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CANADA

# **THE RARE EARTH ELEMENTS INDUSTRY IN CANADA – SUMMARY OF EVIDENCE**

**Standing Committee on  
Natural Resources**

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# **THE RARE EARTH ELEMENTS INDUSTRY IN CANADA – SUMMARY OF EVIDENCE**

## **INTRODUCTION**

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In November 2013, the House of Commons Standing Committee on Natural Resources (hereafter “the Committee”) commenced a study on the rare earth elements (REE) industry in Canada. The purpose of this study was to gain a better understanding of the challenges and opportunities related to the development of REE in Canada and around the world. This document summarizes witness testimony presented to the Committee during the course of four meetings. It is organized according to the following topics: background information on REE and their applications; REE global market, including the role of China in rare earths supply; opportunities and challenges of developing rare earth resources in Canada with a brief overview of current exploration activity; and, ongoing initiatives that support Canada’s REE industry.



## PART I — BACKGROUND

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### A. What Are Rare Earth Elements?

Rare earth elements (REE)<sup>1</sup> are a group of 17 metals (including scandium and yttrium), which exhibit similar properties and occur in many of the same mineral deposits. According to Christine Villemure, Director General at Natural Resources Canada, contrary to what the term “rare earths” may suggest, REE are relatively abundant in the earth’s crust.<sup>2</sup> However, REE seldom occur in concentrations that are economically exploitable; instead, they are found together with other elements and as a result, are difficult to separate for extraction.<sup>3</sup>

### B. Major Uses and Applications of Rare Earth Elements

During the course of the study, the Committee learned that rare earths are essential in many applications, and therefore affect a range of industries in the Canadian and global economies.<sup>4</sup> Ms. Villemure told the Committee that “there is a dependency on [REE]” some of which “are absolutely essential...to develop clean technologies...and various electronic applications.” To illustrate this point, she listed some examples of high-technology goods that require REE: “Hybrid vehicles, rechargeable batteries, mobile phones, LCD screens, laptops, wind turbines, medical imaging equipment, radar systems, catalytic converters, alloys that are more corrosion-resistant.”<sup>5</sup> Furthermore, Alexander King, Director at the Critical Materials Institute in the U.S., explained that “rare earth elements in general have very unique properties” and that “there are no easy substitutes for them in most of their applications.”<sup>6</sup>

Additionally, the Committee learned that certain rare earths are used significantly in the production of high-performance magnets, also referred to as iron-barium magnets,

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1 REE are divided into two categories: light REE (lanthanum, cerium, neodymium, praseodymium) and heavy REE (terbium, europium, lutetium, gadolinium). (United States, Department of Energy, Office of Policy and International Affairs, Critical Materials Strategy, December 2010).

2 Standing Committee on Natural Resources (RNNR), [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure, Director General, Industry and Economic Analysis Branch, Natural Resources Canada).

3 Ibid.

4 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Alexander King, Director, Critical Material Institute); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson, Senior Vice-President, Minerals Services, SGS Canada, as an individual and member of the Canadian Rare Earth Elements Network); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno, Senior Research Analyst, Euro Pacific Canada, as an individual and member of the Canadian Rare Earth Elements Network).

5 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

6 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Alexander King).

which are then used in a wide range of products.<sup>7</sup> According to Anton Chakhmouradian, Professor at the University of Manitoba,

...out of some 70,000 tonnes of neodymium-iron-boron magnets that are manufactured every year, only about 15% are actually used to manufacture traction motors, wind turbines, and these kinds of things, with the remainder going into more mundane products ranging anywhere from magnetic resonance imaging to air conditioners, loudspeakers, hard drives, compact drives, and so on.<sup>8</sup>

Figure 1 demonstrates the REE value chain that starts with mineral raw materials and ends with specific consumer products and technologies.

**Figure 1: Rare Earth Elements Value Chain**



Source: The Canadian Rare Earth Elements Network, *brief presented to Committee*, 3 April 2014

7 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Alexander King).

8 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian, Professor, University of Manitoba, as an individual).

## PART II — RARE EARTH ELEMENTS GLOBAL MARKET

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### A. Global Rare Earths Demand and Supply

The Committee learned that global production of REE is approximately 130,000 tonnes per year, which is estimated to be worth around US\$4 billion, annually.<sup>9</sup> Although the total value of REE annual production may be small when compared to the production of other minerals (e.g., diamonds), Mr. Chakhmouradian discerned that rare earth metals support the manufacturing sector that is worth between US\$2 trillion and US\$4.8 trillion.<sup>10</sup> With respect to the forecasted global consumption of REE, Ms. Villemure observed that demand for rare earths is driven by the rising demand for many of its applications.<sup>11</sup> According to her, “over the last 10 to 15 years, the world consumption of rare earth elements has increased at 8% to 12% per annum, a trend that experts agree will continue, and may increase.”<sup>12</sup> Figure 2 illustrates global consumption of rare earth elements by application in 2010, and projected composition of global consumption in 2015.

