THE EFFECT OF IMPORTS OF TITANIUM SPONGE ON THE NATIONAL SECURITY

AN INVESTIGATION CONDUCTED UNDER SECTION 232 OF THE TRADE EXPANSION ACT OF 1962, AS AMENDED

U.S. Department of Commerce
Bureau of Industry and Security
Office of Technology Evaluation

November 29, 2019

TABLE OF CONTENTS

APPENDICES

Prepared By Bureau of Industry and Security

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I. Executive Summary

This report summarizes the findings of an investigation conducted by the U.S. Department of Commerce (the "Department") pursuant to Section 232 of the Trade Expansion Act of 1962, as amended (hereinafter, the "statute" or "Section 232"), into the effect of imports of titanium sponge[1] on the national security of the United States.

Titanium sponge is the product of the application of various chemical processes on titanium ore, resulting in an end product called titanium sponge. Premium quality titanium sponge is used as the basis for titanium parts in many U.S. defense systems including military fighter aircraft and engines, satellite parts, naval and commercial ships, submarines, and military ground vehicles. Further, critical infrastructure applications such as petrochemical facilities, energy systems, water and sewer systems, and commercial aircraft and engines all depend on varying purities of titanium sponge.

The ore used to make titanium sponge is readily available worldwide. However, as of the date of this report, there is only one active large-scale industrial plant in the United States that produces titanium sponge. This facility is declining due to aging and damaged facilities and overall low global prices for titanium

[1] *See* Section IV, "Product Scope of the Investigation," for definition of titanium sponge.

sponge. This facility only produced about [redacted] of U.S. consumption in 2018, and requires large-scale capital investment approaching [redacted] for continued operations. At full production, this facility would account for [redacted] of U.S. titanium sponge consumption in 2018, or approximately [redacted] per annum.

The United States imports 68 percent of the titanium sponge needed to fulfill domestic demand, largely from Japan, with smaller quantities coming from countries such as Kazakhstan and Ukraine. Some foreign producers, such as Russia's VSMPO-Avisma do not pass on the full cost of titanium sponge to downstream consumers and offer artificially low-priced finished titanium goods. This is most notable with VSMPO-Avisma's joint venture with Boeing to produce titanium-based aircraft parts in Russia for use in U.S.-assembled commercial aircraft.

China has a burgeoning capacity to manufacture titanium sponge. However, at present almost all of China's titanium sponge production is consumed by domestic demand. Nevertheless, Chinese producers are developing export markets for their downstream titanium products, and estimates indicate that at least 23 percent of all Chinese titanium mill products are exported. As Chinese producers develop their technical capabilities to include production of aerospace-grade sponge suitable for use in rotating aircraft parts, China's impact on the global titanium sponge and downstream titanium markets may grow.

If no action is taken, it is anticipated that by [redacted] the U.S. may cease to have any domestic titanium sponge production capacity when the current U.S. facility reaches the end of its useful life. Despite national security concerns, for the reasons set forth in detail herein, an adjustment of tariffs on imported titanium sponge will not address the distortionary effect of non-market producers such as Russia, and eventually China, on the global titanium sponge market.

An alternative approach could include the United States government temporarily compensating U.S. industry for the difference between its comparatively higher production prices and lower global sale prices, affording U.S. industry time to make the investments required to reduce production costs to a level comparable with other market producers, and additional government stockpiles of U.S.-origin titanium sponge or U.S.-melted titanium in a stable form such as ingots. This report also examines the possibility for multilateral negotiations among the world's market titanium sponge producers to constructively address low prices, low inventory levels, and other factors that harm the U.S. and other market producers.

As required by the statute, the Secretary considered all factors set forth in Section 232(d). The Secretary examined the effect of imports on national security requirements, specifically:

i. domestic production needed for projected national defense requirements;

ii. the capacity of domestic industries to meet such requirements;

iii. existing and anticipated availabilities of the human resources, products, raw materials, and other supplies and services essential to the national defense;

iv. the requirements for growth of such industries and such supplies and services including the investment, exploration, and development necessary to assure such growth; and

v. the importation of goods in terms of their quantities, availabilities, character, and use as those affect such industries; and the capacity of the United States to meet national security requirements.

The Secretary also recognized the close relation of the economic welfare of the United States to its national security. Factors that can compromise the nation's economic welfare include, but are not limited to, the impact of "foreign competition on the economic welfare of individual domestic industries; and any substantial unemployment, decrease in revenues of government, loss of skills, or any other serious effects resulting from the displacement of any domestic products by excessive imports" (19 U.S.C. § 1862(d)). In particular, this report assesses whether titanium sponge is being imported "in such quantities" and "under such circumstances" as to "threaten to impair the national security."[2]

[2] 19 U.S.C. § 1862(b)(3)(A).

Findings

In conducting the investigation, the Secretary found:

A. Titanium Sponge is Essential to U.S. National Security

1. Titanium sponge is essential to the manufacturing and maintenance of U.S. defense systems. Titanium is used in many military applications, including aircraft frames, jet and helicopter engines, satellites, ships, submarines, and ground vehicles. Titanium sponge is the intermediate product resulting from the conversion of titanium ore into a form of titanium metal that can be melted to manufacture slab or ingot, which in turn is used to produce finished titanium products. Consequently, titanium sponge production is essential to the production and sustainment of many U.S. defense systems, and preserving this critical capability is imperative to the national security.
2. Further, Congress has implicitly recognized that titanium sponge is critical to national security by including titanium as a strategic material in the Specialty Metals Clause (10 U.S.C. § 2533b). The clause requires all titanium used in national defense systems to be melted or produced in the United States or a qualifying country. Additionally, the Department of the Interior included titanium on the 2018 List of Critical Minerals required by Executive Order 13817 (December 20, 2017). The list established titanium as essential to the national security of the United States and found that the

absence of a titanium supply would have significant consequences for the U.S. economy and the national security. An economically viable domestic source of titanium sponge, therefore, strengthens and diversifies the security of supply of U.S. semi-finished and finished titanium goods.

3. Titanium sponge is also vital for critical infrastructure. Titanium sponge, as the intermediate product for titanium metal, supports 15 of the 16 critical infrastructure sectors identified by the Department of Homeland Security (DHS).[3] Titanium sponge is used in products that support critical infrastructure sectors such as petrochemicals, energy systems, medical applications, transportation systems, water systems, commercial airframe and aircraft engines, and others.

B. The Continued Production of Titanium Sponge at the Sole Remaining Domestic Producer is Threatened

1. Though the U.S. was the first nation to commercialize titanium sponge production in the 1950s, U.S. domestic titanium sponge production capacity has declined significantly. In 1984, there were five plants producing titanium sponge in the U.S.; by 2019, only one producer capable of producing titanium sponge for defense, commercial, and industrial

[3] U.S. White House. Office of the Press Secretary. *Critical Infrastructure Security and Resilience*. Presidential Policy Directive 21. (Washington, DC: 2013) https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil

applications remained. U.S. titanium sponge producers had a combined capacity of [redacted] at two facilities in 2016,[4] but the idling of one of these facilities in late 2016 reduced available U.S. capacity to [redacted] in 2019.

2. TIMET, the sole remaining U.S. titanium sponge producer, also has titanium melting operations. TIMET utilizes the entirety of its sponge production to satisfy internal demand for their titanium melt operations, which in turn manufactures semi-finished and finished titanium products for defense and critical infrastructure applications. The availability of economically viable titanium sponge production, therefore, is an essential component in TIMET's continued melt operations. It is important to note that TIMET's production of sponge does not fully cover needs for their internal melt operations, and TIMET imports about [redacted], on average, of its sponge needs each year.

3. [redacted]

[4] [redacted]

[redacted] The disparity between TIMET's U.S. sponge production costs and non-U.S. sponge prices contributes to TIMET's increasing difficulty in determining whether the return on investment justifies continued sponge production.

4. TIMET, in addition to high production costs, must invest approximately [redacted] in its sponge facility by [redacted] in order to continue production due to "end of life" issues with portions of their integrated production process (including the crucial chlorination process). These essential, expensive capital investments, coupled with the availability of low-priced imports, have pressured TIMET to seriously consider closing its domestic sponge operations in favor of importing low priced non-U.S. sponge. The availability of low-priced sponge imports threatens the financial viability of the sole remaining large-scale sponge facility in the United States.

C. Low Priced Titanium Sponge Imports Threaten Continued U.S. Production and Contribute to the Weakening of the Internal Economy

1. The United States imports significant quantities of titanium sponge. Imports increased 13 percent from approximately 20,700 metric tons, or 59 percent of total consumption in the United States in 2010, to approximately 23,400 metric tons, or 68 percent of total consumption in the United States

in 2018.[5] The value of these imports averaged $196 million annually over the 2015 to 2018 period.

2. U.S. titanium sponge production and inventories satisfied just 32 percent of U.S. sponge demand in 2018, with the remainder of demand being filled by imports. Aggregate U.S. titanium sponge consumption exceeded production by [redacted], or [redacted], between 2015 and 2018. At most, U.S. production operating at full capacity could satisfy only [redacted] of U.S. demand for titanium sponge in 2018.
3. The vast majority of titanium sponge imports in 2018 came from Japan (94.4 percent), with smaller quantities from Kazakhstan (5.2 percent), and China, Russia, and Ukraine (each less than 1 percent).[6] Japanese imports increased from 75 percent of all imports in 2015, to 94.4 percent in 2018, an increase largely driven by the idling of one of the two remaining domestic sponge production facilities in 2016. Between 2015 and 2018, imports of Japanese titanium sponge increased by 43 percent as U.S. production decreased by 60 percent.[7] [8]

[5] U.S. Geological Survey Minerals Report (2010-2018). Note that the U.S. Geological Survey statistics include Honeywell Electronic Materials' 500-metric-ton plant at Bountiful, Utah in its capacity figures. As this plant does not produce material that is used for industrial metal applications, it is excluded from this investigation. More information on this is provided in Chapters IV and V.
[6] USGS Minerals Yearbook 2018, Volume 1, Commodity Report

[7] USITC DataWeb, HTSUS Code 8108.20.0010, 2005 – 2018 Japanese Imports for consumption

[8] BIS Survey Data (U.S. Production)

4. Allegheny Technologies Incorporated (ATI), a major U.S. titanium manufacturer, idled its titanium sponge operations in late 2016. ATI cited high costs of production and availability of low-priced imports as justification for idling its facility. [redacted]

5. TIMET is facing a similar situation as ATI did in 2016. TIMET must decide whether to continue to produce titanium sponge for their melting operations or import low-priced sponge instead. As sponge import prices continue to drop, TIMET is having an increasingly difficult time justifying the continuation of its sponge production. [redacted] This issue is compounded by TIMET's need to recapitalize its sponge operation [redacted]

6. Declining global prices and higher imports of low-priced titanium sponge, principally from Japan, are the primary causes of the decline in U.S. titanium sponge capacity and production. The continued substitution of non-U.S. imports for U.S. produced sponge is the predominant factor in the domestic titanium sponge industry's decline.

7. Another factor impacting the health and competitiveness of U.S. sponge production is the growing use of titanium scrap. Advancements in melt technology have allowed titanium producers to use increasing amounts of titanium scrap, which is less expensive than titanium sponge, as a source of melt feedstock. Sponge demand and prices have therefore decreased due to increasing use of scrap. It is important to note that approximately 52 percent of scrap used in downstream U.S. titanium production is imported. The remaining 48 percent, which is domestically produced, is still dependent on non-U.S. titanium sponge imports for its initial production. Increasing usage of scrap in place of sponge and the consequent downward pressure on sponge prices places even further financial pressure on the remaining U.S. producer of titanium sponge.

D. Increased Foreign Sponge Capacity and Production Raise Future National Security Concerns

1. As U.S. titanium sponge production capacity has declined, other countries' capacities have increased. Between 2004 and 2018, Chinese titanium sponge production capacity increased approximately 1,050 percent from 9,500 metric tons to 110,000 metric tons.[9] Japanese capacity increased by 84 percent from 37,000 to 68,000 metric tons, and Russian capacity

[9] U.S. Geological Survey, "Titanium and Titanium Dioxide: 2006" and "Titanium and Titanium Dioxide: 2018"

increased by 66 percent from 28,000 tons to 46,500 metric tons.[10] By comparison, U.S. capacity stood at just [redacted] in 2018.

2. Although Chinese exports accounted for less than 1 percent of total U.S. imports of titanium sponge in 2018, China's dramatic growth in sponge production and capacity (38 percent of world capacity in 2018) is contributing to overall downward pressure on global titanium prices. The sole remaining domestic producer struggles to justify continued production due to availability of low-priced imports and the need for large capital expenditures. Any further decreases in global prices will put additional pressure on remaining U.S operations. This downward pressure may increase further as domestic Chinese demand for sponge is satisfied and China looks to export excess material of both sponge and finished titanium products.
3. Though China currently consumes almost all of its domestic production of titanium sponge, their large scale capacity for mill products has allowed them to export approximately 23 percent of their titanium ingot and billet production. While no significant quantities of Chinese ingots or billets are imported into the U.S. at present, China has been exporting increasing

[10] Ibid.

quantities of commercial and industrial products containing titanium (bicycles, heat exchangers, condensers, automobile parts, structural aerospace parts, medical devices, construction materials, etc.). Increased Chinese exports of commercial and industrial products containing titanium (with a broader range than Russian exports of aerospace-focused titanium products), and a future focus on exports of titanium sponge, ingot, and billet is expected, as China has implemented a similar export strategy in other material markets. As the U.S. is the second largest market for titanium products in the world, the U.S. will be a natural target for low price imports from China.

4. Only the United States, Japan, Russia, and Kazakhstan have titanium sponge plants certified to produce aerospace rotating-quality sponge that can be used for aerospace engine parts and other sensitive aerospace applications. While Chinese producers have not yet been certified in the U.S. to supply this type of aerospace-grade sponge, it is expected that they will develop the capability to do so in the near future. Increased Russian and future Chinese premium-quality sponge exported at non-market prices will harm the remaining U.S. and Japanese producers and may force U.S. commercial aircraft and engine manufacturers into dependence on Russian and Chinese sources.

Conclusion

Based on these findings, the Secretary concludes that the present quantities and circumstance of titanium sponge imports are "weakening our internal economy" and threaten to impair the national security as defined in Section 232. The consequent adverse impact on the domestic titanium sponge industry, along with the circumstance of increased global production and capacity in titanium sponge, especially in non-market economies, places the United States at risk of losing the remaining industrial capacity and technical knowledge essential to producing the titanium sponge needed to meet national defense and critical infrastructure requirements.

Imports of titanium sponge, which accounted for 68 percent of all sponge consumed in the United States in 2018, threaten to impair the national security by placing the remaining U.S. titanium sponge producer's operation under severe financial stress. Low-priced sponge imports, as well as low-priced titanium scrap imports, depress the price of U.S. titanium sponge and de-incentivize recapitalization of the remaining active facility's aging production capabilities. If the remaining facility ceases operation, the U.S. will have no active domestic capacity to produce titanium sponge for national defense and critical infrastructure needs.

Absent domestic titanium sponge production capacity, the U.S. will be completely dependent on imports of titanium sponge and scrap, and will lack the surge capacity required to support defense and critical infrastructure needs in an extended national emergency.

Titanium producers, including producers of goods such as ingot, billet, sheet, coil, and tube, as well as end-users of finished titanium goods, are almost all entirely dependent on non-U.S. sources for sponge and scrap. This circumstance presents the possibility that, in a national emergency, U.S. titanium producers would be denied access to imports of titanium sponge and scrap due to supply disruption. If U.S. titanium producers do not have access to either domestic or imported supplies of sponge and scrap, their manufacturing operations would severely decline or cease once their existing titanium inventories are depleted.

[redacted] The U.S. no longer maintains titanium sponge in the National Defense Stockpile.

Further, under current global market conditions and with the low price charged by non-market Russian and Chinese titanium producers, it is difficult for the remaining U.S. titanium sponge producer to justify the capital investments needed for continued operations. This inability to invest threatens continued

operation of the sole domestic titanium sponge plant. If this capacity and associated skilled workforce are lost, it will be challenging and expensive to reconstitute U.S. titanium sponge production capabilities should the need arise.

The Department acknowledges that larger industry trends, including increased use of titanium scrap and downstream producers' emphasis on scrap recovery, have decreased the need for titanium sponge. These trends reflect U.S. titanium producers and end users' interest in maximizing profits by leveraging lower scrap costs, and mitigating the need for new sponge purchases. However, these trends do not eliminate the need for new titanium sponge. Certain titanium parts, particularly those used in national defense systems, cannot be made using scrap and require new titanium sponge. Moreover, approximately 52 percent of all scrap is imported and subject to the same potential supply disruptions as sponge imports. The remaining 48 percent of scrap that is domestically produced is also subject to potential supply disruptions. The vast majority of this domestic scrap is generated from semi-fabricated and finished titanium product manufacturing operations, which at present rely on imported sponge for approximately 68 percent of their total sponge consumption.

The displacement of domestic titanium sponge by low-priced imports places the United States at risk of not being able to meet national security and critical infrastructure requirements during an emergency. The Secretary therefore finds

that imports of titanium sponge threaten to impair the national security as defined in Section 232.

Recommendations

The Department has identified several potential actions that could be taken to address the threat of imports of titanium sponge to national security.[11] These actions include domestic initiatives and multilateral negotiations.

Option 1 - Domestic Initiatives

The Department has identified two possible domestic initiatives that the U.S government can undertake to stimulate reinvestment in domestic sponge production. These options include:

Option 1A – Voluntary Agreements with U.S. Titanium Sponge Producer(s) Under Title VII of the Defense Production Act of 1950

One of the challenges identified by the U.S. industry is that low prevailing market prices, which are driven by high volumes of low-priced imports, do not justify the capital investments required to sustain future production. To mitigate this situation, the U.S. government could temporarily compensate U.S. producer(s) for the difference between their current production costs and global purchase prices.

[11] The following recommendations are the Department's and do not necessarily reflect the recommendations of the other agencies with which the Department consulted during the course of this investigation.

Such compensation would serve as a temporary bridge until such time that U.S. producer(s) could make the capital investments needed to upgrade or build new production facilities, which will in turn lower production costs and safeguard future production. Although the proposed compensation is not likely to cover the full cost of any major capital investment, it would nevertheless encourage U.S. producers to invest their own funds in modernizing sponge production.

As shown in Figure A below, the Department estimates that providing this compensation over a five-year period would cost approximately [redacted] per year, or approximately [redacted] of titanium sponge produced. The Department bases these calculations on the remaining active U.S. producer of titanium sponge, and assumes a five-year period would be required to make the essential capital investments needed to safeguard production. After completion of needed capital investments, U.S. production costs are expected to be competitive with the global sponge prices, and the compensation would no longer be required.

Option 1B - Expansion of the National Defense Stockpile to include titanium sponge and additional amounts of titanium metal

The USG also could address the threatened impairment by adding additional titanium materials to the National Defense Stockpile, while simultaneously encouraging the upgrade of domestic sponge production capacity by instituting long-term supply contracts for U.S. producers of titanium sponge and metal. To encourage domestic sponge production, the agreement for this additional material would specify that the winning bidder(s) agree to provide U.S.-origin titanium sponge and domestically melted semi-finished titanium products to fulfill the anticipated 15-year contract.

In order to safeguard against supply chain disruptions, the proposed National Defense Stockpile would maintain one year's worth of U.S. titanium sponge consumption needs (combined defense and commercial). Department survey data

on U.S. producers and melters' 2018-2019 inventories, consumption, and costs were used to calculate and estimate needs for this proposed stockpile. In 2018, 34,100 metric tons of titanium sponge were consumed in the U.S. The sole domestic manufacturer of titanium sponge produced sponge at a cost of [redacted] Additionally, [redacted] of titanium sponge was held by U.S. commercial producers in their inventories in 2018. In order to maintain one years' worth of U.S. consumption in the proposed stockpile (34,100 metric tons total), the USG would have to procure [redacted] of titanium sponge in order to supplement the 2018 commercial inventory level of [redacted]. The agreement would stipulate that commercial inventory levels cannot be sold or liquidated and must be maintained at 2018 levels.

A 15-year agreement to procure the total shortfall of [redacted] would require the purchase of roughly [redacted] of titanium sponge per year, at an average price of [redacted], for a cost of [redacted] per year. The 15-year agreement would result in the procurement of [redacted] of sponge for the stockpile maintained by the USG at a total cost of [redacted]. However, the final amount and mix of sponge and metal (titanium ingots and billets) to be added would be determined by the DoD in consultation with the Department and other agencies. Commercial inventories in the U.S. (including inventories of non-U.S. suppliers) and other factors that could

impact demand in a national emergency would be factored into the acquisition plan.

Option 2 - Multilateral Negotiations

As the Department observed in the recent steel, aluminum, and uranium Section 232 investigations, non-market actors can substantially distort the global market for products through price, quantity, and market access. For titanium sponge and downstream products, Russia and China are examples of such non-market actors. In 2018, Russian and Chinese titanium sponge producers controlled 61 percent of the world's titanium sponge production, an increase on their combined 55 percent share in 2008 and 37 percent share in 1998.

Non-market actors lower the price of titanium sponge, which causes financial harm to U.S. and other market producers, particularly Japan. Japanese producers have responded to low global prices by lowering their own sponge prices. Multilateral negotiations between the United States and other market producers of titanium sponge, including Japan and Kazakhstan, would present an opportunity to address issues affecting market titanium sponge production. The option below is budget neutral.

Option 2 – Common inventory of sponge for use among the parties to mitigate supply issues

In this option, the U.S. and other market titanium producers could agree to establish pre-positioned strategic stores of sponge for use by titanium sponge customers to be held at their U.S. titanium facilities or other locations in the United States. The amount of sponge held would vary with the annual amount sold to each particular customer commensurate to their market share. This action would mitigate potential shortfalls in sponge imports caused by a national emergency.

U.S. Titanium Industrial Base Analysis

The Department, in collaboration with the Department of Defense (DoD), the Department of Interior (DOI), and the U.S. Geological Survey (USGS), should survey and assess the operating status and capacity of the U.S. titanium sponge and downstream titanium industries every three years. Such action would provide the USG with needed economic and financial data on this critical industrial base sector.

II. Legal Framework

A. Section 232 Requirements

Section 232 provides the Secretary with the authority to conduct investigations to determine the effect on the national security of the United States of imports of any article. It authorizes the Secretary to conduct an investigation if requested by the head of any department or agency, upon application of an interested party, or upon his own motion. *See* 19 U.S.C. § 1862(b)(1)(A).

Section 232 directs the Secretary to submit to the President a report with recommendations for "action or inaction under this section" and requires the Secretary to advise the President if any article "is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security." *See* 19 U.S.C. § 1862(b)(3)(A).

Section 232(d) directs the Secretary and the President to consider, in light of the requirements of national security and without excluding other relevant factors, the domestic production needed for projected national defense requirements and the capacity of the United States to meet national security requirements. *See* 19 U.S.C. § 1862(d).

Section 232(d) also directs the Secretary and the President to "recognize the close relation of the economic welfare of the Nation to our national security, and …take into consideration the impact of foreign competition on the economic

welfare of individual domestic industries" by examining whether any substantial unemployment, decrease in revenues of government, loss of skills or investment, or other serious effects resulting from the displacement of any domestic products by excessive imports, or other factors, results in a "weakening of our internal economy" that may impair the national security.[12] *See* 19 U.S.C. § 1862(d).

Once an investigation has been initiated, Section 232 mandates that the Secretary provide notice to the Secretary of Defense that such an investigation has been initiated. Section 232 also requires the Secretary to do the following:

(1) "Consult with the Secretary of Defense regarding the methodological and policy questions raised in [the] investigation;"

(2) "Seek information and advice from, and consult with, appropriate officers of the United States;" and

(3) "If it is appropriate and after reasonable notice, hold public hearings or otherwise afford interested parties an opportunity to present information and advice relevant to such investigation."[13] *See* 19 U.S.C. § 1862(b)(2)(A)(i)-(iii).

As detailed in the report, all of the requirements set forth above have been satisfied.

[12] An investigation under Section 232 looks at whether imports threaten to impair the national security, rather than looking at unfair trade practices as in an antidumping investigation.

[13] Department regulations (i) set forth additional authority and specific procedures for such input from interested parties, *see* 15 C.F.R. §§ 705.7 and 705.8, and (ii) provide that the Secretary may vary or dispense with those procedures "in emergency situations, or when in the judgment of the Department, national security interests require it." *Id*., § 705.9.

In conducting the investigation, Section 232 permits the Secretary to request that the Secretary of Defense provide an assessment of the defense requirements of the article that is the subject of the investigation. *See* 19 U.S.C. § 1862(b)(2)(B). Upon completion of a Section 232 investigation, the Secretary is required to submit a report to the President no later than 270 days after the date on which the investigation was initiated. *See* 19 U.S.C. § 1862(b)(3)(A). The report must:

(1) Set forth "the findings of such investigation with respect to the effect of the importation of such article in such quantities or under such circumstances upon the national security;"

(2) Set forth, "based on such findings, the recommendations of the Secretary for action or inaction under this section;" and

(3) "If the Secretary finds that such article is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security . . . so advise the President." *See* 19 U.S.C. § 1862(b)(3)(A).

All unclassified and non-proprietary portions of the report submitted by the Secretary to the President must be published. *See* 19 U.S.C. § 1862(b)(3)(B).

Within 90 days after receiving a report in which the Secretary finds that an article is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security, the President shall:

(1) "Determine whether the President concurs with the finding of the Secretary;" and

(2) "If the President concurs, determine the nature and duration of the action that, in the judgment of the President, must be taken to adjust the imports of the article and its derivatives so that

such imports will not threaten to impair the national security" *See* 19 U.S.C. § 1862(c)(1)(A).

B. Discussion

While Section 232 does not specifically define "national security" both Section 232 and the implementing regulations at 15 C.F.R. Part 705 contain non-exclusive lists of factors that the Secretary must consider in evaluating the effect of imports on the national security. Congress in Section 232 explicitly determined that "national security" includes, but is not limited to, "national defense" requirements. *See* 19 U.S.C. § 1862(d).

The Department has determined that "national defense" includes both the defense of the United States directly and the U.S. "ability to project military capabilities globally."[14] The Department also concluded that "[i]n addition to the satisfaction of national defense requirements, the term 'national security' can be interpreted more broadly to include the general security and welfare of certain industries, beyond those necessary to satisfy national defense requirements, which are critical to the minimum operations of the economy and government."[15] The Department deemed these certain industries as "critical industries."[16] This report

[14] Department of Commerce, Bureau of Export Administration; *The Effect of Imports of Iron Ore and Semi-Finished Steel on the National Security*; Oct. 2001 ("2001 Report").

[15] *Id.*

[16] *Id.*

uses these interpretations of the terms "national defense" and "national security," as applying to "critical industries." In doing so, this report considers 16 critical infrastructure sectors identified in Presidential Policy Directive 21.[17]

Section 232 directs the Secretary to determine whether imports of any article are being made "in such quantities" or "under such circumstances" that those imports "threaten to impair the national security." *See* 19 U.S.C. § 1862(b)(3)(A). Accordingly, either the quantities or the circumstances, standing alone, may be sufficient to support an affirmative finding.

The statute does not prescribe a threshold or a standard for when "such quantities" of imports are sufficient to threaten to impair the national security, nor does it define the "circumstances" that might qualify.

Likewise, the statute does not require a finding that the quantities or circumstances are impairing the national security. Instead, the threshold question under Section 232 is whether those quantities or circumstances "threaten to impair the national security." *See* 19 U.S.C. § 1862(b)(3)(A). This makes evident that Section 232 may be used to prevent a threatened impairment to the national security from occurring before the national security is actually impaired.

[17] Presidential Policy Directive 21, *Critical Infrastructure Security and Resilience* (February 12, 2013) ("PPD-21").

Section 232(d) contains a list of factors for the Secretary to consider in determining if imports "threaten to impair the national security"[18] of the United States, and this list is mirrored in the implementing regulations. *See* 19 U.S.C. §1862(d) and 15 C.F.R. § 705.4. Congress was careful to note twice in Section 232(d) that the list provided, while mandatory, is not exclusive.[19] Congress' illustrative list is focused on the ability of the United States to maintain the domestic capacity to provide the articles in question as needed to maintain the national security of the United States.[20] Congress broke the list of factors into two equal parts using two separate sentences. The first sentence focuses directly on "national defense" requirements, thus making clear that "national defense" is a subset of the broader term "national security." The second sentence focuses on the broader economy and expressly directs that the Secretary and the President "shall

[18] 19 U.S.C. § 1862(b)(3)(A).

[19] *See* 19 U.S.C. § 1862(d) ("the Secretary and the President shall, in light of the requirements of national security and without excluding other relevant factors…" and "serious effects resulting from the displacement of any domestic products by excessive imports shall be considered, without excluding other factors…").

[20] This reading is supported by Congressional findings in other statutes. *See, e.g.*, 15 U.S.C. § 271(a)(1) ("The future well-being of the United States economy depends on a strong manufacturing base…") and 50 U.S.C. § 4502(a) ("Congress finds that – (1) the security of the United States is dependent on the ability of the domestic industrial base to supply materials and services… (2)(C) to provide for the protection and restoration of domestic critical infrastructure operations under emergency conditions… (3)… the national defense preparedness effort of the United States government requires – (C) the development of domestic productive capacity to meet – (ii) unique technological requirements… (7) much of the industrial capacity that is relied upon by the United States Government for military production and other national defense purposes is deeply and directly influenced by – (A) the overall competitiveness of the industrial economy of the United States; and (B) the ability of industries in the United States, in general, to produce internationally competitive products and operate profitably while maintaining adequate research and development to preserve competitiveness with respect to military and civilian production; and (8) the inability of industries in the United States, especially smaller subcontractors and suppliers, to provide vital parts and components and other materials would impair the ability to sustain the Armed Forces of the United States in combat for longer than a short period.").

recognize the close relation of the economic welfare of the Nation to our national security."[21] *See* 19 U.S.C. § 1862(d).

In addition to "national defense" requirements, two of the factors listed in the second sentence of Section 232(d) are particularly relevant in this investigation. Both are directed at how "such quantities" of imports threaten to impair national security. *See* 19 U.S.C. § 1862(b)(3)(A). In administering Section 232, the Secretary and the President are required to "take into consideration the impact of foreign competition on the economic welfare of individual domestic industries" and any "serious effects resulting from the displacement of any domestic products by excessive imports" in "determining whether such weakening of our internal economy may impair the national security." *See* 19 U.S.C. § 1862(d). Imports of titanium sponge supplied 68 percent of U.S. consumption in 2018. Many of these imports are priced well below the prevailing price for U.S.-origin titanium sponge and have been a major factor in the decline of U.S. titanium sponge production.

Two other factors included in the statute that are also particularly relevant to this investigation are "loss of skills" and "loss of investment." *See* 19 U.S.C. § 1862(d). As imports of titanium sponge have increased, losses of U.S. titanium sponge production capacity have caused a decline in the skilled workforce needed for the sponge manufacturing process. These imports are also a disincentive for

[21] *Accord* 50 U.S.C. § 4502(a).

needed investment in aging U.S. titanium sponge production facilities; without this investment, future production of domestic titanium sponge is not sustainable. These factors are illustrative of a "weakening of the internal economy [that] may impair the national security" as defined in Section 232.

III. Investigation Process

A. Initiation of Investigation

On September 27, 2018 Titanium Metals Corporation (TIMET) petitioned the Secretary to conduct an investigation under Section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. § 1862), to determine the effect of imports of titanium sponge on the national security.

Upon receipt of the petition, the Department reviewed the material facts outlined in the petition. Initial discussions were held with other bureaus within the Department as well as with the Department of Defense. Legal counsel at the Department also reviewed the petition to ensure it met the requirements of the Section 232 statute and the implementing regulations.

Subsequently, on March 4, 2019 the Department accepted the petition and initiated the investigation. Pursuant to Section 232(b)(1)(b), the Department notified the U.S. Department of Defense with a March 4, 2019 letter from Secretary Ross to Acting Secretary of Defense Patrick Shanahan (*See* Appendix A).

On March 8, 2019, the Department published a Federal Register Notice (*See* Appendix B - *Federal Register*, 84 FR 8503) announcing the initiation of an investigation to determine the effect of imports of titanium sponge on the national security. The notice also announced the opening of the public comment period.

B. Public Comments

On March 8, 2019, the Department invited interested parties to submit written comments, opinions, data, information, or advice relevant to the criteria listed in Section 705.4 of the National Security Industrial Base Regulations (15 C.F.R. § 705.4) as they affect the requirements of national security, including the following:

(a) Quantity of the articles subject to the investigation and other circumstances related to the importation of such articles;

(b) Domestic production capacity needed for these articles to meet projected national defense requirements;

(c) The capacity of domestic industries to meet projected national defense requirements;

(d) Existing and anticipated availability of human resources, products, raw materials, production equipment, facilities, and other supplies and services essential to the national defense;

(e) Growth requirements of domestic industries needed to meet national defense requirements and the supplies and services including the investment, exploration and development necessary to assure such growth;

(f) The impact of foreign competition on the economic welfare of any domestic industry essential to our national security;

(g) The displacement of any domestic products causing substantial unemployment, decrease in the revenues of government, loss of investment or specialized skills and productive capacity, or other serious effects;

(h) Relevant factors that are causing or will cause a weakening of our national economy; and

(i) Any other relevant factors.

The initial public comment period ended on April 22, 2019.

The Department received 14 initial written submissions concerning this investigation, all of which were posted on Regulations.gov for public review. Parties who submitted comments included titanium industry participants, representatives of state and local governments, foreign governments, and other concerned parties.

All comments were then opened for a rebuttal period ending on May 22, 2019. Four rebuttal comments from titanium industry participants and other stakeholders were received and posted on Regulations.gov for public review.

All public comments were reviewed and factored into the investigative process. All public comments received are summarized in Appendix C, along with a link to the Regulations.gov docket (BIS-2018-0027) where comments can be viewed in full.

C. Information Gathering and Data Collection Activities

In order to gain insight into the U.S. titanium sponge industry, information gathering activities and meetings were held with representatives of domestic and international titanium sponge producers, titanium end users, industry associations, foreign governments, and other parties with an interest in the U.S. titanium sponge industry.

Due to the limited number of firms engaged in the U.S. titanium sponge industry, it was determined that a public hearing was not necessary in order to conduct a comprehensive investigation. In lieu of holding a public hearing on this investigation, the Department issued surveys (*See* Appendices D and E) to all participants in the U.S. titanium sponge industry as well as a representative sample of downstream consumers of titanium products. These surveys collected both qualitative and quantitative information. The first survey was designed for titanium sponge and semi-fabricated titanium product producers and was distributed to 10 organizations. The second survey was sent to 17 organizations, representative of downstream consumers of titanium products, including aerospace and other firms. The surveys provided an opportunity for organizations to disclose confidential and non-public information needed by the Department to conduct a thorough investigation.

These mandatory surveys were conducted pursuant to Section 705 of the Defense Production Act (DPA) of 1950, as amended (50 U.S.C. § 4555), and collected data on imports/exports, production, capacity utilization, employment, operating status, global competition, and financial information. The resulting aggregate data provided the Department with detailed industry information that is otherwise not publicly available and was necessary to conduct analysis for this investigation.

Responses to the Department's questionnaires were mandatory (*See* 50 U.S.C. § 4555). Information furnished in the survey responses is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the DPA. Section 705 of the DPA prohibits the publication or disclosure of this information unless the President determines that the withholding of such information is contrary to the interest of the national defense. Information will not be shared with any non-government entity other than in aggregate form.

D. Interagency Consultation

The Department consulted with the Department of Defense, including the Office of Industrial Policy and the Defense Logistics Agency, regarding methodological and policy questions that arose during the investigation.

The Department also consulted with other U.S. Government agencies with expertise and information regarding the domestic and global titanium sponge industries, including the Department's International Trade Administration, the Department of the Interior's U.S. Geological Survey, the Department of State, and the White House Office of Trade and Manufacturing Policy.

IV. Product Scope of the Investigation

The scope of this investigation defines titanium sponge at the Harmonized Tariff Schedule of the United States (HTS) 10-digit level. The product and its associated HTS code are provided in Figure 1 below.

Figure 1. Titanium Sponge Product Scope of the Investigation	
Heading/Subheading/Product	**10 Digit HTS Code**
Titanium Sponge	8108.20.0010
Source: United States International Trade Commission and U.S. Department of Commerce, Bureau of Industry and Security	

The HTS code includes all grades of titanium sponge, including standard grade and premium grade (aerospace non-rotating and aerospace rotating).[22] TIMET, the only operating U.S. titanium sponge facility, and Allegheny Technologies Incorporated (ATI), with an idled facility (2016), are the only two domestic companies with the capability and capacity to produce the types of titanium sponge included in the scope of this investigation. Though the HTS code also includes "ultra-high purity" titanium sponge, this type of sponge is not considered in the investigation. Ultra-high purity sponge is not used in conventional industrial titanium metal applications, and is exclusively used for

[22] Most titanium sponge is classified by its intended end use. Standard grade sponge is used for manufacturing and other routine industrial uses. Aerospace non-rotating grade sponge is used in static aerospace structural parts such as wing spars. Aerospace rotating grade sponge is used in high performance aerospace applications, such as engines and landing gear. Each of these grades has different chemistry and quality requirements established by end users.

electronics manufacturing. Material from the one facility in the U.S. producing ultra-high purity sponge is not certified for aerospace applications.[23] Neither TIMET nor ATI have produced ultra-high purity sponge.

