

EVALUATING RARE EARTH ELEMENT AVAILABILITY: A CASE WITH REVOLUTIONARY DEMAND FROM CLEAN TECHNOLOGIES

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TABLE S1: ESTIMATED RE MASS FRACTION IN RARE EARTH OXIDE (REO) BASED ON TYPICAL REO CHEMICAL FORM¹.

Name	Abbreviated Name	Oxide Form	Mass Fraction Rare Earth Element
Cerium	Ce	CeO ₂	81.4%
Dysprosium	Dy	Dy ₂ O ₃	87.1%
Erbium	Er	Er ₂ O ₃	87.5%
Europium	Eu	Eu ₂ O ₃	86.4%
Gadolinium	Gd	Gd ₂ O ₃	86.8%
Holmium	Ho	Ho ₂ O ₃	87.3%
Lanthanum	La	La ₂ O ₃	85.3%
Lutetium	Lu	Lu ₂ O ₃	87.9%
Neodymium	Nd	Nd ₂ O ₃	85.7%
Praseodymium	Pr	Pr ₆ O ₁₁	82.8%
Samarium	Sa	Sm ₂ O ₃	86.2%
Terbium	Tb	Tb ₄ O ₇	85.0%
Thulium	Th	Tm ₂ O ₃	87.6%
Yttrium	Y	Y ₂ O ₃	78.7%
Ytterbium	Yt	Yb ₂ O ₃	87.8%

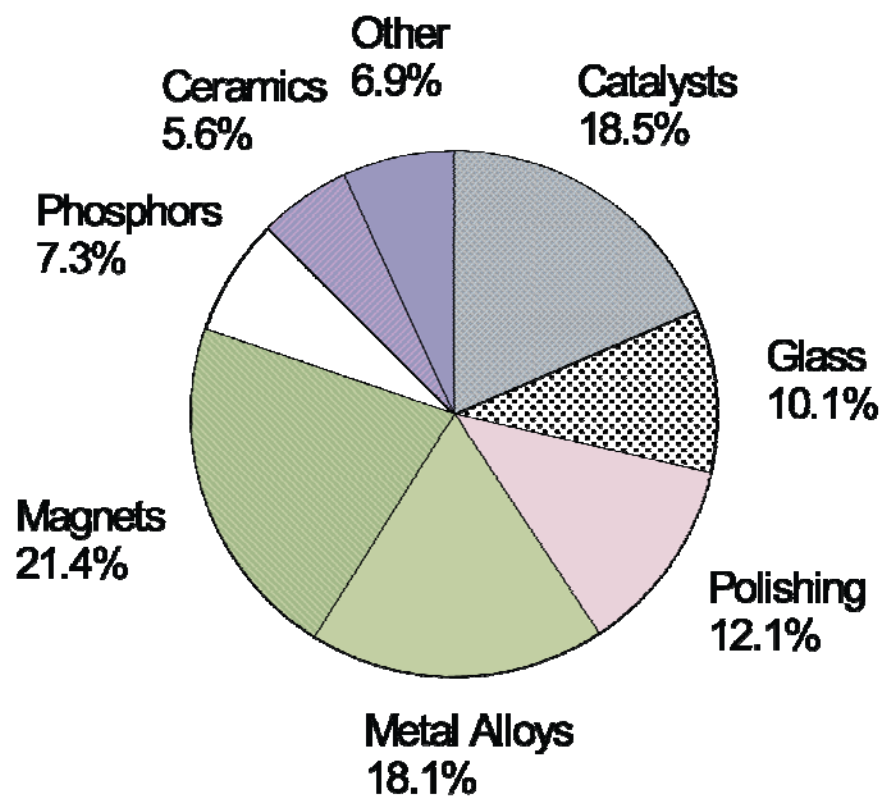


FIGURE S2: GLOBAL REO USAGE PERCENT BREAKDOWN BY APPLICATION IN 2008².