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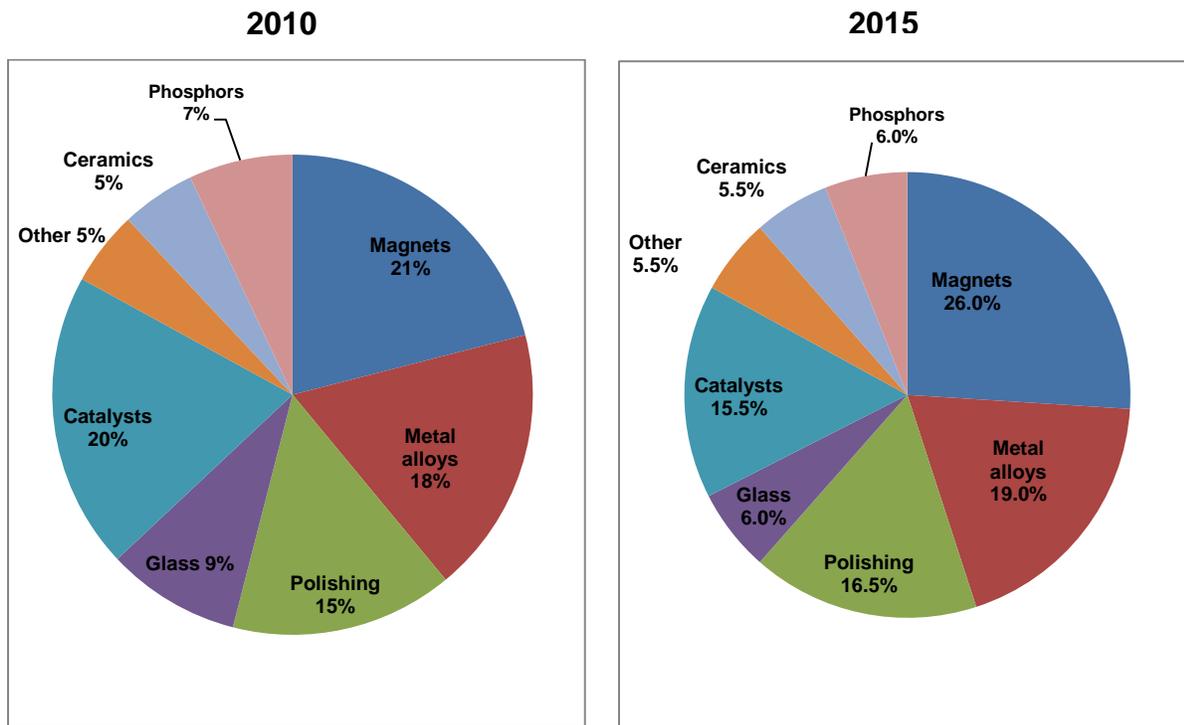
9 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

10 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

11 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

12 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

**Figure 2: Global Consumption of Rare Earth Elements by Application**



Source: Natural Resources Canada, *brief presented to the Committee*, 25 November 2013 and the Congressional Research Service

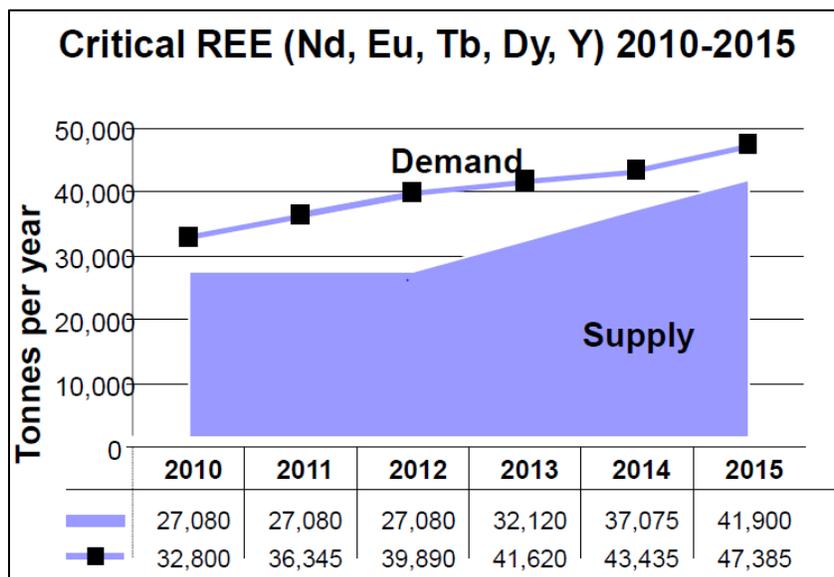
The Committee also heard that supply challenges are anticipated for REE that are necessary for the production of green technologies. In his presentation, Mr. Chakhmouradian elaborated that “a recent study by MIT scientists suggests that in the absence of efficient recycling programs, industrial demand for some of the rare-earth metals may shoot up as much as 2600% by 2025, which will significantly outpace the 30-year historical production trend (ca. 5% annually).”<sup>13</sup> On the basis of this type of projection, market analysts expect supply shortages for five REE – neodymium (Nd), Europium (Eu), Terbium (Tb), Dysprosium (Dy) and Yttrium (Y) – in the short to medium term (see Figure 3).<sup>14</sup> Because of their “scarcity, high demand, and criticality in much high-tech application,” Ms. Villemure indicated that these REE “have been defined as critical by the United States Department of Energy, Japan, and the European Community.”<sup>15</sup>

13 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

14 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky, President, Pele Mountain Resources Inc.); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (André Gauthier, Matamec Explorations Inc.).

15 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

**Figure 3: Supply and Demand of Critical Rare Earth Elements (2010–2015)**



Source: Natural Resources Canada, *brief presented to the Committee*, 25 November 2013.

## B. The Role of China in Supplying Rare Earths Global Demand

Committee members learned that international concerns about the forecasted demand and supply of “critical rare earths” have been exacerbated by the current REE global supply chain situation, where China plays a paramount role. Presently, China is the world’s largest producer of REE, and it accounts for more than 95% of rare earths’ global production.<sup>16</sup> It also has significant control over the various aspects of the rare earths supply chain. For example, André Gauthier, President and Chief Executive Officer of Matamec Explorations Inc., observed that “not only is China the leader in production, it is also unequivocally the leading expert in downstream processing [including] all economic spinoffs from secondary processing...tertiary processing.”<sup>17</sup> Since 2005, China has been implementing restrictions on its rare earths exports, which have resulted in significant REE price increases on a number of occasions.<sup>18</sup> For example, the price of lanthanum peaked at \$250/kg in 2011 compared to \$2/kg in 2007. Al Shefsky, President of Pele Mountain Resources Inc., explained that:

China restricts the export of rare earths in order to use much of its domestic production in manufacturing value-added products within its borders...China’s rare earth national strategy has played an important role in its achievement of extraordinary economic growth and high levels of domestic employment. [It] leads the world in the manufacture

16 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Magdi Habib, Director General, CanmetMINING, Natural Resources Canada); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (André Gauthier).

17 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (André Gauthier).