Titanium sponge is the necessary intermediate product between unprocessed titanium ore and titanium ingot and other downstream titanium products. For the purposes of this investigation, some downstream products including items such as titanium ingot and billet, titanium bar, titanium rod, titanium wire, titanium plate and sheet, and other titanium products, are examined in order to understand the titanium industry as a whole.

Another product examined is titanium scrap. Scrap is included because it can be used as a source of feedstock for titanium melting operations in addition to and in lieu of titanium sponge. U.S. melters are increasingly using both U.S. and non-U.S. origin scrap as feedstock for their melting operations.[24] The titanium scrap that is produced and re-used in the U.S. is reliant on the availability of imported sponge for initial titanium production. Increased reliance on import-dependent titanium scrap, coupled with an increasing reliance on imported titanium

[23] Honeywell Electronic Materials "Honeywell Sodium-Reduced Titanium Sponge" (2010). In the United States, this type of titanium sponge is manufactured by Honeywell Electronic Materials at a facility in Bountiful, Utah. [redacted]

[24] More information on scrap usage can be found in Chapter VII.

sponge, highlights the growing concern that imports pose to both the titanium sponge producers as well as the U.S. downstream titanium industry.

The investigation also considers titanium consumption in aerospace and defense applications, including titanium parts used in airframe and engine assembly in addition to land and naval turbines. In addition, titanium use in critical infrastructure applications is included in overall consumption calculations.

V. Background on the U.S. Titanium Industry

The U.S. began producing titanium metal for industrial applications in the mid-20th century.[25] Titanium, which is principally found in ilmenite and rutile ores, is required for production of two broad types of titanium product. The largest market for titanium, accounting for 93 percent of global titanium feedstock consumption, is the production of titanium dioxide pigment, which is used in applications such as papers, paints, and plastics.[26] The second major market includes the production of titanium sponge for use in titanium metal semi-finished goods and titanium metal finished goods. Less than five percent of titanium

[25] Laurel G. Woodruff, George M. Bedinger, and Nadine M. Piatak, "Titanium: Chapter T of Critical Mineral Resources of the United States – Economic and Environmental Geology and Prospects for Future Supply". United States Geological Survey, Vienna, VA (2017), https://pubs.usgs.gov/pp/1802/t/pp1802t.pdf, T1.

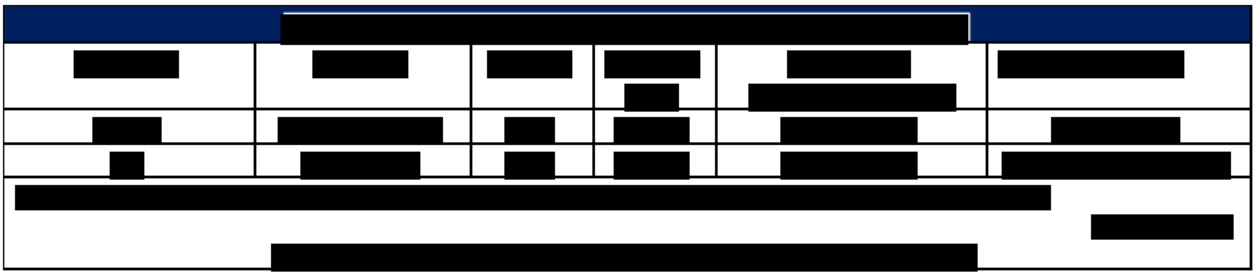
[26] Ibid, T2.

feedstock is used in this market, which includes defense, commercial aerospace, and industrial end-use products.[27]

Titanium sponge is the source material needed to produce titanium metal products used in defense, commercial aerospace, and industrial applications. Titanium sponge is melted to produce titanium ingots, billets, and other downstream titanium goods and finished products such as titanium bar, titanium plate, titanium tube, titanium coil, and titanium sheet. It is important to note that titanium dioxide pigment and titanium sponge production are not interchangeable; titanium dioxide pigment cannot be converted into titanium sponge.

Though the U.S. is a significant global consumer and supplier of titanium products, there is only one remaining domestic producer capable of manufacturing titanium sponge for industrial and defense applications (*See* Figure 2). The other U.S. producer of titanium sponge, ATI, idled operations in late 2016. Honeywell Electronics Materials maintains limited capacity and capabilities to produce ultra-high purity titanium sponge at their facility in Utah, but the applications of this type of sponge are limited to specific electronic uses. Honeywell is not considered a source of titanium sponge production for defense and industrial applications.

[27] Ibid.



A. Titanium Sponge Manufacturing

The sponge production process must start with the conversion of titanium ore into a usable form. This is achieved through the blending of titanium feedstock, including rutile and ilmenite concentrates and titanium slag, with petroleum coke.[28] The concentrate/coke mixture is then exposed to chlorine in a fluid bed reactor at high temperatures. The resulting product is titanium tetrachloride ($TiCl_4$). TIMET manufactures $TiCl_4$ on-site at its Henderson facility for use in sponge manufacturing.[29] Other U.S. producers of $TiCl_4$ include Chemours's facility in New Johnsonville, Tennessee and Cristal's facility in Ashtabula, Ohio.[30] However, the $TiCl_4$ produced by these firms is primarily used for titanium dioxide production for use in the pigments market. Once $TiCl_4$ has

[28] Most $TiCl_4$ production in the United States is done using rutile ore and a certain variety of slag. TZ Minerals International Pty Ltd, "Titanium Feedstock Market Dynamics 2010: Outlook to 2018", 24.

[29] U.S. production of rutile and ilmenite ore is limited; in 2018, U.S. production of these minerals accounted for just 5.7 percent of the world's combined rutile and ilmenite production. Petitioner obtains its rutile and ilmenite feedstock from Australia and South Africa. U.S. Geological Survey, "Titanium Mineral Concentrates" (2019), 177, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-timin.pdf

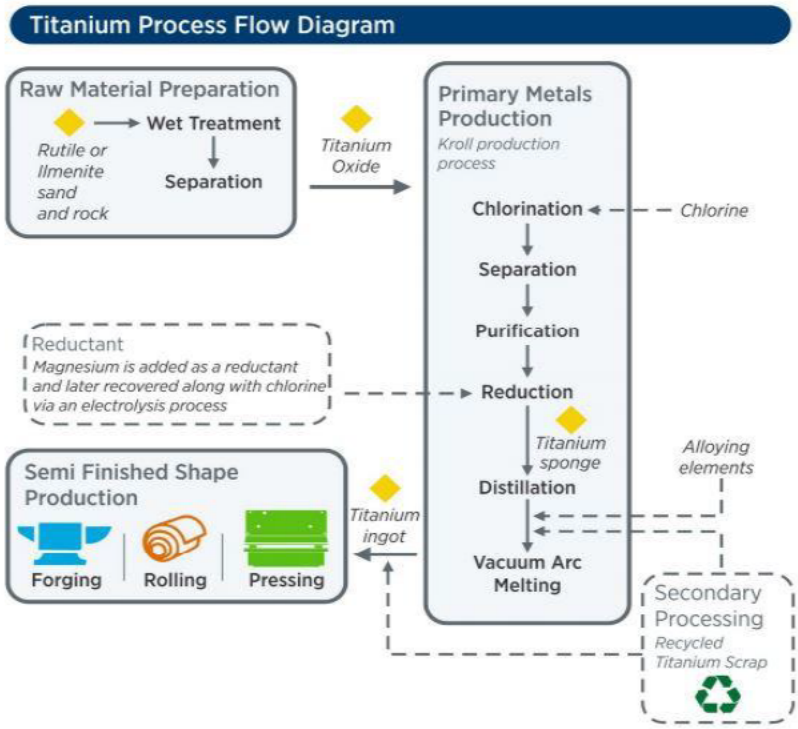
[30] Ibid.

been produced or obtained, it can then be transformed into titanium sponge through two primary processes described below.

1. *Kroll Process*

The Kroll process, which was devised in the 1930s by chemist William Kroll and commercially deployed in 1948, is the principal method for producing titanium sponge. Currently all global producers of titanium sponge for aerospace and other industrial applications use the Kroll process. Figure 3 below shows the Kroll process in more detail.

Figure 3. – Kroll Process



Note: The above diagram shows sponge melted via the vacuum arc re-melting (VAR) process. VAR is not the only titanium melting process used in the United States. Cold-hearth melt processes, including electron beam and plasma melting, are also used.

Source: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, "Bandwidth Study on Energy Use and Potential Energy Savings Opportunities in U.S. Titanium Manufacturing"

The Kroll process involves several steps. First, a pressurized steel vessel is filled with argon and magnesium enabling the reduction of $TiCl_4$.[31] The vessel is then heated to approximately 1,470 to 1,650 degrees Fahrenheit, and $TiCl_4$ is slowly introduced into the vessel.[32] The combined chemical and heat reaction

[31] Steven J. Gerdemann, "Titanium Process Technologies", *Advanced Materials and Processes* (July 2001), https://www.asminternational.org/documents/10192/1755977/amp15907p041.pdf/292e9b8e-d88a-4a72-b67a-b1d8c7904baf, 41.

[32] Ibid.

causes the magnesium to react with the $TiCl_4$.[33] Two products are left following the reaction: titanium metal and magnesium chloride ($MgCl_2$). The $MgCl_2$ and any remaining unreacted magnesium are removed from the vessel, leaving only the titanium metal.[34] Due to its porous properties, the titanium metal produced in this process is colloquially known as titanium sponge. After production, the sponge is sheared and crushed into smaller pellets for storage and eventual melt.

2. Hunter Process

There have been limited attempts to develop alternatives to the Kroll process. The only current active commercial alternative to the Kroll process in the United States is the Hunter process, which is used at Honeywell Electronic Materials' plant in Bountiful, Utah.[35]

The Hunter process differs primarily in its use of sodium instead of magnesium during the production process. Use of sodium allows for the creation of a higher-purity sponge, albeit at a higher overall cost. Consequently, sponge produced by the Hunter process is almost exclusively used for manufacturing semiconductors.[36]

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[33] Ibid.

[34] Ibid.

[35] Honeywell Electronic Materials "Honeywell Sodium-Reduced Titanium Sponge" (2010)

[36] [redacted]

B. History of U.S. Titanium Sponge Production

Titanium sponge production in the United States began in 1938 with a demonstration of the Kroll process funded by the Bureau of Mines. During the Second World War, the U.S. government continued to fund research into the Kroll process and scalability for commercial production; a pilot production facility was completed in 1942.[37] Commercial production began in 1947 when E.I. du Pont de Nemours and Company (DuPont) opened a large scale production line. By 1952, DuPont's facility produced more than 800 metric tons of sponge per year.[38]

Increased aerospace industry demand for titanium encouraged entry into the titanium market. TIMET was founded in January 1950 as a joint venture by the National Lead Company and Allegheny Ludlum Steel Corporation.[39] TIMET opened a titanium sponge production line in Henderson, Nevada in 1951 which is still in service today. By 1957, U.S. titanium sponge production capacity stood at

[redacted]

[37] National Academy of Sciences – National Academy of Engineering, "Direct Reduction Processes for the Production of Titanium Metal", (March 1974), https://pdfs.semanticscholar.org/a101/06d88ae7 9a959156b3cfb6b45d2ad0372fe9.pdf, 5.

[38] F.H. Froes, ed., "Titanium – Physical Metallurgy, Processing, and Applications", (2015), https://www.asminternational.org/documents/10192/1849770/05448G_Sample.pdf/0cceaefd-da84-49d9-9ca4-1f95eb9fc304, 1.

[39] Ibid., 2.

33,100 metric tons per year, with an estimated actual production of 15,600 metric tons.[40]

U.S. government support was instrumental in setting up the domestic titanium sponge industry. After funding multiple sponge research projects, the General Services Administration (GSA) began a comprehensive investment program for commercial production. Beginning in August 1951, GSA advanced capital for the fixed investment costs in titanium sponge plant capacity as part of a contract to purchase a portion of plant output at specified prices or engaged in other contractual agreements. These arrangements were essentially government-backed loans.[41] By the time the program ended in September 1955, it had resulted in contracts with five companies and created 21,000 tons of capacity.[42]

The United States was not alone in developing a titanium sponge industry. Imperial Chemicals Industries opened a titanium sponge production line in the United Kingdom in 1948. Japanese production began with Osaka Titanium Company in 1952, and, by 1954, five Japanese companies had opened titanium sponge production facilities with a combined capacity of 611 metric tons. The

[40] Ibid.; USGS, "Titanium Sponge Statistics" (January 19, 2017)

[41] U.S. Department of Justice, "Review of Voluntary Agreements Program Under the Defense Production Act: Titanium Metal Industry" (May 9, 1957), 11.

[42] Ibid.

Soviet Union also opened three titanium sponge plants during the same period. These foreign competitors then began to challenge previous U.S. dominance of the titanium sponge industry. Sponge imports into the United States were first reported in 1956. By 1967, sponge imports accounted for one-third of all U.S. sponge consumption.[43]

Increased competition from foreign imports and fluctuating demand caused consolidations and closures of U.S. sponge manufacturers. In 1984, there were five plants producing titanium sponge totaling 30,400 metric tons of capacity.[44] By 1987, Teledyne Wah Chang in Albany, Oregon and Western Zirconium in Utah had closed their facilities, leaving a capacity of 25,400 metric tons.

These closures left three active sponge plants: TIMET's Henderson, Nevada facility, Oremet's Albany, Oregon plant, and a joint USX-National Distillers and Chemicals Corporation facility (later RTI International Metals, now Arconic) in Ashtabula, Ohio. Oremet's Albany plant was later sold to ATI and reactivated for a time in the 1990s and 2000s. RMI Titanium closed the Ashtabula facility in

[43] Ibid. In 1967, 81 percent of all U.S. imports came from the United Kingdom and Japan and the remaining 19 percent came from the Soviet Union. United States Tariff Commission, "Titanium Sponge from the U.S.S.R." (July 1968), 21.

[44] F.H. Froes, ed., "Titanium – Physical Metallurgy, Processing, and Applications", 3.

1992[45], and ATI finally ended operations at the Albany plant in 2009 to coincide with the opening of their new Rowley, Utah facility.[46] During the same period, TIMET upgraded its operations at the Henderson plant to include a modern vacuum distillation plant, built with technology licensed from Toho Titanium Company.

In September 2007, to support its contracts with Airbus, RTI International Metals announced plans to build a 9,000 metric ton titanium sponge plant in Hamilton, Mississippi.[47] However, due to cost concerns and market conditions, the company cancelled construction of the plant in December 2009 and instead opted to sign new long-term supply agreements with Japanese producer Osaka Titanium Technologies Co. Ltd (OTC).[48]

ATI broke ground on a new titanium sponge plant in Rowley, Utah in 2006, with operations beginning at the facility at the end of 2009.[49] The Rowley facility

[45] Unlike its contemporaries, the Ashtabula plant used the Hunter process instead of the Kroll process. Paul C. Turner, Alan Hartman, et al. "Low Cost Titanium – Myth or Reality", U.S. Department of Energy, Office of Scientific and Technical Information (2001), https://www.osti.gov/servlets/purl/899609, 3.

[46] Frank Haflich, "ATI sponge plant closure seen a non-issue", *Fastmarkets AMM* (January 31, 2014), https://www.amm.com/Article/3304541/ATI-sponge-plant-closure-seen-a-non-issue html

[47] Donna Ladd, "Breaking: RTI to Build Titanium Sponge Plant in Mississippi", *Jackson Free Press* (September 17, 2007), http://www.jacksonfreepress.com/news/2007/sep/17/breaking-rti-to-build-titanium-sponge-plant-in/

[48] Wally Northway, "RTI puts plant on hold indefinitely", *Mississippi Business Journal* (December 16, 2009), https://msbusiness.com/2009/12/rti-puts-plant-on-hold-indefinitely/

[49] "(AMM) ATI's Rowley titanium sponge plant launched", *Fastmarkets AMM* (January 15, 2010), https://www.metalbulletin.com/Article/2374249/AMM-ATIs-Rowley-titanium-sponge-plant-launched.html

did not have on-site $TiCl_4$ production capability and ATI had to source the material from other suppliers.[50] Reliance on external suppliers and increased production costs at Rowley, combined with decreasing global titanium sponge prices, influenced ATI's decision to idle the plant in August 2016.[51] [redacted] [52]

TIMET's Henderson facility has been the only operating U.S. titanium sponge production facility since 2017. [redacted] [53] [redacted]

[50] ATI obtained $TiCl_4$ from a supplier in Ohio and shipped it via rail to the Rowley plant. The liability costs associated with shipping $TiCl_4$ were one of the factors contributing to ATI's decision to idle the plant. Allegheny Technologies Incorporated, "Comments on Section 232 National Security Investigation of Imports of Titanium Sponge", pp. 16-17.

[51] Allegheny Technologies Incorporated, "Allegheny Technologies Announces Actions to Improve Future Financial Performance", (August 24, 2016), https://www.businesswire.com/news/home/20160824006136/en/Allegheny-Technologies-Announces-Actions-Improve-Future-Financial

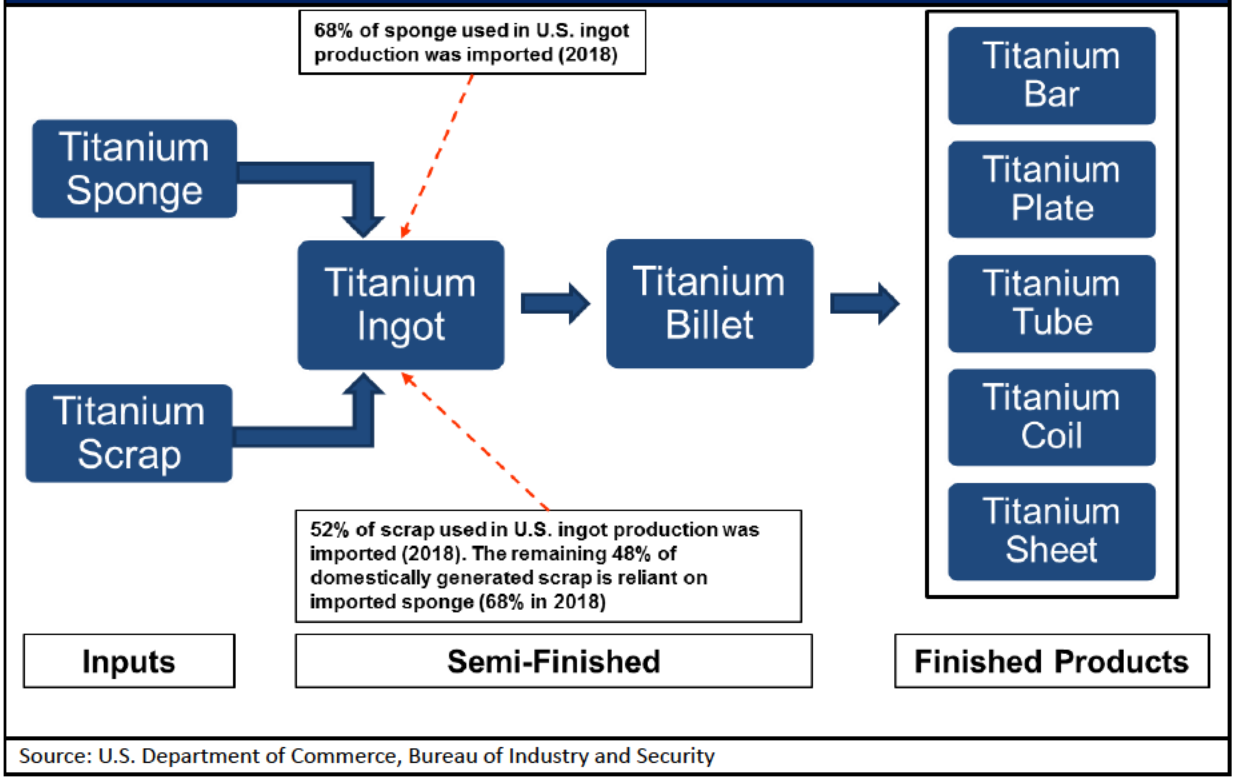
[52] [redacted]

[53] [redacted]

[redacted][54]

Understanding the role of titanium sponge in downstream titanium goods production is imperative to understanding the threat imports pose to the national security. Figure 4 outlines the general flow of inputs to outputs in the titanium products market, and highlights the U.S. titanium industry's reliance on imports of titanium sponge and scrap.

Figure 4. Downstream Titanium Products and Reliance on Imported Titanium Sponge

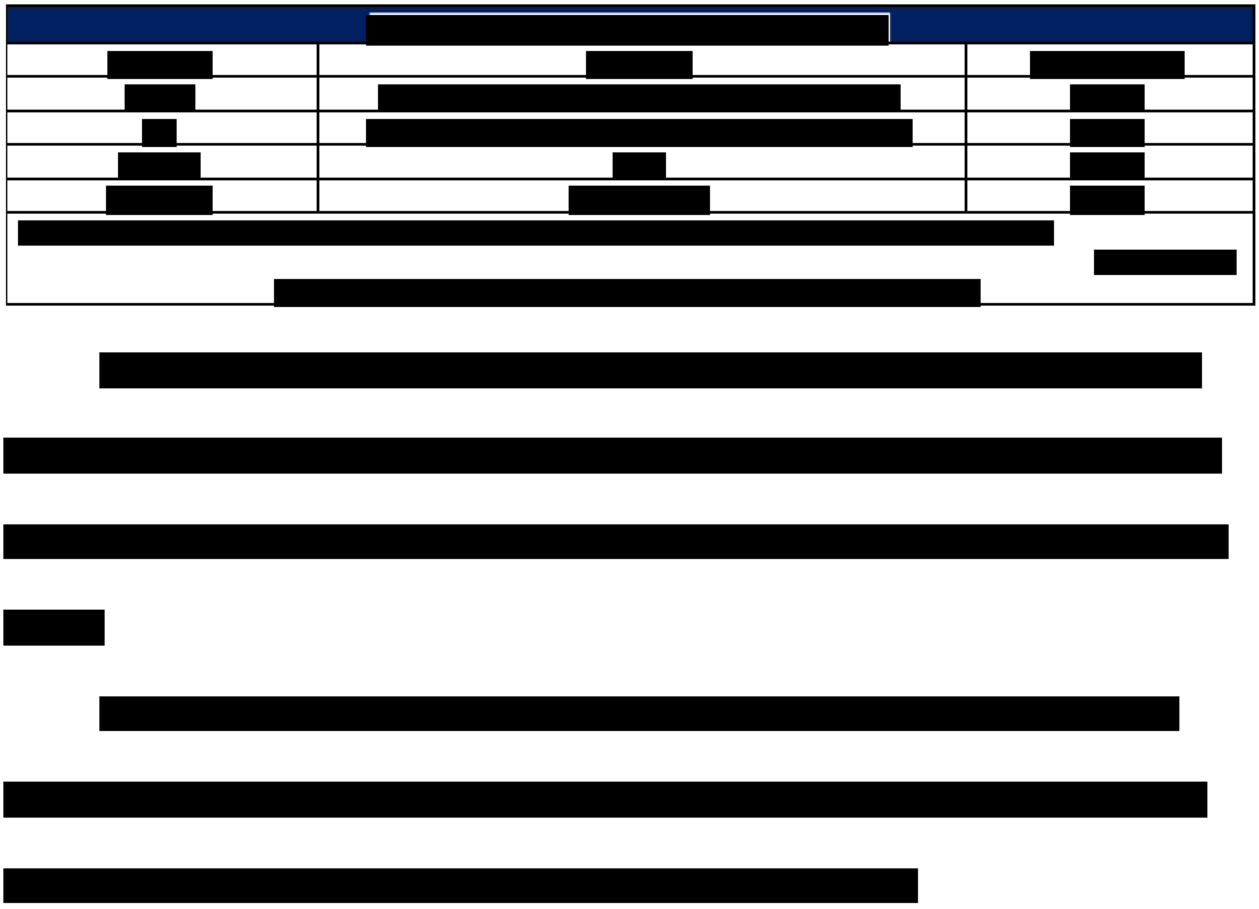


Source: U.S. Department of Commerce, Bureau of Industry and Security

[54] [redacted]

C. Titanium Melting and Finished Titanium Products

Once produced, titanium sponge must then be melted before it can be fabricated into ingot or slab suitable for downstream use.[55] In the United States, four companies have titanium melt capacity: TIMET, Allegheny Technologies Incorporated (ATI), Arconic, and Perryman (*See* Figure 5).



[55] Two processes are used for melting titanium: vacuum arc re-melting (VAR) and hearth melting. The VAR process involves placing the metal in a crucible in a vacuum-sealed furnace; the metal is melted using an electric arc and then formed into an ingot. The hearth melting process uses electron or plasma beams to melt the sponge in a water-cooled hearth; the melted material then forms an ingot.

[redacted]

These firms' capacity utilizations indicate overall company health. On average, the four firms' titanium melting operations had an average capacity utilization of 83 percent in 2018. Similarly, the firms' titanium milling operations had an average capacity utilization of 74 percent in 2018. High capacity utilization rates for melting and milling operations are attributable to strong demand for titanium products from the aerospace, medical, and petrochemical sectors.

Employment figures also suggest a healthy business outlook for the melters. [redacted] reported an average 21 percent increase in the number full-time employees between 2015 and 2019. [redacted] indicated a [redacted] decrease in full-time employees over the same period, this decrease can be attributed to [redacted]

Although the U.S. titanium melting industry is broadly healthy, it remains vulnerable to a potential national emergency. These melters, as will be discussed in Chapter VII, are dependent on non-U.S. sources for much of their titanium sponge and titanium scrap feedstock. If these sources are lost, U.S. titanium

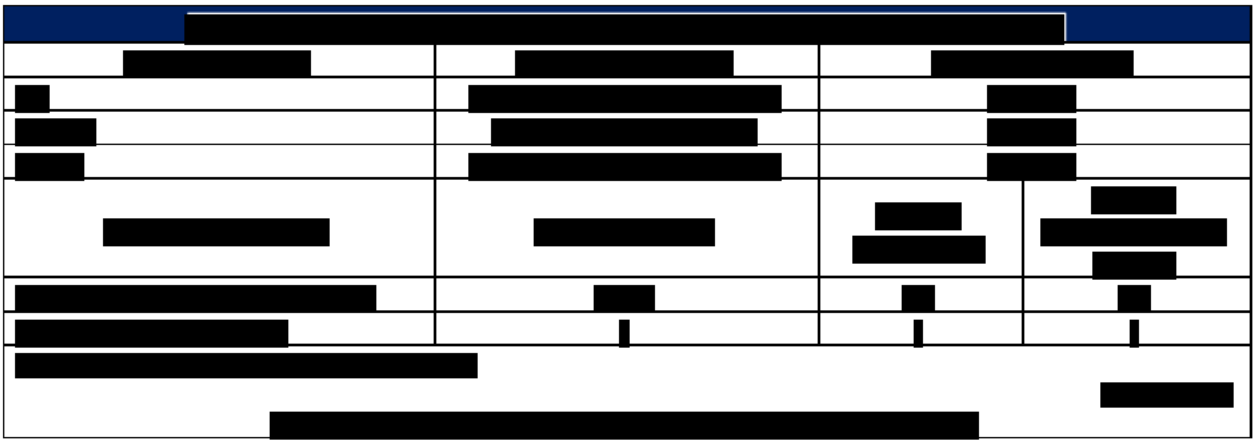
melters would be unable to supply vital national defense and critical infrastructure applications.

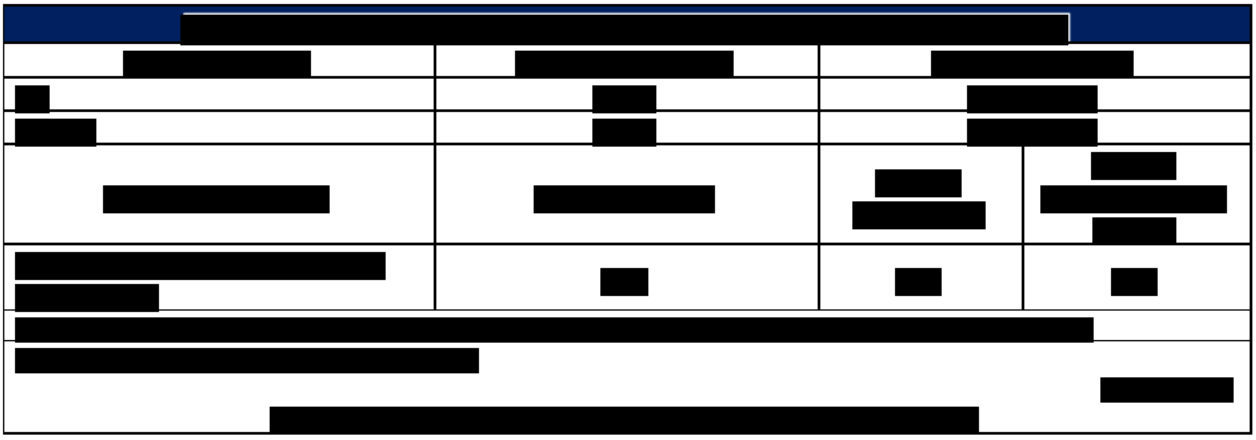
Four notable U.S. firms use titanium in their finished products: [redacted] Further information on their titanium usage are outlined below in Figures 10 through 13.

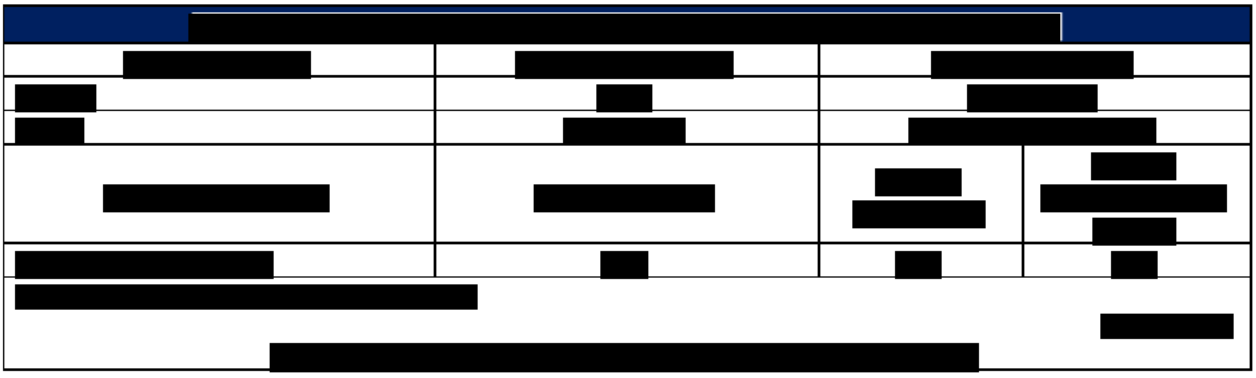
These four end-user companies provide a snapshot of the types of finished titanium products that U.S. companies manufactured in 2018, as well as the sectors that these finished products supported. Both commercial and defense sectors are

supported by these companies, and some exported a significant portion of their commercial titanium products. These exports highlight the demand for U.S.-produced titanium products, and stress the health of this particular part of the U.S. titanium supply chain.

Despite the health of these companies, it is important to note that the four titanium melters which supply titanium goods to these end users are reliant on imports of titanium sponge and scrap for production. End users are therefore indirectly subjected to the same potential risks as their titanium suppliers. The inter-dependency between these companies emphasizes the entirety of the U.S. titanium supply chain's dependency on imports of titanium sponge and scrap and vulnerability to the associated national security threat.







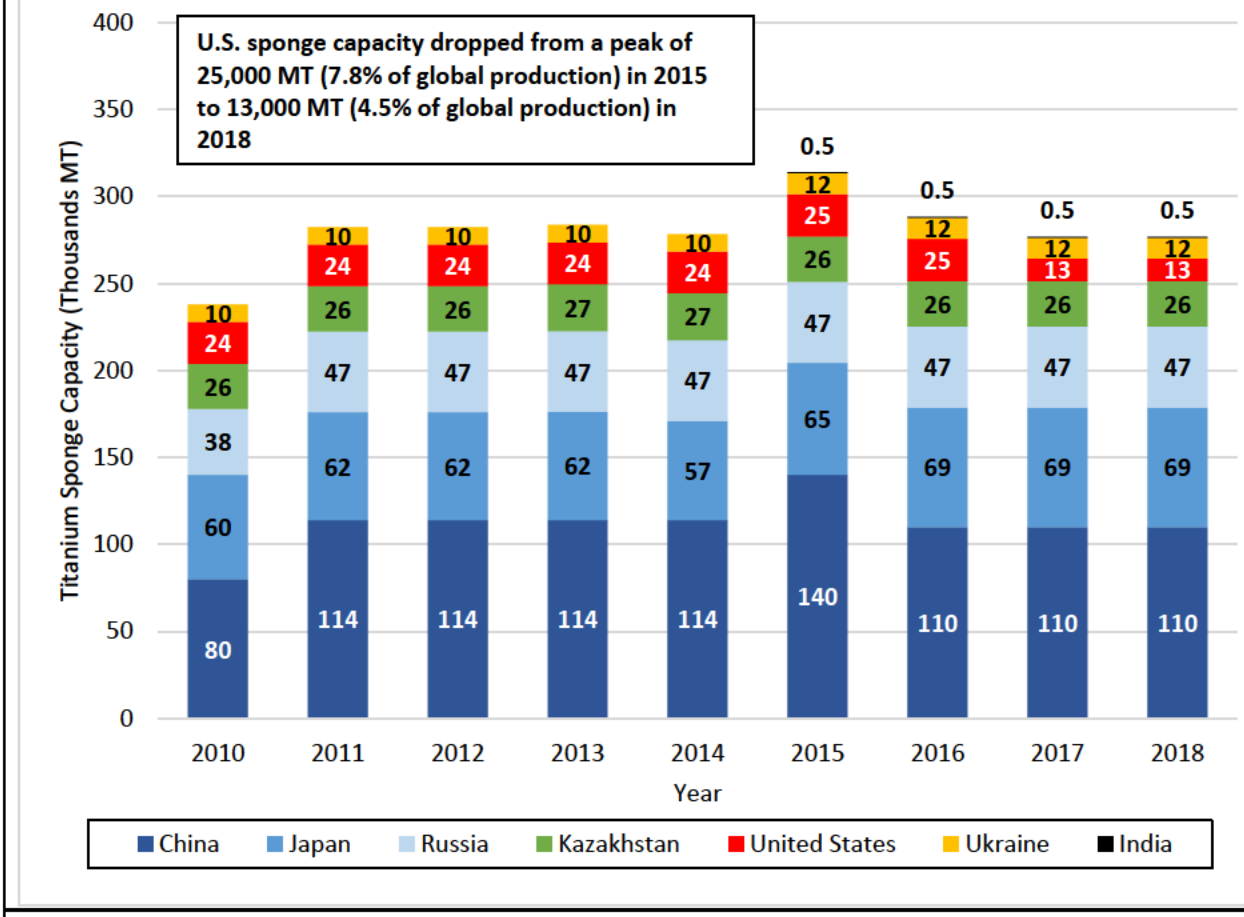
VI. Global Titanium Sponge Industry Conditions

A. Overview

Only a few countries possess the capability to manufacture titanium sponge due to the significant capital investment and supporting infrastructure required to maintain and operate facilities. Figure 14 below identifies countries with titanium sponge production capacity. Over the 2010-2018 period, countries such as China, Japan, and Russia saw capacity growth rates between 15 and 38 percent; in contrast, the U.S. experienced a 46 percent decline. The sole operating U.S. facility has [redacted] of capacity, which is among the smallest worldwide.[56]

[56] The figure provided on this graph includes Honeywell Electronic Materials' 500 MT facility which produces ultra-high purity sponge for use in electronic applications. This type of sponge is not considered in the investigation. [redacted]

Figure 14. World Titanium Sponge Capacity, 2010 - 2018



Note: U.S. capacity figures include Honeywell's sponge operations

Source: U.S. Geological Survey

Many of the major non-U.S. producers of titanium sponge opened their facilities in the immediate post WWII period to fulfill burgeoning aerospace demand. Plants in Russia (now VSMPO-Avisma) and Kazakhstan (now UKTMP), which were commissioned in the 1950s and 1960s to serve Soviet military aerospace demand, are examples of these. Since the collapse of the Soviet Union, VSMPO-Avisma and UKTMP have shifted their focus towards civilian applications. VSMPO-Avisma, as will be detailed in Chapter VII, has built

extensive supplier relationships with Boeing, Airbus, and other Western aerospace firms. UKTMP has pursued similar relationships with aerospace firms and has also entered into joint ventures with Korean and French firms to expand its ingot and slab manufacturing capabilities.

Although VSMPO-Avisma and UKTMP have diversified their product offerings, the two companies remain prominent global producers of sponge. During the 2015-2018 period, both VSMPO-Avisma's and UKTMP's production levels remained constant at 26,000 metric tons and 47,000 metric tons respectively. Combined, these firms account for approximately 25 percent of global production.

China, India, and Saudi Arabia are more recent entries into the global market. China's sponge production capacity, which stood at 7,000 metric tons in 1998, increased by nearly 1,500 percent to 110,000 metric tons in 2018.[57] This increase in capacity has not yet resulted in an increased supply of Chinese sponge on the global market, as Chinese production is principally for domestic consumption at this time. However, China is expected to participate in the global titanium sponge market in the coming years once domestic needs are satisfied. Chinese titanium sponge development, as will be described in a subsequent section, is a key part of Chinese government initiatives to develop the country's

[57] U.S. Geological Survey, Titanium and Titanium Dioxide (1999), https://s3-us-west-2.amazonaws.com/prd-wret/assets/palladium/production/mineral-pubs/titanium/670399.pdf

defense industrial base, particularly the aerospace sector. Japanese and other titanium sponge producers have limited to no access to the Chinese market for sponge.

