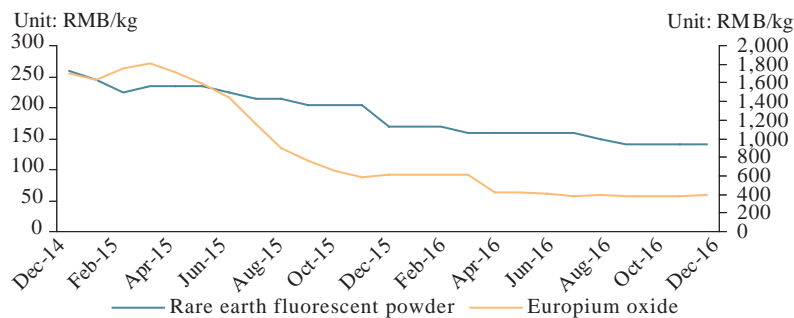


Source: ChinaIOL

China's household air-conditioner output grew 51.89% YoY to 10.69 million sets in December 2016. Sales were 8.52 million sets, up 42.47% YoY. Home sales increased 82.36% YoY to 5.20 million sets, and exports were 3.32 million sets, up 6.15% YoY. Inventories were 9.76 million sets, up 67.70% YoY. Growth in home sales hit an 8-year high. The rapid growth is because home sales were extremely low in the same period of 2015 after stock depletion at distributors. Besides, market expectations of price hike and boost from the property market were also attributable to the rapid growth in home sales. Inventories at the air conditioner industry fell sharply in the first half of 2016, and grew in the latter half of the year due to completion of destocking and high temperatures during the summer season. Home sales slid in 2016 and are expected to grow rapidly in the first three quarters of 2017, helped by the property market and low cardinal number. Air conditioner exports grew steadily in December 2016.

3. Lighting

Figure 11: China Rare Earth Fluorescent Powder Price



Source: SMM

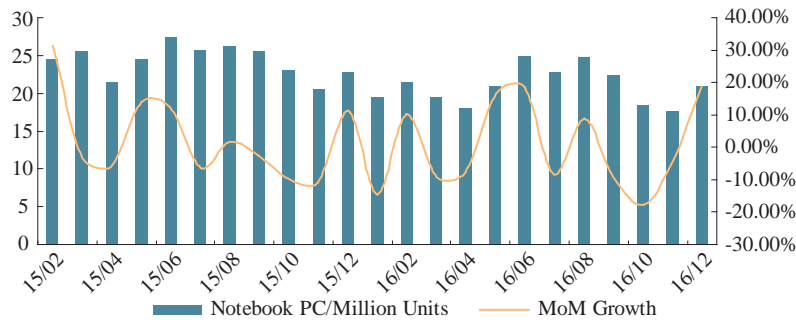
China's rare earth fluorescent powder output peaked at 8,000 mt in 2011. Three primary colors energy saving lamps have been substituted by LED. Fluorescent powder consumption also decreased with improving technology. Low-priced calcium halophosphate fluorescent powder is also used in lamps. In this context, output of three primary colors energy saving lamps fell from 8,500 mt in 2011 to 4,500 mt in 2012, with annual drop of 25% during 2013-2015. Output fell to 2,000 mt in late 2015. SMM expects China's rare earth fluorescent powder output to decrease further to 1,800 mt in 2016.

With the decrease in LED costs and national energy conservation and environmental protection policy support, the penetration of energy-saving lamps in the outdoor, industrial and commercial sectors will be higher and higher during 2017-2019. The growth of the lighting market will push fluorescent powder demand. But LED lamps use lamp bead chip, and the use of three primary colors fluorescent powder is about 1/4 of that used by energy-saving lamps with the same power. Therefore, LED lights will replace part of the market share of energy-saving lamps and will in turn offset the growth in fluorescent powder consumption contributed by the expanded lighting market.

REO content in three primary colors fluorescent powder is about 50%. SMM calculates that REO consumption by fluorescent powder industry was about 900 mt in 2016. The three primary colors fluorescent powder market will be further squeezed by new products during 2017-2019, so REO consumption will decrease to below 700 mt.