18 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

and export of many strategically important products made with rare earths. It has effectively leveraged its control of rare earth resources to dominate many clean energy and high technology value chains.<sup>19</sup>

While discussing the implications of China's export restrictions on the global supply of heavy REE, Luisa Moreno, Senior Research Analyst at Euro Pacific Canada, highlighted that China supplies nearly 100% of the world's heavy rare earths demand; however, its resources are diminishing significantly with less than 30 years' worth of estimated supply.<sup>20</sup>

In light of the supply challenges and demand projections for REE, witnesses indicated that many governments, private companies and research organizations are making significant investments to support the rapid development of rare earth resources outside of China.<sup>21</sup> Mr. Shefsky elaborated that in aggregate, governments around the world are spending "hundreds of millions of dollars...to secure their strategic and economic interests."<sup>22</sup> Governments in Korea, Japan, United States, United Kingdom, Belgium, Germany, and the European Union have created institutions and research programs that aim at diversifying the existing rare earth supply sources, recycling existing products, and developing substitute materials to minimize the use of rare earth metals.<sup>23</sup> For example, the United States established the Critical Materials Institute and committed \$120 million to the organization in order to secure supply chains of critical materials. Witnesses also discussed ongoing domestic REE-related initiatives (see Part IV); however, they noted that Canada has not invested in rare earth industry development to the same extent as other countries.<sup>24</sup>

Efforts to diversify supply have also been made by various industry stakeholders. According to Ms. Moreno, many REE companies were formed between 2008 and 2010, and over \$3 billion have been invested in major projects outside of China, such as Molycorp in the U.S. and Lynas in Australia.<sup>25</sup> Globally, 28 rare earth projects are in their advanced exploration and development stage and another 28 projects are in the resource identification stage. Steven Wilson, Senior Vice-President at the SGS Canada and a member of the Canadian Rare Earth Elements Network (CREEN), pointed out that out of

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19 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

20 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

21 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Magdi Habib).

22 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

23 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, *Briefing Document*, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 24 February 2014 (Ian London, Chair of the Canadian Rare Earth Elements Network).

24 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

25 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

these 56 projects, 19 are located in Canada. By comparison, 9 are in Australia, 5 are in the U.S., and 23 are spread across the rest of the world.<sup>26</sup> Efforts to secure rare earths supply have also been made by the end-user companies, which have significantly stockpiled rare earth metals, and have invested in improving their manufacturing efficiency, as well as their rare earth recycling, redesign and substitution.<sup>27</sup>

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26 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

27 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).



## PART III — RARE EARTH ELEMENTS IN CANADA

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### A. Canada's Rare Earths Resource Potential and Strategic Opportunity

Throughout the course of the study, the Committee heard that Canada has significant rare earth resource potential, and that developing REE is essential to the Canadian economy and global competitiveness. Witnesses remarked that Canada is “endowed with world-class rare earths deposits,” which account for approximately 40% to 50% of the world’s known REE reserves.<sup>28</sup> Mr. Wilson stated that “essentially, half of the rare earths that are available for exploitation outside of China are available in Canada.”<sup>29</sup> More importantly, it was highlighted that “Canada’s geology is rich in the heavy rare resources”: the same critical rare earth metals that are forecasted to be in deficit in the near future.<sup>30</sup>

In light of the aforementioned global rare earths market context and the importance of REE in numerous applications, witnesses observed that Canada has an opportunity to turn its rare earth deposits into a competitive advantage, and at the same time, secure its own supply of this resource for the future. Mr. Chakhmouradian suggested that “If Canada built on that potential and utilized its own resource potential it would not only be able to provide the rest of the world with sustainably sourced rare metals including critical rare earth metals, but it would also provide a much-needed vitamin boost to its own rare earth-based advanced technologies and industry.”<sup>31</sup> Similarly, Mr. Shefsky stated that :

Access to a reliable rare earth supply chain is essential to Canada’s strategic and economic security. With world-class deposits of its own, Canada is in a unique position not only to produce rare earths, but to create its own rare earth supply chain, thereby creating billions of dollars of economic activity along with thousands of high-paying jobs.<sup>32</sup>

Witnesses explained that Canada’s position is unique with respect to REE development not only because of its large rare earths reserves, but also because of the country’s stable investment environment and mining expertise. Pierre Neatby, Vice-President at Avalon Rare Metals, elaborated that:

Canada has a history of mining excellence and companies that are looking for rare earth products outside of China are looking for a culturally, politically stable country to invest in, and Canada fits that description. Some of the other projects that we’re competing against, whether they be in South Africa, Kyrgyzstan.... Those countries may not be seen as being as politically stable as a Canada, or a U.S., or an Australia. So having the Canadian

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28 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

29 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

30 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

31 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

32 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

government make a signal to these potential investors that Canada is supportive of rare earths would help us tremendously in attracting that investment.<sup>33</sup>

Similarly, Mr. Wilson remarked that “Canada has a tremendous leadership in expertise around science and technology...” and the right resources and skills to be at the forefront of the global rare earth industry.<sup>34</sup>

The Committee also heard that timely development of Canada’s rare earth deposits is paramount, and that “the window of opportunity is small”.<sup>35</sup> For instance, Ms. Moreno observed that :

From the perspective of the capital markets, we understand there is a race to supply. End users are looking for places around the world where they can set up infrastructure, where they can set up separation infrastructure, metal capabilities of rare earth materials, and other manufacturing capabilities associated with the rare earths.<sup>36</sup>

Mr. Neatby stressed that “Canada is in a race with Australia, the U.S., and others to develop an industry,” and that “Canada’s opportunity is now.”<sup>37</sup> Similarly, Mr. Shefsky asserted that “[Canada] can lead and win, but [it] must act decisively.” In his view, “if Canada does not adopt a national strategy, it will lose an extraordinary opportunity for economic growth and employment to foreign competitors who are investing heavily to seize this opportunity.”<sup>38</sup>

## **B. Current Rare Earth Exploration Activity and Projects in Canada**

Currently, there is no rare earths production or refining in Canada; however witnesses reported that exploration activity is quite high with more than 200 individual exploration projects across the country at various stages of development.<sup>39</sup> Figure 4 demonstrates the location of potential future rare earth mines in Canada. According to Mr. Chakhmouradian “the 20 most currently active exploration projects in [Canada] amount to some 38 million tonnes of contained total rare earth oxides, [accounting for] roughly 30% of the global total.”<sup>40</sup> He cautioned, however, that out of their geological

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33 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby, Vice-President, Sales and Marketing, Avalon Rare Metals Inc.).