India's sponge plant, which has a capacity of 500 metric tons and came online in 2015, was built to address titanium needs for the country's space program and is not yet intended for commercial production. In contrast, Saudi Arabia's plant is part of the country's economic diversification strategy. Owned by a joint venture of Saudi firms Tasnee and Cristal and Japanese sponge producer Toho, the Saudi plant's 15,600 metric ton capacity rivals existing plants in the United States, Ukraine, Russia, and Japan and began operations in September 2019.[58]

Several factors have driven new entries into the titanium sponge market and expansions of existing capacity. One of these is significant commercial aircraft production backlogs at Boeing and Airbus. As of June 2019, Boeing had an estimated seven year backlog of 5,733 aircraft and Airbus reported an estimated nine year backlog of 7,276 aircraft.[59] Meeting these orders will require increased production of titanium parts, which will require increased production of titanium

[58] "Tasnee postpones its titanium sponge project to H2 2019", *Argaam,* (June 25, 2019), https://www.argaam.com/en/article/articledetail/id/615205

[59] J. Kasper Oestergaard, "Airbus and Boeing Report June 2019 Commercial Aircraft Orders and Deliveries"< Defense and Security Monitor – Forecast International" (July 16, 2019), https://dsm forecastinternational.com/wordpress/2019/03/15/airbus-and-boeing-report-february-commercial-aircraft-orders-and-deliveries/

sponge. Growth in shipbuilding, particularly in China and the Republic of Korea, is also driving demand for titanium.[60] Titanium has growing maritime applications, including in marine turbines, propeller shafts, and various exhaust and piping systems. Expansions in global petrochemical and power generation industries are also raising demand for titanium parts.[61]

Production follows a similar pattern of non-U.S. increases and U.S. decreases. As shown in Figure 15 below, Chinese, Russian, and Japanese production levels increased between 21 and 63 percent over the 2010 to 2018 period. Although U.S. production data before 2015 is unavailable, U.S. production decreased [redacted] between 2015 and 2018.

[60] Argus Metals, "Feed shortage hampers world Ti sponge ramp up," (May 16, 2019), https://metals.argusmedia.com/newsandanalysis/article/1904225

[61] Ibid.

B. Prior Trade Investigations

The United States Government has examined previous allegations of dumping and subsidies for the titanium sponge industry (*See* Figure 16). A review of these cases can be found in Appendix F.

Figure 16. Trade Investigations of Titanium Sponge, 1968 - 2017			
Country	**Date**	**Determination**	**Action**
Union of Soviet Socialist Republics	April 1968	Affirmative	Antidumping duty order issued on imports from the U.S.S.R.
United Kingdom and Japan	January 1984	Affirmative for Japan, Negative for the U.K.	Antidumping duty order issued on imports from Japan
Japan, Kazakhstan, Russia, and Ukraine	August 1998	Negative	Antidumping duty orders on Japan, Kazakhstan, Russia, and Ukraine revoked
Japan and Kazakhstan	November 2017	Negative	No indication of injury to domestic industry from Japanese or Kazakhstani sponge imports
Source: U.S. International Trade Commission			

C. U.S. Duties on Titanium Sponge Imports

As of November 2019, all titanium sponge imported into the United States is subject to a 15 percent duty rate.[62] However, U.S. firms importing titanium sponge generally do not pay this rate due to the drawback provisions of 19 C.F.R. Part 191. Under 19 C.F.R. Part 191, manufacturers are able to claim drawback:

> "upon the exportation [of articles]…which are not used in the United States prior to their exportation or destruction, and which are manufactured or produced in the United States, wholly or in part with the use of particular imported, duty-paid merchandise and/or drawback products."[63]

In other words, a titanium manufacturer that imports sponge and then uses it to manufacture an ingot or other downstream titanium product that is exported to another country can claim drawback on the 15 percent duty paid on the sponge.

[62] Harmonized Tariff Schedule of the United States (2019) Revision 14, Chapter 81, Metals, Cermets, Articles Thereof, 8108.20.0010.

[63] U.S. Code of Federal Regulations Title 19, Part 191.21

Titanium manufacturers also benefit from the provision of 19 C.F.R. Part 191 that allows for a degree of substitution between industrial inputs. U.S. manufacturers have agreements with U.S. Customs and Border Protection that permit them to substitute scrap for sponge in drawback claims, thus allowing them to reclaim some of the duty paid without having to use the physical sponge associated with that duty amount.[64]

Some titanium producers have argued that the existing tariff harms the U.S. industry's overall competitiveness. As all producers other than TIMET are 100 percent dependent on imported sponge, U.S. producers must pursue the drawback process to recover the duty paid. In contrast, certain downstream goods made with significant quantities of titanium, including aircraft parts, can be imported into the United States duty-free.[65]

[64] Until 2018, titanium manufacturers could reclaim up to 99 percent of the duty paid through the drawback process. In 2015, the Trade Facilitation and Trade Enforcement Act (TFTEA) introduced a "lesser of" provision that calculates the drawback amount based on the "lesser of" a) the value of duties, taxes, and fees paid on the imported material or b) the value of duties, taxes, and fees that would have been paid on the substitute material if it had been imported. TIMET calculates that this will cap drawback recovery at approximately 66 percent of total duty paid for most manufacturers. U.S. Customs and Border Protection and the Treasury Department, "Modernized Drawback: A Proposed Rule", *Federal Register* vol. 83, 37886-37990. https://www federalregister.gov/documents/2018/08/02/2018-16279/modernized-drawback and Titanium Metals Corporation, Petition for Relief under Section 232, Exhibit 16.

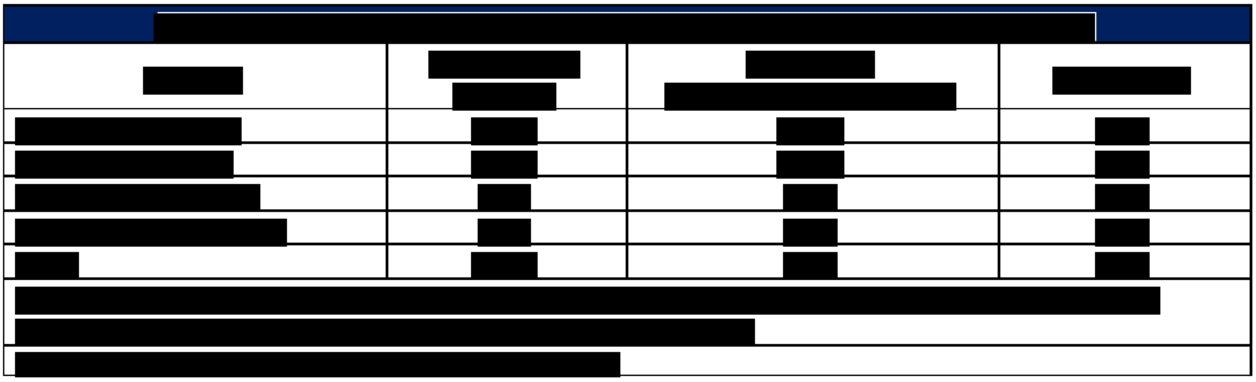
[65] Harmonized Tariff Schedule of the United States (2019) Revision 14, Chapter 88, Aircraft, Spacecraft, and Parts Thereof

VII. Findings

A. Titanium Sponge is Essential to U.S. National Security

As discussed in Chapter II, "national security" under Section 232 includes both national defense requirements and critical infrastructure applications.

The vast majority of titanium sponge is used to satisfy civilian aerospace and other industrial applications (*See* Figure 17).



1. Titanium Sponge is Required for National Defense Systems

Titanium metal, and, by extension, titanium sponge, is a critical material for many U.S. defense systems.[66] As a lightweight and durable material, titanium has been incorporated into U.S. military aircraft, including fighter jets, bombers, attack aircraft, transports, and helicopters. Newer aircraft use increased amounts of titanium compared to earlier generations of aircraft, as illustrated in Figure 18.

[66] The distinction between metal and sponge is made because sponge is an intermediate product. Titanium sponge is one of several sources of potential feedstock for titanium metal, including scrap titanium and titanium slag.

Figure 18. Titanium Content in Select U.S. Military Airframes		
Airframe	**Introduction into Service**	**% of Titanium Content**
CH-47 Chinook	1962	8%
F-15 Eagle	1976	10%
F-16 Fighting Falcon	1978	7%
F/A-18 Hornet	1984	12%
F-22 Raptor	2005	39%
V-22 Osprey	2007	31%
F-35 Lightning II	2015	20%
Military airframes entering service after 2000 have an average **30 percent** titanium content; airframes entering service prior to 2000 had an average of just **9 percent**.		
Source: Arconic Engineered Structures, "World Titanium Trends in Defense", Presentation at the Titanium USA conference, September 24, 2019		

Titanium is also used for ground vehicle armor and frames, as well as naval vessel components. A brief listing of U.S. defense systems using titanium metal can be found in Appendix G.

Congress has recognized the defense importance of titanium metal, including titanium sponge, through legislation. In 1973, Congress expanded the Berry Amendment (10 U.S.C. § 2533a) to include what it defined as "specialty metals."[67] This addition, commonly known as the "Specialty Metals Clause," requires that certain metals procured by DoD for defense use must be melted or produced in the United States or a qualifying country.[68] Both titanium and titanium

[67] The Fiscal Year 2007 National Defense Authorization Act removed this requirement from the Berry Amendment and separately established it in 10 U.S.C. § 2533b. Valerie Bailey Grasso, "The Specialty Metal Clause: Oversight Issue sand Opinions for Congress", *Congressional Research Service* (February 6, 2014), 1.

[68] As defined by DFAR 252.225-7001, qualifying countries are defined as those countries which have reciprocal defense procurement memorandums of understanding or other similar international agreements with the United States. These countries include Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Israel, Italy, Japan, Latvia, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.

alloys are covered by the Specialty Metals Clause.[69] Although the clause does not require that titanium sponge be of U.S. origin, the domestic melt requirement conveys a Congressional recognition of domestic titanium's overall importance to U.S. defense objectives and the criticality of titanium sponge to defense needs.

Though titanium is a key component of many defense systems, defense requirements are a small fraction of overall titanium demand. Consequently, U.S. titanium sponge production depends on the industry's commercial viability and continued ability to supply civilian needs for titanium metal.

While the United States does not currently maintain a stockpile of titanium sponge, a stockpile was maintained for over 50 years. Beginning in 1954, the Defense National Stockpile Center (DNSC) maintained a substantial stockpile of titanium sponge pursuant to the Strategic and Critical Minerals Stockpiling Act. The DNSC initially envisioned that the stockpile would be of sufficient size to supply peak consumption by downstream industry for up to one year. The exact yearly figure has not been publicly released, however, it was estimated to include up to 25,964 short tons (23,554 MT) of stockpile grade in 1994.[70] Following the

[69] Ibid.

[70] DNSC distinguished between stockpile grade and non-stockpile grade titanium sponge. In 1994, for example, the DNSC stockpile included 25,964 short tons of stockpile grade sponge and 10,866 short tons of non-stockpile grade sponge. U.S. Geological Survey, "Minerals Yearbook: Titanium" (1994), 1. https://s3-us-west-2.amazonaws.com/prd-wret/assets/palladium/production/mineral-pubs/titanium/670494.pdf

end of the Cold War, Congress determined that the stockpile was no longer required and authorized its disposal in 1997; all material was sold off by 2005.[71]

2. Titanium Sponge is Required for Critical Infrastructure

Titanium sponge is also required to satisfy U.S. critical infrastructure needs. As noted earlier, U.S. civilian industries consume roughly [redacted] of all titanium sponge produced each year. The Department's definition of critical infrastructure follows the sectors identified in Presidential Policy Directive 21 (PPD-21) (*See* Figure 19).[72]

Figure 19. U.S. Critical Infrastructure Sectors - 16			
Chemical	Commercial Facilities	Communications	Critical Manufacturing
Dams	Defense Industrial Base	Emergency Services	Energy
Financial Services	Food and Agriculture	Government Facilities	Information Technology
Nuclear Reactors, Waste, and Materials	Transportation Systems	Water and Wastewater Systems	Healthcare and Public Health
Source: Presidential Policy Directive 21, February 21, 2013			

Of these 16 sectors, titanium sponge most regularly supports the Transportation Systems sector. This sector includes commercial passenger and cargo aviation and related aircraft engines, which carried approximately 841

[71] Seong, Younoussi and Goldsmith, "Titanium: Industrial Base, Price Trends, and Technology Initiatives", 38.

[72] PPD-21 was also used in the Department's 2018 Section 232 investigations on steel and aluminum, as well as the 2019 investigation on uranium. The White House, Office of the Press Secretary, "Presidential Policy Directive – Critical Infrastructure Security and Resilience", (February 12, 2013), https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil

million passengers[73] and 27.8 million revenue tons of cargo[74] in 2018. Almost all modern passenger and cargo aircraft and related engines contain significant amounts of titanium. For example, a completed Boeing 787 Dreamliner requires approximately 24.9 metric tons of titanium for its manufacture;[75] and the similarly-sized Airbus A350 requires approximately 27.4 metric tons of titanium.[76] Passenger aircraft manufacturers are using increasing amounts of titanium due to titanium's unique properties.

Although the aerospace sector is the largest single consumer of titanium, other sectors also require titanium. The U.S. Geological Survey estimates that approximately 20 percent of titanium sponge or 19,000 metric tons per year, is used for non-aerospace applications.[77] Oil, gas, and other petrochemical industries and nuclear reactors typically use titanium for heat exchangers, pressure vessels and piping systems. Titanium is used due to its corrosion resistance and endurance

[73] U.S. Department of Transportation, Bureau of Transportation Statistics, "Table 1B. 2018 Passengers on U.S. and Foreign Airlines by Origin and Destination", https://www.bts.gov/table-1b-2018-passengers-us-and-foreign-airlines-origin-and-destination

[74] U.S. Department of Transportation, Bureau of Transportation Statistics, "Air Cargo Summary Data October 2002 – February 2019)", https://www.transtats.bts.gov/freight.asp?pn=0&display=data2

[75] Alwyn Scott, "Boeing looks at pricey titanium bid to stem 787 losses", *Reuters* (July 24, 2015), https://www reuters.com/article/us-boeing-787-titanium-insight-idUSKCN0PY1PL20150724

[76] AZO Materials, "The A350 XWB – Advanced Materials and Design", (November 26, 2012), https://www.azom.com/article.aspx?ArticleID=7858

[77] U.S. Geological Survey, "Titanium and Titanium Dioxide: 2019", https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-titan.pdf, 174.

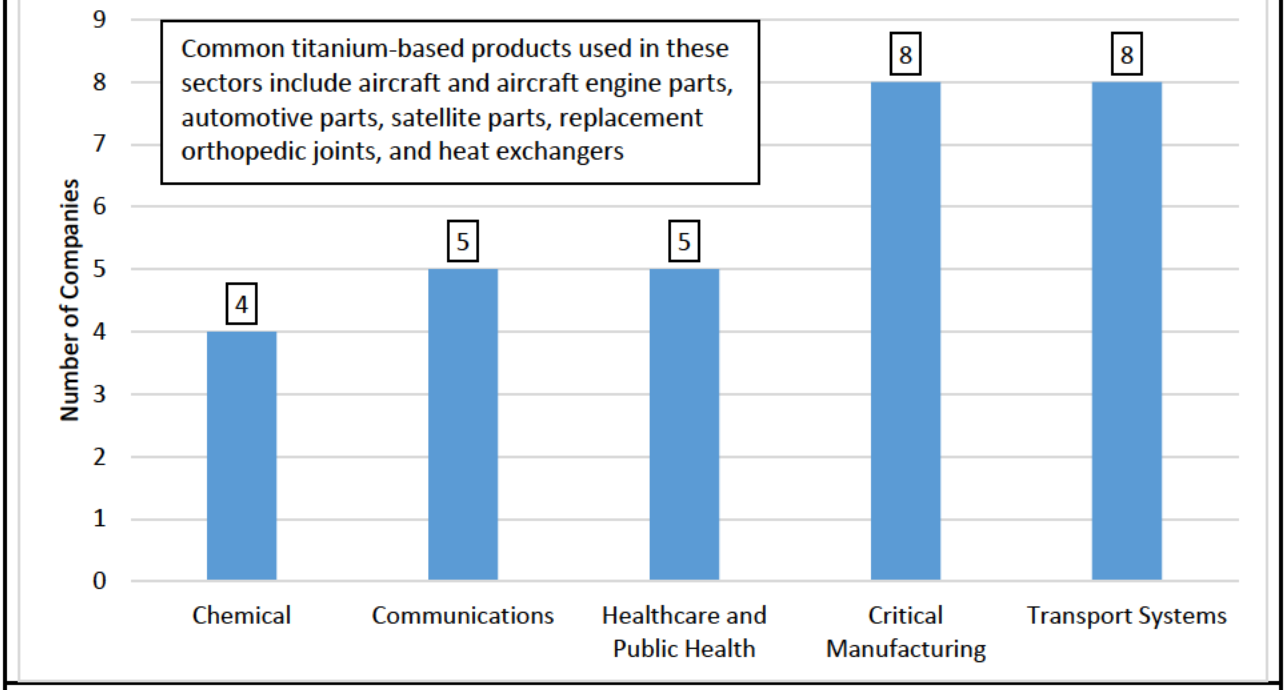
for high pressure, high temperature uses. These properties also make titanium a suitable material for use in power generation applications. Many modern electrical turbines include titanium components.

Titanium is also used for medical applications, including surgical instruments, replacement joints, dental implants, wheelchairs, and other apparatuses. Titanium is highly biocompatible; it can be implanted in the human body without causing a reaction or rejection.[78]

Eight of the 10 producers and melters survey respondents reported manufacturing titanium products used in various critical infrastructure applications. Eight of the ten producers and melters survey respondents supported the Transportation Systems sector through manufacture of airplanes and aerospace components. The top 5 sectors, not including the defense industrial base sector, supported by the 10 survey respondents are represented in Figure 20.

[78] C.N. Elias, J.H.C. Lima, R. Valiev and M.A. Meyers, "Biomedical Applications of Titanium and its Alloys", *JOM*, (March 2008), http://meyersgroup.ucsd.edu/papers/journals/Meyers%20316.pdf, 46.

Figure 20. Top Five Critical Infrastructure Sectors Supported by Survey Respondents



Source: U.S. Department of Commerce, Bureau of Industry and Security, Producers and Melters Survey Q9A

10 Respondents

[redacted]

3. Titanium Is Considered a Critical Mineral

Titanium is one of the 35 minerals included by DOI on the Critical Minerals List. This list, which President Trump directed DOI to define in Executive Order 13817 of December 20, 2017, includes minerals which meet the following criteria:

(i) A non-fuel mineral or mineral material essential to the economic and national security of the United States,

(ii) the supply chain of which is vulnerable to disruption, and

(iii) that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for our economy or our national security.[79]

USGS observed that titanium has significant uses for aerospace, defense, energy, and telecommunications; these sectors are representative of industries critical to U.S. economic and national security.[80] For this reason among others as well as based on input from other U.S. government agencies, USGS included titanium on the critical minerals list.

Although titanium sponge is not separately mentioned, USGS's methodology implies a recognition that titanium sponge is just as critical as titanium:

> Potential supply chain vulnerabilities relating to critical minerals extend beyond what is described herein and should be considered as part of the strategy within the report to the President required by the EO. For example, enhancing domestic mineral processing capacity is important to prevent the immediate export of domestically mined ore.[81]

By extension, the U.S. downstream industry's reliance on titanium sponge imports can be considered a supply chain vulnerability. USGS assesses the United

[79] White House, "Presidential Executive Order on a Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials", (December 20, 2017), https://www.whitehouse.gov/presidential-actions/presidential-executive-order-federal-strategy-ensure-secure-reliable-supplies-critical-minerals/

[80] U.S. Geological Survey, "Draft Critical Mineral List – Summary of Methodology and Background Information – U.S. Geological Survey Technical Input Document in Response to Secretarial Order No. 3359" (2018), https://pubs.usgs.gov/of/2018/1021/ofr20181021.pdf, 2.

[81] Ibid.

States as having a "moderate import reliance on titanium metal (sponge)," while also noting that the U.S. is a significant exporter of finished titanium products.[82] As titanium sponge is required for the manufacture of downstream titanium goods, limited sponge production capacity can create a supply bottleneck. Such a bottleneck is one of the "vulnerabilities" identified in Executive Order 13817.[83]

B. The Economic Decline of the U.S. Titanium Sponge Industry Is Caused By Increased Imports of Titanium Sponge

1. U.S. Reliance on Imports of Titanium Sponge Is Increasing

The United States possesses one third of the world's titanium melt capacity and one quarter of its titanium milling capacity, which results in a substantial demand for inputs including titanium sponge.[84] Because only [redacted] of 2018 domestic demand can be filled by domestic production, U.S. companies are heavily reliant on imports of titanium sponge. Imports accounted for 68 percent of all titanium sponge consumed in the United States in 2018. This reliance on imports

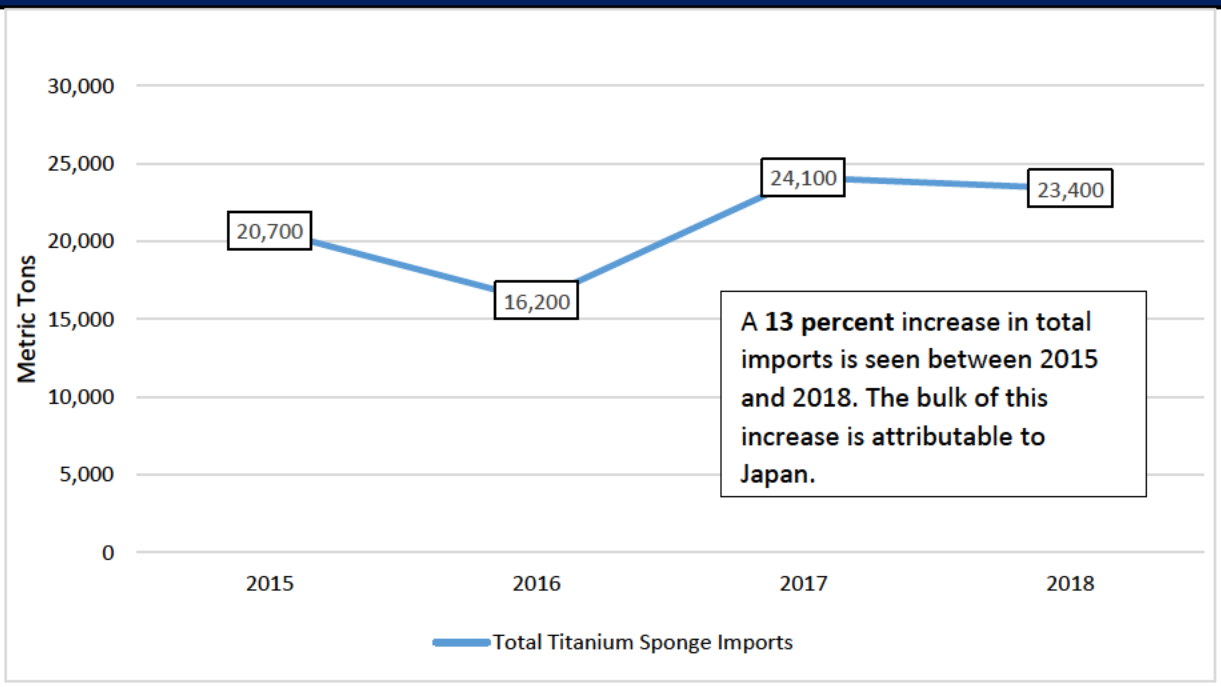
[82] Although USGS distinguishes between import reliance and import vulnerability (e.g., reliance on imports from countries with 'governance risks'), this distinction is not relevant for the present Section 232 investigation. The Section 232 statute discusses imports in broad terms, and does not distinguish among importers based on perceived political risk.

[83] White House, "Presidential Executive Order on a Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials".

[84] Roskill, "Titanium Metal: Global Industry, Markets, and Outlook 2018 – 8th Edition"

of titanium sponge increased by more than 13 percent between 2015 and 2018 (*See* Figure 21).

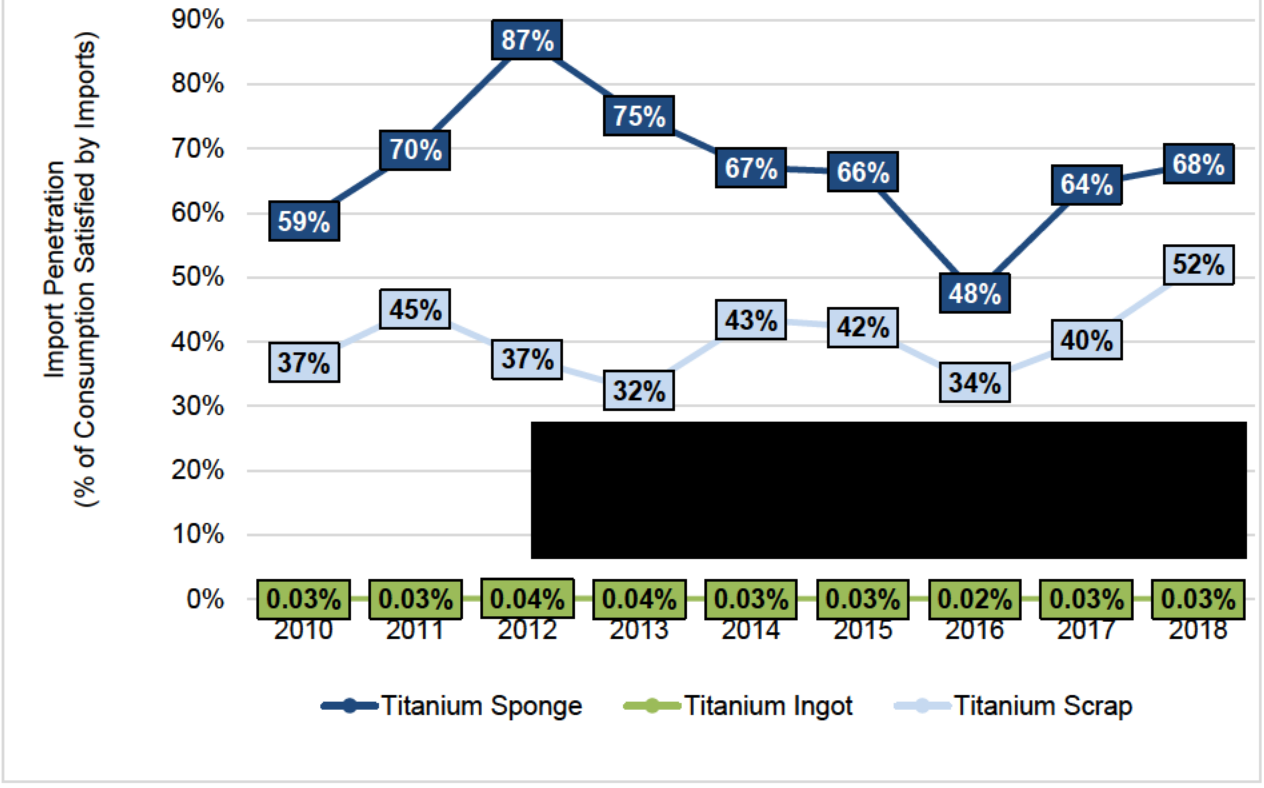
Figure 21. U.S. Titanium Sponge Imports, 2015 - 2018



Source: USGS Minerals Summary (2015-2018)

Over the 2010 to 2018 period, both titanium sponge import penetration and titanium scrap import penetration have grown (*See* Figure 22). Though titanium ingot import penetration remains low over the period, ingot production is reliant on both titanium sponge and scrap as feedstock. Increasing reliance on non-U.S. sponge and scrap to meet ingot production needs indicates the threat imports pose to the titanium industry as a whole.

Figure 22. Titanium Sponge Import Penetration, 2010 - 2018



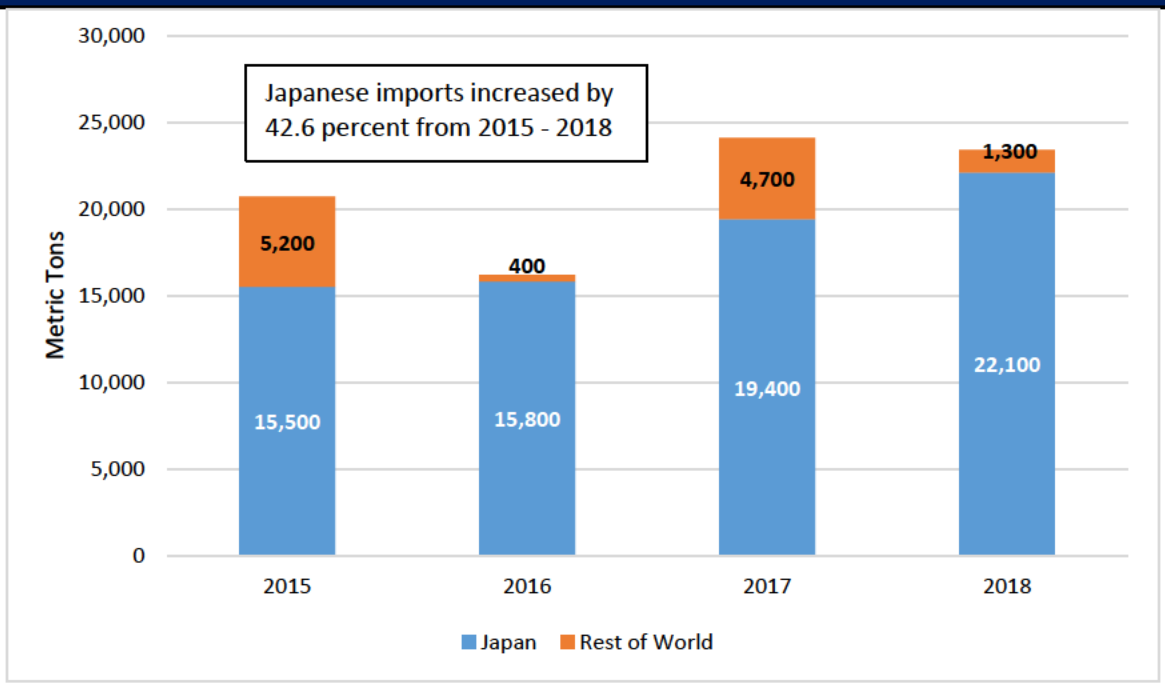
Source: USGS & USITC DataWeb

Of the titanium sponge imported in 2018, 94.4 percent came from Japanese producers, 5.2 percent came from Kazakhstan, and the remaining amount (less than 1 percent) was sourced from Russia and Ukraine, among other countries.[85] Japanese imports of titanium sponge increased from 75 percent of all imports in 2015 to over 94 percent by 2018 (*See* Figure 23). [redacted]

[85] USGS Minerals Yearbook, 2018

[redacted][86]

Figure 23. U.S. Titanium Sponge Imports from Japan, 2015 - 2018



Source: USGS Minerals Summary (2015-2018)

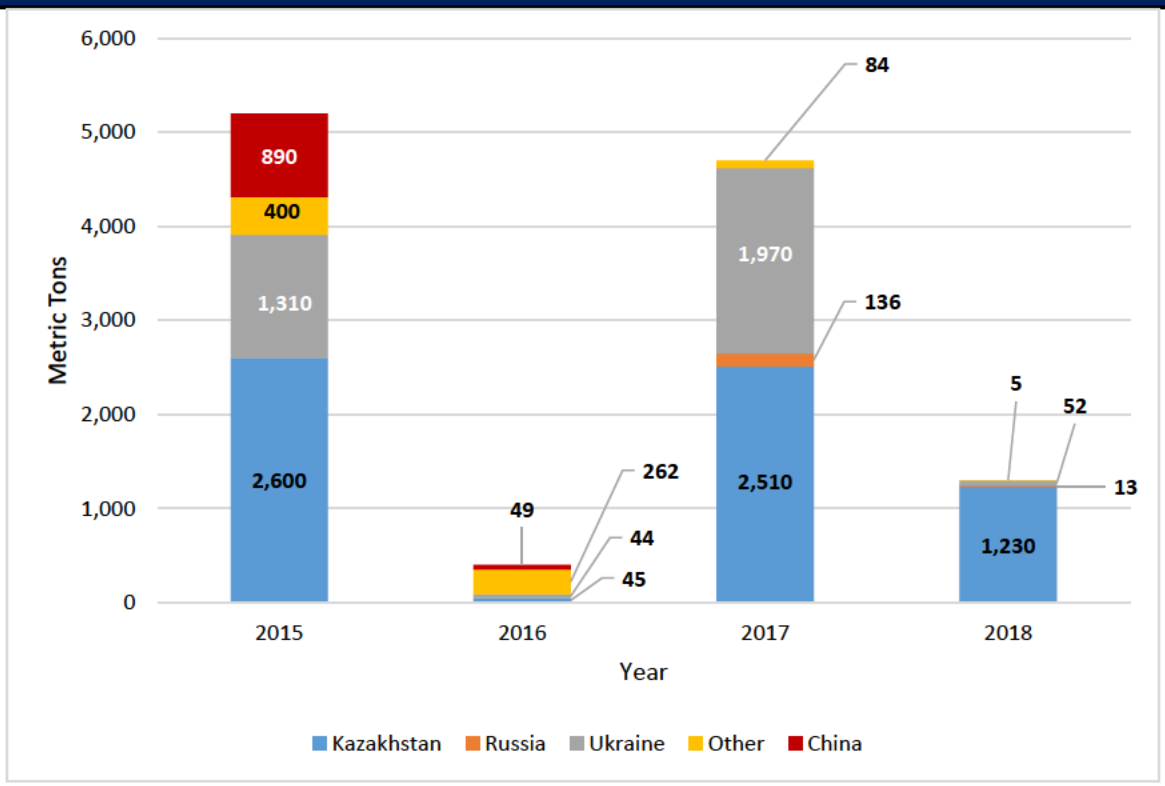
As imports of Japanese sponge increased between 2015 and 2018, imports of sponge from non-Japanese sources declined by approximately 75 percent in the same period (*See* Figure 24). In Russia and Kazakhstan, decreased sponge exports trend with their producers' preference for selling higher volume, less price-sensitive finished downstream titanium products.[87] Imports of Chinese titanium

[86] [redacted]

[87] VSMPO-Tirus, the exclusive U.S. distributor for VSMPO-Avisma, does not advertise sponge as a product for sale. https://www.vsmpo-tirus.com/products/ In recent years, Kazakh producer UKTMP has also shifted its focus

sponge also declined due to increased internal demand from their domestic titanium industry.

Figure 24. U.S. Titanium Sponge Imports from Non-Japanese Sources, 2015 - 2018



Source: USGS Minerals Summary (2015-2018)

U.S. reliance on imported titanium sponge is even clearer when compared to total U.S. consumption of sponge. Figure 25 indicates that demand for sponge continued to increase as U.S. production decreased. Although U.S. consumers of sponge are currently able to meet their needs through imported sponge, decreasing

towards sale of milled products through its joint ventures with Korean producer Posco and French producer Aubert et Duval.

U.S. production and rising U.S. demand illustrate the potential national security problem during a national emergency scenario that causes an import disruption.

[redacted]

Currently, all U.S. titanium sponge production comes from TIMET's single facility in Henderson, Nevada. Should this facility close, all titanium melters in the United States will be reliant on imported titanium sponge.

2. Although Imports of Sponge Are Increasing, U.S. Dependence on Non-U.S. Titanium Semi-Finished and Finished Products is Minimal

[redacted][88] The 2017 U.S. International Trade Commission (USITC) investigation found that TIMET was not considering becoming a merchant sponge producer.[89] ATI internally consumed all sponge produced at Rowley during the facility's period of operation and reported no outside sales of sponge during the USITC investigation period.