4. Electronics

Figure 12: Notebook PC LED Panel Shipments



Source: WitsView

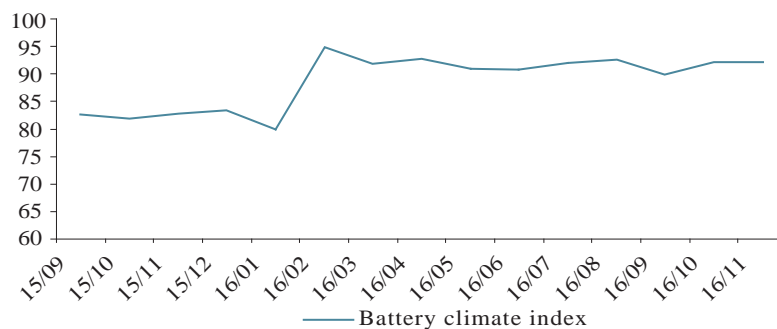
Market research firms Gartner and IDC found global PC shipments decreased in Q4 2016. Gartner estimated global PC shipments decreased 3.7% YoY to 72.60 million sets in Q4 2016, falling for the ninth straight quarter. PC shipments have been declining from 2012, according to the company's data.

"The PC market had been stagnant until Q4 2016," Gartner Chief Analyst Mikako Kitagawa said in a statement. "Technological improvement is not enough to push real market growth. But appearance innovation continues, and battery service life has been prolonged. Big PC fans still prefer PCs, but will barely contribute to growth of the overall market.

IDC is more optimistic. "Q4's result reinforced our expectations that the market will stabilize or recover." IDC analyst Loren Loverde said in a statement. "Traditional PC shipments shrank over the past five years but may improve with system updating by users. Traditional PC market has opportunities and consumption is expected to pick up because of lower pressure from mobile phone and tablet PC markets.

5. Battery Industry

Figure 13: China Battery Climate Index



Source: China National Light Industry Information Center

China Motive and Energy Storage Battery Industry Development White Paper (2016) pointed out China has been an important producing country of new energy vehicles. After subsidy cheat investigation, suspension of application for ternary battery used in bus, release of motive battery industry norms directory and directory of new energy vehicle promotion in early 2016, the new energy vehicles industry policy has gradually changed toward "policy + market" driven mode, and will form a "new energy car points + carbon quota" dual system in the future.

Despite negative effects from above the foresaid, domestic new energy vehicle sales totaled 517,000 units in 2016. Motive battery output was about 25.25 billion Wh in 2016. Battery installation increased 61% YoY in 2016.

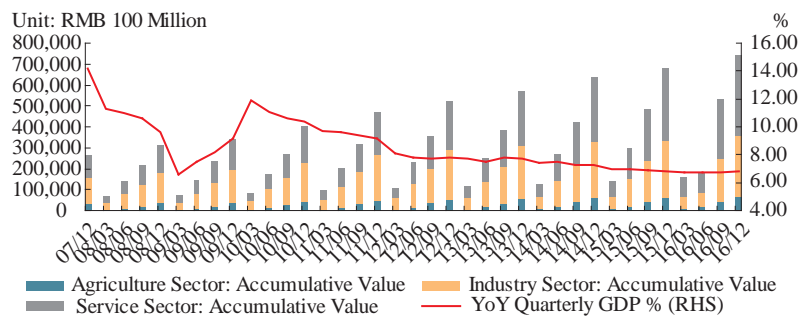
Taking into account the energy density and other properties, ternary batteries and lithium iron phosphate batteries will remain mainstream battery products in recent years. Shipments of lithium iron phosphate batteries accounted for over 70% in total market share in 2016. There were 73 lithium iron phosphate battery producers and 64 ternary battery producers.

Investment and capacity of motive battery continue expanding. According to the White Paper, motive battery investment is mainly in the first three quarters, with total investment of RMB 200 billion based on incomplete statistics. Expansion projects exceeded 78, and the number of new motive battery production projects was 21, with 10 expansion and capital increase projects, 11 new energy resources material investment projects and 1 membrane project.