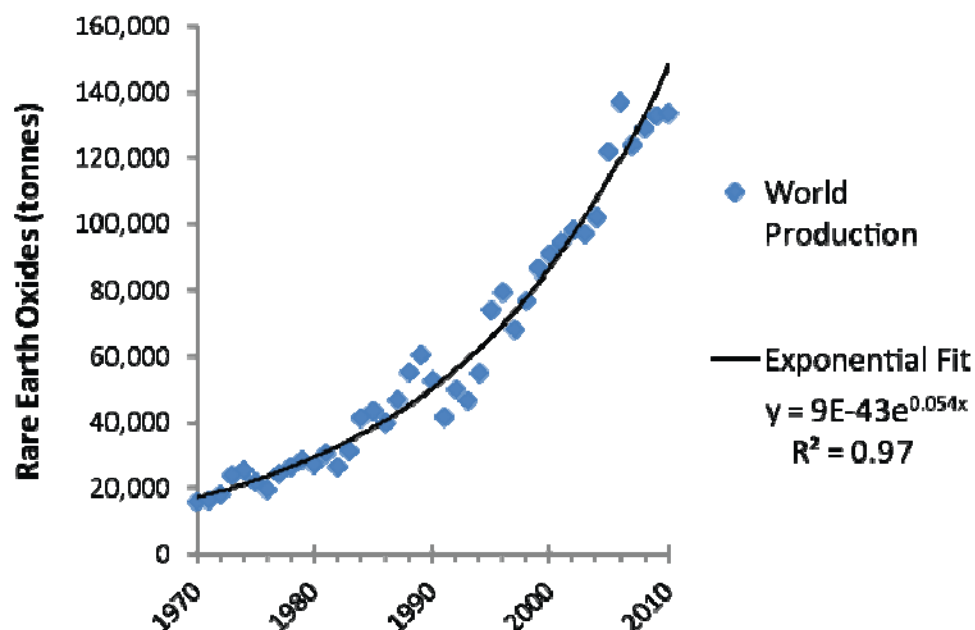


FIGURE S3: GLOBAL PRODUCTION OF REO WITH EXPONENTIAL FIT FOR 1970 TO 2010³.