[redacted] The entire volume of U.S. titanium sponge exports from 1985 to 2014 totaled approximately 33,000 metric tons.[90] By comparison, Japanese titanium sponge exports in 2017 and 2018 alone exceeded a combined [redacted][91]

[88] [redacted]

[89] USITC, Titanium Sponge from Japan and Kazakhstan, V-6

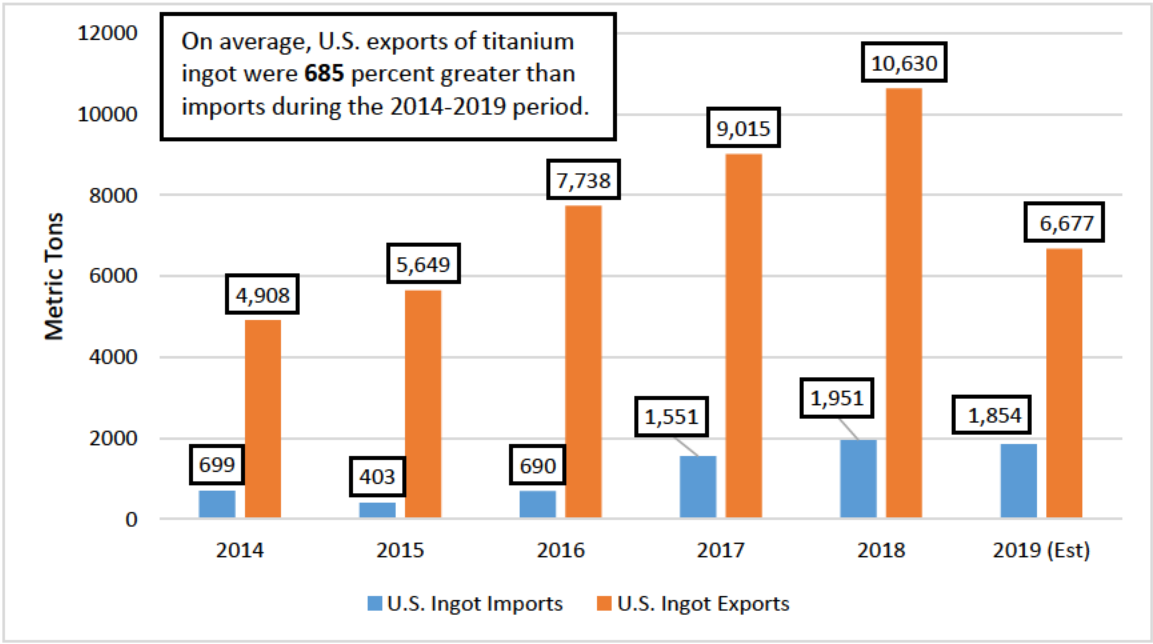
[90] USGS, "Titanium Sponge Statistics" (January 19, 2017)

[91] [redacted]

Although the United States imports a majority of its titanium sponge, there is no similar dependence on foreign sources for downstream titanium metal goods. It is important to note, however, that U.S. semi-finished and finished titanium production is subject to the same 68 percent import dependency on sponge and 52 percent import dependency on scrap.

During the 2014 to 2019 period, approximately 7,100 metric tons of titanium ingots were imported into the United States for consumption. During the same timeframe, U.S. exports of titanium ingot stood at approximately 45,000 metric tons (*See* Figure 26).

Figure 26. U.S. Imports and Exports of Titanium Ingot, 2014 - 2019

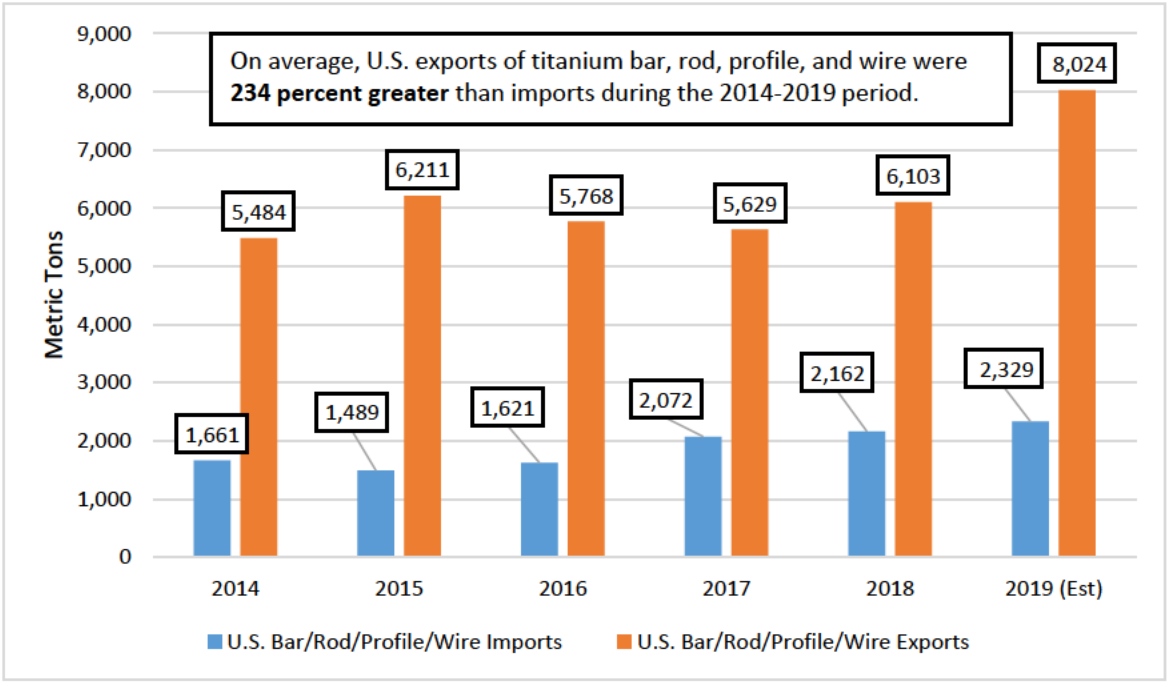


Note: 2019 estimate is computed by applying the percent change from YTD 2018 to YTD 2019 to the figure for calendar year 2018.

Source: U.S. International Trade Commission DataWeb

A similar phenomenon can be seen with titanium bars, rods, profiles, and wire (*See* Figure 27). In the 2014 to 2019 period, approximately 11,000 metric tons were imported into the United States compared to an approximate 37,000 metric tons exported. These high exports to imports ratios indicate a financially healthy and globally competitive U.S. titanium melt products industry.

Figure 27. U.S. Imports and Exports of Titanium Bar, Rod, Profile, and Wire, 2014 - 2019



Note: 2019 estimate is computed by applying the percent change from YTD 2018 to YTD 2019 to the figure for calendar year 2018.

Source: U.S. International Trade Commission DataWeb

High export volumes can be explained in part by extensive U.S. titanium melting capacity. Roskill Information Services estimated that, as of 2016, the United States possessed approximately 136,000 metric tons of melt capacity,

approximately 31 percent of total global melt capacity.[92] Only China, which is estimated to have an approximate 138,000 metric tons of melt capacity, is on par with the United States. China's melt capacity is currently largely used for domestic consumption, while U.S. titanium producers use their significant capacity to serve both domestic and foreign demand.

U.S. titanium metal production is also bolstered by high demand from U.S. aerospace firms such as Boeing, Lockheed Martin, Pratt and Whitney, and General Electric Aviation. These companies require considerable amounts of downstream titanium products, and the titanium sponge used as melt feedstock for these products is highly reliant on non-U.S. sponge. This reliance on foreign titanium sponge highlights the potential vulnerabilities of the titanium production supply chain in the event of a sponge import disruption.

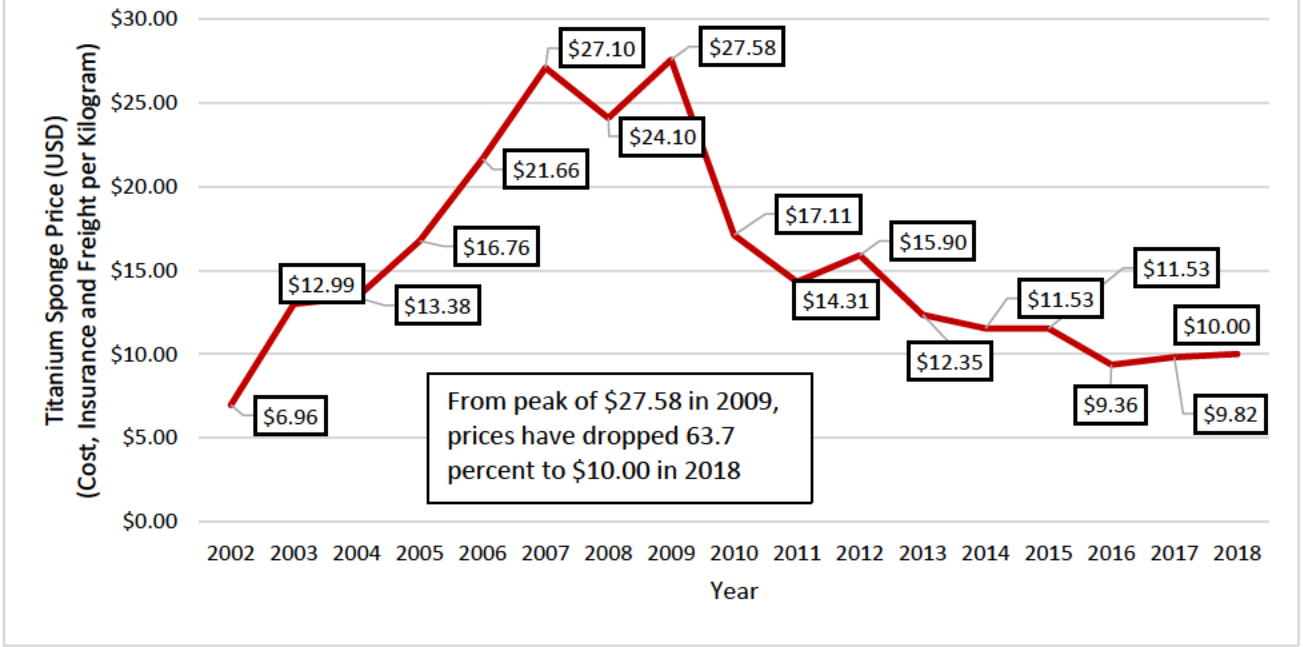
[92] A 2013 presentation by Roskill Consulting Group estimates that Chinese producers Zunyi Titanium as well as the Pangang and Jichuan Groups produced small amounts of premium grade sponge in 2012. This material was used in Chinese domestic industry and was not exported. Philip Dewhurst, "Titanium Sponge Supply: Past, Present and Future", Presentation at the Titanium USA 2013 Conference in Las Vegas, Nevada, (October 9, 2013), https://cdn.ymaws.com/titanium.org/resource/resmgr/2010_2014_papers/DewhurstPhilipTiUSA2013Suppl.pdf , 21

3. Price History and Recent Price Trends

Overview

Although a 44 percent increase in titanium sponge prices between 2002 and 2018 suggests broad U.S. titanium sponge industry health, a deeper investigation of prices reveals difficulties for the industry. Falling prices after 2009, prompted by increased Chinese domestic production and industry trends such as increased scrap reversion, highlight the mid and long term problems for U.S. sponge production. Titanium sponge price trends since 2002 are displayed in Figure 28.

Figure 28. Global Titanium Sponge Prices, 2002 – 2018

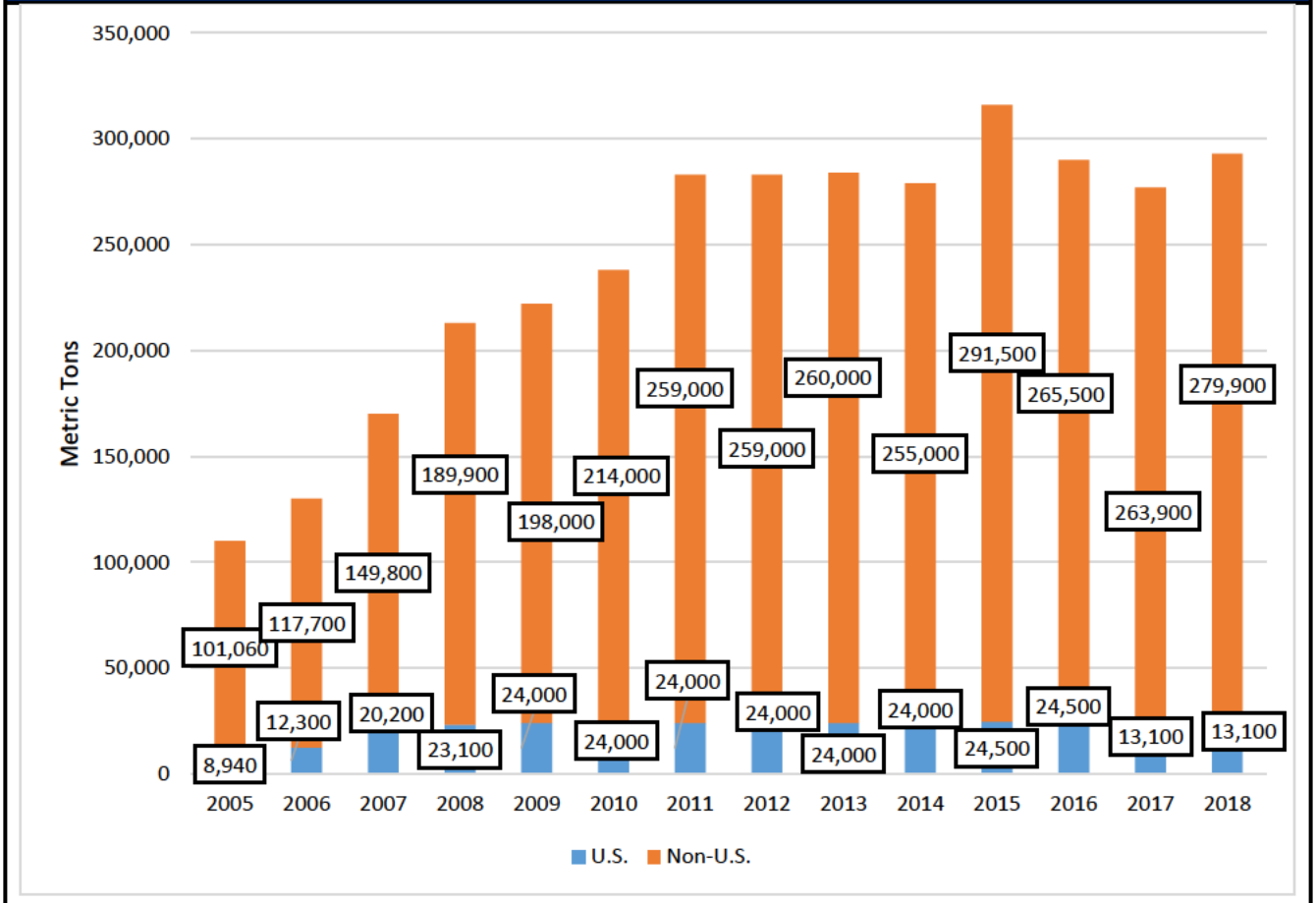


Source: U.S. International Trade Commission DataWeb

Global Increases in Capacity and Production Depress Sponge Prices

Increased demand for titanium sponge incentivized the creation of additional global sponge capacity. Figure 29 shows increases in U.S. and non-U.S. titanium sponge production capacity from 2002 to 2018.

Figure 29. U.S. and Non-U.S. Titanium Sponge Production Capacity, 2005 - 2018



*Note: Honeywell's capacity of 500MT is included in U.S. figures
Source: U.S. Geological Survey

Though U.S. sponge capacity experienced net growth between 2005 and 2018 from 8,940 to 13,100 metric tons, U.S. capacity peaked in 2015 at 24,500

metric tons. These gains were lost in 2016 when ATI Rowley idled operations. ATI's closure represented a 46.5 percent decrease in U.S. sponge capacity from 24,500 metric tons in 2015 to 13,100 metric tons in 2018. In contrast, non-U.S. sponge capacity increased by approximately 178,840 tons, or 177 percent, between 2005 and 2018. These capacity additions were principally driven by China, Japan, and Russia in response to increasing global aviation consumption and other demand.

Continued increases in global titanium sponge production contributed to eventual declines in titanium sponge prices. Between 2009 and 2011, global sponge production increased 69 percent from 110,000 metric tons to 186,000 metric tons.[93] Most of these increases were seen in Japan and China, which boosted production by 26,000 and 25,000 metric tons respectively.[94] The average titanium sponge price declined by 48 percent as result, from $27.58 per Kg ($27,580 per metric ton) in 2009 to $14.31 per Kg ($14,310 per metric ton) in 2011.

Although production slightly declined after 2015, prices continued to fall due to market saturation. As sponge prices continued to decrease, some plants

[93] U.S. Geological Survey, "Titanium and Titanium Dioxide: 2010" and "Titanium and Titanium Dioxide: 2012"

[94] Ibid.

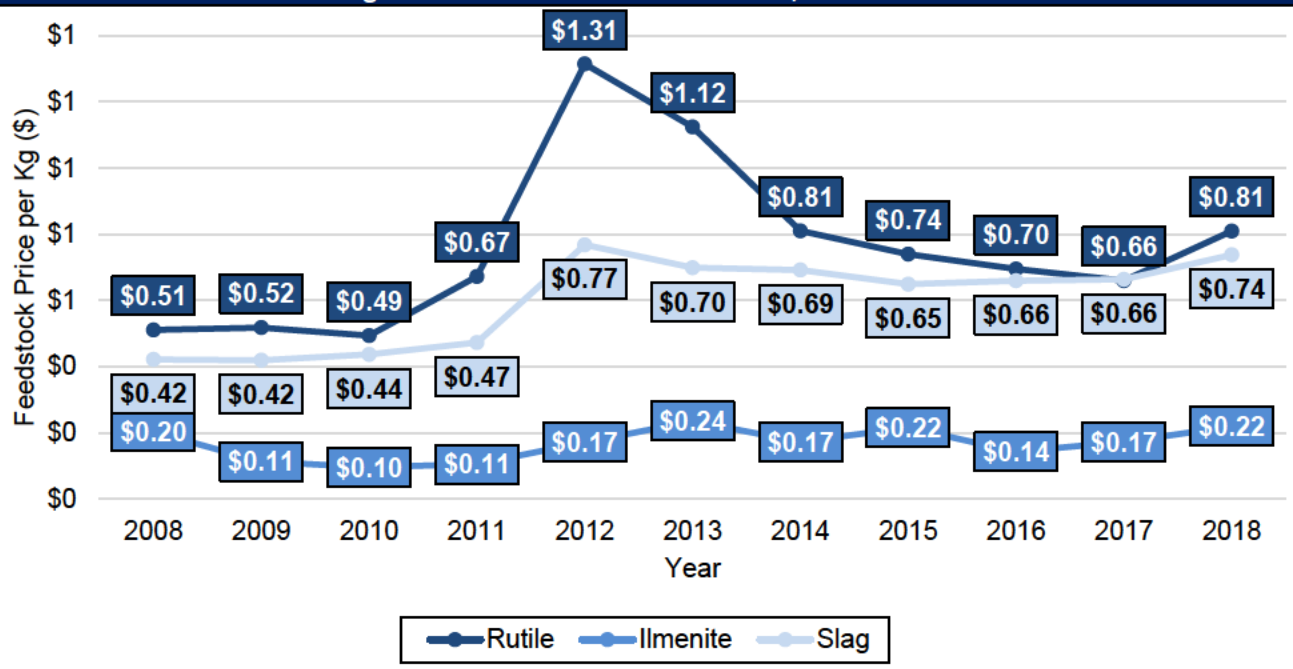
were idled due to declining market conditions. Chinese producers idled approximately 30,000 metric tons of capacity between 2015 and 2016, much of which had been built to capitalize on price increases in the late 2000s.[95] By 2016, sponge prices declined to $9.36 per Kg ($9,360 per metric ton). Although prices slightly recovered to $10.00 per Kg ($10,000 per metric ton) in 2018, the price is still 23 percent below 2003 levels.

Cost of Feedstock Impacts Sponge Prices

Another factor influencing sponge prices and production are feedstock prices. Titanium sponge producers use several different types of feedstock in the Kroll process, including rutile and ilmenite ores as well as slag. Prices for these inputs are shown in Figure 30.

[95] USGS Data.

Figure 30. Titanium Feedstock Prices, 2008 - 2018



Note: 1 Metric Ton = 1,000 Kg

Source: USITC DataWeb, HTSUS Codes: 2614.00.3000, 2614.00.6040, 2614.00.6020, 2620.99.5000, CIF 2008-2018

On average, titanium sponge feedstock prices increased by 48 percent over the 2008 to 2018 period. The most profound increases were in rutile and ilmenite, which increased by 59 and 76 percent respectively. Although these price increases coincided with increases in global titanium sponge production, sponge production has only a limited impact on feedstock price increases.

Increased titanium dioxide production, which accounts for 93 percent of all industrial use of titanium feedstock, is the primary driver of these increases in feedstock prices. Between 2008 and 2018, global titanium dioxide capacity jumped 45 percent from approximately 5.3 million metric tons to approximately

7.7 million metric tons.[96] Expansions of Chinese capacity account for a significant portion of this increase: Chinese capacity increased 267 percent from approximately 900,000 metric tons to 3.3 million metric tons between 2008 and 2018.[97] Consequently, as global demand for titanium dioxide increases, feedstock prices also increase.

[redacted]

U.S. Cost of Titanium Sponge Production Compared to Import Prices

[redacted]

[96] U.S. Geological Survey, Titanium and Titanium Dioxide: 2009" and "Titanium and Titanium Dioxide: 2018"

[97] Ibid.

[redacted]

ATI cited both higher input prices, particularly $TiCl_4$, and availability of low-cost titanium sponge imports as drivers of its decision to idle its sponge plant in favor of purchasing from foreign suppliers:

> "…titanium sponge, including aerospace quality sponge, can now be purchased from qualified global producers under long-term supply agreements at prices lower than the production costs at ATI's titanium sponge facility in Rowley, UT….ATI has entered into long-term, cost-competitive supply agreements with several leading global producers of premium-grade and standard-grade titanium sponge."[98]

[redacted]

[98] "Allegheny Technologies Announces Actions to Improve Future Financial Performance", *ATI* (August 24, 2016), https://ir.atimetals.com/news-and-events/news-releases/2016/08-24-2016-122218784

[redacted]

Low non-U.S. prices, as seen in Figure 32, inhibit domestic investment and the continuation of sponge production in the U.S. [redacted][99] [redacted] However, high energy and labor costs in

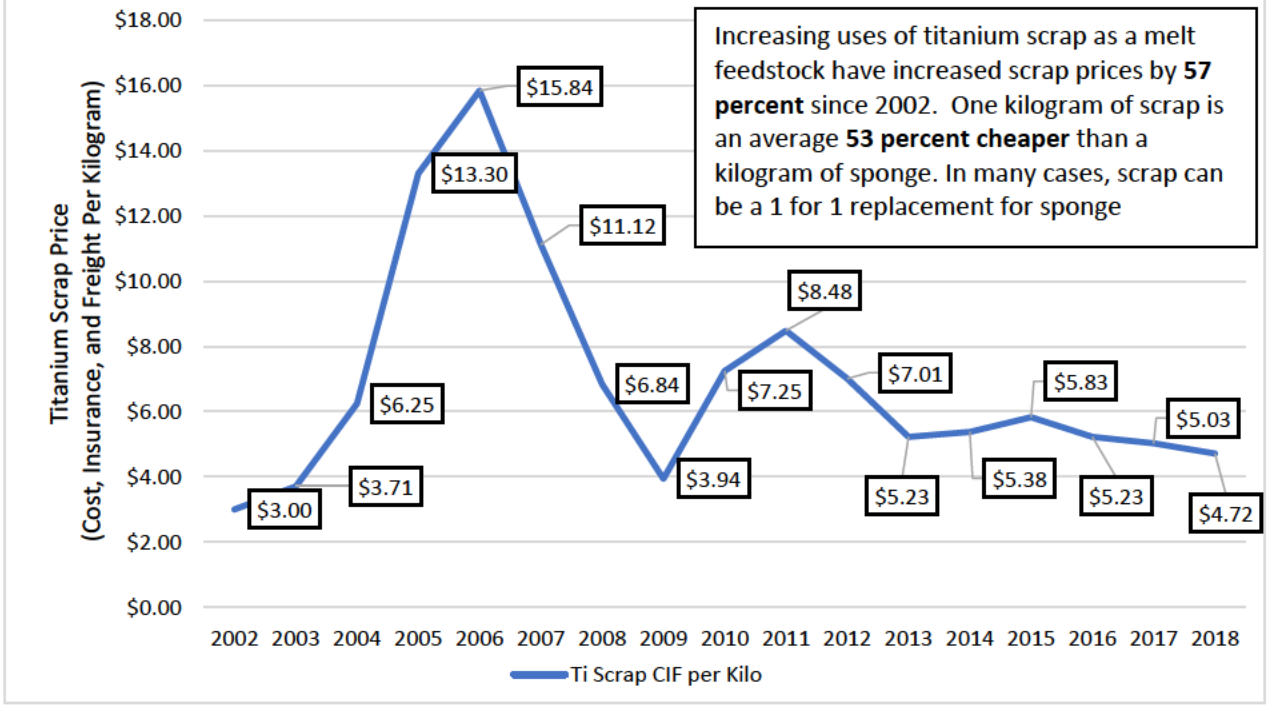
[99] [redacted]

Japan raise the question of whether Japanese producers can continue to seemingly subsidize their exports of titanium sponge.

Increased Use of Titanium Scrap Affects Titanium Sponge Prices

Titanium scrap, which is generated during the downstream manufacturing process, can also be used as a source of feedstock for titanium melting operations. Titanium scrap prices increased substantially over the 2002 to 2018 period (*See* Figure 33).

Figure 33. Titanium Scrap Prices, 2002 - 2018



Source: U.S. International Trade Commission DataWeb

Increased scrap prices stem from downstream consumers' initiatives to recover scrap. In most cases, as a billet is forged, rolled, and/or machined to

produce a finished good, excess titanium metal is produced. This metal can then be collected and returned to a titanium melter for reprocessing into another ingot or billet. Downstream consumers, particularly aerospace firms, seek to increase the amount of recycled scrap that they use in their products in order to realize cost-savings on input costs.[100]

On average, approximately 40 to 50 percent of a given melt's feedstock comes from scrap.[101] This percentage, however, will vary depending on the customer's requirements for the alloy.[102] Globally, scrap accounts for an average of 31 percent of titanium producers' annual melt feedstock.[103] U.S. producers use even higher amounts, ranging between 59 and 66 percent.[104] U.S. producers also dramatically increased their titanium scrap imports in the first half of the 2010s, as shown in Figure 34.

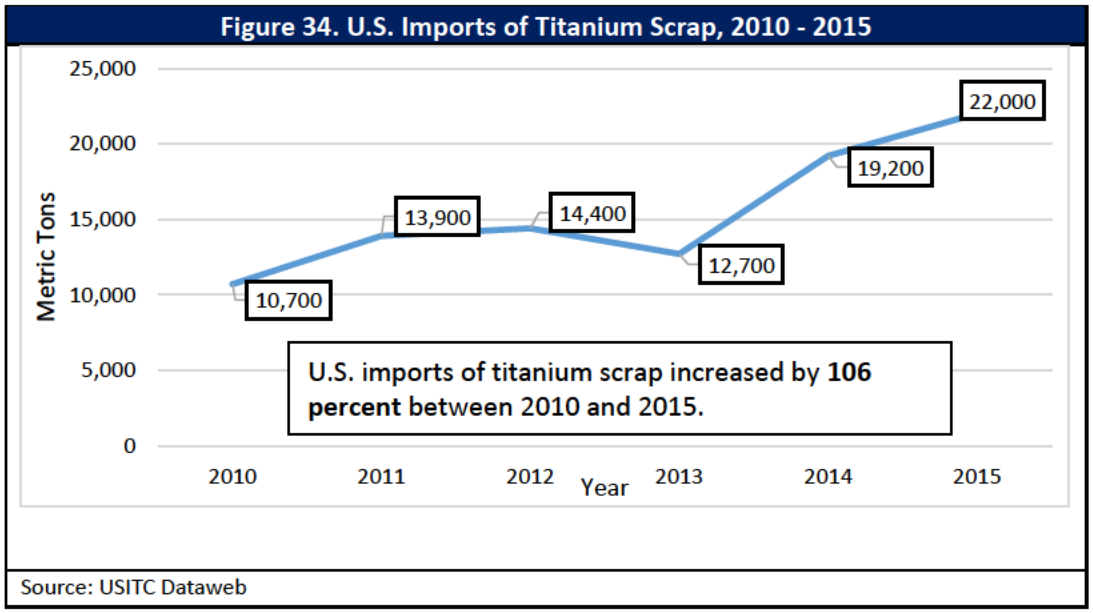
[100] Seong, Younoussi, and Goldsmith, "Titanium: Industrial Base, Price Trends, and Technology Initiatives", 15.

[101] Ibid.

[102] Purer alloys cannot use higher percentages of scrap. Some applications, such as billets for the F-35 Joint Strike Fighter, use no scrap whatsoever. Ibid., 17.

[103] U.S. Geological Survey

[104] U.S. Geological Survey



One reason for the increased use of scrap is the aviation industry's use of the "buy to fly" (BTF) ratio. The BTF ratio specifies the amount of titanium required to produce a given part.[105] For example, if the BTF ratio for a given part weighing one pound is 20:1, 20 pounds of titanium metal is required to produce the part weighing 1 pound. New developments in metallurgy and manufacturing techniques have allowed for increased use of scrap in aerospace-grade titanium. In 2008, Boeing and VSMPO-Avisma announced the development of a titanium alloy that can use up to 75 percent scrap for its initial melt to be produced in Russia.[106] Additive manufacturing techniques, including 3-D printing and joining techniques such as linear friction welding and explosive forming, have the potential to reduce

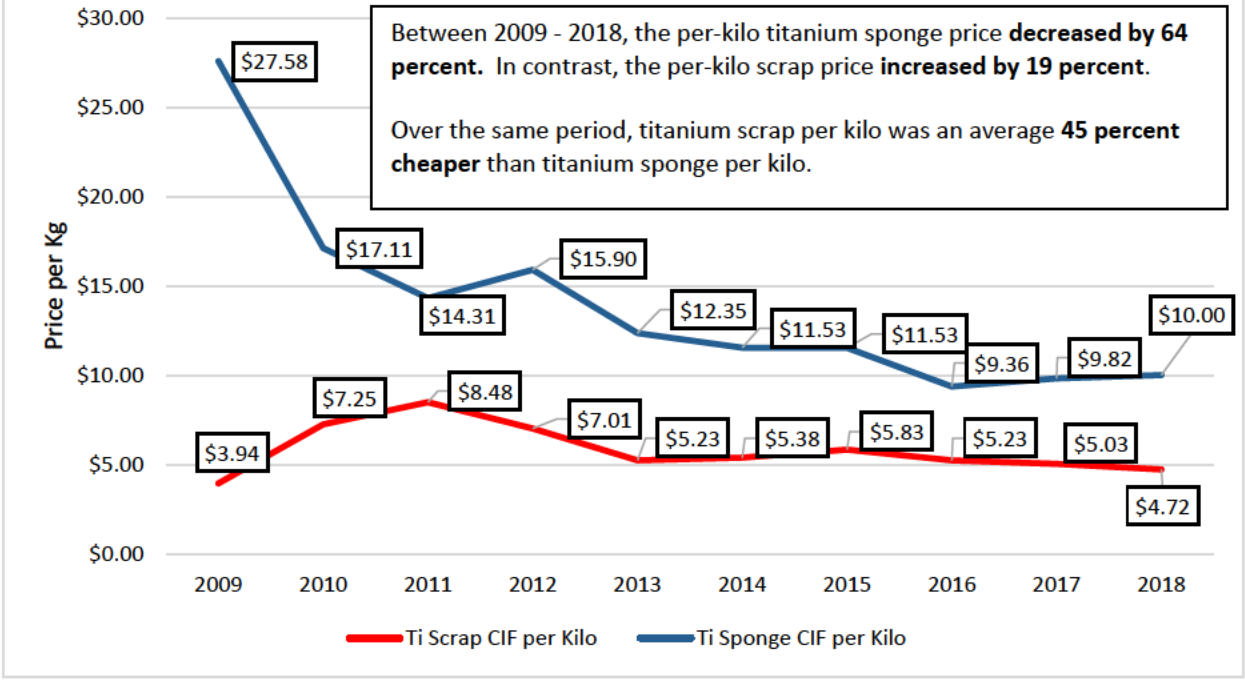
[105] Ibid., 18.

[106] The Boeing Company, "The quest for stronger, cheaper titanium alloys," (February 2018), https://www.boeing.com/features/innovation-quarterly/feb2018/feature-titanium.page

BTF ratios to 2:1 from the then-contemporary industry average of 10:1.[107] Manufacturers thus have significant financial incentive to recover and reuse scrap titanium.

Another incentive for increasing scrap usage is due to the price difference between scrap and titanium sponge (*See* Figure 35).

Figure 35. Per Kg Cost of U.S. Imports of Titanium Sponge and Titanium Scrap, 2009 - 2018



Note: 1 Metric Ton = 1,000 Kg

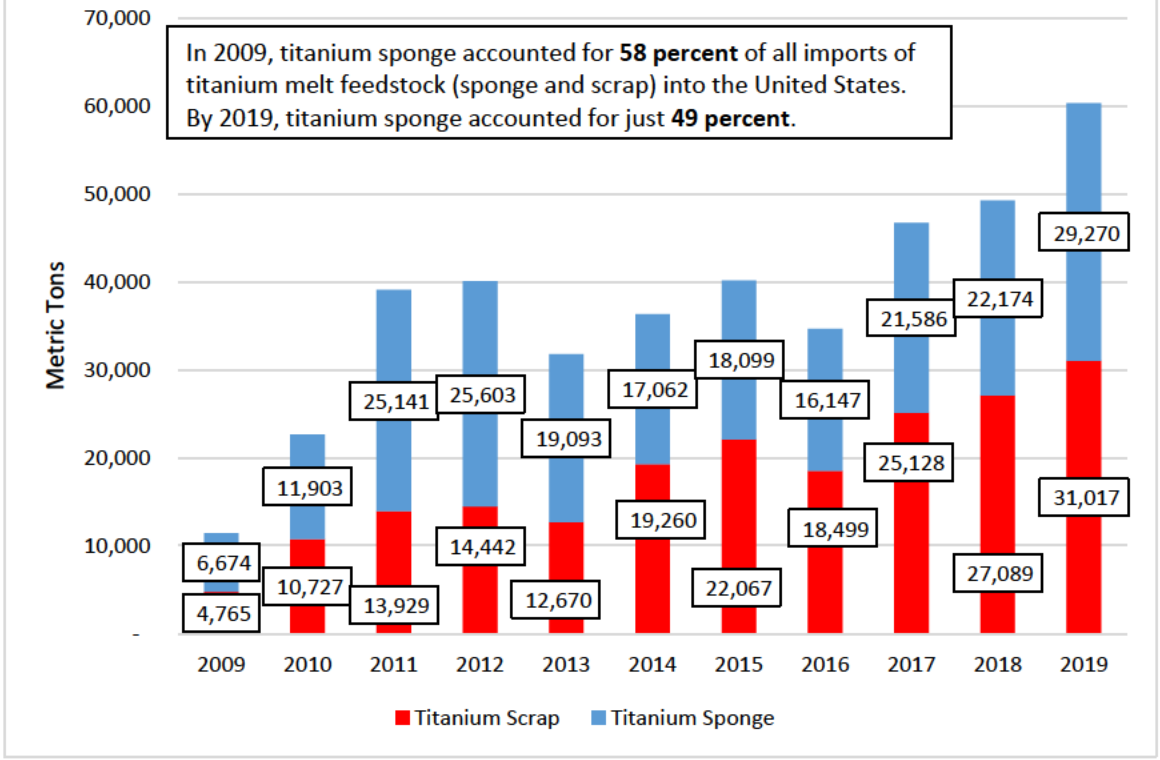
Source: USITC Dataweb

Availability of cheaper scrap inputs incentivizes use of scrap material in place of titanium sponge where possible. Further, as aircraft production increased

[107] Guy Norris, "Metallics Make Comeback With Manufacturing Advances', *Aviation Week and Space Technology* (May 6, 2013), https://aviationweek.com/awin/metallics-make-comeback-manufacturing-advances

in the years following 2011, available scrap supplies increased. Increased availability caused scrap prices to decrease by 44 percent; in contrast, sponge prices only decreased by 37 percent. By 2018, the cost per Kg of scrap was 47 percent of that for a Kg of sponge (note: 1 metric ton equals 1,000 Kg). Increased use of titanium scrap has offset use of titanium sponge (*See* Figure 36). However, decreasing scrap prices are putting further financial pressures on the domestic production of titanium sponge.

Figure 36. U.S. Imports of Titanium Sponge and Titanium Scrap, 2009 - 2019



Note: 2019 estimate is computed by applying the percent change from YTD 2018 to YTD 2019 to the figure for calendar year 2018.

Source: USITC Dataweb

Increased use of titanium scrap as feedstock does not, however, eliminate the need for new titanium sponge. In the United States, scrap accounts for approximately 59-66 percent of titanium melt feedstock.[108] Using scrap as a source of feedstock allows titanium manufacturers to offset price increases in sponge with increased consumption of scrap, or vice-versa.[109] However, the chemical composition requirements for aerospace rotating-grade titanium preclude usage of higher amounts of scrap. The inability to substitute high grade sponge with scrap emphasizes the importance of a secure supply of sponge for defense applications.[110]

It is also important to note the U.S. dependency on scrap, when combined with higher import levels of sponge, further jeopardizes the ability of the U.S. to produce titanium ingot, billet, and other downstream finished titanium products in a national emergency. Domestically produced titanium scrap is reliant on the availability of titanium sponge in the initial production of titanium goods. As imported sponge accounts for 68 percent of U.S. titanium sponge consumption,

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[108] U.S. Geological Survey

[109] Decreased aircraft production during 2003-2005 caused global shortages of titanium scrap; between 2003 and 2006, the average per-kilogram price of titanium scrap imports jumped 326 percent. In contrast, titanium sponge prices increased by only 66 percent. Imports of sponge thus increased by 136 percent of the period, compared to 130 percent for scrap. USITC Dataweb and Seong, Younoussi, and Goldsmith, "Titanium: Industrial Base, Price Trends, and Technology Initiatives" 36-37.

[110] Titanium scrap can contain non-titanium elements that cannot reasonably removed during the recycling and melt processes. The presence of these elements thus precludes use of significant amounts of scrap in higher grades of sponge.

U.S. titanium scrap production is similarly reliant on the availability of sponge imports.