Macroeconomy and Relevant Markets

1. China GDP Grew Slightly in Q4 on Supply-Side Structural Reform

Figure 14: China GDP



Source: NBS

According to preliminary data, China GDP totaled RMB 74.4 trillion in 2016, up 6.7% YoY on the comparable price basis. By quarter, GDP rose 6.7%, 6.7%, 6.7% and 6.8% in four quarters respectively on a yearly basis. By industry, value added was RMB 6.37 trillion in the first industry, up 3.3% YoY, and that expanded 6.1% YoY to RMB 29.62 trillion in the second industry and increased 7.8% YoY to RMB 38.42 trillion in the third industry.

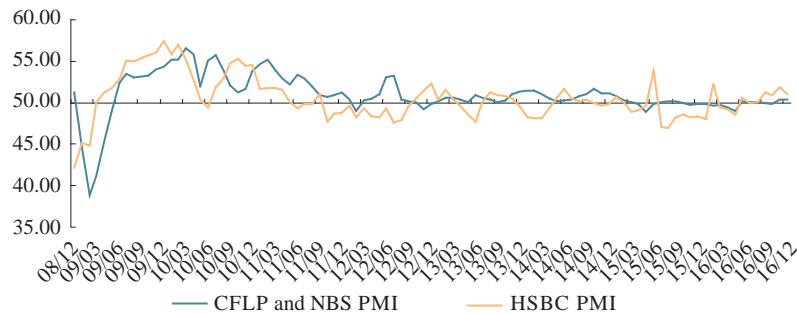
This indicated that China's economy approaches to bottom of a long business cycle. Economic growth will not range widely unless the government makes mistakes on policies. Positive impact from supply-side structural reform showed up in 2016, especially in industrial product prices and profits at industrial enterprises. Rising prices and industry indicated an improving economic growth quality, helping reverse market prospect on China's economy.

Stable industrial production was attributed as the main driver behind China's stable GDP growth in 2016. Industrial added value expanded 6.0% in 2016 and the growth stabilized above 6.0% from March 2016. Promotion of supply-side structural reform eased conflicts between demand and supply, the key factor for the stable industrial production in 2016. Sales and production rate at industrial enterprises was 97.8%, up 0.2 percentage point from 2015's level and the rate hit the highest level from 2014 at 98.8% in December 2016. As external demand improved, export delivery value expanded 0.4% or 2.2 percentage points from 2015's level.

To sum up, China's economic data was positive in 2016 thanks to fiscal stimulus and supply-side structural reform. Positive effect from supply-side structural reform was the core factor for China's stable economy. Improving internal investment and external demand will support China's economy to remain stable in 2017.

2. China Manufacturing PMI Stabilizes at Lows in December 2016 and to Face Downward Pressure in 2017

Figure 15: China Manufacturing PMI



Sources: CFLP, HSBC, Markit

China's manufacturing PMI kept stable in December 2016 and dropped to 51.4% from November's 51.7%. By sub-items, index of raw material price and delivery time increased on a monthly basis while other ten indexes dropped. Manufacturing PMIs were above 50% at large enterprises while those were below 50% at SMEs. Manufacturing PMIs in November and December were two highs in 2016 and the data expanded for five months in a row, and gap between new orders and finished goods inventory widened further, a sign of stable manufacturing PMI stabilized. With tight monetary policy and falling loans, China's economy will meet downward pressure from Q2 2017.

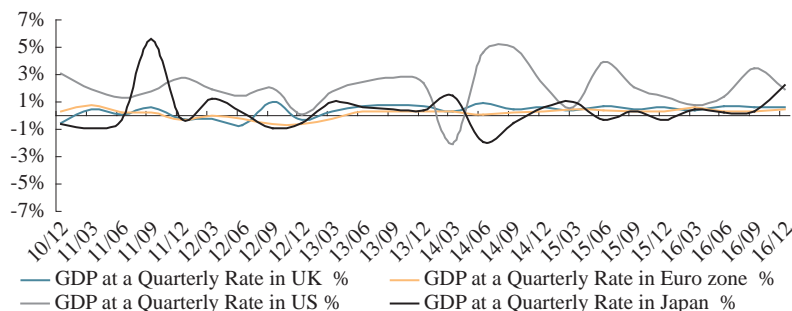
Demand: Index of import and export orders was the second high in 2016, showing an improving demand. Index of new orders hit a 2-year high at 53.2% in December, which was flat at November's level. Index of export orders fell 0.2 percentage point MoM and index of import dropped 0.3 percentage point MoM and backlog of orders fell 0.5 percentage point MoM.