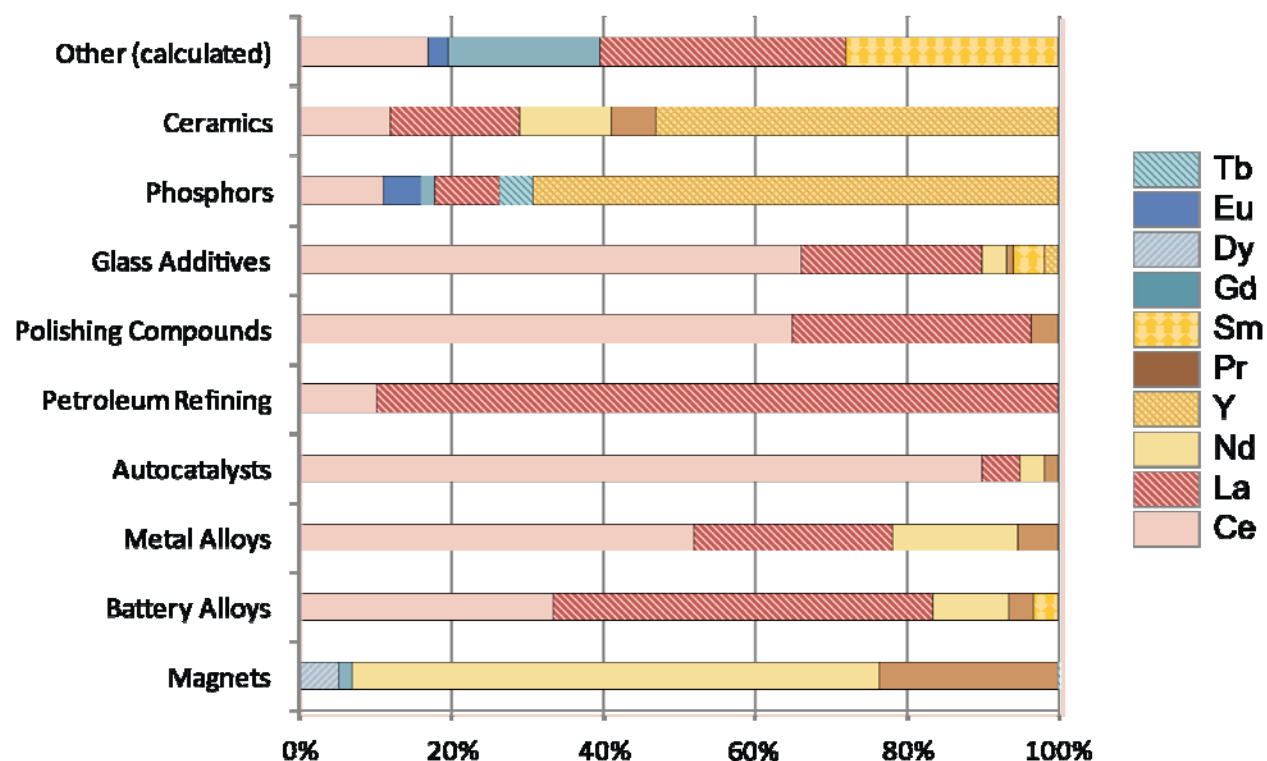


FIGURE S4: TYPICAL DISTRIBUTION OF INDIVIDUAL RARE EARTH (RE) USED FOR EACH APPLICATION (PERCENTAGES BASED ON REO BY MASS). BASED ON INFORMATION ON RARE EARTH ELEMENTS (REE) USED BY APPLICATION⁴ AND REO MOLECULAR FORMULAS¹.

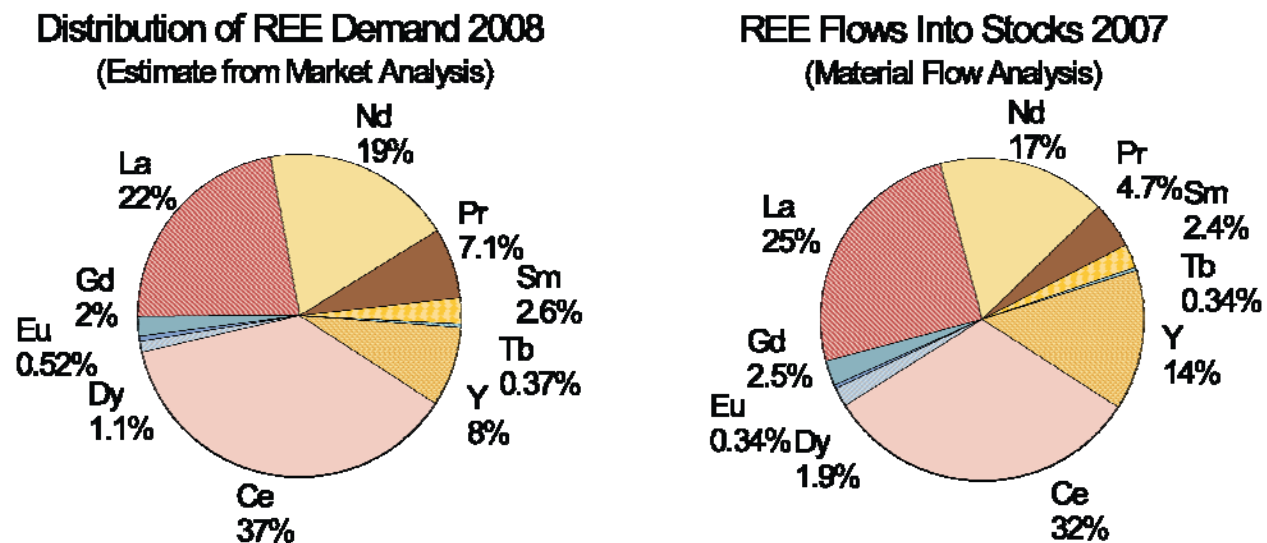


FIGURE S5: REE USE PROFILE: (LEFT) CALCULATED IN THE PRESENT WORK FOR 2008 BASED ON TOTAL RE DEMAND BY APPLICATION AND REE DISTRIBUTION USED IN EACH APPLICATION; (RIGHT) MATERIALS FLOW ANALYSIS RESULTS REPORTED BY DU AND GRAEDEL FOR 2007⁵.

TABLE S6: REE PER VEHICLE CONTENT (GRAMS OF REE)^{6,7}.

