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### RARE EARTH ELEMENT ADVANCED COAL TECHNOLOGIES ACT

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MAY 22, 2018.—Ordered to be printed  
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Ms. MURKOWSKI, from the Committee on Energy and Natural  
Resources, submitted the following

### R E P O R T

[To accompany S. 1563]

[Including cost estimate of the Congressional Budget Office]

The Committee on Energy and Natural Resources, to which was referred the bill (S. 1563) to authorize the Office of Fossil Energy to develop advanced separation technologies for the extraction and recovery of rare earth elements and minerals from coal and coal by-products, and for other purposes, having considered the same, reports favorably thereon without amendment and recommends that the bill do pass.

#### PURPOSE

The purpose of S. 1563 is to authorize the Department of Energy's Office of Fossil Energy to develop advanced separation technologies for the extraction and recovery of rare earth elements and minerals from coal and coal byproducts.

#### BACKGROUND AND NEED

Rare earth elements (REEs) are a group of 17 chemical elements (the so-called "lanthanides," the elements numbered 57 to 71 in the periodic table, plus elements 21 and 39, which tend to occur with the lanthanides in ore bodies). Their economic importance and demand for them is increasing because their electrochemical properties make them useful in a wide range of consumer products, including: cell phones, computer drives, and GPS devices; clean energy technologies, including electric motors for hybrid vehicles and wind turbines; and numerous industrial, medical, and defense ap-

plications, including high-temperature superconductors, aerospace components, oil refining, fiber optics, lasers, cancer treatment, and medical imaging. For this reason, they are often referred to as “critical minerals” or “technology metals.” Further, the entire class of REEs was officially classified as a critical mineral on May 18, 2018 (83 F.R. 23295), pursuant to Executive Order 13817 (82 F.R. 60835).

REEs highlight our nation’s foreign mineral dependence. In 2017, the United States imported 100 percent of 21 different minerals (including REEs), and at least 50 percent of 50 different minerals. The Mountain Pass Mine in California supplied most of the world’s demand for REEs from the 1960s to the 1980s. But the Mountain Pass Mine closed in 2002 and its owner filed for bankruptcy in August 2015, removing the only known domestic mine of REEs. The Mountain Pass Mine was acquired by a Chinese-led consortium in 2017. The mine’s closure has left the nation 100 percent dependent on foreign suppliers—predominantly China. China now supplies over 80 percent of the world’s demand, with Australia supplying much of the rest. The United States also has limited processing capabilities for REEs. The nation faced the dangers of extensive dependence on foreign supply of REEs when China began reducing its exports in 2006. The average cost of REEs imports from China rose 2,432 percent from 2002 to 2011, and by 723 percent in 2011 alone.

U.S. mineral import dependence and the concentration of mineral supply from certain countries are broadly recognized as growing threats to economic growth, competitiveness, and national security. The resulting price and supply chain volatility has prompted a greater focus on policies related to mineral security and critical minerals that are important in use, susceptible to supply disruption, and for which no substitutes are readily available.

According to the National Energy Technology Lab (NETL), and based on annual estimates, acid mine drainage sludge in West Virginia and Pennsylvania represents approximately 45,000 tons per year of rare earth elements.

NETL has been examining the concept of extracting rare earth elements from coal and coal byproducts since 2010. Congress appropriated funding in 2014 for NETL to develop extraction technologies for rare earth elements from coal byproducts. Additional legislation is needed to spur development of advanced separation technologies for the extraction and recovery of REEs from coal and coal byproducts.

#### LEGISLATIVE HISTORY

S. 1563 was introduced by Senator Manchin on July 13, 2017. On December 5, 2017, the Subcommittee on Energy held a legislative hearing on S. 1563. In addition, on March 28, 2017, the Committee held an oversight hearing that examined U.S. foreign mineral dependence and ways to rebuild and improve the mineral supply chain in the United States (S. Hrg. 115–183).

The Committee on Energy and Natural Resources met in open business session on March 8, 2018, and ordered S. 1563 favorably reported.

## COMMITTEE RECOMMENDATION

The Senate Committee on Energy and Natural Resources, in open business session on March 8, 2018, by majority voice vote of a quorum present, recommends that the Senate pass S. 1563. Senator Lee asked to be recorded as voting no.

## SECTION-BY-SECTION ANALYSIS

*Section 1. Short title*

Section 1 sets forth a short title for the bill.

*Section 2. Findings*

Section 2 sets forth Congressional findings for the bill.

*Section 3. Program for extraction and recovery of rare earth elements and minerals from coal and coal byproducts*

Section 3(a) directs the Secretary, acting through the Assistant Secretary for Fossil Energy, to carry out a program to develop advanced separation technologies for the extraction and recovery of REEs and minerals from coal and coal byproducts.

Subsection (b) authorizes \$20 million for each of fiscal years 2018 through 2025.

*Section 4. Assessment and report*

Section 4(a) requires the Secretary, in consultation with the Secretary of Defense, to produce an assessment of REEs and advanced separation technologies, along with a report analyzing any additional resources needed for second generation technologies and the market impact of sludge-derived treatments, within one year of the Act's enactment.

Subsection (b) requires the Secretary to focus on REEs determined to be most critical to the national security of the United States in carrying out the assessment and report.