Supply: Enterprises inventories dropped after demand increased. Production index fell 0.6 percentage point MoM to 53.3% in December but was still in rising territory. The decline was due largely to output reduction resulted by environmental protection inspections. PMIs in high energy consumption industry and ferrous metal smelting and rolling industry narrowed. Raw material inventory continued declining by 0.4 percentage point MoM and finished goods inventory dropped sharply by 1.5 percentage points, the lowest level since 2010.

Price: Purchasing prices grew 1.3 percentage points MoM to 69.6 in December 2016, the seventh month growth, hitting the highest level from 2011. Considering the base effect, global crude oil prices will increase thanks to output reduction. This, together with depreciation pressure on Chinese yuan, will allow PPI to rise further in Q1 2017.

3. Japan GDP Rises for Three Quarters and US GDP Growth Falls

Figure 16: GDP of Major Developed Countries and Economies



Sources: US Commerce Department, Markit

US: US's Department of Commerce issued final reading of GDP on December 22, 2016. US's real GDP for Q3 grew 3.5% YoY, which was higher than second expectation at 3.2%, hitting the highest growth since 2014. The Department of Commerce attributed the rising consumption expenditures and nonresidential fixed-asset investment as the main drivers behind the economic growth in Q3. According to the fresh reading released on January 27, 2017, US real GDP increased 1.9% YoY in Q4 2016.

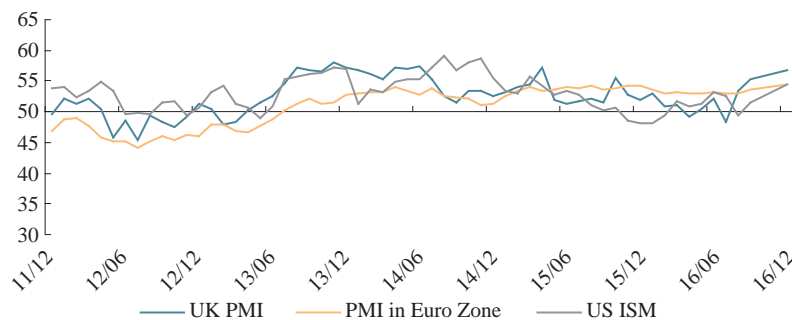
UK: UK's Statistics Authority announced on January 26, 2017 that UK's GDP expanded 0.6% quarter to quarter in Q4 2016 and remained higher-than-average growth from Q3, overturning expectation over economic growth decline after Brexit in June 2016. One UK's Statistics Authority statistician Darren Morgan indicated that strong consumption expenditure allowed GDP to expand in service industry. Manufacturing industry rallied from lows seen in Q3 2016 and construction industry held small changes. However, most analysts are negative toward 2017's economy. Pound dropped significantly after vote for leaving from EU, strengthening inflation pressure on households and enterprises.

Eurozone: Final reading of eurozone GDP rose 0.3% quarter-to-quarter in Q3 2016 after seasonally adjustment, released by Eurostat on December 6, 2016 with growth meeting market expectation and fresh reading. Final reading of eurozone GDP expanded 1.7% YoY in Q3 2016 and the growth was higher than expectation and fresh reading at 1.6%. Private and government consumption helped eurozone economy increase in Q3 2016 while trade restrained economic output.

Japan: Japan's GDP released on November 14, 2016 kept growing by 2.2% YoY in Q3 2016, the longest economic growth period in three years. Abe promised to revitalize economy but failed according to Japan's low economic growth. Continuous rises in GDP is a good news for Shinzo Abe, who involves in finding ways to promote Japan's economy. Ease monetary policy and economic stimulus failed stimulating Japan's households and enterprises to increase consumption, which will also be confirmed by economic data issue in the future.