4. Employment Trends

[redacted]

[redacted] These positions, about one third of the workforce, aside from maintenance and engineering and administration and management, require no formal education and have minimal on the job

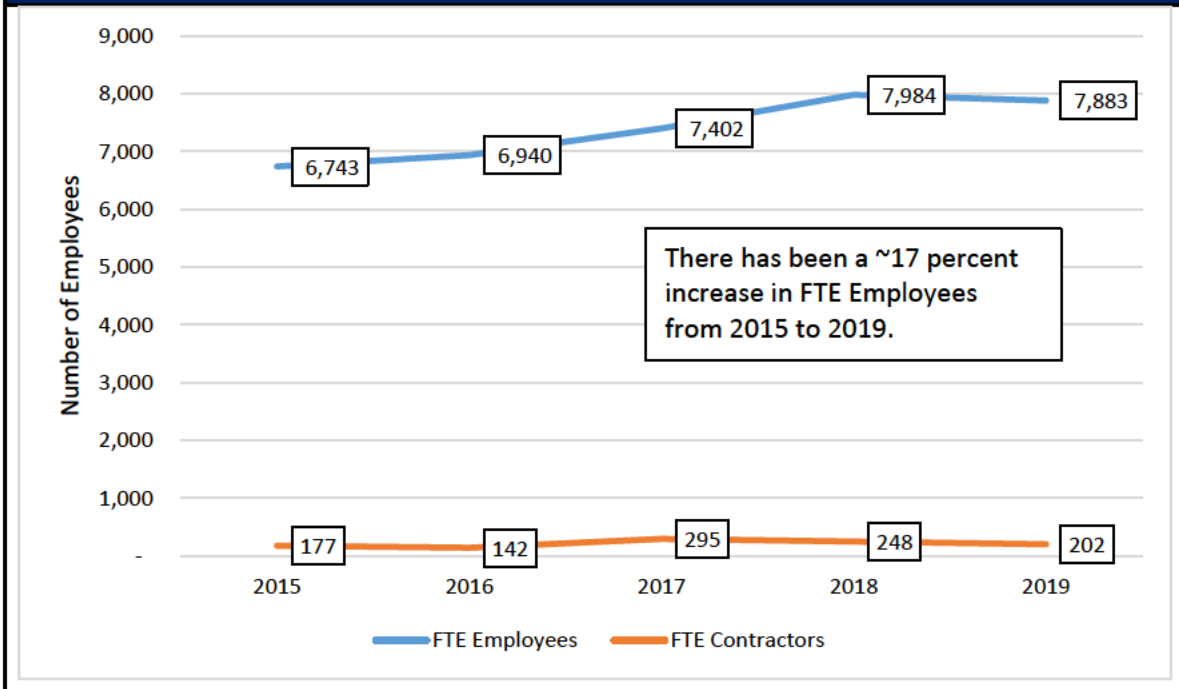
training requirements; maintenance and administration require bachelor's degrees and one to six months of on-the-job training.

[redacted]

Downstream Titanium Employment

Employment in downstream titanium manufacturing has shown growth over the 2015 to 2019 period (*See* Figure 39).

Figure 39. U.S. Downstream Titanium Employment, 2015 - 2019



Source: U.S. Department of Commerce, Bureau of Industry and Security, Producers and Melters Survey, Q14A

4 Respondents

[redacted]

Stable employment in downstream titanium manufacturing indicates a broadly healthy sector. [redacted]

[redacted]

[redacted][111]

[redacted]

However, as reviewed in this section, stable downstream industry employment does not imply stability for employment in sponge manufacturing. The remaining [redacted] employees in the U.S. titanium sponge industry, all concentrated at TIMET's Henderson facility, will probably transfer to other industries and regions if sponge production ceases. By the time that old capacity were to be reactivated or new capacity built, it is unlikely that the required skills and technical knowledge would be readily available. Any effort to restore U.S.

[111] [redacted]

titanium sponge capacity would therefore incur additional costs and delays due to the need to train a new skilled workforce.

5. Financial Outlook

TIMET is the sole active titanium sponge manufacturer in the United States, and the firm's financial health highlights the status of U.S. titanium sponge production. [redacted][112] [redacted]

[112] [redacted]

[redacted][114] [redacted]

[113] Ibid.

[114] Ibid.

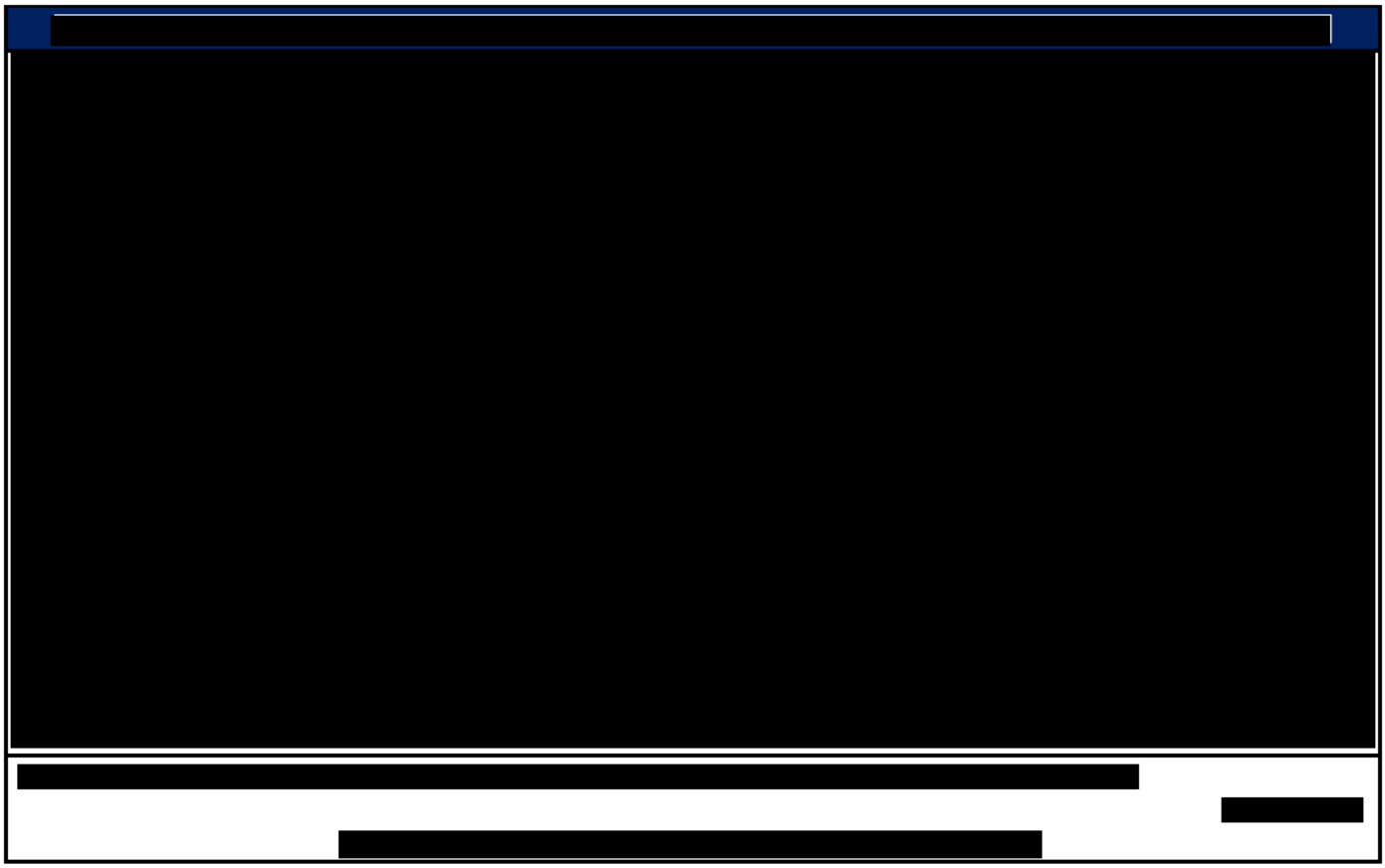
[redacted][115] [redacted]

[redacted]

[redacted]

6. Research and Development

Overall titanium industry research and development expenditures increased over the 2015 to 2018 period for the five companies reporting (*See* Figure 41).



[115] U.S. International Trade Commission DataWeb

Of these expenditures, an average of 11 percent went to basic research, 21 percent went to applied research, and the remaining 68 percent went to process development. [redacted]

An increase in overall industry R&D expenditures should not be taken as a sign of health for U.S. titanium sponge production. As discussed earlier in this report, the basic titanium sponge production process has remained unchanged for several decades. The expenditures reported in Figure 41 above likely pertain to downstream production processes, including advanced melting and additive manufacturing techniques, rather than sponge operations.

7. Capital Expenditures

Low-priced sponge imports have impeded U.S. producers' ability to make needed capital investments for future production. [redacted][116] [117] [redacted]

[116] Petition, 36.

[117] Business Confidential Exhibit 19, 9.

[redacted]

[redacted][118]

[redacted]

[redacted]

[redacted]

[redacted]

[118] Ibid, 8.

[redacted]

Low sponge prices had already harmed ATI's ability to continue sponge production operations at its Rowley, Utah plant, which was idled in 2016. The

Rowley plant, unlike TIMET's facility, did not have the capacity to produce $TiCl_4$ or recycle magnesium, both of which are critical to sponge production. These materials were obtained from third parties and shipped by rail to the Rowley facility.[119] [redacted]

[119] U.S. ITC, In the Matter of Titanium Sponge from Japan and Kazakhstan (701-TA-587 and 731-TA-1385-1386), p. 108.

C. Diminishing U.S. Titanium Sponge Production Capacity May Impair the National Security in the Future

1. U.S. Production is Well Below Domestic Demand

Total consumption of titanium sponge in the United States was approximately 34,000 metric tons in 2018.[120] As identified earlier, total available U.S. titanium sponge capacity is only [redacted], representing approximately [redacted] of total U.S. demand. However, actual production in 2018 was approximately [redacted]. The entirety of current U.S. titanium sponge production satisfies just [redacted] of U.S. demand.[121]

[redacted][122] [redacted] U.S. titanium melters will continue to rely on imported titanium sponge and scrap for the foreseeable future.

[120] U.S. Geological Survey, "Titanium and Titanium Dioxide: 2019"

[121] U.S. Geological Survey, 2019 Mineral Commodity Summaries: Titanium and Titanium Dioxide, 174. https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-titan.pdf

[122] USGS reports that aerospace applications accounted for 80 percent of titanium sponge usage in 2018. The USGS figure does not appear to distinguish between commercial and military aerospace applications. Ibid.

Surge Capability

The U.S. has some ability to utilize surge capabilities in the event of a national emergency through ATI's idled sponge facility. This reactivated capacity would add as much as [redacted] of titanium sponge production capacity. [redacted] However, given the non-integrated nature of the plant and the associated difficulties with obtaining titanium tetrachloride and magnesium inputs,

the Rowley facility would face significant obstacles to full production. It is unclear whether the Rowley plant would be able to adequately meet emergency needs within a reasonable period of time.

2. Domestic Titanium Sponge Capacity Is Highly Concentrated and Limits Capacity Available for a National Emergency

Active U.S. titanium sponge production is concentrated exclusively at TIMET's plant in Henderson, Nevada. This plant, which began operations in the 1950s, is aging and will not be able to continue future operations without significant capital investments. ATI's plant in Rowley, Utah was indefinitely idled at the end of 2016 and the company [redacted] Additionally, ATI's plant in Albany, Oregon was idled in 2009, when ATI Rowley began operations, and is now permanently closed without the ability to reopen. If TIMET does not replace the chlorination facility at Henderson by [redacted] and consequently closes its titanium sponge production facility, there will be no active titanium sponge production capacity suitable for industrial metal applications in the United States.[123]

Reduced sponge capacity already forces U.S. downstream producers into a heightened dependence on foreign suppliers. Although U.S. downstream

[123] While it is expected that Honeywell Electronic Materials' plant in Bountiful, Utah will remain operational, as noted earlier, this plant does not currently produce titanium sponge suitable for most national defense and critical infrastructure applications.

producers have used imports to satisfy some of their production requirements for decades, the current level of import dependence is at a historic high. In 1988, U.S. titanium sponge production could fulfill all domestic consumption. By 2018, production at the last operational sponge facility fulfilled just [redacted] of domestic consumption.[124] In an emergency scenario where imports were disrupted, U.S. downstream producers may not be able to continue normal melting and fabrication operations without access to titanium sponge and scrap imports.

In contrast, China and Russia have integrated titanium production capacity. In a hypothetical emergency scenario involving conflict between the United States and either China or Russia, the U.S. could soon lose its capability to manufacture titanium parts due to a lack of sponge availability and a finite supply of scrap. This would be further compounded by a cutback in imports of semi-finished and finished titanium products. China or Russia, in contrast, could continue titanium production without significant interruptions.

National emergency scenarios could potentially affect imports from Japan and Kazakhstan. In the event of a general conflict in the Pacific, including China and/or Russia, the United States may not be able to access titanium sponge or scrap imports from Japan. [redacted]

[124] U.S. Geological Survey, "Titanium Sponge Statistics" (January 19, 2017)

[redacted][125] Loss of these imports and limited domestic sponge capacity from TIMET would effectively halt U.S. titanium metal production and could impair sustainment and assembly of aircraft and other defense systems requiring titanium.

[redacted][126] While these capacity additions could mitigate import losses, shortages are still possible and U.S. national security would be impaired.

These possibilities, in the Secretary's assessment, represent a significant weakening of the internal economy needed to support defense and critical infrastructure needs and threatens to impair the national security as defined in Section 232.

[125] [redacted]

[126] [redacted]

3. [redacted]

[redacted]

[redacted]

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

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[redacted]

[redacted]

[redacted]

[redacted]

D. Increased Global Titanium Sponge Capacity and Production Further Impact the Long-Term Viability of U.S. Titanium Sponge Production

1. Extreme Growth in Chinese Titanium Sponge Production Will Place Downward Pressure on Global Titanium Sponge Prices

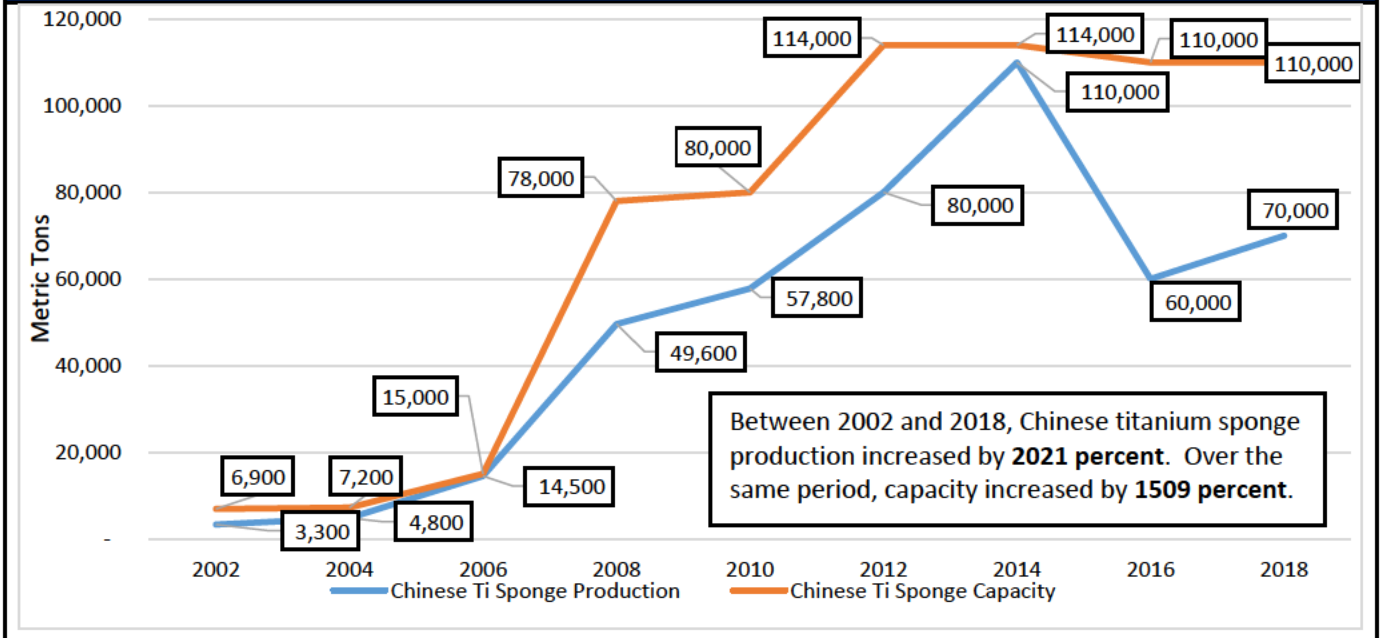
Although Chinese imports accounted for only 0.01 percent of all U.S. titanium sponge imports and 0.16 percent of downstream titanium imports (ingot and billet) in 2018, China's dramatic growth in titanium sponge production will contribute to overall downward pressure on global titanium sponge prices.[127] This pressure may increase in the future if Chinese producers shift their business focus away from supplying domestic industry and towards exports of titanium sponge, ingot, and billet.

Currently, the Chinese are instead exporting a variety of finished products which contain titanium metal (bicycles, cookware, heat exchangers, condensers, automobile parts, structural aerospace parts, medical devices, construction materials, etc.).

As shown in Figure 47, Chinese producers have exponentially increased their sponge capacity and production over the past two decades.

[127] USITC Dataweb

Figure 47. Chinese Titanium Sponge Production and Capacity, 2002 - 2018



Source: U.S. International Trade Commission DataWeb, U.S. Geological Survey

These increases in capacity and production, facilitated in no small part by state assistance to producers, continued despite low global sponge prices. As reviewed earlier in this chapter, sponge prices in 2018 were 63 percent lower than their 2009 peak. Over the same timeframe, Chinese production increased by 14 percent and capacity by 41 percent. These increases in Chinese capability despite declining global prices suggest that, similar to the country's actions in the steel and aluminum industries, Chinese titanium sponge producers need not heed market signals in the same way as U.S. and other market producers.

China is virtually self-sufficient in titanium sponge production.[128] In 2018, estimated Chinese production may have been as high as 75,000 metric tons, compared to approximate total Chinese demand of 79,000 metric tons.[129] The gap between domestic production and consumption largely represents shortfalls in premium-grade sponge manufacture, which is currently being filled with imports. However, this gap will likely be lowered in the coming years. Chinese production of premium-grade sponge suitable for aerospace structures is already estimated to be 30 percent of total global capacity.[130]

Chinese demand for titanium sponge will increase over the coming decades due to rapid expansions in the country's chemical, aerospace, and electricity generation industries. In 2018, these three sectors consumed nearly three quarters of all titanium products produced in China.[131] Government initiatives emphasizing advanced manufacturing, including the Made in China 2025 plan, the *Chang'e*

[128] TIMET testimony before the U.S. International Trade Commission, https://www.usitc.gov/trade_remedy/731_ad_701_cvd/investigations/2017/Titanium%20Sponge%20from%20Japan%20and%20Kazakhstan/Preliminary/titanium_sponge_from_japan_and_kazakhstan-conference-09-14-2017.pdf, 36

[129] Argus Metals, "Feed shortage hampers world Ti sponge ramp up" (May 16, 2019), https://metals.argusmedia.com/newsandanalysis/article/1904225

[130] Roskill, "Titanium Metal: Global Industry, Markets, and Outlook 2018 – 8th Edition"

[131] Exhibit 11, TIMET Rebuttal Comment: "Sylvain Gehler, World Titanium Sponge Supply Situation", 14.

lunar exploration project, and development of domestic civilian airliners such as the C919 and CR929 will drive an increasing demand for titanium metal.

Chinese domestic near self-sufficiency in titanium production places significant pressure on other titanium producers. Foreign producers are currently able to access roughly 5 percent of the Chinese sponge market and, as China develops more premium-grade sponge capacity, will be further excluded. Further, it is anticipated that China will begin to export material once domestic production exceeds domestic demand.

The gap between Chinese capacity and production, therefore, is notable. The UGS estimates that only 63 percent of Chinese titanium sponge capacity was active in 2018, and China continues to increase sponge capacity.[132] If increased to full capacity, Chinese production would exceed combined Japanese and Russian sponge production. This potential illustrates the impact of Chinese production and capacity on the global market, and highlights the impact China will have on the global market should their production focus switch towards exports. An increased presence of low-priced Chinese sponge in the global market would place further downward pressure on sponge prices and potentially force market producers, like

[132] U.S. Geological Survey, "Titanium and Titanium Dioxide: 2019", https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-titan.pdf

Japan, to cut prices below economically viable levels in order to remain competitive in the export market.

Though China currently consumes almost all domestic production of titanium sponge, their large scale capacity for mill products has allowed them to export approximately 23 percent of their ingot and billet production (no significant quantities are imported to the U.S.). Instead, China has been exporting large quantities of commercial and industrial products containing titanium (bicycles, heat exchangers, condensers, automobile parts, structural aerospace parts, medical devices, construction materials, etc.).

Increased Chinese exports of commercial and industrial products containing titanium (with a broader range than Russian exports of aerospace-focused titanium products), and a future focus on exports of titanium sponge, ingot and billet, are expected as China has implemented a similar strategy in other material markets.

Chief among export markets is the United States. The United States is the second largest market for titanium products in the world, and is a natural focus for exports. [redacted] Existing availability of low price imports has forced TIMET to consider the future of its own aging sponge production facility and its high production costs. Increased competition from

Japanese producers due to rising Chinese production, as well as the potential for China to begin exporting more low-priced material to the U.S., may further depress sponge and scrap prices. A further reduction in import prices would make it even more difficult for TIMET to justify continued sponge production when low-priced imports are available.

2. Increased Chinese and Russian Premium Quality Sponge Production Threatens U.S. Aerospace Supply Chains

Premium quality sponge is required for rotating aircraft parts, particularly in engines. As highlighted earlier, not every titanium sponge plant is certified to supply premium quality sponge. The certification process requires extensive consultation with equipment manufacturers and testing of sponge samples to ensure chemical purity. Most U.S. and European Union aerospace firms have at some point granted certification to six producers: TIMET, ATI, Toho Titanium, Osaka Titanium, VSMPO-Avisma, and UKTMP (Kazakhstan).[133]

Although China has not yet produced aerospace non-rotating grade titanium sponge for export, Chinese producers have produced it for domestic consumption.[134] Aerospace non-rotating grade sponge is believed to have been

[133] Prior to its 2016 idling, ATI had obtained certification for its Rowley facility.

[134] A 2013 presentation by Roskill Consulting Group estimates that Chinese producers Zunyi Titanium as well as the Pangang and Jichuan Groups produced small amounts of premium grade sponge in 2012. This material was used in Chinese domestic industry and was not exported. Philip Dewhurst, "Titanium Sponge Supply: Past, Present and

used for structural aerospace applications in Chinese military airframes. However, it is not clear whether Chinese producers are capable of producing aerospace rotating-grade titanium sponge at this time.

As noted earlier, China will need increasing amounts of aerospace non-rotating titanium sponge in the future to support new initiatives in the aerospace sector. Furthermore, Chinese government objectives of self-sufficiency in aircraft engine production will require the development of aerospace rotating grade sponge capacity.[135] The Department anticipates that future Chinese activities in titanium sponge will follow the same pattern as their activities in the global steel and aluminum trade, namely price-insensitive production that will undermine all other competitors.[136]

Russia's activities in global titanium sponge trade suggest a precedent for future Chinese activity. Russian producer VSMPO-Avisma, like many Chinese

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Future", Presentation at the Titanium USA 2013 Conference in Las Vegas, Nevada, (October 9, 2013), https://cdn.ymaws.com/titanium.org/resource/resmgr/2010 2014 papers/DewhurstPhilipTiUSA2013Suppl.pdf, 21

[135] At present, Chinese civil and military aircraft manufacturers rely on engines from U.S., European Union, and Russian companies. To counteract this dependence, the Chinese government created the Aero Engine Corporation of China in 2016 as an integrated engine manufacturing firm. Development of premium grade titanium sponge capacity complements this effort to build a domestic aircraft engine industry. BBC News, "China launches own aircraft engine-maker to rival the West" (August 29, 2016), https://www.bbc.com/news/business-37212009

[136] Section 232 steel report, 52-53, https://www.bis.doc.gov/index.php/documents/steel/2224-the-effect-of-imports-of-steel-on-the-national-security-with-redactions-20180111/file, and Section 232 aluminum report, 102, https://www.bis.doc.gov/index.php/documents/steel/2224-the-effect-of-imports-of-steel-on-the-national-security-with-redactions-20180111/file

producers, receives a significant amount of state assistance.[137] VSMPO-Avisma is also an integrated producer of titanium sponge and downstream titanium products, and is able to offer titanium products at lower prices than U.S. or European producers.

These low prices and favorable contract terms were a major incentive behind Boeing's 2006 joint venture with VSMPO-Avisma to establish Urals Boeing Manufacturing (UBM) at Verkhnyaya Salda in Sverdlovsk Oblast.[138] The UBM plant creates titanium forgings from VSMPO-manufactured sponge and ingot for use in Boeing's 787 aircraft. In 2018, Boeing and VSMPO-Avisma announced plans for a second $82.3 million production line at UBM that would support the 787, 737 MAX, and 777X aircraft. Altogether, VSMPO-Avisma provides 35 percent of Boeing's titanium products. European manufacturer Airbus is similarly dependent on VSMPO-Avisma's exports. In 2009, Airbus signed a $4 billion agreement with the firm to supply titanium through 2020.[139] As of 2019, VSMPO-Avisma supplied approximately 50 percent of Airbus's annual titanium

[137] Russian state holding company Rostec owns a blocking interest of 25 percent in VSMPO-Avisma. VSMPO-Avisma has also passed through several periods of outright control by the Russian state; additionally, VSMPO management has significant ties to the Russian government.

[138] The Boeing Company, "Boeing and VSMPO-AVISMA Announce Titanium Agreement", (August 11, 2006), https://boeing.mediaroom.com/2006-08-11-Boeing-and-VSMPO-AVISMA-Announce-Titanium-Agreement

[139] Eleonore Demry, "Russia, Airbus Sign $4 Billion Titanium Deal), *Agence France Presse* (April 20, 2009), https://www.industryweek.com/companies-amp-executives/russia-airbus-sign-4-billion-titanium-deal

requirements.[140] Although VSMPO-Avisma is not a significant exporter of sponge, its ventures with Boeing and Airbus indicate an interest in increasing the company's share of the global titanium aviation parts market.

Lower prices, made possible by Russian state support, allow VSMPO-Avisma to capture a significant share of Boeing's business. [redacted]

[140] "Interview: Julien Franiatte, head of Airbus Russia", *Russian Aviation Insider* (August 27, 2019), http://www.rusaviainsider.com/interview-julien-franiatte-head-of-airbus-russia/

VSMPO-Avisma's export model could easily be copied by a Chinese manufacturer in the future. A fully-integrated Chinese titanium sponge and downstream titanium producer could offer U.S. and other market aerospace firms significant cost savings over market titanium sponge and titanium product producers. Such an outcome would threaten the future viability of market production of aerospace grade titanium sponge, including U.S., Japanese, and Kazakhstani production.

If Chinese production assists in the displacement of market production of aerospace grade sponge, global aircraft manufacturers, including those in the United States and European Union, will depend on state-influenced Russian and Chinese sources of titanium metal. Russia and China could then use their de facto dominance of the global titanium sponge industry as a tool of geopolitical leverage, as they have with other industries such as uranium and steel. Additionally, in the event of an emergency potentially involving hostilities with Russia or China, U.S. titanium production would be severely impaired if deprived of imports from these countries. As Russia and China are both identified in the 2017 National Security Strategy as "revisionist powers…that challenge U.S. values and interests,"[141] dependence on these countries for titanium sponge would threaten to impair the national security.

[141] Executive Office of the President, "National Security Strategy of the United States of America", (December 2017), 25.

VIII. Conclusion

Based on these findings, the Secretary concludes that the present quantities and circumstance of titanium sponge imports are "weakening our internal economy" and threaten to impair the national security as defined in Section 232. The consequent adverse impact on the domestic titanium sponge industry, along with the circumstance of increased global production and capacity in titanium sponge, especially in non-market economies, places the United States at risk of losing the remaining industrial capacity and technical knowledge related to titanium sponge production that is essential to meet national defense and critical infrastructure requirements.

Imports of titanium sponge, which accounted for 68 percent of all sponge consumed in the United States in 2018, threaten to impair the national security by placing the sole remaining U.S. titanium sponge producer's operation under severe financial stress. Low-priced sponge imports, as well as low priced titanium scrap imports, depress the price of U.S. titanium sponge and de-incentivize recapitalization of the remaining active facility's aging production capabilities. If the remaining facility ceases operation, the U.S. will have no active domestic capacity to produce titanium sponge for national defense and critical infrastructure needs.

Absent domestic titanium sponge production capacity, the U.S. will be completely dependent on imports of titanium sponge and scrap, and will lack the surge capacity required to support defense and critical infrastructure needs in an extended national emergency.

Titanium producers, including producers of goods such as ingot, billet, sheet, coil, and tube, as well as end-users of finished titanium goods, are almost all entirely dependent on non-U.S. sources for sponge and scrap. This circumstance presents the possibility that, in a national emergency, U.S. titanium producers would be denied access to imports of titanium sponge and scrap due to supply disruption. If U.S. titanium producers do not have access to either domestic or imported supplies of sponge and scrap, their manufacturing operations would severely decline or cease once their existing titanium inventories were depleted. These working and strategic inventories have decreased substantially during the 2015 to 2018 period, and are now estimated to only last approximately five months at current consumption rates. The U.S. no longer maintains titanium sponge in the National Defense Stockpile.

Further, under current global market conditions and the going rate of non-market Russian and Chinese titanium producers, it is difficult for the remaining U.S. titanium sponge producer to justify the capital investments needed for continued operations. This inability to invest threatens continued operation of the

sole domestic titanium sponge plant. If this capacity and associated skilled workforce are lost, it will be challenging and prohibitively expensive to reconstitute U.S. titanium sponge production capabilities.

The Department acknowledges that larger industry trends, including increased use of titanium scrap and downstream producers' emphasis on scrap recovery, have decreased the need for titanium sponge. These trends reflect U.S. titanium producers and end users' interest in maximizing profits by leveraging lower scrap costs, and mitigating the need for new sponge purchases. However, these trends do not eliminate the need for new titanium sponge. Certain titanium parts, particularly those used in national defense systems, cannot be made using scrap and require new titanium sponge. Moreover, approximately 52 percent of all scrap is imported and subject to the same potential supply disruptions as sponge. The remaining 48 percent of scrap that is domestically produced is also subject to potential supply disruptions. The vast majority of this scrap is generated from semi-fabricated and finished titanium product manufacturing operations, which rely on imported sponge for approximately 68 percent of their total sponge consumption.

The displacement of domestic titanium sponge by low-priced imports places the United States at risk of not being able to meet national security requirements

during an emergency. The Secretary therefore finds that imports of titanium sponge threaten to impair the national security as defined in Section 232.

Recommendations

The Department has identified several potential actions that could be taken to address the threat of imports of titanium sponge to national security.[142] These actions include domestic initiatives and multilateral negotiations.

Option 1 - Domestic Initiatives

The Department has identified two possible domestic initiatives that the U.S. government can undertake to stimulate reinvestment in domestic sponge production. These options include:

Option 1A – Voluntary Agreements with U.S. Titanium Sponge Producer(s) Under Title VII of the Defense Production Act of 1950

One of the challenges identified by the U.S. industry is that low prevailing market prices, which are driven by high volumes of imports, do not justify the capital investments required to sustain future production. To mitigate this situation, the U.S. government could temporarily compensate U.S. producer(s) for the difference between their current production costs and global purchase prices.

[142] The following recommendations are the Department's and do not necessarily reflect the recommendations of the other agencies with which the Department consulted during the course of this investigation.

Such compensation would serve as a temporary bridge until such time that U.S. producer(s) could make the capital investments needed to upgrade or build production facilities, which will in turn lower production costs and safeguard future production. Although the proposed compensation is not likely to cover the full cost of any major capital investment, it would nevertheless encourage U.S. producers to invest their own funds in modernizing sponge production.

As shown in Figure 1A below, the Department estimates that providing this compensation over a five-year period would cost approximately [redacted] per year, or approximately [redacted] of titanium sponge produced. The Department bases these calculations on the remaining active U.S. producer of titanium sponge, and assumes a five-year period would be required to make the essential capital investments needed to safeguard production. After completion of needed capital investments, U.S. production costs are expected to be competitive with the global sponge prices, and the compensation would no longer be required.

Option 1B - Expansion of the National Defense Stockpile to include titanium sponge and additional amounts of titanium metal

The USG also could address the threatened impairment by adding additional titanium materials to the National Defense Stockpile, while simultaneously encouraging the upgrade of domestic sponge production capacity by instituting long-term supply contracts for U.S. producers of titanium sponge and metal. To encourage domestic sponge production, the agreement for this additional material would specify that the winning bidder(s) agree to provide U.S.-origin titanium sponge and domestically melted semi-finished titanium products to fulfill the anticipated 15-year contract.

In order to safeguard against supply chain disruptions, the proposed National Defense Stockpile would maintain one year's worth of U.S. titanium sponge consumption needs (combined defense and commercial). Department survey data

on U.S. producers and melters' 2018-2019 inventories, consumption, and costs were used to calculate and estimate needs for this proposed stockpile. In 2018, 34,100 metric tons of titanium sponge were consumed in the U.S. The sole domestic manufacturer of titanium sponge produced sponge at a cost of [redacted]. Additionally, [redacted] of titanium sponge was held by U.S. commercial producers in their inventories in 2018. In order to maintain one years' worth of U.S. consumption in the proposed stockpile (34,100 metric tons total), the USG would have to procure [redacted] of titanium sponge in order to supplement the 2018 commercial inventory level of [redacted]. The agreement would stipulate that commercial inventory levels cannot be sold or liquidated and must be maintained at 2018 levels.

A 15-year agreement to procure the total shortfall of [redacted] would require the purchase of roughly [redacted] of titanium sponge per year, at an average price of [redacted], for a cost of [redacted]. The 15-year agreement would result in the procurement of [redacted] of sponge for the stockpile maintained by the USG at a total cost of [redacted]. However, the final amount and mix of sponge and metal (titanium ingots and billets) to be added would be determined by the DoD in consultation with the Department and other agencies. Commercial inventories in the U.S. (including inventories of non-U.S. suppliers) and other factors that could

impact demand in a national emergency would be factored into the acquisition plan.

Option 2 - Multilateral Negotiations

As the Department observed in the recent steel, aluminum, and uranium Section 232 investigations, non-market actors can substantially distort the global market for products through price, quantity, and market access. For titanium sponge and downstream products, Russia and China are examples of such non-market actors. In 2018, Russian and Chinese titanium sponge producers accounted for 61 percent of the world's titanium sponge production, an increase over their combined 55 percent share in 2008 and 37 percent share in 1998.

Non-market actors lower the price of titanium sponge, which causes financial harm to U.S. and other market producers, particularly Japan. Japanese producers have responded to low global prices by lowering their own sponge prices. Multilateral negotiations between the United States and other market producers of titanium sponge, including Japan and Kazakhstan, would present an opportunity to address issues affecting market titanium sponge production. The option below is budget neutral.

Option 2 – Common inventory of sponge for use among the parties to mitigate supply issues

In this option, the U.S. and other market titanium producers could agree to establish pre-positioned strategic stores of sponge for use by titanium sponge customers to be held at their U.S. titanium facilities or other locations in the United States. The amount of sponge held would vary with the annual amount sold to each particular customer commensurate to their market share. This action would mitigate potential shortfalls in sponge imports caused by a national emergency.

U.S. Titanium Industrial Base Analysis

The Department, in collaboration with DoD, DOI, and USGS, should survey and assess the operating status and capacity of the U.S. titanium sponge and downstream titanium industries every three years. Such action would provide the USG with needed economic and financial data on this critical industrial base sector.

Appendix A

UNITED STATES DEPARTMENT OF COMMERCE
The Secretary of Commerce
Washington, D.C. 20230

March 4, 2019

The Honorable Patrick M. Shanahan
Acting Secretary of Defense
Washington, DC 20301-3010

Dear Mr. Acting Secretary:

I am writing to notify you that I am initiating an investigation in response to a petition requesting a determination of the effects of imported titanium sponge on national security. I am taking this action pursuant to Section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. § 1862). Section 232 requires notice be provided to the Secretary of Defense upon initiation of an investigation.

During the course of the investigation, Department of Commerce staff will consult with their counterparts in the Department of Defense regarding any methodological and policy questions that arise during the investigation. The investigation report will include any information provided by the Department of Defense regarding the national defense requirements for titanium sponge.

The Department's point of contact for this investigation is Brad Botwin, Director, Industrial Studies, Office of Technology Evaluation, Bureau of Industry and Security. Mr. Botwin can be reached at Brad.Botwin@bis.doc.gov and (202) 482-4060.

I look forward to our collaboration on this important issue.

Sincerely,

Wilbur Ross

Wilbur Ross

Appendix B

DEPARTMENT OF COMMERCE

Bureau of Industry and Security

Notice of Request for Public Comments on Section 232 National Security Investigation of Imports of Titanium Sponge

AGENCY: Bureau of Industry and Security, Office of Technology Evaluation, U.S. Department of Commerce.

ACTION: Notice of request for public comments.

SUMMARY: On March 4, 2019, in response to a petition, the Secretary of Commerce (the ''Secretary'') initiated an investigation to determine the effects on the national security from imports of titanium sponge. This investigation has been initiated under section 232 of the Trade Expansion Act of 1962, as amended.