34 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

35 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby).

36 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

37 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby).

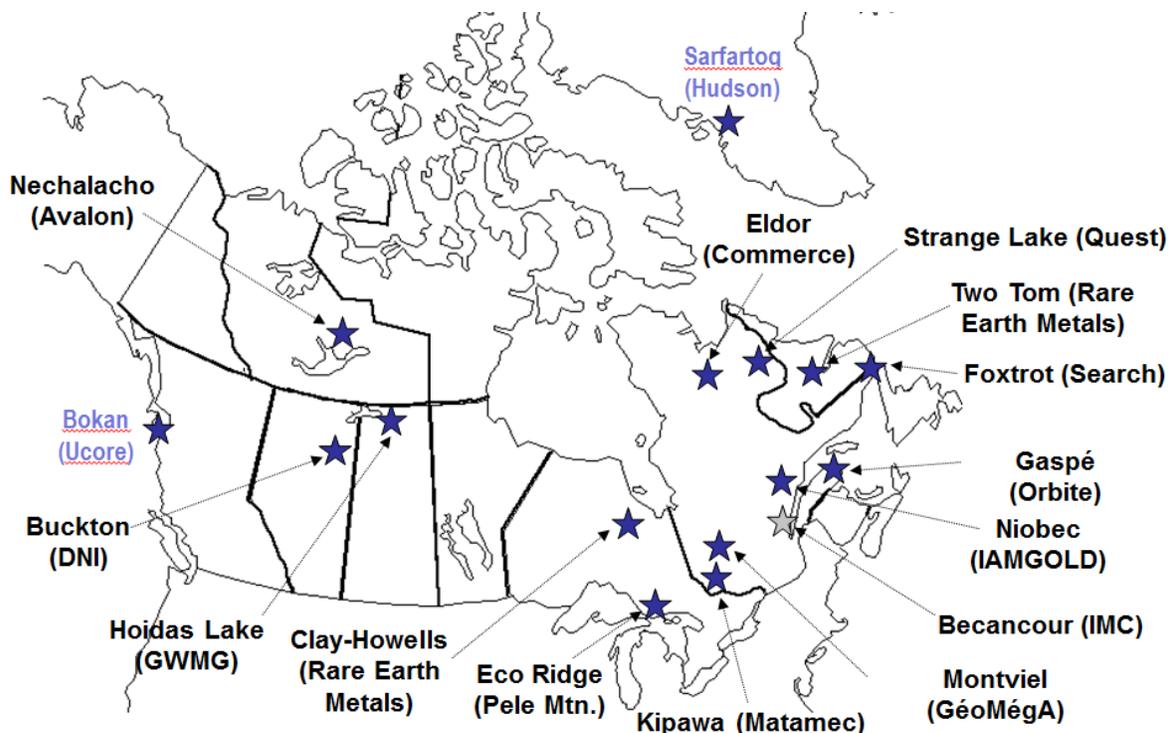
38 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

39 RNNR, [Briefing Document](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 7 January 2014 (Christine Villemure).

40 RNNR, [Briefing Document](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

context, these numbers can be misleading, particularly because achieving profitable recovery of certain rare earth metals is difficult.<sup>41</sup>

**Figure 4: Rare Earth Projects (Potential Future Mines)**



Source: Natural Resources Canada, *brief presented to the Committee*, 25 November 2013.

Government officials identified 11 REE projects in their advanced exploration stage, all of which are Canadian owned.<sup>42</sup> Table 1 provides specific details about each individual advanced project, including, but not limited to, project ownership, stage of development, mining method, estimated total capital expenditures, net present value, and target date of completion. Amongst these projects, five (owned by Avalon, Quest, Matamec, Pele Mountain, and Orbit) are expected to reach production in the next four to five years.<sup>43</sup> Based on the data presented in Table 1 and witness testimony, total capital expenditure requirements of developing a rare earth mine in Canada range between \$106 million and \$2.5 billion. Mr. Wilson noted that generally, development costs of a rare earths mine are much higher than those associated with mining a more traditional metal, such as copper.<sup>44</sup> Some companies expect annual revenue of approximately \$1 billion; however, this may

41 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian).

42 The advanced projects are all Canadian owned; however, some may have foreign participation, such as the Matamec's Kipawa Project that is 49% owned by Toyota Tsusho (Christine Villemure).

43 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

44 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

vary depending on the nature and geology of the deposit.<sup>45</sup> The Committee also learned that developing a REE mine may take between 7 to 10 years and involves several stages of development (e.g., prefeasibility studies and environmental assessment).<sup>46</sup>

Government officials noted that currently, it is not possible to reliably estimate the total economic value of Canada's rare earths deposits, particularly because this commodity is not yet in production.<sup>47</sup> However, some witnesses pointed to a report entitled *The Economic Benefits of the North American Rare Earths Industry*, which was recently published by a Washington-based organization, the Rare Earth Technology Alliance (RETA).<sup>48</sup> In a background document presented to the Committee, Ian London, Chair of CREEN, summarized the report's key findings on the essential role of REE in the North American market. For example, he noted that "the industry directly contributes to the North American economy with \$795 million in shipments, employing nearly 1050 workers with a payroll of \$116 million." The industry also fosters significant economic activity indirectly through supply chain purchases and induced effects, where each job in the REE industry generates an additional five jobs elsewhere in the North American market.<sup>49</sup>

During her presentation to the Committee, Ms. Moreno confirmed that current estimates suggest that hundreds of thousands of jobs can be created across various industries that use rare earth metals.<sup>50</sup> Developing the REE industry in Canada is also expected to create direct high-skilled jobs. As an example, Peter Cashin, President and Chief Executive Officer of Quest Rare Minerals, noted that the company's project in Quebec would create more than 840 jobs, of which 380 would be highly skilled technical jobs.<sup>51</sup> Likewise, Pele Mountain Resources' mine and milling operations in Elliot Lake would require a workforce of approximately 350 employees.<sup>52</sup>

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45 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Peter Cashin, President and Chief Executive Officer, Quest Rare Minerals Ltd.); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

46 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

47 RNNR, *Briefing Document*, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 7 January 2014 (Christine Villemure).

48 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

49 RNNR, *Briefing Document*, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 4 April 2014 (Ian London).

50 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

51 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Peter Cashin).