4. Global Manufacturing Activities Stay Robust in Q4 2016

Figure 17: PMI in Major Developed Countries



Source: Markit

US: US's manufacturing PMI increased to 54.7 from 53.2 in December 2016, which was higher than economists' expectation at 53.7, hitting the highest level since December 2014. In December 2016, index of new orders in manufacturing industry rose 7.2 basis points to 60.2, production index grew 4.3 basis points to 60.3, employment index was up 0.8 basis point to 53.1 and new export orders increased 4 basis points to 56. By industry, manufacturing PMI in 11 of surveyed industries expanded while that dropped in 6 of them. According to the survey, computer, electronic product, metal product, machine, plastic and rubber product industries all showed decent demand, strengthening price rising pressure. And those industries expected orders to rise further in 2017. One analyst said that US manufacturing growth hit a 2-year high in December 2016, indicating that negative effect from rising US dollar and falling oil prices subsided gradually. US manufacturing industry will keep improving in 2017.

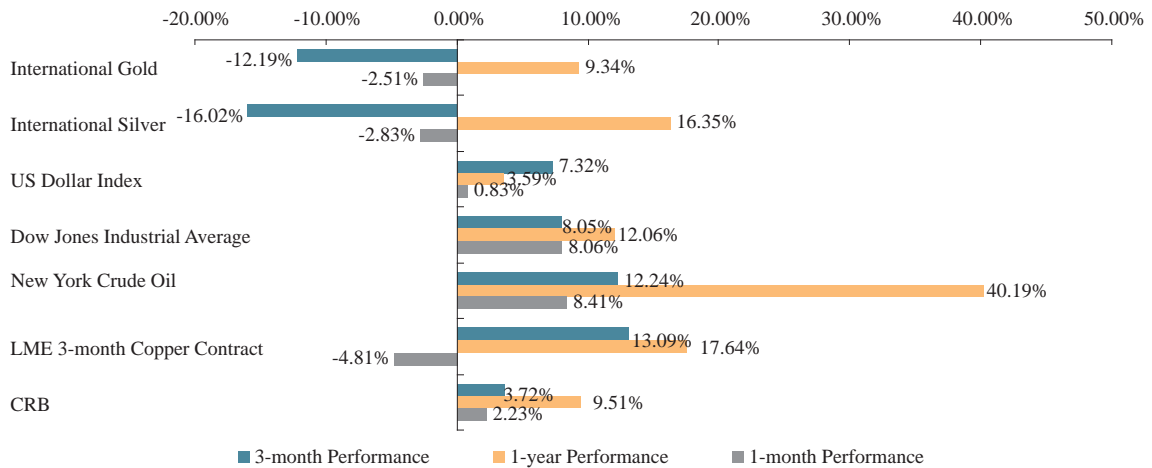
Eurozone: Eurozone enterprise activity growth hit a five-and-a-half year high in 2016, according to Markit data issued on January 4, 2017. Because depreciating euro stimulated demand on commodity and service in December 2016. Germany service industry remained stable growth in December 2016, despite of small decline of the growth, showing that private sector supported economy to rise. France's private sector activity also surged to an 18-month high in December 2016 thanks to higher-than-expected growth in service industry.

UK: UK's Markit services PMI rose to a 17-month high at 56.2 in December 2016 released on January 5, 2017 and UK's composite PMI was 56.7, which was higher than expectation at 55.0. According to Markit PMI released previously, enterprise

activity dropped sharply in July after the vote for leaving from EU in June. Bank of England thus launched a new round of stimulus plan in August 2016 and PMI later rallied quickly. But, according to UK's official data, UK's economy actually grew after the vote. Many analysts expected UK's inflation to rise to 3% in 2017 and Reuter's survey also found that UK's economy growth will halve to 1.1%. So far, UK's enterprises gained profits from decent demand. One company surveyed by Markit said that new orders hit the highest in December 2016 since March 2015.