Interested parties are invited to submit written comments, data, analyses, or other information pertinent to the investigation to the Department of Commerce's (the ''Department'') Bureau of Industry and Security by April 22, 2019. Rebuttal comments will be due by May 22, 2019. This notice identifies issues on which the Department is especially interested in obtaining the public's views.

DATES: The due date for filing comments is April 22, 2019. The due date for rebuttal comments is May 22, 2019. Rebuttal comments may only address issues raised in comments filed on or before April 22, 2019.

ADDRESSES: *Submissions:* All written comments on the notice must be submitted in English and must be addressed to Section 232 Titanium Sponge Investigation and filed through the Federal eRulemaking Portal: *http://www.regulations.gov.* To submit comments via *http://www.regulations.gov,* enter docket number BIS–2018–0027 on the home page and click ''search.'' The site will provide a search results page listing all documents associated with this docket. Find a reference to this notice and click on the link entitled ''Comment Now!'' (For further information on using *http://www.regulations.gov,* please consult the resources provided on the website by clicking on ''How to Use This Site.'')

FOR FURTHER INFORMATION CONTACT: Brad Botwin, Director, Industrial Studies, Bureau of Industry and Security, U.S. Department of Commerce (202) 482–3110, *Titanium232@bis.doc.gov.* For more information about the section 232 program, including the regulations and the text of previous investigations, please see *www.bis.doc.gov/232.*

SUPPLEMENTARY INFORMATION:

Background

On March 4, 2019, in response to a petition, the Secretary initiated an investigation under section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), to determine the effects on the national security from imports of titanium sponge. If the Secretary finds that titanium sponge is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security, the Secretary shall so advise the President in his report on the findings of the investigation.

Written Comments

This investigation is being undertaken in accordance with part 705 of the National Security Industrial Base Regulations (15 CFR parts 700 to 709) (''NSIBR''). Interested parties are invited to submit written comments, data, analyses, or information pertinent to this investigation to the Department's Office of Technology Evaluation no later than April 22, 2019. Rebuttal comments submitted in response to issues raised in comments received on or before April 22, 2019 may be filed no later than May 22, 2019.

The Department is particularly interested in comments and information directed to the criteria listed in § 705.4 of the NSIBR as they affect national security, including the following:

(i) Quantity of or other circumstances related to the importation of titanium sponge;

(ii) Domestic production and productive capacity needed for titanium sponge to meet projected national defense requirements;

(iii) Existing and anticipated availability of human resources, products, raw materials, production equipment, and facilities to produce titanium sponge;

(iv) Growth requirements of the titanium sponge industry to meet national defense requirements and/or requirements for supplies and services necessary to assure such growth including investment, exploration, and development;

(v) The impact of foreign competition on the economic welfare of the titanium sponge industry;

(vi) The displacement of any domestic titanium sponge production causing substantial unemployment, decrease in the revenues of government, loss of investment or specialized skills and productive capacity, or other serious effects;

(vii) Relevant factors that are causing or will cause a weakening of our national economy; and

(viii) Any other relevant factors, including the use and importance of titanium sponge in critical infrastructure sectors identified in Presidential Policy Directive 21 (Feb. 12, 2013) (for a listing of those sectors see *https://www.dhs.gov/cisa/critical-infrastructure-sectors*).

Requirements for Written Comments

The *http://www.regulations.gov* website allows users to provide comments by filling in a ''Type Comment'' field, or by attaching a document using an ''Upload File'' field. The Department prefers that comments be provided in an attached document. The Department prefers submissions in Microsoft Word (.doc) or Adobe Acrobat (.pdf). If the submission is in an application format other than those two, please indicate the name of the application in the ''Type Comment'' field. Please do not attach separate cover letters to electronic submissions; rather, include any information that might appear in a cover letter in the comments themselves. Similarly, to the extent possible please include any exhibits, annexes, or other attachments in the same file as part of the submission itself rather than in separate files. Comments will be placed in the docket and open to public inspection, except information determined to be confidential as outlined in § 705.6 of the NSIBR. Comments may be viewed on *http://www.regulations.gov* by entering docket number BIS–2018–0027 in the search field on the home page.

Material submitted by members of the public that is properly marked business confidential information and accepted as such by the Department will be exempted from public disclosure as provided for by § 705.6 of the NSIBR. Anyone submitting business confidential information should clearly identify the business confidential portion at the time of submission, file a statement justifying nondisclosure and referring to the specific legal authority claimed, and provide a non-confidential submission which can be placed in the public file on *http://www.regulations.gov.* Communications from agencies of the United States Government will not be made available for public inspection. For comments submitted electronically containing business confidential information, the file name of the business confidential version should begin with the characters ''BC''. Any page containing business confidential information must be clearly marked ''BUSINESS CONFIDENTIAL''

on the top of that page. The non-confidential version must be clearly marked ''PUBLIC''. The file name of the non-confidential version should begin with the character ''P''. The ''BC'' and ''P'' should be followed by the name of the person or entity submitting the comments or rebuttal comments. All filers should name their files using the name of the person or entity submitting the comments. If a public hearing is held in support of this investigation, a separate **Federal Register** notice will be published providing the date and information about the hearing.

The Bureau of Industry and Security does not maintain a separate public inspection facility. Requesters should first view the Bureau's web page, which can be found at *https://efoia.bis.doc.gov/* (see ''Electronic FOIA'' heading). If requesters cannot access the website, they may call 202–482–0795 for assistance. The records related to this assessment are made accessible in accordance with the regulations published in part 4 of title 15 of the Code of Federal Regulations (15 CFR 4.1 *et seq.*).

Dated: March 4, 2019.

Wilbur Ross,

Secretary of Commerce.

[FR Doc. 2019–04209 Filed 3–7–19; 8:45 am]

BILLING CODE 3510–33–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Hydrographic Services Review Panel

AGENCY: National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: Notice of call for nominations for NOAA's Hydrographic Services Review Panel Federal Advisory Committee.

SUMMARY: The National Oceanic and Atmospheric Administration is seeking nominations for members to serve on the Hydrographic Services Review Panel.

DATES: Nominations are sought to fill five vacancies that occur on January 1, 2020. Nominations should be submitted by no later than May l, 2019. Nominations will be accepted and kept on file on an ongoing basis regardless of date submitted for use with current and future vacancies. HSRP maintains a pool of candidates and advertises once a year to fulfill the HSIA requirements on membership solicitation. Current members who may be eligible for a second term must reapply.

ADDRESSES: Nominations will be accepted by email and should be sent to: *Hydroservices.panel@noaa.gov* and *Lynne.Mersfelder@noaa.gov.* You will receive a confirmation response.

FOR FURTHER INFORMATION CONTACT: Lynne Mersfelder-Lewis, NOAA HSRPprogram manager, email *Lynne.Mersfelder@noaa.gov* or phone: 240–523–0064.

SUPPLEMENTARY INFORMATION: In accordance with the Hydrographic ServiceImprovements Act Amendments of 2002, Public Law 107–372, the Administrator of the NationalOceanic and Atmospheric Administration (NOAA) is required to solicit nominations for membership at least once a year for the Hydrographic Services Review Panel (HSRP). The HSRP, a Federal advisory committee, advises the Administrator on matters related to the responsibilities and authorities set forth in section 303 of the Hydrographic Services Improvement Act and such other appropriate matters as the Administrator refers to the Panel for review and advice. Those responsibilities and authorities include, but are not limited to: Acquiring and disseminating hydrographic data and providing hydrographic services, as those terms are defined in the Act; promulgating standards for hydrographic data and services; ensuring comprehensive geographic coverage of hydrographic services; and testing, developing, and operating vessels, equipment, and technologies necessary to ensure safe navigation and maintain operational expertise in hydrographic data acquisition and hydrographic services.

The Act states ''the voting members of the Panel shall be individuals who, by reason of knowledge, experience, or training, are especially qualified in one or more of the disciplines and fields relating to hydrographic data and hydrographic services, marine transportation, port administration, vessel pilotage, coastal and fishery management, and other disciplines as determined appropriate by the Administrator.'' The NOAA Administrator seeks and encourages individuals with expertise in marine navigation and technology, port administration, marine shipping or other intermodal transportation industries, cartography and geographic information systems, geodesy, physical oceanography, coastal resource management, including coastal preparedness and emergency response, and other related fields. To apply for membership, applicants are requested to submit five items including a cover letter that responds to the five questions below. The entire package should be a maximum length of eight pages or fewer. NOAA is an equal opportunity employer.

(1) A cover letter that responds to the five questions listed below and serves as a statement of interest to serve on the panel. Please see ''Short Response Questions'' below.

(2) Highlight the nominee's speeific area(s) of expertise relevant to the purpose of the Panel from the list in the **Federal Register** Notice.

(3) A short biography of 300 to 400 words.

(4) A current resume.

(5) The nominee's full name, title, institutional affiliation, mailing address, email, phone, fax and contact information.

Short Response Questions

(l) List your area(s) of expertise, as listed above.

(2) List the geographic region(s) of the country with which you primarily associate your expertise.

(3) Describe your leadership or professional experiences which you believe will contribute to the effectiveness of this panel.

(4) Describe your familiarity and experience with NOAA NOS navigation data, products, and services.

(5) Generally describe the breadth and scope of your knowledge of stakeholders, users, or other groups who interact with NOAA and whose views and input you believe you can share with the panel.

Under 33 U.S.C. 883a, *et seq.,* NOAA's National Ocean Service (NOS) is responsible for providing nautical charts and related information for safe navigation. NOS collects and compiles hydrographic, tidal and current. geodetic, and a variety of other data in order to fulfill this responsibility.· The HSRP provides advice on current and emerging oceanographic and marine science technologies relating to operations, research and development; and dissemination of data pertaining to:

(a) Hydrographic surveying;

(b) Shoreline surveying;

(c) Nautical charting;

(d) Water level measurements;

(e) Current measurements;

(f) Geodetic measurements;

(g) Geospatial measurements;

(h) Geomagnetic measurements; and

(i) Other oceanographic/marine related sciences.

The Panel has fifteen voting members appointed by the NOAA Administrator in accordance with 33 U.S.C. 892c.

Appendix C

Redacted

Appendix D

Next Page

OMB Control Number: 0694-0120
Expiration Date: March 31, 2020

Section 232 Investigation: The Effect of Imports of Titanium Sponge on U.S. National Security

Producers and Melters Survey

SCOPE OF ASSESSMENT

The U.S. Department of Commerce, Bureau of Industry and Security (BIS), Office of Technology Evaluation (OTE), is conducting a survey of U.S. titanium sponge production and titanium production. The survey results will be used to support an ongoing investigation of the effect of imports of titanium sponge on U S. national security initiated under Section 232 of the Trade Expansion Act of 1962, as amended.

The principal goal of this survey is to assist the U.S. Department of Commerce in determining whether titanium sponge is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security. Information collected will include facilities and production data, mergers and acquisitions, joint ventures, imports and exports, supply chain networks, customers, sales and demand data, employment information, conditions of domestic and global competition, research and development, and other factors. The resulting data will provide the U.S. Department of Commerce detailed titanium industry information that is otherwise not publicly available and needed to effectively conduct this Section 232 investigation.

RESPONSE TO THIS SURVEY IS REQUIRED BY LAW

A response to this survey is required by law (50 U S.C. Sec. 4555). Failure to respond can result in a maximum fine of $10,000, imprisonment of up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. Sec. 4555). Section 705 prohibits the publication or disclosure of this information unless the President determines that its withholding is contrary to the national defense. Information will not be shared with any non-government entity, other than in aggregate form. The information will be protected pursuant to the appropriate exemptions from disclosure under the Freedom of Information Act (FOIA), should it be the subject of a FOIA request.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number.

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information to BIS Information Collection Officer, Room 6883, Bureau of Industry and Security, U.S. Department of Commerce, Washington, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (OMB Control No. 0694-0120), Washington, D.C. 20503.

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

II. Table of Contents

Previous Page Next Page

III. General Instructions

A.	Your organization is required to complete this survey of U.S. titanium sponge production and titanium production, using an Excel template, which can be downloaded from the BIS website: http://www.bis.doc.gov/TiSponge232 If you are unable to download the survey document, at your request, BIS survey support staff will e-mail the Excel survey template directly to you. For your convenience, a PDF version of the survey and required drop-down content is available on the BIS website to aid internal data collection. **DO NOT SUBMIT** the PDF version of the survey as your response to BIS. Should this occur, your organization will be required to resubmit the survey in the requested Excel format.
B.	Respond to every question. Surveys that are not fully completed will be returned for completion. Use the comment boxes to provide any information to supplement responses provided in the survey form. Make sure to record a complete answer in the space provided, even if the space does not appear to expand to fit all of the information. **This is a comprehensive survey of sponge production and consumption. As such, some questions may not be relevant to your organization. Read each question carefully to ensure its applicability to your organization.** **DO NOT CUT AND PASTE RESPONSES WITHIN THIS SURVEY OR PASTE IN RESPONSES FROM OUTSIDE THE SURVEY**. Survey inputs should be completed by typing in responses or by using a drop-down menu. The use of cut and paste can corrupt the survey template. If your survey response is corrupted as a result of cut and paste response, your survey will be rejected and your organization must immediately resubmit the survey.
C.	**Do not disclose any USG classified information in this survey form.**
D.	Upon completion of the survey, final review, and certification, **transmit the survey document via e-mail to**: Titanium232@bis.doc.gov
E.	Questions related to the survey should be directed to BIS survey support staff at Titanium232@bis.doc.gov. E-mail is the preferred method of contact. You may speak with a member of the BIS survey support staff by calling (202) 482-3110.
F.	For questions related to the overall scope of this Section 232 Investigation, contact Titanium232@bis.doc.gov or: Brad Botwin, Director, Industrial Studies Office of Technology Evaluation, BIS, Room 1093 U.S. Department of Commerce 1401 Constitution Avenue, NW Washington, DC 20230 **DO NOT** submit completed surveys to Mr. Botwin's postal or personal e-mail address. All surveys must be submitted electronically to: Titanium232@bis.doc.gov

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Previous Page Next Page

IV. Definitions

Term	Definition
Authorizing Official	An executive officer of the organization or business unit or another individual who has the authority to execute this survey on behalf of the organization.
Applied Research	Systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met. This activity includes work leading to the production of useful materials, devices and systems or methods, including design, development, and improvement of prototypes and new processes.
Basic Research	Systematic, scientific study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind.
Capital Expenditures	Investments made by an organization in buildings, equipment, property, and systems where the expense is depreciated. This does not include expenditures for consumable materials, other operating expenses, and salaries associated with normal business operations.
Chlorination	As applied to titanium sponge production, chlorination is the process in which chlorine gas is introduced to rutile or ilmenite ore to produce titanium tetrachloride.
Crushing/Shearing	The process by which large masses of titanium sponge produced via chemical methods are reduced to smaller sizes suitable for melting into ingots and other forms.
Customer	Any organization (external or internal entity) for which your organization manufactures/processes any product comprised of, or containing, titanium in any form.
DPAS	The purpose of DPAS is to assure the timely availability of industrial resources to meet current national defense and emergency preparedness program requirements and to provide an operating system to support rapid industrial response in a national emergency. The Defense Production Act of 1950 authorized the President to require preferential treatment of national defense programs.
Electrolysis	As applied to titanium sponge production, electrolysis is the process used to separate magnesium and chloride into magnesium and chlorine, resulting in the recycling of magnesium and chlorine.
Exports	Shipments to destinations outside the United States, including shipments to Canada and Mexico.
Facility	A building or the minimum complex of buildings or parts of buildings in which an organization operates to serve a particular function, producing revenue, and incurring costs for the company. A facility may produce an item of tangible or intangible property or may perform a service. It may encompass a floor or group of floors within a building, a single building, or a group of buildings or structures. Often, a facility is a group of related locations at which organization employees work, together constituting a profit-and-loss center for the company, and it may be identified by a unique DUNS number.
Finishing	Finishing treats the exterior of a metal product with the application of a thin complementary layer. Finishing is performed to improve a metal object's appearance and/or durability, titanium finishing steps include heat treating, machining, grinding, sizing, cutting, flattening and other surface preparation processes as well as inspection and testing processes to ready the product for shipment to customers
Forging	This process shapes titanium metal through the application of localized compressive forces, usually a hammer or die. It can be performed at various temperatures depending on the requirement for the final product.
Full Time Equivalent (FTE) Employees	Employees who work for 40 hours in a normal work week. Convert part-time employees into "full time equivalents" by taking their work hours as a fraction of 40 hours.
Full Time Equivalent (FTE) Contractors	Contractors who work for 40 hours in a normal work week. Convert part-time contractors into "full time equivalents" by taking their work hours as a fraction of 40 hours.
Global Headquarters	A location that serves as the organization’s hub of worldwide operations with all global branches or divisions reporting to it.
Harmonized Tariff Schedule (HTS)	A 10-digit numbering system that classifies a good based on its name, use, and/or the material used in its construction. The number provides Customs and Border Protection (CBP) with a standardized method of tracking all merchandise imported into the United States and sets out the tariff rates and statistical categories.
Import Value	Values reported should be the CIF duty un-paid value.
Inventory	The goods or materials an organization holds for its own use or for the ultimate goal of sale, or disposition or future conversion, enrichment, fabrication, or other use. This is material to which your organization has title; this does not include holding material for third-party use or storage.

Melting	This process heats titanium metal feedstock, including both scrap, sponge, and any alloy additions. This step is required to produce semi-fabricated titanium products, such as ingots.
Milling	This is the process of converting ingots and other melted forms into downstream products such as billet, bar, extrusions, plate, sheet, coil, tube and wire. Processes involved in milling include forging, hot rolling, cold rolling and finishing.
Major Non-NATO Ally Sales	Sales of titanium products to the militaries of Afghanistan, Argentina, Australia, Bahrain, Brazil, Egypt, Israel, Japan, Jordan, Kuwait, Morocco, New Zealand, Pakistan, the Philippines, Republic of Korea (South Korea), Thailand, and Taiwan (Republic of China).
NATO Military Sales	Sales of titanium products to militaries of North Atlantic Treaty Organization member states other than the United States. These states include Albania, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Latvia, Lithuania, Luxembourg, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, and the United Kingdom
Non-U.S. Facility	A facility that is physically located outside of the United States.
Organization	A company, firm, laboratory, or other entity that owns or controls one or more U.S. establishment or facility involved in titanium production or consumption.
Product/Process Development	The systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.
Production	The process of transforming inputs (raw materials, semi-finished goods, subassemblies, ideas, information, knowledge) into goods or services.
Research & Development	Basic and applied research in the engineering sciences, as well as design and development of prototype products and processes. Efforts that an organization conducts towards innovating, introducing and/or improving products and processes.
Sales	All reported and unreported sales of titanium, including sales to end-users, and sales within divisions of the organization.
Scrap	Titanium metal that is recovered from the titanium manufacturing process or through dismantling older objects containing titanium. Scrap can be used as feedstock for a melt.
Sponge	A porous, brittle form of titanium created from the reduction of titanium tetrachloride. This is most frequently achieved through the Kroll process.
Sponge - Standard Quality	Titanium sponge with chemical compositions suitable for use in structural non-aerospace applications.
Sponge - Non-Rotating Aerospace	Titanium sponge with chemical compositions suitable for use in aerospace applications such as struts, turbine frames, exhaust sidewalls, and other static aerospace structures.
Sponge - Rotating Grade	Titanium sponge with chemical compositions suitable for use in aerospace applications such as blade rotors, shafts, fan and compressor blades, and shifters. The titanium sponge must be of sufficient quality to ensure zero-tolerance for structural failure.
Supplier	An entity from which your organization obtains inputs, which may be goods or services. A supplier may be another organization with which you have a contractual relationship, or it may be another facility owned by the same parent organization.
Titanium Tube	This is tube manufactured from titanium. It is primarily used in aerospace ducting applications since it does not have the strength for most hydraulic applications. It is also used power generation, chemical processing, and medical applications
Titanium-Related	Components/products produced and/or consumed by your organization that contain titanium metal.
United States	The "United States" or "U.S." includes the 50 states, Puerto Rico, the District of Columbia, Guam, the Trust Territories, and the U.S. Virgin Islands.
Vacuum Distillation	Reduction of titanium tetrachloride with magnesium metal in a reactor followed by a distillation process to remove magnesium and chlorine impurities.

Previous Page

Next Page

1. Organization Information

A.

Provide the following information for your organization	
Organization Name	
Street Address	
City	
State	
ZIP Code	
Country of Global Headquarters	
U.S. Point of Contact Name	
U.S. Point of Contact Email	
U.S. Point of Contact Phone	

B. Is this organization owned, in whole or in part, by any private or government entity? Indicate Yes/No, then identify the entities below, if applicable. List entities with at least 5% ownership.

Entity Name	Global Headquarters Street Address	Global Headquarters City	Global Headquarters State/Province	Global Headquarters Country	Ownership %

C. For the listed titanium related activities, record the number of facilities your organization owns that conduct these activities. If one facility does more than one of the listed activities, count it in each category.

Activities	Number of U.S. Located Facilities	Number of Non-U.S. Located Facilities
Titanium Sponge Production		
Titanium Melting		
Titanium Recycling		
Titanium Casting		
Titanium Milling		
Titanium Forging		
Titanium Finishing		
Aerospace Structural Parts (e.g. spars, ribs)		
Aerospace High-impact Parts (e.g. landing gear)		
Aerospace External Engine Parts (e.g. cowl, fan)		
Aerospace Internal Engine Parts (e.g. low pressure compressor)		
Titanium Satellite Components/Finished Parts		
Land-Based Turbine Engine and Structural Parts		
Maritime Turbine Engine and Structural Parts		
Chemical Processing Equipment (e.g. tubing)		
Specialty Titanium Parts Manufacturing (not to include aerospace)		
Other (Explain in Comments)		

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

2. Mergers, Acquisitions, Divestitures and Joint Ventures

Mergers, Acquisitions, and Divestitures

From 2015-2019, record the total number of mergers, acquisitions, and divestitures related to all titanium related activities, product development and design, and R&D activities. Be sure to report related private/public partnerships in which your organization participated.

Identify your organization's mergers, acquisitions, and divestitures below, if applicable.

A.

	Organization Name	Type of Activity	% of Equity Held by Partner Organization	Partner Organization Country Headquarters	Year Initiated	Primary Scope of Activity	Primary Purpose of Activity	Explain
1						see below section		
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Joint Ventures

From 2015-2019, record the total number of joint ventures and other business partnerships related to all titanium related activities, product development and design, and R&D, including public/private partnerships, in which your organization participated.

Identify your organization's joint venture relationships below, if applicable.

B.

	Organization Name	Type of Joint Venture	% of Equity Held by Organization	Organization Country Headquarters	Year Initiated	Primary Scope of Relationship	Primary Purpose of Relationship	Explain
1						Titanium Sponge Production		
2						Titanium Melting		
3						Titanium Recycling		
4						Titanium Casting		
5						Titanium Milling		
6						Titanium Forging		
7						Titanium Finishing		
8						Titanium Ore Mining		
9						Aerospace Structural Parts		
10						Aerospace High-impact Parts		
11						Aerospace External Engine		
12						Aerospace Internal Engine	Chemical Processing Equipment (e.g.	
13						Titanium Satellite	Specialty Titanium Parts Manufacturing	
14						Land-Based Turbine Engine	Other (Explain in Comments)	
15						Maritime Turbine Engine and		

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

3. Facilities

Identify all of your organization's facilities with **titanium related** operations (e.g. sponge production milling forging casting and components) including facilities that are on standby/idled. Provide the **LOCATION (U.S. and Non-U.S.)** of the facility indicate all operations at each facility using the drop down menus and specify any changes that may impact that faci ity over the next five years. If a given fac lity has more than one operation list each operation at the facility and the given operation's capacity on separate ines.

	Facility Name	Location					Facility Operation		Facility Capacity		Outlook	
		City	State	Country	Facility Located in a Free Trade Zone?	Facility Located in an Opportunity Zone?	Operation Type	Faci ity Operating Status	Total Facility Capacity (MT)	Average Capacity Ut lization Rate (Last Fu l Year of Operation)	Do you anticipate any significant changes in this particular operation the next five years?	If yes or unknown provide a brief explanation.
1					y/n	Y/N	Titanium Sponge Production				yes	
2							Titanium Melting				no	
3							Titanium Recycling				unknown	
4							Titanium Casting					
5							Titanium Milling					
6							Titanium Forging					
7							Titanium Finishing					
8							Titanium Ore Mining					
9							Aerospace Structural Parts					
10							Aerospace High-impact Parts					
11							Aerospace External Engine					
12							Aerospace Internal Engine					
13							Titanium Satel ite					
14							Land-Based Turbine Engine					
15							Maritime Turbine Engine and					
16							Chemical Processing					
17							Specialty Titanium Parts					
18							Other (Explain in Comments)					
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

Has your organization benefited from being located in an opportunity zone or would your organization l ke more information regarding relocation to opportunity zones?

If any of your organization's **titanium sponge** production faci ities were idled in the 2015-2019 **or may be idled after 2019,** how long would it take if possible to restart operations at that shut down fac lity? Indicate the factors that might inhibit restarting operations and the degree of impact for each factor. Estimate the total costs associated with each factor and then explain your reasoning for your choices.

	Facility Name	Possible to Restart?	Estimated Time to Restart (in days)	Estimated Total Cost to Restart (in $ 000s USD)	Factors Inhibiting Restart		Estimated Cost of Each Factor (in $ 000s USD)	Time to Reach 100% Capacity Ut lization	Cost to Reach 100% Capacity Ut lization	Factors Inh biting 00% Capcity Ut lization	
					Factor	Degree of Impact				Factor	Degree of Impact
1						High					High
						Medium					Medium
						Low					Low
2	Facility Name	Possible to Restart?	Estimated Time to Restart (in days)	Estimated Total Cost to Restart (in $ 000s USD)	Factors Inhibiting Restart		Estimated Cost of Each Factor (in $ 000s USD)	Time to Reach 100% Capacity Ut lization	Cost to Reach 100% Capacity Ut lization	Factors Inh biting 00% Capcity Ut lization	
					Factor	Degree of Impact				Factor	Degree of Impact
3	Facility Name	Possible to Restart?	Estimated Time to Restart (in days)	Estimated Total Cost to Restart (in $ 000s USD)	Factors Inhibiting Restart		Estimated Cost of Each Factor (in $ 000s USD)	Time to Reach 100% Capacity Ut lization	Cost to Reach 100% Capacity Ut lization	Factors Inh biting 00% Capcity Ut lization	
					Factor	Degree of Impact				Factor	Degree of Impact

For any **idled sponge facilities** explain the circumstances that led to idling in the comment box to the right.

Is your organization considering the development of expanded and/or new titanium production capacity whether inside or outside the United States? If yes describe.	Y/N	

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

P ev ous Page

Next Page

4. Production

Indicate if your organization produced sponge between the years 2015-2019 in the box to the right. If yes, complete section A, B, and C. If no, proceed to section D. y/n

Fo yea s 2015-2019, p ov de the follow ng capc ty ut l zat on ates by fac l ty and agg egated p oduct on data fo U S. **t tanium sponge product on**. If you o gan zat on d d not p oduce sponge du ng th s t me pe od move to sect on B of th s tab.

		Fac l ty Name	2015 Capac ty Ut l zat on Rate	2016 Capac ty Ut l zat on Rate	2017 Capac ty Ut l zat on Rate	2018 Capac ty Ut l zat on Rate	2019 YTD (June) Capac ty Ut l zat on Rate
A	1						
	2						
	3						

		Type of Sponge (Reco d n K log ams)	2015		2016		2017		2018		2019 (YTD)	
			K log ams P oduced	Ave age cost pe Kg to p oduce	K log ams P oduced	Ave age cost pe Kg to p oduce	K log ams P oduced	Ave age cost pe Kg to p oduce	K log ams P oduced	Ave age cost pe Kg to p oduce	K log ams P oduced	Ave age cost pe Kg to p oduce
B	1	Standa d Qual ty										
	2	Non-Rotat ng Ae ospace										
	3	Rotat ng G ade										
	4	**Total**										

f you o gan zat on has obta ned qual f cat on/ce t f cat on to p oduce Ae ospace Rotat ng G ade sponge p ov de the follow ng.

			1	2	3	4	5	6	7	8	9	10
C	1	O gan zat on Ce t fy ng										
	2	Date of Ce t f cat on										
	3	Desc pt on of Ce t f cat on P ocess										

Fo all t tan um p oducts below answe the appl cable quest ons to you o gan zat ons U.S. based p oduct on by yea . Repo t a l quant t es n k log ams fo the yea s 2015-2019.

		Type of T tan um Metal (Reco d all Responses n K log ams)	2015	2016	2017	2018	2019 (to date)
D	1	T tan um Ingot (Total)					
	1a	T tan um Ingot Conta n ng Standa d Qual ty Sponge					
	1b	T tan um Ingot Conta n ng Ae ospace Non-Rotat ng Sponge					
	1c	T tan um Ingot Conta n ng Rotat ng G ade Sponge					
	2	T tan um B llet (Total)					
	2a	T tan um B llet Conta n ng Standa d Qual ty Sponge					
	2b	T tan um B llet Conta n ng Ae ospace Non-Rotat ng Sponge					
	2c	T tan um B llet Conta n ng Rotat ng G ade Sponge					
	3	T tan um Sc ap					
	4	T tan um Ba					
	5	T tan um Plate					
	7	T tan um Tube					
	8	T tan um Sheet (Hot Ro led)					
	9	T tan um Sheet (Cold Ro led)					
	10	T tan um Co l					
	11	Othe (Expla n n Comments)					

f your organization produces any of the below products indicate so in the box to the right. If yes, complete sections E and F. f no, proceed to the next page. y/n

		P ov de the med an, and max mum quant t es of t tan um sc ap that can be used fo the follow ng pa ts.	Comments	Med an Sc ap Quant ty (%)	Max mum Sc ap Quant ty (%)
E	1	Ae ospace St uctu al Pa ts (e.g. spa s, bs)			
	2	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)			
	3	Ae ospace Exte nal Eng ne Pa ts (e g. cowl, fan)			
	4	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)			
	5	Land Based Tu b ne Eng ne and St uctu al Pa ts			
	6	Ma t me Tu b ne Eng ne and St uctu al Pa ts			
	7	Chem cal P ocess ng Equ pment (e.g. tub ng)			
	8	T tan um Satell te Components/F n shed Pa ts			
	9	Othe (Expla n n Comments)			

		What pe centage of you bus ness (by we ght) s used fo defense p oducts vs. comme c al p oducts?	Defense P oducts	Comme c al P oducts	Comments
F	1	Ae ospace St uctu al Pa ts (e.g. spa s, bs)			
	2	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)			
	3	Ae ospace Exte nal Eng ne Pa ts (e g. cowl, fan)			
	4	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)			
	5	Land Based Tu b ne Eng ne and St uctu al Pa ts			
	6	Ma t me Tu b ne Eng ne and St uctu al Pa ts			
	7	Chem cal P ocess ng Equ pment (e.g. tub ng)			
	8	T tan um Satell te Components/F n shed Pa ts			
	9	Othe (Expla n n Comments)			
	10	**Total (Explain in comments if defense plus commercial does not equal 100%)**			

Comments	

Previous Page

Next Page

5. Cost of Production Inputs

A. For all facilities owned by your organization (U.S. and non-U.S.) producing titanium sponge use the drop down to select all relevant input costs to each facility. f your facility is currently idled but had production between 2015-2019 report for the app icable years. All dollar values should be reported as $1000s USD.

	Faci ity Location (City State)	Country	Operating Status	Estimated Total Annual Operating Costs	Primary Inputs to Titanium Sponge Production	2015 Average Annual Cost of Input Used	2016 Average Annual Cost of Input Used	2017 Average Annual Cost of Input Used	2018 Average Annual Cost of Input Used	2018 YTD (June) Average Annual Cost of Input Used	2019 YTD (June) Average Annual Cost of Input Used	Explain
1			operating/idled		Labor							
					Electricity							
					Rutile							
					Ilmenite							
					Coke							
					Chlorine							
					Magnesium							
					TiCl4							
					Slag							
					Inert Gas							
					Transportation							
					Other Fac lity Overhead Costs							
2					Labor							
					Electricity							
					Rutile							
					Ilmenite							
					Coke							
					Chlorine							
					Magnesium							
					TiCl4							
					Slag							
					nert Gas							
					Transportation							
					Other Fac lity Overhead Costs							
3					Labor							
					Electricity							
					Rutile							
					Ilmenite							
					Coke							
					Chlorine							
					Magnesium							
					TiCl4							
					Slag							
					Inert Gas							
					Transportation							
					Other Fac lity Overhead Costs							

Comments:

B. For all of your organization's U.S. and non-U.S. ingot productions use the drop down to select a l relevant input costs. The values presented should be an **average** of all of your organization's ingot production operations. A l dollar values should be reported as $1000s USD.

Primary Inputs to Titanium Ingot Production	2015 Average Annual Cost of Input Used	2016 Average Annual Cost of Input Used	2017 Average Annual Cost of Input Used	2018 Average Annual Cost of Input Used	2018 YTD (June) Average Annual Cost of Input Used	2019 YTD (June) Average Annual Cost of Input Used	Explain
Labor							
Electricity							
T tan um Sponge							
Aluminum							
Vanadium							
Other Alloying Elements (Specify in Comments)							
Transportation							
Other Facility Overhead Costs							

Comments:

Previous Page

Next Page

6. Surge Capacity

Provide the following information regarding your organization's U.S. 2018 production capacity for the below titanium products

			What is 2018 utilization rate averaged across U.S. facilites for the below products?	Current shift schedule (expressed as number of shifts/length of shift/days per week operational)	Time needed to reach 100% capacity utilization? (Months)	Estimate costs to reach 100% capacity utilization? (USD)	Time needed to hire and train personnel to reach 100% capacity utilization? (Months)	Total additional number of FTE's required to reach 100% capacity utilization?	Shift Schedule under 100% capacity utilization (expressed as number of shifts/length of shift/days per week operational)
A	1	Standard Quality Sponge							
	2	Aerospace Non-Rotating Sponge							
	3	Rotating Sponge							
B	1	Titanium Ingot							
	2	Titanium Billet							
	3	Titanium Scrap							
	4	Titanium Bar							
	5	Titanium Plate							
	6	Titanium Sheet							
	7	Titanium Tube							
	8	Titanium Sheet							
	9	Other (Explain in Comments)							

			Do any factors exist that inhibit surge capacity beyond 100% capacity utilization?	If yes, list and descirbe the inhibiting factors.	Amount of Potential Surge Capacity Beyond 100% Capcity Utilization (MT)	Time needed to reach surge capacity? (Months)	Estimate costs to reach surge capacity? (USD)	Time needed to hire and train personnel to reach surge capacity? (Months)	Total additional number of FTE's required to reach surge capacity?	Shift Schedule under surge capcity (expressed as number of shifts/length of shift/days per week operational)
C	1	Standard Quality Sponge								
	2	Aerospace Non-Rotating Sponge								
	3	Rotating Sponge								
D	1	Titanium Ingot	Yes							
	2	Titanium Billet	No							
	3	Titanium Scrap								
	4	Titanium Bar								
	5	Titanium Plate								
	6	Titanium Sheet								
	7	Titanium Tube								
	8	Titanium Sheet								
	9	Other (Explain in Comments)								

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

P ev ous Page Next Page

7. Fac lity Inventory

P ov de all U.S. nvento es held d ectly o nd ectly by you fo the 2015 to 2018 pe od, cu ent as of the end of calenda yea 2018.

Work ng Inventory

Ind cate t tan um you o gan zat on ma nta ns n wo k ng nvento y, and the amounts of each n nvento y fo the 2015 to 2019 pe od. Repo t all amounts n **kilograms.** If you o gan zat on has mo e than one a loy of a g ven p oduct n nvento y, l st each a loy sepa ately. (e.g., f you o gan zat on has T tan um B llet w th A loys A and B, p ov de two ent es fo T tan um B let w th 'A' n the Alloy column fo the f st ent y and 'B' n the A loy column fo the second). Fo th s quest on, wo k ng nvento y s def ned as the comb nat on of wo k- n-p og ess mate al and f n shed mate al held as nvento y n ant c pat on of futu e sales.

		Types of T tan um n Invento y	Alloy	2015	2016	2017	2018	Comments
A	1	T tan um Sponge - Standa d G ade						
	2	T tan um Sponge - Rotat ng G ade						
	3	T tan um Sponge - Ae ospace Non-Rotat ng G ade						
	4	T tan um Ingot Conta ng Standa d G ade Sponge						
	5	T tan um Ingot Conta ng Rotat ng G ade Sponge						
	6	T tan um Ingot Conta ng Ae ospace Non-Rotat ng G ade Sponge						
	7	T tan um B llet Conta n ng Standa d G ade Sponge						
	8	T tan um B llet Conta n ng Rotat ng G ade Sponge						
	9	T tan um B llet Conta n ng Ae ospace Non-Rotat ng G ade Sponge						
	10	T tan um Sc ap						
	11	T tan um Ba						
	12	T tan um Plate						
	13	T tan um Sheet (Hot Rolled)						
	14	T tan um Sheet (Cold Rolled)						
	15	T tan um Tube						
	16	T tan um Co l						
	17	T tan um Satell te Components/F n shed Pa ts						
	18	Ae ospace St uctu al Pa ts (e.g. spa s, bs)						
	19	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)						
	20	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)						
	21	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)						
	22	Land-Based Tu b ne Eng ne and St uctu al Pa ts						
	23	Ma t me Tu b ne Eng ne and St uctu al Pa ts						
	24	Othe Expla n n Comments)						
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

Strategic Inventory

Ind cate t tan um you o gan zat on ma nta ns n st ateg c nvento y, and the amounts of each n nvento y fo the 2015 to 2018 pe od. Repo t all amounts **n kilograms**. If you o gan zat on has mo e than one alloy of a g ven p oduct n nvento y, l st each a loy sepa ately. (e.g., f you o gan zat on has T tan um B llet w th A loys A and B, p ov de two ent es fo T tan um B let w th 'A' n the Alloy column fo the f st ent y and 'B' n the A loy column fo the second). Fo th s quest on, st ateg c nvento y s def ned as mate al kept by you o gan zat on as a ese ve o hedge aga nst supply d s upt on, ma ket cond t ons, etc.