52 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

**Table 1: Advanced Rare Earth Elements Exploration Projects in Canada**

Project Name	Ownership	Project State	Proposed Mining Method	Projected Mine Life	Projected NPV <sup>a</sup> (before taxes) Millions	Projected NPV (after taxes) Millions	Differential Millions
Montview Project, Lebel-sur-Quevillon, Quebec	GéoMéga Resources	PEA <sup>b</sup> in progress	Open Pit	N/A	\$616 @ 10%	N/A	N/A
Hoidas Lake Project, Saskatchewan	Great Western Minerals Group	PEA in progress	Open Pit	N/A	N/A	N/A	N/A
Two Tom Project, Labrador	Canada Rare Earth Corp. / Rare Earth Metals	PEA in progress	Open Pit	N/A	N/A	N/A	N/A
Clay Howells Project, Ontario	Canada Rare Earth Corp / Rare Earth Minerals	PEA in progress	Open Pit	N/A	N/A	N/A	N/A
Eldor Project, Quebec	Commerce Resources	PEA in progress	Open Pit	25 years	\$2,320 @ 10%	N/A	N/A
Eco-Ridge Project, Ontario	Pele Mountain Resources	PEA	Open Pit	11 years	\$1,020 @ 10%	N/A	N/A
Grand Vallee Project Cap Chat, Quebec	Orbite Aluminae	PEA	Open Pit	25 years	\$2,800 @ 10%	N/A	N/A
Foxtrot Project, Labrador	Search Minerals	PEA	Open Pit / Underground	10 years	\$219 @ 10%	N/A	N/A
Strange Lake Project, Quebec	Quest Rare Minerals	Pre-Feasibility Study Completed	Open Pit	30 years	\$2,950 @ 10%	\$1,800 @ 10%	\$1,150 @ 10%
Nechalacho Project, North West Territories	Avalon Rare Metals	Feasibility Study Completed	Underground <sup>c</sup>	20 years	\$1,351 @ 10%	\$900 @ 10%	\$451 @ 10%
Zeus-Kipawa Project, Quebec	Matamec Exploration 51% Toyota Tsusho 49%	Feasibility Study Completed	Open Pit	15 years	\$260 @ 10%	\$128 @ 10%	\$132 @ 10%

<sup>a</sup> NPV = Net Present Value

<sup>b</sup> PEA = Preliminary Economic Assessment

<sup>c</sup> According to testimony provided by Pierre Neatby, Vice-President, Sales and Marketing, Avalon Rare Metals Inc., 25 February 2014

**Table 1: Advanced Rare Earth Elements Exploration Projects in Canada (Continued)**

Project Name	Anticipated By-Products	Resource Size Million tonnes (est) <sup>a</sup>	Tonnes /year REE (est)	Target year (est)	Total REE % (est)	Heavy REE % (est)	HREE (est) Tonnes/yr	Infrastructure	Market Cap Millions	Est Capital Expenditure Millions
Montview Project, Lebel-sur-Quevillon, Quebec	Niobium	250	6,500	> 2020	1.45%	3%	200	Services available	\$5.20	N/A
Hoidas Lake Project, Saskatchewan	Phosphates	2.9	5,000	> 2020	2.57%	4%	200	Services available	\$29	N/A
Two Tom Project, Labrador	Niobium, Beryllium, Zirconium	40	5,000	> 2020	1.18%	6%	300	Services available	\$5.00	N/A
Clay Howells Project, Ontario	Iron Ore, Niobium	8.5	5,000	> 2020	0.73%	10%	500			
Eldor Project, Quebec	N/A	250	16,850	> 2020	1.90%	10%	1,685		\$10	N/A
Eco-Ridge Project, Ontario	Uranium	60	4,500	2018	0.16%	15%	675	Services available	\$9.10	N/A
Grand Vallee Project Cap Chat, Quebec	Alumina, Gallium, Silica, Magnesium	1,040	1,000	2015	0.01%	20%	160	Services available	\$87.50	\$106
Foxtrot Project, Labrador	Zirconium, Niobium	10	7,000	> 2020	1.10%	20%	1,400	Services available	\$4.30	\$469
Strange Lake Project, Quebec	Zirconium/Niobium	300	13,650	2018	0.93%	38%	6,350	Isolated location <sup>b</sup>	\$59.20	\$2,500
Nechalacho Project, North West Territories	Zirconium, Niobium, Tantalum	320	10,000	2017	1.70%	28%	2,800	Services needed <sup>c</sup>	\$96.50	\$1,575
Zeus-Kipawa Project, Quebec		16	4,000	2017	0.51%	37%	1,520	Services needed <sup>d</sup>	\$13.80	\$375

Source: Natural Resources Canada, *Brief presented to the Committee*, 7 January 2014.

Notes:

- <sup>a</sup> All resource and financial projections taken directly from Company reports on web sites and Sedar.
- <sup>b</sup> Quest: Strange Lake site is undeveloped and will require a 168 km road as link to a deep-water port; construction of port facilities and utilities at mine site.
- <sup>c</sup> Avalon: Thor Lake site is undeveloped with no road access. Thor Lake located 100 km southeast of Yellowknife; Pine Point is accessible with all-season road but few services.
- <sup>d</sup> Matamec: Kipawa Project has 50 km of logging roads to Temiscaming and needs access to Hydro-Quebec electrical grid. Good road access and services from Temiscaming.