5. Relevant Markets

Figure 18: Market Movement



Sources: WIND, SMM

Appendix

Appendix 1: SMM Main Rare Earth Prices

Product	Grade	Unit	2016/12/30	Average Price		
				Oct.	Nov.	Dec.
Rare earth carbonate	REO 42.0-45.0%	RMB/mt	21,500	21,500	21,500	21,500
Lanthanum oxide	La ₂ O ₃ /TREO 99.5-99.9%	RMB/mt	13,500	11,188	12,041	13,081
Cerium oxide	CeO ₂ /TREO 99.5-99.9%	RMB/mt	12,500	9,406	9,732	10,893
Praseodymium oxide	Pr ₆ O ₁₁ /TREO 99.0-99.9%	RMB/mt	325,000	312,781	317,273	321,833
Neodymium oxide	Nd ₂ O ₃ /TREO 99.0-99.9%	RMB/mt	259,000	254,000	254,000	258,667
Samarium oxide	Sm ₂ O ₃ /TREO 99.5-99.9%	RMB/mt	12,500	12,500	12,500	12,500
Europium oxide	Eu ₂ O ₃ /TREO 99.95-99.99%	RMB/kg	395	380	380	395
Gadolinium oxide	Gd ₂ O ₃ /TREO 99.5-99.9%	RMB/mt	69,500	66,813	67,091	69,690
Terbium oxide	Tb ₄ O ₇ /TREO 99.95-99.99%	RMB/kg	2,875	2,720	2,788	2,908
Dysprosium oxide	Dy ₂ O ₃ /TREO 99.5-99.9%	RMB/kg	1,200	1,209	1,216	1,227
Erbium oxide	Er ₂ O ₃ /TREO 99.5-99.9%	RMB/mt	171,000	162,500	162,500	170,429
Yttrium oxide	Y ₂ O ₃ /TREO 99.995-99.999%	RMB/mt	21,500	21,500	21,500	21,500
Didymium oxide	(Nd ₂ O ₃ +Pr ₆ O ₁₁)/TREO≥75.0%	RMB/mt	259,000	245,156	247,682	259,595
Lanthanum metal	La/TREM≥99.0%	RMB/mt	32,500	29,500	29,500	30,929
Cerium metal	Ce/TREM≥99.0%	RMB/mt	32,500	30,500	30,500	31,452
Praseodymium metal	Pr/TREM 96.0-99.0%	RMB/mt	460,000	460,000	460,000	460,000
Neodymium metal	Nd/TREM 99.0-99.9%	RMB/mt	337,500	316,500	320,409	334,262
Terbium metal	Tb/TREM≥99.9%	RMB/kg	3,900	3,506	3,645	3,900
Dysprosium metal	Dy/TREM≥99%	RMB/kg	1,650	1,650	1,650	1,650
Yttrium metal	Y/TREM 99.9-99.95%	RMB/kg	225	225	225	225
Cerium misch metal	Ce/TREM≥65.0% TREM≥98.5%	RMB/mt	29,000	24,469	25,136	28,000
Praseodymium-neodymium alloy	Pr/TREM 20-25% Nd/TREM 75-80% TREM≥98.5%	RMB/mt	337,500	314,719	319,432	335,810
Praseodymium-neodymium-dysprosium alloy	TREM≥99.0%	RMB/mt	339,500	316,375	319,182	335,595
Battery class misch metal	TREM≥99.0% Nd/TREM≥15%	RMB/mt	125,000	125,000	125,000	125,000
Dysprosium-iron alloy	Dy80%	RMB/mt	1,240,000	1,231,875	1,239,318	1,252,143

Note: SMM rare earth prices refer to mainstream average traded prices in major domestic markets which are settled on the basis of various price levels in markets, producers and traders.