		Types of T tan um n Invento y	A loy	2015	2016	2017	2018	Comments
B	1	T tan um Sponge - Standa d G ade						
	2	T tan um Sponge - Rotat ng G ade						
	3	T tan um Sponge - Ae ospace Non-Rotat ng G ade						
	4	T tan um Ingot						
	5	T tan um B llet						
	6	T tan um Sc ap						
	7	T tan um Ba						
	8	T tan um Plate						
	9	T tan um Sheet (Hot Rolled)						
	10	T tan um Sheet (Cold Rolled)						
	11	T tan um Tube						
	12	T tan um Co l						
	13	T tan um Satell te Components/F n shed Pa ts						
	14	Spec a ty T tan um Pa ts Manufactu ng (not to nclude ae ospace)						
	15	Ae ospace St uctu al Pa ts (e.g. spa s, bs)						
	16	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)						
	17	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)						
	18	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)						
	19	Land-Based Tu b ne Eng ne and St uctu al Pa ts						
	20	Ma t me Tu b ne Eng ne and St uctu al Pa ts						
	21	Chem cal P ocess ng Equ pment (e.g. tub ng)						
	22	Othe Expla n n Comments)						
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

C — G ven you o gan zat on's cu ent levels of p oduct on and the levels of nvento y epo ted n Sect ons A and B, how long would you epo ted nvento y last f you could not access d ect t tan um mpo ts o mate al f om suppl e s de ved f om mpo ts? P ov de answe s n months fo the fo low ng scena os

Rate of P oduct on	Months Able to Susta n Ope at ons	Amount P oduced (k log ams)	Un ts P oduced
Cu ent Ut l zat on Rate			
100% Ut l zat on Rate			
Defense Cont acts Only			
C t cal Inf astuctu e Cont acts Only			

Comments

Previous Page

Next Page

8. National Defense Support

A	Did your organization directly or indirectly supply titanium products for U.S. defense systems between 2015 and 2019? If no, proceed to next tab. If yes, complete sections B, C, and D below.	yes/no

B — From the list of U.S. Government agencies below, select those whose systems you supported between 2015 and 2019.

U.S. Air Force	yes/no	U.S. Coast Guard	yes/no	Department of Energy	yes/no
U.S. Army	yes/no	U.S. Intelligence Community (such as CIA, NGA, NRO, NSA)	yes/no	Other (Specify to the Right)	write in
U.S. Marine Corps	yes/no	Missile Defense Agency (MDA)	yes/no	Other (Specify to the Right)	write in
U.S. Navy	yes/no	Defense Logistics Agency	yes/no	Other (Specify to the Right)	write in

C — Identify the specific U.S. Government programs/systems your organization has supported since 2015. In the first column, write-in the DEFENSE SYSTEM NAME. Provide as much detail as possible and spell out all acronyms. The **AGENCY NAME** column dropdown will be populated with the agencies you identified above (in part B), select the applicable agency.

In the **TITANIUM-RELATED PRODUCT** columns, write in the products that your organization has provided. If additional products are provided in support of a specific government program/system, repeat the program/system on a new row and select the remaining products.

NOTE: If your organization is unsure of the specific **GOVERNMENT PROGRAM/SYSTEM NAME** or **AGENCY NAME**, provide as much information as possible. **Do not disclose any classified information.**

	Defense System Name	Agency Name (select from dropdown)	Estimated Total Amount of Titanium Provided for System (Kilograms)	Titanium Product and/or Finished Good 1	Titanium Product and/or Finished Good 2	Titanium Product and/or Finished Good 3	Titanium Product and/or Finished Good 4	Titanium Product and/or Finished Good 5
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

D	Are any of your organization's titanium related contracts rated under the Defense Priorites & Allocations System (DPAS)? Further information about DPAS can be found here https //www.dcma.mil/DPAS/	yes/no	If yes, specify the nature and product of the DPAS rating.	
Comments				

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

9. Critical Infrastructure

From the list of Critical Infrastructure Sectors below indicate which sectors your organization has supp ied with titanium products. In-depth definitions of each sector may be found at : https://www.dhs.gov/cisa/critical-infrastructure-sectors

A

Chemical Sector (e.g. pipes and tubes for chemical factories pressure vessels heat exchangers)	y/n	**Dams Sector** (e.g. titanium parts for electric turbines used in dams)	y/n	**Financial Services Sector** (e.g. titanium parts for data systems used by financial services firms)	y/n	**Information Technology Sector** (e.g. titanium parts for batteries)	y/n
Commercial Facilities Sector (e.g. cladding structural supports)	y/n			**Food and Agriculture Sector** (e.g. titanium parts used in agricultural equipment)	y/n	**Nuclear Reactors, Materials, and Waste Sector** (e.g. waste storage pipes and tubing for reactors reactor shields)	y/n
Communications Sector (e.g. titanium parts for communications satellites)	y/n	**Emergency Services Sector** (e.g. titanium applications for police fire and EMS)	y/n	**Government and Facilities Sector** (e.g. titanium parts provided for end use in U.S. government facilities)	y/n	**Transportation Systems Sector** (e.g. civil aviation titanium parts for oil and gas pipelines titanium parts for motor vehicles ships and railroad equipment)	y/n
Critical Manufacturing Sector (e.g. titanium parts for various industrial machinery titanium parts for aircraft engines)	y/n	**Energy Sector** (e.g. titanium parts for solar panels titanium turbine parts pipes for power plants)	y/n	**Healthcare and Public Health Sector** (e.g. replacement joints prosthetics medical instruments)	y/n	**Water and Wastewater Systems Sector** (e.g. pipes for water and sewer and treatment plant systems)	y/n

B

Identify the specific critical infrastructure In the first column write-in the **CRITICAL INFRASTRUCTURE SYSTEM NAME.** Provide as much detail as possible and spell out all acronyms. The **SECTOR NAME** column dropdown will be populated with the sectors you identified above (in part A) select the applicable sector. **Do not repeat items already reported in the National Defense Support section.**

In the **TITANIUM-RELATED PRODUCT** columns state the **titanium**-related products your organization provides in support of the specific sector. If additional products are provided in support of a specific sector repeat the program/system on a new row and select the remaining products.

NOTE: If your organization is unsure of the specific **CRITICAL INFRASTRUCTURE SYSTEM name** provide as much information as possible. **Do not disclose any classified information.**

	Critical Infrastructure System	Sector Name (select from dropdown)	Titanium-Related Product 1	Titanium-Related Product 2	Titanium-Related Product 3	Titanium-Related Product 4	Titanium-Related Product 5
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

10. Suppliers/Purchases

For each type of titanium input purchased (purchases include both domestic and imports) by your organization from 2015-2019 state the supplier amounts purchased and prices paid. When applicable specify the alloy.

Slag (Kilograms)

Identify your organization's total number of suppliers for Slag. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
A	1							Commercial										
	2							Research										
	3							U.S. Government (Non-defense)										
	4							U.S. Government (Defense)										
	5							Other										
	6							Unknown										
	7																	
	8																	
	9																	
	10																	

Rutile (Kilorams)

Identify your organization's total number of suppliers for Rutile. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
B	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Ilmenite (Kilograms)

Identify your organization's total number of suppliers for Ilmenite. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
C	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sponge Standard Quality (Kilograms)

Identify your organization's total number of suppliers for Titanium Sponge - Standard Quality. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
D	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sponge Aerospace Non-Rotating Quality (Kilograms)

Identify your organization's total number of suppliers for Titanium Sponge - Aerospace Non-Rotating Quality. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
E	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sponge Aerospace Rotating Parts Quality (Kilograms)

Identify your organization's total number of suppliers for Titanium Sponge - Aerospace Rotating Parts Quality. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
F	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Scrap (Kilograms)

Identify your organization's total number of suppliers for Titanium Scrap. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
G	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Ingot (Kilograms)

Identify your organization's total number of suppliers for Titanium Ingot. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
H	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Slab (Kilograms)

Identify your organization's total number of suppliers for Titanium Slab. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
I	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Billet (Kilograms)

Identify your organization's total number of suppliers for Titanium Billet. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
J	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Bar (Kilograms)

Identify your organization's total number of suppliers for Titanium Bar. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
K	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Plate (Kilograms)

Identify your organization's total number of suppliers for Titanium Plate. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
L	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sheet (Kilograms)

Identify your organization's total number of suppliers for Titanium Sheet. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
M	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Tube (K lograms)

Identify your organization's total number of suppliers for Titanium Tube. Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
N	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium (Other - Explain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is the Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Titanium Origin	Alloy	End-Use	2015		2016		2017		2018		2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
O	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

11. Customers

For each type of titanium sold by your organization from 2015-2019 state the customer (both U.S. and non-U.S.) ammount sold and price received. When applicable specify the alloy.

Titanium Sponge Standard Qua ity (Kilograms)

Identify your organization's total number of customers for Titanium Sponge - Standard Quality. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Titanium Sponge Origin	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
A	1			Yes				Commercial										
	2			No				Research										
	3							U.S. Government (Non-defense)										
	4							U.S. Government (Defense)										
	5							Other										
	6							Unknown										
	7																	
	8																	
	9																	
	10																	

Titanium Sponge Aerospace Non-Rotating Quality (Kilograms)

Identify your organization's total number of suppliers for Titanium Sponge - Aerospace Non-Rotating Quality. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Titanium Sponge Origin	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
B	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sponge Aerospace Rotating Parts Quality (Kilograms)

Identify your organization's total number of suppliers for Titanium Sponge - Aerospace Rotating Parts Quality. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Titanium Sponge Origin	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
C	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Scrap (Kilograms)

Identify your organization's total number of customers for Titanium Scrap. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Titanium Scrap Origin	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
D	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Ingot (Kilograms)

Identify your organization's total number of customers for Titanium Ingot. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Ingot Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
E	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Billet (Kilograms)

Identify your organization's total number of customers for Titanium Billet. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Billet Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
F	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Bar (Kilograms)

Identify your organization's total number of customers for Titanium Bar. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Bar Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
G	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Plate (Kilograms)

Identify your organization's total number of customers for Titanium Plate. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Plate Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
H	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Sheet (Kilograms)

Ident fy your organization's total number of customers for Titanium Sheet. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Sheet Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
I	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium Tube (Kilograms)

Identify your organization's total number of customers for Titanium Tube. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Tube Fabrication	Alloy	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
J	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium (Other - Explain in Comments)

Identify your organization's total number of customers for Titanium Finished Goods. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	Comments	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
K	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Titanium (Other - Explain in Comments)

Identify your organization's total number of customers for Titanium (Other). Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	Comments	End-Use	2015		2016		2017		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
L	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

12. Prices

Provide the average prices in U.S. dollars your organization has sold the following products at per kilogram over the 2015-2019 period. Internal consumption and transfers within your organization should be listed at fair market value.

	Product		Year					
			2015	2016	2017	2018	2018 YTD	2019 YTD
1	Standard Quality Sponge							
2	Aerospace Non-Rotating Sponge							
3	Rotating Grade Sponge							
4	Titanium Scrap							
5	Titanium Ingot							
	A	Titanium Ingot Containing Standard Quality Sponge						
	B	Titanium Ingot Containing Aerospace Non-Roatating Sponge						
	C	Titanium Ingot Containing Rotating Grade Sponge						
6	Titanium Billet							
	A	Titanium Billet Containing Standard Quality Sponge						
	B	Titanium Billet Containing Aerospace Non-Rotating Sponge						
	C	Titanium Billlet Containing Rotating Grade Sponge						
7	Titanium Bar							
8	Titanium Plate							
9	Titanium Sheet							
10	Titanium Tube							
11	Other (Explain in Comments)							
12	Aerospace Structural Parts (e.g. spars ribs)							
13	Aerospace High-impact Parts (e.g. landing gear)							
14	Aerospace External Engine Parts (e.g. cowl fan)							
15	Aerospace Internal Engine Parts (e.g. low pressure compressor)							
16	Land-Based Turbine Engine and Structural Parts							
17	Maritime Turbine Engine and Structural Parts							
18	Chemical Processing Equipment (e.g. tubing)							
19	Titanium Satellite Components/Finished Parts							
20	Other (Explain in Comments)							
Comments:								

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

13. Employment - Sponge Production

Indicate in the box to the right if your organization produced titanium sponge at a U.S. facility between 2015-2019. If yes, complete sections A-F. If no, proceed to the next page. y/n

Record the total number of full time equivalent (FTE) employees and contractors for the 2015 to 2019 period for U.S. facilities producing titanium sponge.

		2015	2016	2017	2018	2019
A	FTE Employees					
	FTE Contractors					

Record the total number of employees for each occupation type below for 2015 to 2019.

	Occupation		2015	2016	2017	2018	2019	Comments
B	Chlorination							
	Sponge Mass Production							
	Electrolysis							
	Crushing/Shearing							
	Inspection							
	Laboratory Testing							
	Blending/Packaging							
	Maintenance and Engineering							
	Administrative, Management, Legal Staff, IT Staff							
	Marketing and Sales							
	Other	(specify here)						

Provide the following information about employment difficulties, workforce age, educational requirements, vacancies, and changes in employment for the 2015 to 2019 period.

	Occupation		Explanation for Difficulty, if Applicable	Current Average Age of Worker (2018)	Formal Education Requirements	On the Job Training Requirements (OTJ)	Current Number of Vacancies (2018)	Average Weeks Vacant	Explanation
C	Chlorination								
	Sponge Mass Production								
	Electrolysis								
	Crushing/Shearing								
	Inspection								
	Laboratory Testing								
	Blending/Packaging								
	Maintenance and Engineering								
	Administrative, Management, Legal Staff, IT Staff								
	Marketing and Sales								
	Other	(specify here)							

D	Are the skills associated with the workforce in your organization transferable to other non-titanium industries?		
E	If you resumed operations at an idled facility, do you reasonably anticipate being able to hire or rehire workers? What would the hiring timeline be?		
F	Does the geographic location of your organization's facilities play any role in the challenges in hiring, retaining, and rehiring employees?		

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

14. Employment - Non-Sponge Titanium Production

Record the total number of full time equivalent (FTE) employees and contractors for the 2015 to 2019 period for U.S. facilities. **Do not include any sponge employees on this page.**

		2015	2016	2017	2018	2019
A	FTE Employees					
	FTE Contractors					

Record the total number of employees for each occupation type below for 2015 to 2019.

	Occupation		2015	2016	2017	2018	2019	Comments
B	Furnace/Melt Shop Operators							
	Grinders, Cutters, Forge Operators							
	Casters, Finishers							
	Machinists and Technicians							
	Inspection and Quality Control							
	Other Production Staff							
	Maintenance, Engineering, and Chemical							
	Administrative, Management, Legal Staff, IT Staff							
	Marketing and Sales							
	Other	(specify here)						

Provide the following information about employment difficulties, workforce age, educational requirements, vacancies, and changes in employment for the 2015 to 2019 period.

	Occupation		Explanation for Difficulty, if Applicable	Current Average Age of Worker (2018)	Formal Education Requirements	On the Job Training Requirements (OTJ)	Current Number of Vacancies (2018)	Average Weeks Vacant	Explanation
C	Furnace/Melt Shop Operators								
	Grinders, Cutters, Forge Operators								
	Casters, Finishers								
	Machinists and Technicians								
	Inspection and Quality Control								
	Other Production Staff								
	Maintenance, Engineering, and Chemical								
	Administrative, Management, Legal Staff, IT Staff								
	Marketing and Sales								
	Other	(specify here)							

D	Does the industry experience any amount of workforce cross-over between commercial and U.S. government titanium activities?			
E	Are the skills associated with the workforce in your organization transferable to other non-titanium industries?			
F	If you resumed operations at an idled facility, do you reasonably anticipate being able to hire or rehire workers? What would the hiring timeline be?			
G	Does the geographic location of your organization's facilities play any role in the challenges in hiring, retaining, and rehiring employees?			
	Comments			

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

15. Financials

Provide the following financial line items for your organization's titanium-related cost center/business activity U.S. operations below for the 2015 to 2019 period. Only complete section B if your organization operated a sponge facility between 2015-2019.

Source of Financial Data:	
Reporting Schedule:	

A.	Income Statement (Select Line Items)	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019 (estimate)
1	Net Sales (and other revenue)					
2	Cost of Goods Sold					
3	Total Operating Income (Loss)					
4	Earnings Before Interest and Taxes					
5	Net Income					

B.	Income Statement (Select Sponge Line Items)	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019 (estimate)
1	Sponge Net Sales					
2	Cost of Sponge Sold					
3	Sponge Total Operating Income (Loss)					
4	Sponge Earnings Before Interest and Taxes					
5	Sponge Net Income					

C.	Balance Sheet (Select Line Items)	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019 (estimate)
1	Cash					
2	Inventories					
3	Total Current Assets					
4	Total Assets					
5	Total Current Liabilities					
6	Total Liabilities					
7	Retained Earnings					
8	Total Owner's Equity					

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

16. Sales

From 2015 to 2019, record your organization's total sales data for all titanium products, including sponge.

In Line 1, indicate your total sales (including commercial and government sales).
In Line 2, indicate what percent of your total sales which were non-U.S. sales (sales from U S. facilities which are exported outside of the U S.)
In Line 3, indicate what percent of your total sales (Line A) that were U.S. defense-related (including commercial, government)
In Line 4, indicate what percent of your total sales (Line A) that were NATO (non-U.S.) military-related
In Line 5, indicate what percent of your total sales (Line A) that were Major Non-NATO Ally military-related
Note: "Non-U.S." means export sales from U.S. locations.

A.

	Sales	<Corporate/Whole Organization, Division/Business Unit>									
		<Calendar Year/Fiscal Year>									
		Record in $ Thousands, e.g. $12,000.00 = survey input $12									
		2015		2016		2017		2018		2019 YTD	
1	Total Sales, all domestic and foreign customers										
Lines 2-5 need not sum to 100%. Estimates are acceptable.											
2	Total non-U.S. Sales (as a % of A)	%		%		%		%		%	
3	Total U.S. Defense Related Sales (as a % of A)	%		%		%		%		%	
4	Total NATO (Non-U.S.) Military Sales (as a % of A)	%		%		%		%		%	
5	Total Major Non-NATO Ally Military Sales (as a % of A)	%		%		%		%		%	
Explain any irregularities with the sales data:											

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

17. Research & Development and Capital Expenditures

A.	Has your organization conducted titanium sponge, titanium melt, or titanium fabrication related research and development (R&D) from 2015-2019?	y/n	If no, proceed to Section D below.

Record your organization's total R&D dollar expenditures and type of R&D expenditure for the 2015 to 2019 period.

			Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
			2015	2016	2017	2018	2019
B.	1	Total R&D Expenditures					
	2	Basic Research [as a % of B1]					
	3	Applied Research [as a % of B1]					
	4	Product/Process Development [as a % of B1]					
	5	Total of 2 - 4 [must equal 100%]	0%	0%	0%	0%	0%
	6	Titanium sponge and/or titanium melting and/or titanium fabrication -related R&D [as a % of B1]					

C.	1	From 2015-2019, were your investments in R&D related to titanium sponge and/or titanium melting and/or titanium fabrication diminished by financial constraints?	y/n	
		If yes, identify the reasons for these constraints:		

Record your organization's titanium sponge, titanium melting, and titanium fabrication related capital expenditures corresponding to the select categories below for the 2015-2019 period.

Below, provide any additional comments in relation to capital expenditures made in the past 5 years (2015-2019).

Capital Expenditure Activity Type		Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019
D.	Total Capital Expenditures					
1	Machinery, Equipment, and Vehicles [as a % of D]					
2	IT, Computers, Software [as a % of D]					
3	Land, Buildings, and Leasehold Improvements [as a % of D]					
4	Other (Specify) [as a % of D]					
5	Other (Specify) [as a % of D]					
Lines 1 through 5 must total 100%		0%	0%	0%	0%	0%

E. For the below categories, indicate whether your organization experienced significant changes (increases, decreases, or both), in titanium sponge and/or titanium melting and/or titanium fabrication expenditures over the past ten years (20010-2019). Explain what factors have been affecting changes in your organization's capital expenditures from 2010 to 2019, including, but not limited to, U.S. Government or state government policies or regulations, domestic and foreign competition, and declining sponge prices.

		Yes/No	If Yes, Type of Change	Explain
1	Machinery, Equipment, and Vehicles	y/n		
2	IT, Computers, Software			
3	Land, Buildings, and Leasehold Improvements			
4	Other (Specify)			
5	Other (Specify)			
Comments:				

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

18. Competition and Demand Trends

A From 2009 to 2019, indicate whether import competition has affected your U.S. titanium related operations, sales, employment, planned expansions, etc. with respect to the production of any type of titanium. Indicate Yes/No to the right and explain below.

	Item	Yes/No	Explain
1	Manufacturing Operations		
2	Sales		
3	Employment		
4	Planned Expansions		
5	Other		

B Does your organization anticipate any negative effects on its business due to future imports of titanium sponge and finished products into the United States from the listed countries below? Indicate Yes/No to the right and explain below.

	Item	Sponge	Explain	Finished Products	Explain
1	Russia	y/n		y/n	
2	Kazakhstan				
3	China				
4	Japan				
5	Ukraine				
6	India				
7	Saudi Arabia				
8	Other				
9	Other				
10	Other				

C Is your organization aware of any government assistance and/or non-market support given to sponge producers in the following countries? Indicate Yes/No to the right and explain below.

	Item	Yes/No	Explain
1	Russia		
2	Kazakhstan		
3	China		
4	Japan		
5	Ukraine		
6	India		
7	Saudi Arabia		

D

1	If there were no U.S. facilities producing titanium sponge would your operations be impacted? Explain.
2	What steps has your organization taken to protect business if in a hypothetical situation imports of sponge were unavailable? Explain.
3	Has your organization ever experienced a shortage or complete cut off of sponge imports? Explain.

E

1 Describe the top five most significant challenges to the competitive position of your organization in the U.S. titanium market.

1	
2	
3	
4	
5	

2 Describe the top five most significant challenges to the competitive position of your organization in the non-U.S. titanium market.

1	
2	
3	
4	
5	

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

19. Certification

The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct to the best of his/her knowledge. It is a criminal offense to willfully make a false statement or representation to any department or agency of the United States Government as to any matter within its jurisdiction (18 U.S.C. 1001 (1984 & SUPP. 1197)).

Organization Name	
Organization's Internet Address	
Name of Authorizing Official	
Title of Authorizing Official	
E-mail Address	
Phone Number and Extension	
Date Certified	

In the box below, provide any additional comments or any other information you wish to include regarding this survey assessment.

How many hours did it take to complete this survey?	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Appendix E

Next Page

OMB Control Number: 0694-0120
Expiration Date: March 31, 2020

Section 232 Investigation: The Effect of Imports of Titanium Sponge on U.S. National Security

End Users Survey

SCOPE OF ASSESSMENT

The U.S. Department of Commerce, Bureau of Industry and Security (BIS), Office of Technology Evaluation (OTE), is conducting a survey of the U.S. titanium end users. The survey results will be used to support an ongoing investigation of the effect of imports of titanium sponge on U.S. national security initiated under Section 232 of the Trade Expansion Act of 1962, as amended.

The principal goal of this survey is to assist the U.S. Department of Commerce in determining whether titanium sponge is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security. Information collected will include facilities and production data, mergers and acquisitions, joint ventures, imports and exports, supply chain networks, customers, sales and demand data, conditions of domestic and global competition, research and development, and other factors. The resulting data will provide the U.S. Department of Commerce detailed titanium industry information that is otherwise not publicly available and needed to effectively conduct this Section 232 investigation.

RESPONSE TO THIS SURVEY IS REQUIRED BY LAW

A response to this survey is required by law (50 U.S.C. Sec. 4555). Failure to respond can result in a maximum fine of $10,000, imprisonment of up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. Sec. 4555). Section 705 prohibits the publication or disclosure of this information unless the President determines that its withholding is contrary to the national defense. Information will not be shared with any non-government entity, other than in aggregate form. The information will be protected pursuant to the appropriate exemptions from disclosure under the Freedom of Information Act (FOIA), should it be the subject of a FOIA request.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number.

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information to BIS Information Collection Officer, Room 6883, Bureau of Industry and Security, U.S. Department of Commerce, Washington, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (OMB Control No. 0694-0120), Washington, D.C. 20503.

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

II. Table of Contents

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

III. General Instructions	
A.	Your organization is required to complete this survey of the U.S. titanium end users using an Excel template, which can be downloaded from the BIS website: http://www.bis.doc.gov/TiSponge232 If you are unable to download the survey document, at your request, BIS survey support staff will e-mail the Excel survey template directly to you. For your convenience, a PDF version of the survey and required drop-down content is available on the BIS website to aid internal data collection. **DO NOT SUBMIT** the PDF version of the survey as your response to BIS. Should this occur, your organization will be required to resubmit the survey in the requested Excel format.
B.	Respond to every question. Surveys that are not fully completed will be returned for completion. Use the comment boxes to provide any information to supplement responses provided in the survey form. Make sure to record a complete answer in the space provided, even if the space does not appear to expand to fit all of the information. **This is a comprehensive survey of the titanium end user. As such, some questions may not be relevant to your organization. Read each question carefully to ensure its applicability to your organization.** **DO NOT CUT AND PASTE RESPONSES WITHIN THIS SURVEY OR PASTE IN RESPONSES FROM OUTSIDE THE SURVEY**. Survey inputs should be completed by typing in responses or by using a drop-down menu. The use of cut and paste can corrupt the survey template. If your survey response is corrupted as a result of cut and paste response, your survey will be rejected and your organization must immediately resubmit the survey.
C.	**Do not disclose any USG classified information in this survey form.**
D.	Upon completion of the survey, final review, and certification, **transmit the survey document via e-mail to**: Titanium232@bis doc.gov
E.	Questions related to the survey should be directed to BIS survey support staff at Titanium232@bis.doc.gov. E-mail is the preferred method of contact. You may speak with a member of the BIS survey support staff by calling (202) 482-3110.
F.	For questions related to the overall scope of this Section 232 Investigation, contact Titanium232@bis doc.gov or: Brad Botwin, Director, Industrial Studies Office of Technology Evaluation, BIS, Room 1093 U.S. Department of Commerce 1401 Constitution Avenue, NW Washington, DC 20230 **DO NOT** submit completed surveys to Mr. Botwin's postal or personal e-mail address. All surveys must be submitted electronically to: Titanium232@bis.doc gov
BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act	

Previous Page Next Page

IV. Definitions

Term	Definition
Authorizing Official	An executive officer of the organization or business unit or another individual who has the authority to execute this survey on behalf of the organization.
Applied Research	Systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met. This activity includes work leading to the production of useful materials, devices and systems or methods, including design, development, and improvement of prototypes and new processes.
Basic Research	Systematic, scientific study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind.
Buy-to-Fly Ratio	This is the weight of the titanium used in a product's manufacturing process divided by the weight of the final product (e.g., if 100 lbs of titanium is required to make a 10 lb part, the ratio is 10:1).
Capital Expenditures	Investments made by an organization in buildings, equipment, property, and systems where the expense is depreciated. This does not include expenditures for consumable materials, other operating expenses, and salaries associated with normal business operations.
Chlorination	As applied to titanium sponge production, chlorination is the process in which chlorine gas is introduced to rutile or ilmenite ore to produce titanium tetrachloride.
Critical Infrastructure	As defined by the Department of Homeland Security, critical infrastructure is defined as sectors of the economy whose assets, systems, and networks, whether physical or virtual, are considered vital to the United States's national security, economic security, public health and safety, or any combination of the above. More
Crushing/Shearing	The process by which large masses of t tanium spo ge produced via chemical methods are reduced to smaller sizes suitable for melting into ingots and other forms.
Customer	Any organization (external or internal entity) for which your organization manufactures/processes any product comprised of, or containing, titanium in any form.
Defense Priorities and Allocation System (DPAS)	This system, administered by the Department of Commerce, assigns priority ratings to prime contracts, subcontracts, and purchase orders for all authorized Department of Defense programs. Suppliers must accepted and fulf ll rated orders accord ng to the r ass gned pr or ty
Electrolysis	As applied to titanium sponge production, this is the process that separates magnesium chloride into magnesium and chlorine for subsequent use in the chlorination and vacuum distillation processes.
Exports	Shipments to destinations outside the United States, including shipments to Canada and Mexico.
Facility	A building or the minimum complex of buildings or parts of buildings in which an organization operates to serve a particular function, producing revenue, and incurring costs for the company. A facility may produce an item of tangible or intangible property or may perform a service. It may encompass a floor or group of floors within a building, a single building, or a group of buildings or structures. Often, a facility is a group of related locations at which organization employees work, together constituting a profit-and-loss center for the company, and it may be identified by a unique DUNS number.
Finishing	Finishing treats the exterior of a metal product with the application of a thin complementary layer. Finishing is performed to improve a metal object's appearance and/or durability, titanium finishing steps include heat treating, machining, grinding, sizing, cutting, flattening and other surface preparation processes as well as inspection and testing processes to ready the product for shipment to customers
Forging	This process shapes titanium metal through the application of localized compressive forces, usually a hammer or die. It can be performed at various temperatures depending on the requirement for the final product.
Full Time Equivalent (FTE) Employees	Employees who work for 40 hours in a normal work week. Convert part-time employees into "full time equivalents" by taking their work hours as a fraction of 40 hours.
Full Time Equivalent (FTE) Contractors	Contractors who work for 40 hours in a normal work week. Convert part-time contractors into "full time equivalents" by taking their work hours as a fraction of 40 hours.
Global Headquarters	A location that serves as the organization’s hub of worldwide operations with all global branches or divisions reporting to it.

Harmonized Tariff Schedule (HTS)	A 10-digit numbering system that classifies a good based on its name, use, and/or the material used in its construction. The number provides Customs and Border Protection (CBP) with a standardized method of tracking all merchandise imported into the United States and sets out the tariff rates and statistical categories.
Import Value	Values reported should be landed, duty paid values at the U.S. port of entry, including ocean freight and insurance costs, brokerage charges, and import duties (i.e., all charges except inland freight in the United States).
Inventory	The goods or materials an organization holds for its own use or for the ultimate goal of sale, or disposition or future conversion, enrichment, fabrication, or other use. This is material to which your organization has title; this does not include holding material for third-party use or storage.
Melting	This process heats titanium metal feedstock, including both scrap, sponge, and any alloy additions within a high frequency induction furnace in an inert atmosphere. This step is required to produce semi-fabricated titanium products, such as ingots.
Milling	This is the process of converting ingots and other melted forms into downstream products such as billet, bar, extrusions, plate, sheet, coil, tube and wire. Processes involved in milling include forging, hot rolling, cold rolling and finishing.
Major Non-NATO Ally Sales	Sales of titanium products to the militaries of Afghanistan, Argentina, Australia, Bahrain, Brazil, Egypt, Israel, Japan, Jordan, Kuwait, Morocco, New Zealand, Pakistan, the Philippines, Republic of Korea (South Korea), Thailand, and Taiwan (Republic of China).
NATO Military Sales	Sales of titanium products to militaries of North Atlantic Treaty Organization member states other than the United States. These states include Albania, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Latvia, Lithuania, Luxembourg, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, and the United Kingdom
Non-U.S. Facility	A facility that is physically located outside of the United States.
Organization	A company, firm, laboratory, or other entity that owns or controls one or more U.S. establishment or facility involved in titanium production or consumption.
Opportunity Zones	An Opportunity Zone is an economically-distressed community where new investments, under certain conditions, may be eligible for preferential tax treatment. A list of these zones may be found at: https://www.cdfifund.gov/Pages/Opportunity-Zones.aspx
Product/Process Development	The systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.
Production	The process of transforming inputs (raw materials, semi-finished goods, subassemblies, ideas, information, knowledge) into goods or services.
Research & Development	Basic and applied research in the engineering sciences, as well as design and development of prototype products and processes. Efforts that an organization conducts towards innovating, introducing and/or improving products and processes.
Sales	All reported and unreported sales of titanium, including sales to end-users, and sales within divisions of the organization.
Scrap	Titanium metal that is recovered from the titanium manufacturing process or through dismantling older objects containing titanium. Scrap can be used as feedstock for a melt.
Sponge	A porous, brittle form of titanium created from the reduction of titanium tetrachloride. This is most frequently achieved through the Kroll process.
Sponge - Standard Quality	Titanium sponge with chemical compositions suitable for use in structural non-aerospace applications.
Sponge - Non-Rotating Aerospace	Titanium sponge with chemical compositions suitable for use in aerospace applications such as struts, turbine frames, exhaust sidewalls, and other static aerospace structures.
Sponge - Rotating Grade	Titanium sponge with chemical compositions suitable for use in aerospace applications such as blade rotors, shafts, fan and compressor blades, and shifters. The titanium sponge must be of sufficient quality to ensure zero-tolerance for structural failure.
Supplier	An entity from which your organization obtains inputs, which may be goods or services. A supplier may be another organization with which you have a contractual relationship, or it may be another facility owned by the same parent organization.
Titanium -Related	Components/products produced and/or consumed by your organization that contain titanium metal.
Titanium Tube	This is tube manufactured from titanium. It is primarily used in aerospace ducting applications since it does not have the strength for most hydraulic applications. It is also used power generation, chemical processing, and medical applications

United States	The "United States" or "U.S." includes the 50 states, Puerto Rico, the District of Columbia, Guam, the Trust Territories, and the U S. Virgin Islands.
Vacuum Distillation	Reduction of titanium tetrachloride with magnesium metal in a reactor followed by a distillation process to remove magnesium and chlorine impurities.

Previous Page Next Page

1. Organization Information

A. Provide the following information for your organization

Organization Name	
Street Address	
City	
State	
ZIP Code	
Country of Global Headquarters	
U.S. Point of Contact Name	
U.S. Point of Contact Email	
U.S. Point of Contact Phone	

B. Is this organization owned, in whole or in part, by any private or government entity? Indicate Yes/No, then identify the entities below, if applicable. List entities with at least 5% ownership.

Entity Name	Global Headquarters Street Address	Global Headquarters City	Global Headquarters State/Province	Global Headquarters Country	Ownership %

C. For the listed titanium related activities, record the number of facilities your organization owns that conduct these activities. If one facility does more than one of the listed activities, count it in each category. For the purposes of this section, "aircraft" includes both fixed-wing and rotary aircraft.

Activities	Number of U.S. Facilities	Number of Non-U.S. Facilities	Comments
Aircraft Manufacturing/Assembly			
Aircraft Turbine Engine Manufacturing/Assembly			
Land/Naval Turbine Engine Manufacturing/Assembly			
Aerospace Structural Parts (e.g. spars, ribs)			
Aerospace High-impact Parts (e.g. landing gear)			
Aerospace External Engine Parts (e.g. cowl, fan)			
Aerospace Internal Engine Parts (e.g. low pressure compressor)			
Titanium Satellite Components/Finished Parts			
Satellite and Other Space Manufacturing/Assembly			
Land-Based Turbine Engine and Structural Parts			
Maritime Turbine Engine and Structural Parts			
Chemical Processing Equipment (e.g. tubing)			
Specialty Titanium Parts Manufacturing (not to include aerospace)			
Titanium Recycling			
Titanium Milling			
Titanium Forging			
Titanium Finishing			
Other (Explain in Comments)			
Other (Explain in Comments)			
Other (Explain in Comments)			
Other (Explain in Comments)			

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

2. Facilities

Identify all of your organization's facilities with current **titanium related** operations (e.g. aircraft assembly, engine manufacturing) not including facilities that are on standby/idled. Provide the **LOCATION (U.S. and Non-U.S.)** of the facility, indicate all operations at each facility using the drop down menus, and specify any changes that may impact that facility over the next five years. If a given facility has more than one operation, list each operation at the facility and the given operation's capacity on separate lines.

	Facility Name	Location					Facility Operation	Outlook	
		City	State	Country	Facility Located in a Free Trade Zone?	Facility Located in an Opportunity Zone?	Operation Type	Do you anticipate any significant changes in this particular operation over the next five years that may affect your titanium consumption and/or production?	If yes or unknown, provide a brief explanation.
1					Y/N	Y/N	Aircraft	Yes	
2							Aircraft Turbine Engine	No	
3							Land/Naval Turbine Engine	Unknown	
4							Aerospace Structural Parts		
5							Aerospace High-impact Parts		
6							Aerospace External Engine		
7							Aerospace Internal Engine		
8							Titanium Satellite Components/Finished Parts		
9							Satellite and Other Space Manufacturing/Assembly		
10							Land-Based Turbine Engine		
11							Maritime Turbine Engine and		
12							Chemical Processing		
13							Specialty Titanium Parts		
14							Titanium Recycling		
15							Titanium Milling		
16							Titanium Forging		
17							Titanium Finishing		
18							Other (Explain in Comments)		
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
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40									

Is your organization considering the development of new titanium-related facilities, whether inside or outside the United States? If yes, describe.	Y/N	
If any of your organization's facilities are located in an Opportunity Zone, explain the impact that these zones have had on your organization's operations. If your organization does not have facilities located in an Opportunity Zone, would your organization consider relocation?		
Comments		

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

3. Mergers, Acquisitions, Divestitures, and Joint Ventures

Mergers, Acquisitions, and Divestitures

From 2015-2019, record the total number of mergers, acquisitions, and divestitures related to **all titanium metal and titanium metal parts production**, product development and design, and R&D activities. Be sure to report related private/public partnerships in which your organization participated.