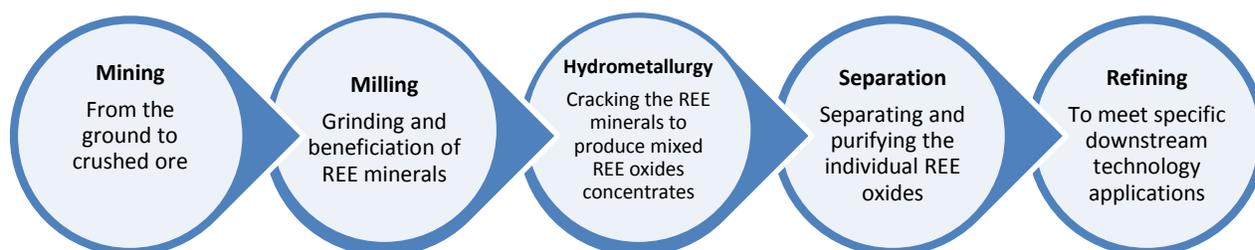
## C. Key Challenges associated with REE Development in Canada

Witnesses told Committee members that Canadian rare earth companies are facing significant technical, economic, environmental management, and community engagement and consultation challenges.

### 1. Technical Challenges

Technical challenges stem from the complexity and the technological requirements involved in testing, separating, processing and refining the REE deposits (see Figure 4). In their presentation, members of CREEN expressed that “no two REE deposits are the same” and that “each deposit requires unique, costly and innovative engineering on front-end processing.”<sup>53</sup> The Committee also learned that Canada’s mineral hardrock deposits are a lot more difficult to process and separate than the clay REE deposits typically found in China. Vladimiros Papangelakis, Professor at the University of Toronto, elaborated that “in Canada we have unique deposits” and that “rare earths are locked into more difficult minerals.” He further stated that “We need to be able to develop technology that is well adapted and suited to these types of deposits.”<sup>54</sup>

**Figure 5: Front-End REE Supply Chain**



Source: Natural Resources Canada, *brief presented to the Committee*, 25 November 2013, and the Canadian Rare Earth Elements Network, *brief presented to the Committee*, 13 February 2014

Witnesses told the Committee that expertise in mineral process and separation, extractive metallurgy, hydrometallurgy and chemical engineering design already exists in Canadian universities as well as potential REE producers, and that Canada has the necessary science and technology to conduct the front-end processing steps of REE production.<sup>55</sup> However, Mr. Papangelakis observed that “Canada’s leadership in metallurgical process technology for REE could be enhanced by a collaborative and robust

53 RNNR, Presentation, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson and Vladimiros Papangelakis, University of Toronto, as an individual and member of the Canadian Rare Earth Elements Network).

54 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Vladimiros Papangelakis).

55 RNNR, Presentation, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson and Vladimiros Papangelakis).

research and development and funding model.”<sup>56</sup> Some witnesses also pointed out that Canada currently lacks the capacity to process and refine heavy REE, and in turn, produce metal. Mr. King explained that currently, “there is no facility in North America that is capable of separating rare earth elements after they have been extracted from a mine.” Nor is there a facility that can convert separated rare earth oxides into metal – a process called smelting.<sup>57</sup> Witnesses representing CREEN confirmed that there is no REE metal production in North America. Mr. Wilson reported that at this time, “most Canadian companies are forced to go to Mintek in South Africa or to the [Australian Nuclear Science and Technology Organization] ANSTO to be able to find that capacity.”<sup>58</sup>

## 2. Economic Challenges

As previously noted, exploration and development of Canadian rare earth deposits requires significant capital expenditure. Witnesses representing CREEN explained that in order to perform the necessary tests on REE deposits, hundreds of kilograms of material need to be mined in order to get sufficient quantity of rare earths concentrate. As a result, “the development costs might be an order of magnitude larger than they would be for a conventional base metal or precious metal mine.”<sup>59</sup>

Mr. Wilson observed that Canadian potential REE producers are operating in “...an environment where they have capital constraints and fairly significant cashflow restrictions.”<sup>60</sup> Speaking about capital markets, Ms. Moreno explained that there are several reasons why REE resource development has not seen more investment activity or interest than one would expect. In addition to a slowdown in the whole commodity market, she recounted that “capital markets have realized that it is complex to extract some of these elements” and that some capital costs are much higher than originally anticipated.<sup>61</sup>

Canadian potential producers are struggling also because they need to compete with China, where costs of production are much lower. Mr. Gauthier remarked that companies have “the economic challenge of setting up western supply of heavy rare earth [elements] for specific markets competing with China, whose production costs are very competitive...”<sup>62</sup> On this subject, Mr. Shefsky asserted that:

While we are great believers of free market principles, in view of the poor capital market conditions for Canada's junior resource sector, we respectfully ask how Canadian rare earth developers are to compete unsupported in a market dominated by a powerful sovereign nation pursuing a calculated strategy and where other governments are

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56 Ibid. (Vladimiro Papangelakis).

57 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Alexander King).

58 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

59 Ibid.

60 Ibid.

61 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

62 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (André Gauthier).

spending vast sums on rapid development of rare earth deposits to support their national interests.<sup>63</sup>

### 3. Environmental Management Challenges

The Committee also heard testimony on some of the environmental management challenges and risks involved in the development of REE. The presence of naturally occurring radioactive materials (NORM) found in some rare earth deposits was raised as one of the key and most common concerns. Magdi Habib, Director General at CanmetMINING, explained that “many of the minerals we have, contain radioactive elements such as thorium and uranium,” which can end up in effluent streams and tailings.<sup>64</sup> According to government officials, existing data indicates that most Canadian deposits do not have high concentrations of radioactive materials.<sup>65</sup>

In their presentation, members of CREEN noted that “Canadian data on toxicity effects of REE is limited,” and that “further work is required [to develop] methods of safe management of associated radioelements (e.g., uranium and thorium) and REE tailings.”<sup>66</sup> Mr. Wilson told the Committee that :