Attachment 2: Major Chinese Laws and Regulations on Rare Earth Industry in Recent Years

Issue Date	Laws and Regulations on Rare Earth Industry Content
Dec. 2016	China's Ministry of Commerce published 2017 Catalogue of Goods Subject to Export License Administration on December 30, 2016, which was implemented from January 1, 2017. According to the 2017 Catalogue, rare earth subjects to export license administration. Exports of cerium and its alloy (<500 μm) are free from export license but exporters should apply for Dual-Use Items and Technologies Export Licenses.
Dec. 2016	China eight ministries, including Ministry of Industry&Information Technology, jointly announced to launch inspections on illegal activities on rare earth from December 2016 to April 2017. The inspection team will crackdown rare earth illegal mining and illegal process of ore products in the name of comprehensive utilization, standardize rare earth trade, trace suppliers of low-price rare earth and inspect supervisory responsibility of local governments.
Dec. 2016	China's State Council delegated approval rights of rare earth mine exploitation and smelting and separating projects in December 2016.
Dec. 2016	Five departments, including Commission of Industry&Information Technology of Ganzhou, launched inspections on rare earth recycling through classification in December 2016.
Oct. 2016	China's Ministry of Industry & Information Technology (MIIT) issued the <i>Rare Earth Industry Development Plan (2016-2020)</i> on October 18. The Plan summarizes achievements and defects in Chinese rare earth sector during 12 th Five-Year period and identifies the key tasks for the next five years, with model of supply side reform + high-end applications promotion. And Chinese government will eliminate outdated rare earth capacity and reduce rare earth annual separation capacity to 200,000 mt/yr by 2020.
Jul. 2016	In July, China's Ministry of Land & Resources released the circular on total rare earth mining quota in 2016, which sets 105,000 mt of rare earth oxides (REO) mining quotas in 2016, including 17,900 mt of the ion-absorption-type medium and heavy rare earths, and 87,100 mt of the rock-type light rare earths.

Attachment 2: Major Chinese Laws and Regulations on Rare Earth Industry in Recent Years (Continue)