Identify your organization's mergers, acquisitions, and divestitures below, if applicable.

A.

	Organization Name	Type of Activity	% of Equity Held by Partner Organization	Partner Organization Country Headquarters	Year Initiated	Primary Scope of Activity	Primary Purpose of Activity	Explain
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Joint Ventures

From 2015-2019, record the total number of joint ventures and other business partnerships related to **all titanium metal and titanium metal parts production**, product development and design, and R&D, including public/private partnerships, in which your organization participated.

Identify your organization's joint venture relationships below, if applicable.

B.

	Organization Name	Type of Joint Venture	% of Equity Held by Organization	Organization Country Headquarters	Year Initiated	Primary Scope of Relationship	Primary Purpose of Relationship	Explain
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

P ev ous Page
Next Page

4. Product on

Has your organization certified titanium sponge for use in rotating par s f yes, complete section A. If no, proceed o section B. es/no

If you o gan zat on ma nta ned ce t f cat on fo any manufactu e s of otat ng g ade t tan um sponge du ng the 2015-2019 pe od, l st the suppl e you have ce t f ed, date of ce t f cat on, and desc be the ce t f cat on p ocess. f the ce t f cat on has been w thd awn state the date and c cumstances of w thd awal, f st ll act ve leave the cell blank.

			1	2	3	4	5
A	1	O gan zat on Ce t f ed					
	2	Date of Ce t f cat on					
	3	Date of Ce t f cat on W thd awal (f Appl cable)					
	4	Desc pt on of Ce t f cat on P ocess					
	5	f the ce t f cat on was w thd awn as nd cated n A3, desc be the easons fo w thd awal.					
		Comments					

Select from the drop down at right f your organization produces any of the below products containing titanium. If yes, complete section B. f no, proceed to sect on C. yes/no

Fo a l t tan um p oducts below answe the appl cable catego es to you o gan zat ons p oduct on by yea , **only report product on at U.S. facil ties**. Repo t all quant t es n k log ams fo the yea s 2014 2019.

		Type of T tan um Metal (Reco d all Responses n K log ams)	2015	2016	2017	2018	2018 (to date)	2019 (to date)
B	1	T tan um Ingot (Total)						
	1a	T tan um Ingot Conta n ng Standa d Qual ty Sponge						
	1b	T tan um Ingot Conta n ng Ae ospace Non-Rotat ng Soonge						
	1c	T tan um Ingot Conta n ng Rotat ng G ade Sponge						
	2	T tan um B llet (Total)						
	2a	T tan um B llet Conta n ng Standa d Qual ty Sponge						
	2b	T tan um B llet Conta n ng Ae ospace Non-Rotat ng Sponge						
	2c	T tan um B l let Conta n ng Rotat ng G ade Sponge						
	3	T tan um Sc ap						
	4	T tan um Ba						
	5	T tan um Plate						
	6	T tan um Sheet						
	7	T tan um Tube						
	8	T tan um Co l						
	9	F n shed T tan um P oducts (L st n Comments)						
	11	Othe (Expla n n Comments)						
		Comments						

Select from the drop down to the right if your organ zation produces any of the below products in the U.S. and they contain titanium scrap. If yes, complete section C. f no, proceed to sect on D. yes/no

		P ov de the med an and max mum quant t es of t tan um sc ap, n k log ams, that can be used fo the fo low ng pa ts you o gan zat on p oduces.	Med an Sc ap Quant ty	Max mum Sc ap Quant ty	Comments
C	1	A c aft Manufactu ng/Assembly			
	2	A c aft Tu b ne Eng ne Manufactu ng/Assembly			
	3	Land/Naval Tu b ne Eng ne Manufactu ng/Assembly			
	4	Ae ospace St uctu al Pa ts (e.g. spa s, bs)			
	5	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)			
	6	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)			
	7	Ae ospace Inte nal Eng ne Pa ts (e g. low p essu e comp esso)			
	8	T tan um Sate l te Components/F n shed Pa ts			
	9	Satell te and Othe Space Manufactu ng/Assembly			
	10	Land-Based Tu b ne Eng ne and St uctu al Pa ts			
	11	Ma t me Tu b ne Eng ne and St uctu al Pa ts			
	12	Chem cal P ocess ng Equ pment (e g. tub ng)			
	13	Spec alty T tan um Pa ts Manufactu ng (not to nclude ae ospace)			
	14	T tan um Recycl ng			
	15	T tan um M l ng			
	16	T tan um Fo g ng			
	17	T tan um F n sh ng			
	18	Othe (Exola n n Commentsl)			
		Comments			

Select from the drop down to the right if your organ zation produces any of the below products in the U.S. f yes, complete section D and provide the percents a located to defense vs. commercial use. If no, proceed to the next page. yes/no

		What pe centage of you bus ness (by we ght) s used fo defense p oducts vs. comme c al p oducts?	Defense P oducts	Comme c al P oducts	Comments
D	1	A c aft Manufactu ng/Assembly			
	2	A c aft Tu b ne Eng ne Manufactu ng/Assembly			
	3	Land/Naval Tu b ne Eng ne Manufactu ng/Assembly			
	4	Ae ospace St uctu al Pa ts (e.g. spa s, bs)			
	5	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)			
	6	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)			
	7	Ae ospace Inte nal Eng ne Pa ts (e g. low p essu e com			
	8	T tan um Sate l te Components/F n shed Pa ts			
	9	Satell te and Othe Space Manufactu ng/Assembly			
	10	Land-Based Tu b ne Eng ne and St uctu al Pa ts			
	11	Ma t me Tu b ne Eng ne and St uctu al Pa ts			
	12	Ch l P E t (t)			
	13	Spec alty T tan um Pa ts Manufactu ng (not to nclud			
	14	T tan um Recycl ng			
	15	T tan um M l ng			
	16	T tan um Fo g ng			
	17	T tan um F n sh ng			
	18	Othe (Expla n n Comments)			
		Comments			

Previous Page

Next Page

5. Finished Products Containing Titanium

Provide the following information about your organization's finished products made in the U.S. containing titanium. Order these products by volume (highest to lowest) of titanium contained in the product. For the purposes of this section, a "finished product" is defined as an end product sold to the consumer. If your organization sells aircraft, for example, the "finished product" would be an individual aircraft; if your organization does not manufacture engines, do not report them as part of the aircraft. If your organization sells aircraft engines, the "finished product" would be an individual engine. "Production Cost" is defined as the cost of intermediate goods and services, labor, energy, transportation, and other factors making up the total cost of producing the product. "Cost of Titanium" is defined as the total cost of titanium for a given product, including metal acquisition, melting, and fabrication.

		Finished Product Name	Product Category	For Defense End-Use?	Number of Units Produced in 2018	Estimated Titanium Content (kilograms)	Average Per-Unit Production Cost (USD)	Cost of Titanium As Percentage of Average Per-Unit Production Cost	Plurality Country of Origin for Titanium Used In Product	Product Titanium "Buy-to-Fly" Ratio
	1		Aircraft Manufacturing/Assembly	y/n						
	2		Aircraft Turbine Engine Manufacturing/Assembly							
	3		Land/Naval Turbine Engine Manufacturing/Assembly							
	4		Aerospace Structural Parts (e.g. spars, ribs)							
	5		Aerospace High-impact Parts (e.g. landing gear)							
	6		Aerospace External Engine Parts (e.g. cowl, fan)							
	7		Aerospace Internal Engine Parts (e.g. low pressure compressor)							
	8		Titanium Satellite Components/Finished Parts							
	9		Satellite and Other Space Manufacturing/Assembly							
	10		Land-Based Turbine Engine and Structural Parts							
	11		Maritime Turbine Engine and Structural Parts							
	12		Chemical Processing Equipment (e.g. tubing)							
A	13		Specialty Titanium Parts Manufacturing (not to include aerospace)							
	14		Other (Explain in Comments)							
	15									
	16									
	17									
	18									
	19									
	20									
	21									
	22									
	23									
	24									
	25									
	26									
	27									
	28									
	29									
	30									

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

P P N t P

6. Facility Inventory

P ov de a l U.S. nvento es held d ectly o nd ectly by you fo the 2015 to 2018 pe od, cu ent as of the end of calenda yea 2018.

Working Inventory

Ind cate quant ty of t tan um you o gan zat on ma nta ns n wo k ng nvento y, and the amounts of each n nvento y fo the 2015 to 2019 pe od. Repo t all amounts n **kilograms.** If you o gan zat on has mo e than one alloy of a g ven p oduct n nvento y, l st each alloy sepa ately. (e.g., f you o gan zat on has T tan um B let w th Alloys A and B, p ov de two ent es fo T tan um B let w th 'A' n the Alloy column fo the f st ent y and 'B' n the Alloy column fo the second). Fo th s quest on, wo k ng nvento y s def ned as the comb nat on of wo k- n-p og ess mate al and f n shed mate al held as nvento y n ant c pat on of futu e sales.

		Types of T tan um n Invento y	Alloy	2015	2016	2017	2018	Comments
A	1	T tan um Sponge - Standa d G ade						
	2	T tan um Sponge - Rotat ng G ade						
	3	T tan um Sponge - Ae ospace Non-Rotat ng G ade						
	4	T tan um Ingot Conta ng Standa d G ade Sponge						
	5	T tan um Ingot Conta ng Rotat ng G ade Sponge						
	6	T tan um Ingot Conta ng Ae ospace Non-Rotat ng G ade Sponge						
	7	T tan um B llet Conta n ng Standa d G ade Sponge						
	8	T tan um B llet Conta n ng Rotat ng G ade Sponge						
	9	T tan um B llet Conta n ng Ae ospace Non-Rotat ng G ade Sponge						
	10	T tan um Sc ap						
	11	T tan um Ba						
	12	T tan um Plate						
	13	T tan um Sheet (Hot Rolled)						
	14	T tan um Sheet (Cold Rolled)						
	15	T tan um Tube						
	16	T tan um Co l						
	17	T tan um Satell te Components/F n shed Pa ts						
	18	Ae ospace St uctu al Pa ts (e.g. spa s, bs)						
	19	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)						
	20	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)						
	21	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)						
	22	Land-Based Tu b ne Eng ne and St uctu al Pa ts						
	23	Ma t me Tu b ne Eng ne and St uctu al Pa ts						
	24	Othe (Expla n n Comments)						
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

Strategic Inventory

Ind cate quant ty of t tan um you o gan zat on ma nta ns n st ateg c nvento y, and the amounts of each n nvento y fo the 2015 to 2018 pe od. Repo t all amounts **n kilograms**. If you o gan zat on has mo e than one a loy of a g ven p oduct n nvento y, l st each alloy sepa ately. (e.g., f you o gan zat on has T tan um B let w th Alloys A and B, p ov de two ent es fo T tan um B let w th 'A' n the Alloy column fo the f st ent y and 'B' n the Alloy column fo the second). Fo th s quest on, st ateg c nvento y s def ned as mate al kept by you o gan zat on as a ese ve o hedge aga nst supply d s upt on, ma ket cond t ons, etc.

		Types of T tan um n Invento y	Alloy	2015	2016	2017	2018	Comments
B	1	T tan um Sponge - Standa d G ade						
	2	T tan um Sponge - Rotat ng G ade						
	3	T tan um Sponge - Ae ospace Non-Rotat ng G ade						
	4	T tan um Ingot						
	5	T tan um B llet						
	6	T tan um Sc ap						
	7	T tan um Ba						
	8	T tan um Plate						
	9	T tan um Sheet (Hot Rolled)						
	10	T tan um Sheet (Cold Rolled)						
	11	T tan um Tube						
	12	T tan um Co l						
	13	T tan um Satell te Components/F n shed Pa ts						
	14	Spec alty T tan um Pa ts Manufactu ng (not to nclude ae ospace)						
	15	Ae ospace St uctu al Pa ts (e.g. spa s, bs)						
	16	Ae ospace H gh- mpact Pa ts (e.g. land ng gea)						
	17	Ae ospace Exte nal Eng ne Pa ts (e.g. cowl, fan)						
	18	Ae ospace Inte nal Eng ne Pa ts (e.g. low p essu e comp esso)						
	19	Land-Based Tu b ne Eng ne and St uctu al Pa ts						
	20	Ma t me Tu b ne Eng ne and St uctu al Pa ts						
	21	Chem cal P ocess ng Equ pment (e.g. tub ng)						
	22	Othe (Expla n n Comments)						
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

C

G ven you o gan zat on's cu ent levels of p oduct on and the levels of nvento y epo ted n Sect ons A and B, how long would you epo ted nvento y last f you could not access d ect t tan um mpo ts o mate al f om suppl e s de ved f om mpo ts? P ov de answe s n months fo the follow ng scena os

Rate of P oduct on	Months Able to Susta n Ope at ons	Amount P oduced (k log ams)	Un ts P oduced
Cu ent Ut l zat on Rate			
100% Ut l zat on Rate			
Defense Cont acts Only			
C t cal Inf astuctu e Cont acts Only			

Comments

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

7. National Defense Support

A	Did your organization directly or indirectly supply titanium products for U.S. defense systems between 2015 and 2019? If no, proceed to next page. If yes, complete the following sections B, C, and D below.	yes/no

B — From the list of U.S. Government agencies below, select those whose systems you supported between 2015 and 2019.

U.S. Air Force	yes/no	U.S. Coast Guard	yes/no	Department of Energy	yes/no
U.S. Army	yes/no	U.S. Intelligence Community (such as CIA, NGA, NRO, NSA)	yes/no	Other (Specify to the Right)	write in
U.S. Marine Corps	yes/no	Missile Defense Agency (MDA)	yes/no	Other (Specify to the Right)	write in
U.S. Navy	yes/no	Defense Logistics Agency	yes/no	Other (Specify to the Right)	write in

C — Identify the specific U.S. Government programs/systems your organization has supported since 2015. In the first column, write-in the DEFENSE SYSTEM NAME. Provide as much detail as possible and spell out all acronyms. The **AGENCY NAME** column dropdown will be populated with the agencies you identified above (in part B), select the applicable agency.

In the **TITANIUM-RELATED PRODUCT** columns, write in the products that your organization has provided. If additional products are provided in support of a specific government program/system, repeat the program/system on a new row and select the remaining products.

NOTE: If your organization is unsure of the specific **GOVERNMENT PROGRAM/SYSTEM NAME** or **AGENCY NAME**, provide as much information as possible. **Do not disclose any classified information.**

	Defense System Name	Agency Name (select from dropdown)	Estimated Total Amount of Titanium Provided for System (kilograms)	Titanium Product and/or Finished Good 1	Titanium Product and/or Finished Good 2	Titanium Product and/or Finished Good 3	Titanium Product and/or Finished Good 4	Titanium Product and/or Finished Good 5
1	DSS Drop Down							
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Comments	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

8. Critical Infrastructure

A

From the list of Critical Infrastructure Sectors below indicate which sectors your organization has supplied with titanium products. In-depth definitions of each sector may be found at : https://www.dhs.gov/cisa/critical-infrastructure-sectors

Chemical Sector (e.g. pipes and tubes for chemical factories pressure vessels heat exchangers)	y/n	**Dams Sector** (e.g. titanium parts for electric turbines used in dams)	y/n	**Financial Services Sector** (e.g. titanium parts for data systems used by financial services firms)	y/n	**Information Technology Sector** (e.g. titanium parts for batteries)	y/n
Commercial Facilities Sector (e.g. cladding structural supports)	y/n			**Food and Agriculture Sector** (e.g. titanium parts used in agricultural equipment)	y/n	**Nuclear Reactors, Materials, and Waste Sector** (e.g. waste storage pipes and tubing for reactors reactor shields)	y/n
Communications Sector (e.g. titanium parts for communications sate lites)	y/n	**Emergency Services Sector** (e.g. titanium applications for police fire and EMS)	y/n	**Government and Facilities Sector** (e.g. titanium parts provided for end use in U.S. government facilities)	y/n	**Transportation Systems Sector** (e.g. civil aviation titanium parts for oil and gas pipelines titanium parts for motor vehicles ships and railroad equipment)	y/n
Critical Manufacturing Sector (e.g. titanium parts for various industrial machinery titanium parts for aircraft engines)	y/n	**Energy Sector** (e.g. titanium parts for solar panels titanium turbine parts pipes for power plants)	y/n	**Healthcare and Public Health Sector** (e.g. replacement joints prosthetics medical instruments)	y/n	**Water and Wastewater Systems Sector** (e.g. pipes for water and sewer and treatment plant systems)	y/n

B

Identify the spec fic critical infrastructure In the first column write-in the **CRITICAL INFRASTRUCTURE SYSTEM NAME.** Provide as much detail as possible and spell out all acronyms. The **SECTOR NAME** column dropdown will be populated with the sectors you identified above (in part A) select the applicable sector. **Do not repeat items already reported in the National Defense Support section.**

In the **TITANIUM-RELATED PRODUCT** columns state the **titanium**-related products your organization provides in support of the specific sector. If additional products are provided in support of a specific sector repeat the program/system on a new row and select the remaining products.

NOTE: If your organization is unsure of the specific **CRITICAL INFRASTRUCTURE SYSTEM name** provide as much information as possible. **Do not disclose any classified information.**

	Critical Infrastructure System	Sector Name (select from dropdown)	Titanium-Related Product 1	Titanium-Related Product 2	Titanium-Related Product 3	Titanium-Related Product 4	Titanium-Related Product 5
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

9. Prices

Provide the average prices per kilogram your organization has purchased the below titanium and/or titanium-related products over the 2015-2019 period.
Provide all prices in U.S. dollars. (Include purchases of both U.S. and non-U.S.)

	Product		Year					
			2015	2016	2017	2018	2018 YTD	2019 YTD
1	Titanium Ingot							
	A	Titanium Ingot Containing Standard Quality Sponge						
	B	Titanium Ingot Containing Aerospace Non-Roatating Sponge						
	C	Titanium Ingot Containing Rotating Grade Sponge						
2	Titanium Billet							
	A	Titanium Billet Containing Standard Quality Sponge						
	B	Titanium Billet Containing Aerospace Non-Rotating Sponge						
	C	Titanium Billlet Containing Rotating Grade Sponge						
3	Titanium Bar							
4	Titanium Plate							
5	Titanium Sheet (Hot Rolled and Cold Rolled)							
6	Titanium Tube							
7	Titanium Coil							
8	Aerospace Structural Parts (e.g. spars, ribs)							
9	Aerospace High-impact Parts (e.g. landing gear)							
10	Aerospace External Engine Parts (e.g. cowl, fan)							
11	Aerospace Internal Engine Parts (e.g. low pressure compressor)							
12	Land-Based Turbine Engine and Structural Parts							
13	Maritime Turbine Engine and Structural Parts							
14	Chemical Processing Equipment (e.g. tubing)							
15	Titanium Satellite Components/Finished Parts							
16	Other (Explain in Comments)							
17	Other (Explain in Comments)							
18	Other (Explain in Comments)							
Comments								

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

10. Suppliers/Purchases

For each type of titanium purchased by your organization with receipt at a U.S. fac lity from 2015-2019 state the supplier amounts purchased and prices paid. If your organization has more than ten suppliers for a given product provide the top ten suppliers by volume. For any category of items you do not purchase enter a 0 in the corresponding box.

T tan um Ingot Contain ng Standard Qua ity Sponge (Ki ograms)

Identify your organization's total number of suppliers for Titanium Ingot Containing Standard Quality Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Ingot Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
A	1			y/n			Commercial													
	2						Research													
	3						U.S. Government (Non-defense)													
	4						U.S. Government (Defense)													
	5						Other													
	6						Unknown													
	7																			
	8																			
	9																			
	10																			

Titanium Ingot Containing Aerospace Non-Rotating Grade Sponge (Kilograms)

Ident fy your organization's total number of suppliers for Titanium Ingot Containing Aerospace Non-Rotating Grade Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Ingot Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
B	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium Ingot Containing Rotating Grade Sponge (Kilograms)

Identify your organization's total number of supp iers for Titanium Ingot Containing Rotating Grade Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Ingot Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
C	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium B llet Containing Standard Quality Sponge (K lograms)

Identify your organization's total number of suppliers for Titanium Billet Containing Standard Qua ity Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Billet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
D	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium Billet Containing Aerospace Non-Rotating Grade Sponge(Kilograms)

Ident fy your organization's total number of suppliers for Titanium Billet Containing Aerospace Non-Rotating Grade Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Billet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
E	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium Billet Containing Rotating Grade Sponge (Kilograms)

Identify your organization's total number of suppliers for Titanium Billet Containing Rotating Grade Sponge. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Billet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
F	1																			
	2																			
	3																			
	4																			
	5																			
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	9																			
	10																			

Titanium Bar (Kilograms)

Ident fy your organization's total number of suppliers for Titanium Bar. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Bar Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
G	1																			
	2																			
	3																			
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	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium Plate (Kilograms)

Identify your organization's total number of supp iers for Titanium Plate. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Plate Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
H	1																			
	2																			
	3																			
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	5																			
	6																			
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	8																			
	9																			
	10																			

Titanium Sheet (K lograms)

Ident fy your organization's total number of suppliers for Titanium Sheet. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Sheet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
I	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium Tube (Kilograms)

Identify your organization's total number of supp iers for Titanium Tube. Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Tube Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
J	1																			
	2																			
	3																			
	4																			
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	8																			
	9																			
	10																			

Titanium (Other - Explain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
K	1																			
	2																			
	3																			
	4																			
	5																			
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	8																			
	9																			
	10																			

Titanium (Other - Exp ain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
L	1																			
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Titanium (Other - Exp ain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
M	1																			
	2																			
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	9																			
	10																			

Titanium (Other - Exp ain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
N	1																			
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	10																			

Titanium (Other - Explain in Comments)

Identify your organization's total number of suppliers for Titanium (Other). Where necessary input 0.

		Supplier	Supplier Headquarters	Is This Supplier a Related Party?	Manufacturer/Processor (if different from supplier)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
O	1																			
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	9																			
	10																			

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

11. Customers

For each type of titanium and/or titanium-related product sold by your organization from 2015-2019 state the customer amounts sold and prices. If your organization has more than ten customers for a given product provide the top ten customers by volume. Titanium (Other) should include finished products. For any items you do not have customers for enter a 0 in the corresponding box.

Titanium Scrap (Kilograms)

Identify your organization's total number of customers for Titanium Scrap. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Titanium Scrap Origin	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
A	1						Commercial													
	2						Research													
	3						U.S. Government (Non-defense)													
	4						U.S. Government (Defense)													
	5						Other													
	6						Unknown													
	7																			
	8																			
	9																			
	10																			

Titanium Ingot (Kilograms)

Identify your organization's total number of customers for Titanium Ingot. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Ingot Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
B	1																			
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	8																			
	9																			
	10																			

Titanium Billet (Kilograms)

Identify your organization's total number of customers for Titanium Billet. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Billet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
C	1																			
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	8																			
	9																			
	10																			

Titanium Bar (Kilograms)

Identify your organization's total number of customers for Titanium Bar. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Bar Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
D	1																			
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	3																			
	4																			
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	8																			
	9																			
	10																			

Titanium Plate (Kilograms)

Identify your organization's total number of customers for Titanium Plate. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Plate Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
E	1																			
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	8																			
	9																			
	10																			

Titanium Sheet (K lograms)

Identify your organization's total number of customers for Titanium Sheet. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Sheet Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
F	1																			
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	9																			
	10																			

Titanium Tube (Kilograms)

Identify your organization's total number of customers for Titanium Tube. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Tube Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
G	1																			
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	8																			
	9																			
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Assemb ed Aircraft

Identify your organization's total number of customers for Assembled Aicrafts. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
H	1																			
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	8																			
	9																			
	10																			

Assembled Engine for Aircraft

Identify your organization's total number of customers for Assembled Engines for Aircrafts. Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
I	1																			
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	3																			
	4																			
	5																			
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	8																			
	9																			
	10																			

Titanium (Other - Explain in Comments)

Identify your organization's total number of customers for Titanium (Other). Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
J	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium (Other - Explain in Comments)

Identify your organization's total number of customers for Titanium (Other). Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
K	1																			
	2																			
	3																			
	4																			
	5																			
	6																			
	7																			
	8																			
	9																			
	10																			

Titanium (Other - Exp ain in Comments)

Identify your organization's total number of customers for Titanium (Other). Where necessary input 0.

		Customer	Customer Headquarters	Is This Customer a Related Party?	End User (If Different from Customer)	Country of Other Titanium Fabrication	End-Use	Comments	2015		2016		2017		2018		YTD 2018		YTD 2019	
									Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)	Volume	Value ($USD)
L	1																			
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	6																			
	7																			
	8																			
	9																			
	10																			

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

12. Research & Development and Capital Expenditures

A.	Has your organization conducted **titanium-related** research and development (R&D) in the United States from 2015-2019?	y/n	If no, proceed to Section C below.

Record your organization's total R&D dollar expenditures and type of R&D expenditure for the 2015 to 2019 period. Lines 6-8 will address specific titanium-related expenditures.

			Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
			2015	2016	2017	2018	2019
B.	1	Total R&D Expenditures					
	2	Basic Research [as a % of B1]					
	3	Applied Research [as a % of B1]					
	4	Product/Process Development [as a % of B1]					
	5	Total of 2 - 4 [must equal 100%]	0%	0%	0%	0%	0%
	6	Titanium-related Basic Research [as a % of B1]					
	7	Titanium-related Applied Research [as a % of B1]					
	8	Titanium-related Product/Process Development [as a % of B1]					
		Total of 6-8	0%	0%	0%	0%	0%

	Provide any additional comments relating to R&D expenditures to the right.	

C.	Has your organization conducted **titanium-related** capital expenditures in the United States from 2015-2019?	y/n	If no, proceed to the next page.

Record your organization's titanium-related capital expenditures in the United States corresponding to the select categories below for the 2015-2019 period.

Below, provide any additional comments in relation to your organization's capital expenditures made in the past 5 years (2015-2019).

	Capital Expenditure Activity Type	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019
D.	Total Titanium-Related Capital Expenditures					
1	Machinery, Equipment, and Vehicles [as a % of A]					
2	IT, Computers, Software [as a % of A]					
3	Land, Buildings, and Leasehold Improvements [as a % of A]					
4	Other (Specify) [as a % of A]					
5	Other (Specify) [as a % of A]					
Lines 1 through 5 must total 100%		0%	0%	0%	0%	0%

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

13. Financials

Provide the following financial line items for your organization's titanium-related U.S. cost center/business activity U.S. operations below for the 2015 to 2019 period.

Source of Financial Data:	
Reporting Schedule:	

A.	Income Statement (Select Line Items)	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019
1	Net Sales (and other revenue)					
2	Cost of Goods Sold					
3	Total Operating Income (Loss)					
4	Earnings Before Interest and Taxes					
5	Net Income					

	Balance Sheet (Select Line Items)	Record $ in Thousands, e.g. $12,000.00 = survey input of $12				
		2015	2016	2017	2018	2019
6	Cash					
7	Inventories					
8	Total Current Assets					
9	Total Assets					
10	Total Current Liabilities					
11	Total Liabilities					
12	Retained Earnings					
13	Total Owner's Equity					

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Data Confirmation
2018 Net Sales
None

Previous Page

14. Certification

The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct to the best of his/her knowledge. It is a criminal offense to willfully make a false statement or representation to any department or agency of the United States Government as to any matter within its jurisdiction (18 U.S.C. 1001 (1984 & SUPP. 1197)).

Organization Name	
Organization's Internet Address	
Name of Authorizing Official	
Title of Authorizing Official	
E-mail Address	
Phone Number and Extension	
Date Certified	

In the box below, provide any additional comments or any other information you wish to include regarding this survey assessment.

How many hours did it take to complete this survey?	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Appendix F

Appendix F. Trade Cases Involving Titanium Sponge, 1968-2017

Union of Soviet Socialist Republics (U.S.S.R.), 1968

In April 1968, the United States Tariff Commission (USTC) was advised by the Department of the Treasury that titanium sponge from the U.S.S.R. was being sold at less than fair value within the United States.[1] The USTC launched an investigation, completed in July 1968, determining that domestic industry experienced material injury from Soviet titanium sponge imports.[2] An antidumping duty order was imposed on Soviet titanium sponge imports.

USTC observed that as U.S. production of titanium products increased, titanium sponge imports similarly increased to meet demand for melt feedstock. Between 1958 and 1967, U.S. production of titanium mill products increased from 5 million pounds to 28 million pounds. In the same period, titanium sponge imports increased from 1 million pounds to nearly 14 million pounds.[3] Soviet imports, which began in 1965, rapidly displaced imports from Japan and the United Kingdom. Soviet imports increased from 3.6 percent in 1965 to 23.1 percent in the first quarter of 1968.[4] Soviet producers had also extended offers to

[1] USTC, "Titanium Sponge from the U.S.S.R.", (July 1968), https://www.usitc.gov/publications/aa1921/pub255.pdf, 1.

[2] Ibid., 2.

[3] Ibid. 20.

[4] Ibid., 21.

U.S. suppliers equivalent to 68 percent of 1967 imports; an amount representing nearly a quarter of all U.S. titanium sponge consumption.[5]

Soviet producers significantly benefited from government support. Soviet sponge on average was 37 cents per pound, 28 percent cheaper than comparable domestic material at $1.32 per pound.[6] Industry representatives testified to the commission that if Soviet imports continued, the domestic price per pound could drop to as low as 95 cents per pound. At that price point, U.S. titanium producers would find it "necessary to buy such sponge rather than pursue a further increase in its [sic] production capacity."[7] For these reasons, the USTC concluded that the U.S. industry was being injured by Soviet titanium sponge imports.

United Kingdom and Japan, 1984

In November 1983, the RMI Company filed a petition with the United States International Trade Commission (USITC) alleging that imported titanium sponge from Japan and the United Kingdom was sold at less than fair value.[8] RMI's petition focused on the General Services Administration's (GSA) purchase of 4,500

[5] Ibid., 4.

[6] Ibid., 7.

[7] Ibid. 8.

[8] USITC, "Titanium Sponge from Japan and the United Kingdom (Investigation Nos. 731-TA-161 and 162)", (January 1984), https://www.usitc.gov/publications/701_731/pub1477.pdf, 1.

tons of titanium sponge in October 1983 for the National Defense Stockpile.[9] GSA's bid was open to both domestic and foreign suppliers with an imposition of a 17 percent *ad valorem* duty to foreign bid for comparability purposes.

GSA awarded four contracts for the purchase; of these, only one contract was signed with a U.S. producer, the Petitioner. The Petitioner's contract was for 1,000 tons, 23 percent of the order. The remainder of the contracts were for Japanese and British sponge.[10] USITC noted that the winning Japanese bids were at a price of approximately $3.20 per pound whereas the winning British bid was at a price of $3.37 per pound.[11] In contrast, the losing domestic U.S. bids had prices ranging from $3.79 per pound to $6.25 per pound. Titanium sponge imports were having a noticeable negative effect on U.S. industry, as observed by USITC Chairman Alfred Eckes:

> In particular, I note that the domestic industry has experienced a dramatic decline in production and capacity utilization in 1982 and 1983. Also, average employment has fallen sharply in the same time period from a 3-year high in 1980. Income-and-loss data, supplied by three U.S. producers, provide further evidence of injury to the domestic industry in 1982 and 1983.[12]

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[9] Ibid., 10.

[10] Ibid., 11.

[11] Ibid., 11, 15.

[12] Ibid., 19.

Based on future U.S. government need for titanium sponge, the likelihood of continued high imports, and the state of U.S. industry, USITC found that the U.S. titanium sponge industry was threatened with material injury. USITC observed that both the United Kingdom and Japan had sponge capacity far exceeding domestic or regional demand, and would seek to export to the United States in the future. Subsequently, USITC imposed an antidumping duty order on imports of Japanese titanium sponge; however, it declined to do so on sponge imports from the United Kingdom.

Japan, Kazakhstan, Russia, and Ukraine, 1998

Following the 1968 and 1984 cases, antidumping duty orders were issued against titanium sponge from the U.S.S.R. and Japan.[13] The duty orders on Soviet titanium sponge were continued after the U.S.S.R.'s dissolution in December 1991, and were applied to imports of titanium sponge from Russia, Kazakhstan, and Ukraine.[14]

[13] The USITC's final determination in the November 1984 case revised the prior finding of injury for imports from the United Kingdom, and determined that British titanium sponge did not threaten injury to domestic industry. U.S. International Trade Commission, "Titanium Sponge From Japan, Kazakhstan, Russia, and Ukraine", Investigation Ns. 751-TA-17-20 (August 1998), 1.

[14] In August 1992, the International Trade Administration transferred the 1968 antidumping finding into fifteen separate findings for the twelve former Soviet republics and the three Baltic states. "Titanium Sponge From the U.S.S.R.; Transfer of the Antidumping Finding on Titanium Sponge From the U.S.S.R. to the Baltic States and the Former Republics of the Soviet Union", Federal Register 57, no. 156 (August 12, 1992), 36070. https://www.govinfo.gov/content/pkg/FR-1992-08-12/pdf/FR-1992-08-12.pdf

In December 1997, Irish trading firm TMC Trading International Ltd. filed a request with the Commission for a changed circumstances review of the 1968 determination. TMC's request argued that several material changes in the global industry since 1968 meant that the Commission's determination was no longer applicable. TMC observed that the U.S. titanium industry was now internationally competitive and had shifted its focus towards production of downstream titanium products; U.S. industry was not focused on sponge production.[15] TMC also alleged that significant declines in sponge capacity in the former Soviet Union, combined with evidence of no dumping during calendar year 1997, supported discontinuation of antidumping duties.[16]

The Commission's investigation found that global titanium sponge capacity had decreased approximately 25 percent since 1991.[17] Although a significant portion of this capacity loss was in the United States[18], the Commission found that that these closures did not affect downstream operations. Petitioner and Oremet, the only domestic sponge producers, internally consumed all of their production and imported sponge to meet production requirements.[19] Increased use of titanium

[15] Ibid., 3.

[16] Ibid., 3.

[17] Ibid., 14.

[18] RMI's Ashtabula facility had closed in 1992; TIMET closed an older facility in 1994. Ibid.

[19] Ibid., 15.

in civil aviation, combined with the adoption of longer-term sponge supply agreements, would create a predictable demand for U.S. titanium sponge in the coming years.[20]

The Commission determined that revocation of the antidumping duty orders on titanium sponge from Japan, Kazakhstan, Russia, and Ukraine would "not be likely to lead to continuation or recurrence of material injury" to U.S. titanium sponge producers. These antidumping duty orders were revoked on August 13, 1998.[21]

Japan and Kazakhstan, 2017

In August 2017, Petitioner filed a petition with the Department and USITC alleging injury from Japanese and Kazakh titanium sponge imports.[22] The USITC then opened countervailing duty and antidumping duty investigations into these imports, both of which were concluded in October 2017.

USITC determined that there was "no reasonable indication" of material injury to U.S. industry based on the available record.[23] The Commission's analysis was

[20] Ibid., 16-18.

[21] "Revocation of Antidumping Findings and Antidumping Duty Order and Termination of Five-Year ('Sunset' Reviews): Titanium Sponge from Kazakhstan, Russia, Ukraine, and Japan", Federal Register 63, no. 168 (August 31, 1998), 46215-26216. https://www.govinfo.gov/content/pkg/FR-1998-08-31/html/98-23465.htm

[22] USITC, "Titanium Sponge from Japan and Kazakhstan (Investigation Nos. 701-TA-587 and 731-TA-1385-1386)", October 2017, https://www.usitc.gov/publications/701_731/pub4736.pdf, 1.

[23] Ibid.

based on its finding that there was no "head to head" competition between U.S. titanium sponge and Japanese and Kazakh titanium sponge.[24] U.S. titanium sponge was not sold to other consumers of titanium sponge; it was all consumed by Petitioner.

Downstream purchasers testified to the Commission that TIMET had not made an attempt to sell sponge on the market, and had never approached them with formal sales offers.[25] The downstream purchasers also stated that, in their view, import prices were not lower than prices for U.S. equivalent product, and claimed that availability and reliability of supply was the primary factor informing their purchase of imported material.[26] Thus, in the Commission's view, it was impossible to state that "actual competition, much less price competition, existed between the domestic producers and subject imports from Japan or Kazakhstan for commercial sales."[27]

Although the Commission acknowledged Petitioner's argument that "the availability of subject imports in the market may affect a domestic producer's decision whether to make titanium sponge at its U.S. plant or buy it from subject

[24] Ibid., 16.

[25] Ibid., V-6.

[26] Ibid.

[27] Ibid, 16.

imports", it held that this circumstance does not indicate competition between imports and the domestic like product.[28]

In contrast to the Commission's standards, the Section 232 statute does not include a similar definition of competition; there is no requirement to demonstrate direct competition between domestic and foreign industries. Rather, Section 232 examines the broader effect of imports on the national security and on a given domestic industry's financial health, workforce, and capability to meet national defense and critical infrastructure needs.

[28] Ibid., 16-17.

Appendix G

Redacted