There is an effective treatment requirement for uranium, for thorium, for some of the aluminiums that are associated with rare earth deposits. There are challenges there and issues around developing and understanding the toxicity. We have some significant efforts still to go through to be sure that we can produce these metals in an environmentally sustainable and appropriate manner.<sup>67</sup>

Witnesses also pointed out that Canada has significant experience in uranium mining and the management of uranium tailings, which could be applied to REE development.<sup>68</sup> Mr. Wilson added that “in general, the regulatory framework that exists for the existing base metal, precious metal, and uranium mining structures will be sufficient.”<sup>69</sup> However, Chief Madeleine Paul from the Algonquin First Nations in Quebec remarked that federal uranium and nuclear safety regulations do not apply to REE mining because uranium and thorium are qualified as NORM (Naturally Occurring Radioactive Material).<sup>70</sup>

Overall, industry witnesses agreed that sustainability and effective environmental management of rare earths mining is important for the successful development of

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63 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

64 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Magdi Habib).

65 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

66 RNNR, Presentation, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson and Vladimiro Papangelakis).

67 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

68 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Vladimiro Papangelakis; RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure).

69 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

70 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Chief Madeleine Paul, Algonquin Nation, Quebec Region, Eagle Village First Nation).

Canada's REE industry. Some companies have already taken steps to minimize the environmental impacts of their proposed REE mining projects. For example, Mr. Neatby from Avalon noted that his company is committed to sustainable business practices and is designing "state-of-the art tailings and water quality management systems to prevent significant impacts on water." The company's plan is also to build the Nechalacho mine underground, as opposed to an open-pit mine which has a greater impact on the land.<sup>71</sup>

#### **4. Challenges related to Social License to Operate**

Similar to other resource development industries, it was recognized that the rare earths industry needs to have a social license to operate and grow. Representatives from a number of companies discussed the ways in which they are engaging local and Aboriginal stakeholders in the development of their rare earth projects. For example, Mr. Cashin noted that "Quest has been meeting with local Aboriginal leaders since 2008," and that in 2013, "a draft memorandum of understanding was presented to affected Aboriginal groups" as a basis for an impacts and benefits agreement.<sup>72</sup> Mr. Neatby stated that "Avalon has made corporate social responsibility one of the cornerstones of its strategy," and that "[it has] engaged early on with First Nations and Aboriginal groups around Nechalacho, completed two accommodation agreements, and [has] a third being ratified." He added that "[Avalon] want[s] the Aboriginal groups and the First Nations groups to be [its] partners and to benefit from [its] project."<sup>73</sup>

The Committee also invited a witness who spoke on behalf of two First Nations in Quebec, and learned that in some cases, further Aboriginal engagement is required. Chief Madeleine Paul informed Committee members that the Eagle Village First Nation and the Wolf Lake First Nation are concerned about the environmental, social and economic implications of the proposed rare earth mining project in Temiscaming, Quebec.<sup>74</sup> She reported that while the communities have not yet assessed the potential environmental impacts of the project, they are worried that "the proposed location of the open-pit mine, the waste rock tailings, the new road construction, the processing plant, and the tailings ponds are all located close to rivers, lakes, and wetlands in several watersheds of critical importance to [them]."<sup>75</sup> Furthermore, Ms. Paul highlighted that the results of the First Nations' cultural and socio-economic assessments indicate that the proposed rare earths project will have "irreversible impact on [First Nations'] quality of life, customs and traditions, and access to and use of traditional lands".<sup>76</sup>

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71 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby).

72 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Peter Cashin).

73 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby).

74 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Chief Madeleine Paul).

75 Ibid.

76 Ibid.

In light of these concerns, the two First Nations signed a memorandum of Understanding (MOU) in 2012, which states that “...the parties acknowledge that the Crown owes Eagle Village and Wolf Lake the Duty to Consult and accommodate and that nothing in this MOU shall serve to relieve the Crown of its Duties.”<sup>77</sup> The First Nations have also asked the federal Minister of the Environment for a joint review panel as per section 38 of the *Canadian Environmental Assessment Act* (CEAA 2012).<sup>78</sup>

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77     ibid.

78     ibid.



## PART IV — CURRENT INITIATIVES THAT SUPPORT CANADA’S RARE EARTH ELEMENTS INDUSTRY

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During the course of the study, Committee members consulted witnesses regarding initiatives that are currently advancing the development of Canada’s rare earths industry. They also asked witnesses to comment on the role of the federal government in supporting Canada’s REE resource sector.

### A. Government Initiatives

Government officials told the Committee that Canada’s public investment in REE research and development (R&D) is relatively small; approximately \$1 million for a period of 3 years ending in March 2014. In comparison, the U.S. and the Australian governments are investing close to \$120 million (over 5 years) and \$80 million (over 3 years), respectively.<sup>79</sup> Nonetheless, Mr. Habib remarked that Natural Resources Canada’s CanmetMINING has been successful in leveraging five dollars from industry, in terms of in-kind contribution, for every dollar invested by the federal government.<sup>80</sup>

Committee members learned that the majority of the allotted funds were used for scientific research and laboratories, and the remaining was allocated to the study of REE economics and global market dynamics. In terms of scientific research, Natural Resources Canada conducted a research gap analysis to determine Canada’s R&D priorities with regard to REE resource development. Having consulted with industry, the provinces and territories, and academia, the Department identified five CanmetMINING research projects that would help address rare earths processing and environmental challenges. The projects are as follows:

- Mineralogical Characterization – to provide critical information on the chemical/surface of REE;
- Physical Separation – a process to produce high grade REE concentrates;
- Hydrometallurgy – the evaluation of leaching and separation processes for REE;
- REE Toxicity – to investigate potential toxicity of effluent produced by leaching REE; and
- Certified Reference materials – to produce certified reference materials to validate analytical methods of REE analysis.<sup>81</sup>

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79 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Magdi Habib).

80 Ibid.

81 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Christine Villemure); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 November 2013 (Magdi Habib).