## COST AND BUDGETARY CONSIDERATIONS

The following estimate of the costs of this measure has been provided by the Congressional Budget Office:

Summary: S. 1563 would authorize appropriations for the Department of Energy (DOE) to develop technologies to lower the cost of recovering rare earth elements and other materials from coal and coal byproducts.

Assuming appropriation of the authorized amounts, CBO estimates that implementing S. 1563 would cost \$60 million over the 2018–2023 period. Enacting the bill would not affect direct spending or revenues; therefore, pay-as-you-go procedures do not apply.

CBO estimates that enacting S. 1563 would not increase net direct spending or on-budget deficits in any of the four consecutive 10-year periods beginning in 2029.

S. 1563 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA).

Estimated cost to the Federal Government: The estimated budgetary effect of S. 1563 is shown in the following table. The costs of the legislation fall within budget function 270 (energy).

	By fiscal year, in millions of dollars						
	2018	2019	2020	2021	2022	2023	2018–2023
INCREASES IN SPENDING SUBJECT TO APPROPRIATION							
Authorization Level .....	20	20	20	20	20	20	120
Estimated Outlays .....	0	3	9	14	16	18	60

The bill would authorize the appropriation of \$20 million in 2018. CBO does not estimate any outlays for that authorization because appropriations for 2018 have already been enacted.

**Basis of estimate:** For this estimate, CBO assumes that S. 1563 will be enacted near the start of fiscal year 2019 and that authorized amounts will be provided each year beginning in 2019.

S. 1563 would authorize the appropriation of \$20 million annually over the 2018–2025 period for DOE to carry out research related to rare earth elements and minerals and to develop advanced technologies to improve the economic viability of separating, extracting, and recovering those materials from coal and coal byproducts. The bill also would require DOE to assess the importance of rare earth elements and minerals to U.S. consumers, evaluate technologies developed under the bill, and analyze other factors related to the costs and economic effects of implementing such technologies.

For 2018, the Congress has provided \$15 million for DOE’s research activities related to rare earth elements and minerals; for this estimate, CBO assumes no further funding will be provided this year. Assuming appropriation of the authorized amounts over the 2019–2025 period, CBO estimates that outlays would total \$60 million over the 2018–2023 period covered by this estimate. (Additional outlays after 2023 would total \$80 million.) That estimate is based on historical spending patterns for existing activities.

Pay-As-You-Go considerations: None.

Increase in long-term direct spending and deficits: CBO estimates that enacting S. 1563 would not increase net direct spending or on-budget deficits in any of the four consecutive 10-year periods beginning in 2029.

Mandates: S. 1563 contains no intergovernmental or private-sector mandates as defined in UMRA.

Estimate prepared by: Federal Costs: Megan Carroll; Mandates: Jon Sperl.

Estimate reviewed by: Kim Cawley, Chief, Natural and Physical Resources Unit; H. Samuel Papenfuss, Deputy Assistant Director for Budget Analysis.

#### REGULATORY IMPACT EVALUATION

In compliance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee makes the following evaluation of the regulatory impact which would be incurred in carrying out S. 1563.

The bill is not a regulatory measure in the sense of imposing Government-established standards or significant economic responsibilities on private individuals and businesses.

No personal information would be collected in administering the program. Therefore, there would be no impact on personal privacy.

Little, if any, additional paperwork would result from the enactment of S. 1563, as ordered reported.

## CONGRESSIONALLY DIRECTED SPENDING

S. 1563, as reported, does not contain any congressionally directed spending items, limited tax benefits, or limited tariff benefits as defined in rule XLIV of the Standing Rules of the Senate.

## EXECUTIVE COMMUNICATIONS

The testimony provided by the Department of Energy at the December 5, 2017, hearing on S. 1563 follows:

TESTIMONY OF UNDER SECRETARY MARK MENEZES, U.S.  
DEPARTMENT OF ENERGY, BEFORE THE U.S. SENATE  
COMMITTEE ON ENERGY AND NATURAL RESOURCES SUB-  
COMMITTEE ON ENERGY

*S. 1563—Rare Earth Element Advanced Coal Technologies Act*

It's likely the development of a domestic supply of rare earth elements (REEs) that is economically competitive will help fuel our nation's economic growth, secure our energy independence, and increase our national security. The bill appears to authorize \$20 million per year from 2018 through 2025 for the Department of Energy (specifically the Office of Fossil Energy) to develop advanced separation technologies for the extraction and recovery of REEs and minerals from coal and coal byproducts. It appears the bill also requests that DOE, in consultation with the Department of Defense, within 1 year after date of enactment, submit a report that assesses the importance of REEs to the United States, evaluates the development of new separation technologies, and analyzes the market impact of new technologies. Due to the complexities of the research and scope of the report, Congress may want to consider extending the due date of the initial assessment.

The bill appears to acknowledge the current ongoing efforts within DOE to advance separation technologies for the recovery of REEs. Thus, DOE appreciates the proposed legislation as it incorporates its ongoing R&D. DOE is developing technologies with the goal of enabling additional domestic supplies of REEs, reducing environmental impact of coal and REE production, and delivering technologies that can be manufactured within the United States. DOE has accomplished much in this area, including the evaluation of pilot-scale processing options, and the nature and distribution of REEs in U.S. coal deposits.

## CHANGES IN EXISTING LAW

In compliance with paragraph 13 of rule XXVI of the Standing Rules of the Senate, the Committee notes that no changes in existing law are made by S. 1563, as ordered reported.