Issue Date	Laws and Regulations on Rare Earth Industry Content
May 2016	On May 10, China's Ministry of Finance and State Administration of Taxation jointly released the Notice on the Implementation of the Reform of Resource Tax, which takes effect since July 1, 2016. The notice leaves resource tax unchanged for crude oil, natural gas, coal, rare earth, tungsten and molybdenum, whose taxes are levied based on prices.
Apr. 2016	China's Ministry of Land and Resources issued on April 14 the Outlines of the 13 th Five-Year Plan for Land and Resources. The Outlines specify more effective exploration and protection of land and resources, improvement of mineral reserve mechanism and increase in stockpiling of strategic mineral resources, including tungsten, rare earth and crystalline graphite etc.
Apr. 2016	To implement the relevant resolutions of the Security Council of the United Nations, China's Foreign Trade Law now forbid imports of gold ore, titanium ore, vanadium ore and rare earth minerals from North Korea.
Apr. 2016	China's Ministry of Industry & Information Technology (MIIT) recently announced production limit plan on the first batch of rare earth in 2016. The rare earth ore production shall be controlled at 525,000 mt in China and smelting and separation products shall be controlled at 45,000 mt. Of which, six large rare earth producers can produce 52,440 mt of ore products and 44,805 mt of smelting and separation products.
Dec. 2015	The Standardization Administration of the People's Republic of China (SAC) reports the General Administration of Quality Supervision, Inspection and Quarantine and the SAC approved and promulgated 23 national standards for the rare earth sector as of early December 2015. There were 14 standards revised, which will come into effect April 1, 2016. The other 9 standards were new and will take effect August 1, 2016.
Aug. 2015	China's Standardization Administration (SAC) issued <i>The Second Batch of National Standards Revision Plan 2015</i> on July 31. The plan covers SCR catalyst, determination of aluminum oxide content (GB/T 18882.2-200) - the 2th part of chemical analysis methods for mixed rare earth oxide of ion-absorbed rare earth ore, and determination of lead oxide content (GB/T 16484.13-2009) - the 13th part of methods for chemical analysis of rare earth chloride and carbonate.
Jul. 2015	Central Board of Excise and Customs (CBEC) announced on July 28 to accept the final result of anti-dumping investigation concerning imports of compact fluorescent lamps (CFL) from China and will levy anti-dumping duties on CFL imports from China for a period of 5 years, effectively July 28, 2015. The tax rate shall be USD 0.3 for each CFL and Customs assigned number is 8539.
May 2015	Chinese government decided to levy resource tax on rare earth, tungsten, and molybdenum based on prices starting from May 1, to replace the old volume-based, with an 11.5% rate for Inner Mongolia light rare earths, 9.5% for Sichuan and 7.5% for Shandong. The tax rate for medium and heavy rare earth was set at 27%.
Apr. 2015	The MIIT announced the first batch of rare earth production quota for this year, which includes 52,500 mt of rare earth mining products and 50,050 mt of rare earth smelting and separating products. Production quota allocated to six rare earth groups totals 96,402 mt, including 49,712 mt of mining products and 46,690 mt of smelting and separating products. China Northern Rare Earth (Group) High-Tech has obtained production quota for 29,750 mt of mining products and 25,960 mt of smelting and separating products, accounting for nearly 60% of quota allocated to six groups.
Dec. 2014	The Ministry of Commerce issued Export License Management Cargo Catalogue 2015, requiring that rare earth exports shall be subject to export license management. Companies are required to apply for export license with export contracts. China cancelled rare earth export quotas, effective January 1, 2015, but has kept export tariff on rare earth in place.
Oct. 2014	The Ministry of Industry & Information Technology, the Ministry of Public Security, the Ministry of Land & Resources, the Ministry of Environmental Protection, the General Administration of Customs, the State Administration of Taxation, the State Administration for Industry & Commerce and the State Administration of Work Safety issued the Special Campaign on Cracking down on Violations of Laws and Regulations Regarding Rare Earth.
Aug. 2014	The Ministry of Industry & Information Technology (MIIT) released the second list of companies required to eliminate outdated and excess capacity in 2014. The list covers 28 rare earth oxide companies with a total capacity of 103,710 mt/yr.
Jul. 2014	Notice of the State Council on Issuing the Planning for the Development of the Energy-Saving and New Energy Automobile Industry (2012-2020) (No. 22 [2012] of the State Council) was released.
Jul. 2014	China's Ministry of Commerce (MOFCOM) announced the second batch of rare earth export quotas for 2014, including 13,691 mt of light rare earth and 1,809 mt of medium and heavy rare earth.
Jul. 2014	The Ministry of Industry & Information Technology (MIIT) promulgated subsidy capital regulations for the rare earth industry.
May 2014	The MIIT released Rare-Earth Mine Development Project Examination & Approval and Rare-Earth Smelting & Separation Project Examination & Approval.
Mar. 2014	The MIIT released the first batch of rare earth production control plan for 2014.
Feb. 14	In accordance with the provisions of the Regulation of the People's Republic of China on the Administration of the Import and Export of Goods and Measures for the Administration of Export Commodities Quotas, the Ministry of Commerce issued the Circular on Supplemental Allocation of the First Batch of Export Quotas of antimony, silver, rare earth and tin in 2014.
Feb. 14	In order to accelerate application and promotion of clean production technologies in key industries and effectively reduce pollutant discharge, the Ministry of Industry & Information Technology (MIIT) published Rare Earth Clean Production Technology Promotion Program.
Jan-14	The Ministry of Industry & Information Technology (MIIT) decided to press on with consolidation in rare earth industry which will be led by Batou Iron & Steel, China Minmetals, Chalco, Guangdong Rare Earth Industry, Ganzhou Rare Earth, and Xiamen Tungsten.

Sources: SMM, Ministry of Land and Resources, Ministry of Commerce, Ministry of Industry and Information Technology, Ministry of Environmental Protection, the State Council, State Administration of Taxation, China Customs, Ministry of Finance

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SMM Research Team

Hotline: +86-21-5155-0322

Fax: +86-21-5155-0345

Email: service.en@smm.cn

Add: 8th FL in North Section, Building 9, Lujiazui Software Park, No. 20, Lane 91, E'Shan Road, Pudong New Area, Shanghai, 200127, China.

Web: <http://www.metal.com>

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