REE	Conventional	HEV with NiMH	HEV with Li-ion	PHEV	BEV	FCEV
Ce	Base Vehicle	+1021	-8.9	-8.9	-82.0	-82.0
Dy	Base Vehicle	+231	+231	+231	+347	+231
Eu	Base Vehicle					
Gd	Base Vehicle					
La	Base Vehicle	+730				
Nd	Base Vehicle	+684	+374	+374	+561	+374
Pr	Base Vehicle					
Sm	Base Vehicle					
Tb	Base Vehicle					
Y	Base Vehicle					
Other	Base Vehicle					
Total	Base Vehicle	+2667	+597	+597	+826	+524

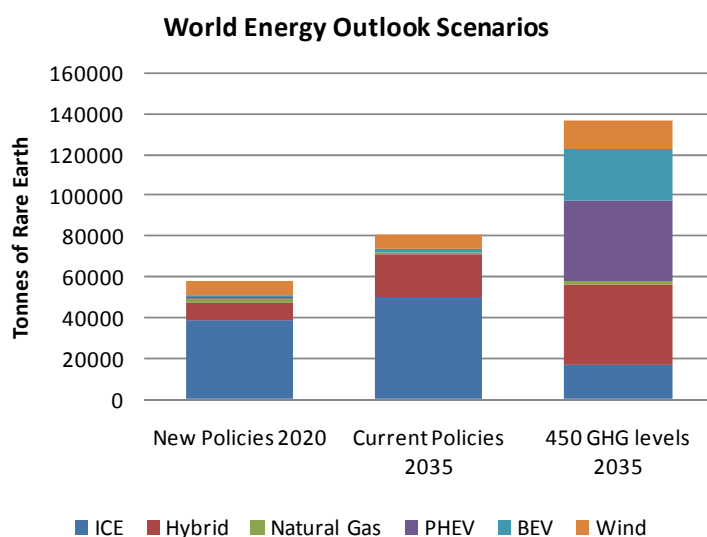


FIGURE S7: SCENARIO D: AUTOMOBILE AND WIND TURBINE RE DEMAND PROJECTIONS^{8,9}.

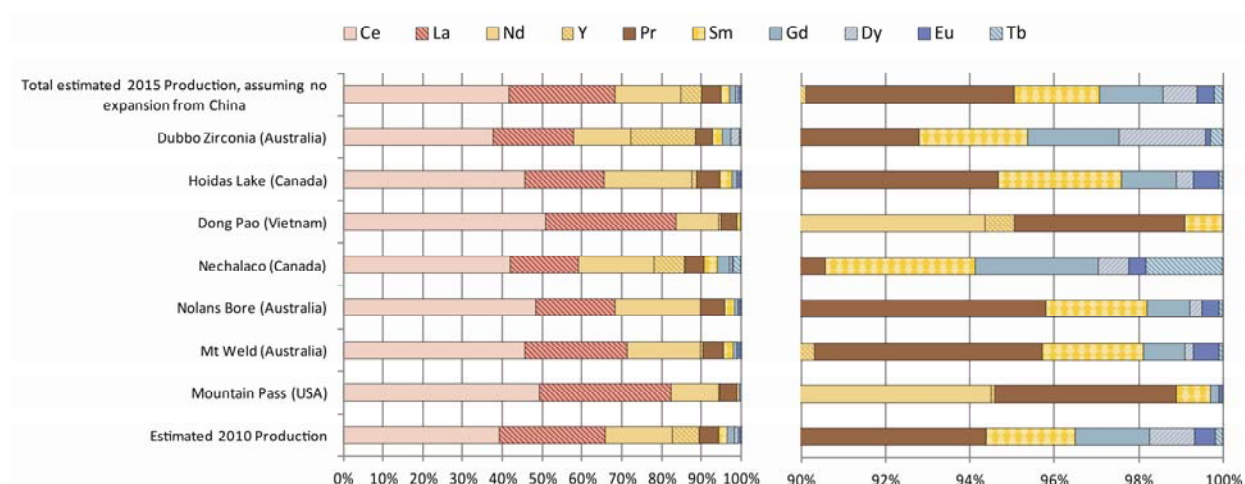


FIGURE S 8: DISTRIBUTION OF REO IN MINES EXPECTED TO BE PRODUCING IN NEXT 5 YEARS¹⁰.

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