Government officials were not able to provide detailed information about the Department's research on the environmental impacts of REE mining as this type of work commenced fairly recently, and the results are still pending. However, they noted that the federal government "is committed to developing technologies that will have no impact upon the environment and our ecosystem."<sup>82</sup> They also remarked that CanmetMINING laboratories are working closely with industry and universities (e.g., Wilfrid Laurier University) as a way to access knowledge that may exist throughout the country. For example, Natural Resources Canada organized two workshops that helped jumpstart an industry-led multi-stakeholder network on the Canadian rare earth elements, discussed in the next section.<sup>83</sup>

## B. Industry Initiatives

The Canadian Rare Earth Elements Network (CREEN) was created in 2013 to establish a Canadian-based rare earths production and secure 20% of critical REE global supply by 2018.<sup>84</sup> CREEN is comprised of mining companies, academia, government, research centres, consulting firms and other organizations that are working together to develop innovative solutions to the various challenges faced by this sector.<sup>85</sup> Mr. Wilson elaborated that "it is a little bit of a paradox or a dichotomy when you talk about potential competitors in an industrial market who come together to collaborate to build infrastructure and to build capacity to enable all of them to succeed. But that that is really what the CREEN vision is."<sup>86</sup> Similarly, Mr. Papangelakis remarked that CREEN was created "to bring all of these companies together, identify technology issues that are common to them, and ....develop the common technology needed to address [these issues] for the sake of efficiency..."<sup>87</sup> Speaking about CREEN's short and long term goals, Mr. Wilson stated that:

In the short term, our objectives are to look at very focused, industry-driven project work that will apply existing technologies that will get us to that early stage production with what we know now. But the longer-term need that we have as an industry is actually to develop better technologies, to develop more appropriate solutions, and to focus on the downstream opportunities there.<sup>88</sup>

To achieve these goals, some mining companies have been working closely with the Saskatchewan Research Council (SRC), an independent research and technology organization. Bryan Schreiner, Chief Geoscientist at the SRC, told the Committee that the organization "works with mining companies to develop rare earth properties through

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82 Ibid.

83 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno).

84 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

85 RNNR, *Briefing Document*, 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February (Canadian Rare Earth Elements Network).

86 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

87 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Vladimiro Papangelakis).

88 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

laboratory, bench scale, pilot testing, and field implementation...<sup>89</sup> According to him, SRC also works "...with specialists from across the world to expand Canadian knowledge and capabilities in rare earth elements technology, which will keep Canada competitive in the industry in the future."<sup>90</sup> Mr. Schreiner also noted that :

In fall 2013, with support from the federal government through Western Economic Diversification, and based on industry demand, SRC completed the construction of a state-of-the-art mineral processing pilot plant that is the first of its kind in western Canada. This plant supports the development and demonstration of new, improved methods for processing minerals and enables pilot-scale demonstration of new technologies that increase yields and decrease costs.<sup>91</sup>

### C. The Role of the Federal Government in Advancing Canada's Rare Earth Industry

Throughout the study, witnesses emphasized that the federal government has an important role to play in supporting and promoting the advancement of Canada's REE industry. The Committee learned that there are several areas where federal intervention is desired. A number of witnesses noted that the federal government should provide financial assistance to support academic and industry R&D.<sup>92</sup> Mr. Papangelakis explained that :

[Canadian companies are] in an environment where they have capital constraints and fairly significant cashflow restrictions. So they're not in a place where they have an economic opportunity to fund upfront research or to get into the really long-term development opportunities. That's an area where we could as a government add some support and some access through organizations like [Natural Sciences and Engineering Research Council] NSERC or the [Canada Foundation for Innovation] CFI to continue to develop those areas of expertise.<sup>93</sup>

Mr. Shefsky agreed that research is necessary, but cautioned the Committee that it, alone, is not sufficient to advance Canada's REE industry. He stated that "research alone will not produce critical rare earths, nor will it bring essential separation facilities to Canada," and that "[it] alone will not protect Canada's poorly capitalized rare earth developers from predatory foreign interests seeking to control Canadian deposits in order to export Canadian rare earth as low value, unrefined, mixed concentrates."<sup>94</sup> In his view, Canada should implement "a national strategy that prioritizes support to the development of critical rare earth deposits and the separation of rare earth into refined products."<sup>95</sup> Specifically "...[it] should provide logistical support for a strategic alliance with a

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89 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Bryan Schreiner, Chief Geoscientist, Saskatchewan Research Council).

90 Ibid.

91 Ibid.

92 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Vladimiro Papangelakis); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Luisa Moreno); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Anton Chakhmouradian); RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Steven Wilson).

93 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 13 February 2014 (Vladimiro Papangelakis).

94 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Al Shefsky).

95 Ibid.

non-Chinese company that has the expertise and experience to build and operate a rare earth separation plant in Canada.”<sup>96</sup> According to him, “achieving production and separation of rare earths in Canada will spawn the creation of a rare earth supply chain to support downstream value-added manufacturing in Canada.”<sup>97</sup>

Several witnesses also emphasized the need for the Canadian government to publicly endorse the Canadian REE industry and express its commitment to developing this resource sector. Mr. Gauthier stated that:

In our view, whether we are talking about Canada or any other country trying to develop those markets, government and industry must attract investments in order to ensure the development of activities that complement the rare earths mining production. The Canadian government must promote this industry in our country, because other countries, such as Brazil and Vietnam, are planning the development of their own rare earths industry and they are making it a priority.<sup>98</sup>

Similarly, Mr. Neatby suggested that government support would increase confidence in the capital markets. He noted that:

the Canadian government can support the industry in two ways, first by publicly stating that it supports the development of a Canadian rare earth industry. This could go a long way to inspiring confidence in the capital markets. Ideally, this would start with a short report from this committee on what has been heard, along with some recommendations, and would be accompanied by a public statement by the government to let the world know that Canada is serious about being a player in this industry.<sup>99</sup>

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96 Ibid.

97 Ibid.

98 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (André Gauthier).

99 RNNR, [Evidence](#), 2<sup>nd</sup> Session, 41<sup>st</sup> Parliament, 25 February 2014 (Pierre Neatby).