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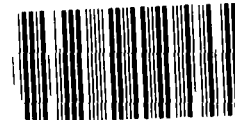
United States General Accounting Office 130631

Briefing Report to
Congressional Requesters

August 1986

**NATIONAL DEFENSE
STOCKPILE**

**Adequacy of National
Security Council Study
for Setting Stockpile
Goals**



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United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-223657

August 4, 1986

The Honorable James A. McClure
Chairman, Committee on Energy
and Natural Resources
United States Senate

The Honorable Charles E. Bennett
Chairman, Subcommittee on Seapower and
Strategic and Critical Materials
Committee on Armed Services
House of Representatives

In July 1985, you asked us to evaluate the National Security Council's (NSC's) study of national defense stockpile goals, the results of which were announced on July 8, 1985, and to obtain participating agencies' views on the study. In subsequent discussions with your office, we were asked to provide this interim briefing report assessing whether the NSC stockpile study is a sufficient basis for U.S. mobilization planning, including the proposed changes in national defense stockpile goals.

Materials, such as cobalt and titanium, are stockpiled to meet increased defense demands expected at the beginning of a wartime mobilization. Which materials, and the amounts to be stockpiled, can vary significantly depending on the assumptions used. Assumptions need to be made about issues such as the anticipated defense demand, the capability of U.S. industry to surge to meet demand, sacrifices in consumer-goods production to reallocate resources to mobilization needs, and the availability of materials from foreign sources in times of conflict.

Because of the assumptions it used, the NSC study recommended a stockpile goal of \$0.7 billion, which is much lower than the previous goal of \$16.1 billion, established based on a 1979 study. Of \$10.1 billion in stockpile inventory on hand against the previous \$16.1 billion goal, the NSC study recommended selling \$3.2 billion and holding a \$6 billion supplemental reserve, at least temporarily, of materials already on hand.

Our preliminary assessment is that the NSC study does not appear to provide a sufficient basis for setting stockpile goals or for other U.S. mobilization planning. Although the NSC study methodology was similar to the methods of past studies and made some improvements, the assumptions used were very different, and the study report did not adequately reflect major disagreements among study participants with regard to key assumptions. Furthermore, the study did not adequately show that its results could vary greatly with changes in its assumptions. Such ranges

of results, which can be quantified by doing sensitivity tests on the assumptions used, were a key part of the prior study, and provided decision makers a basis by which to assess the study's conclusions.

We caution that this preliminary assessment is based on a partial analysis of unclassified material. In our ongoing evaluation of the NSC stockpile study, we are reviewing the stockpile study report and supporting classified documentation, examining past stockpile studies and critiques of those studies, and discussing stockpile issues with representatives of each of the agencies that participated in the NSC study. We are also obtaining the views of outside experts. In our remaining work, one of the key steps is to determine which of NSC's assumptions have the most impact on the level of the stockpile. In order to accomplish this task, sensitivity tests need to be conducted for each assumption.

MAJOR QUESTIONS ARISING IN OUR EVALUATION
OF THE NSC STOCKPILE STUDY

Although our work is not complete, it raises questions about whether the NSC study adequately supports its recommendations to (1) significantly reduce stockpile-goal levels and (2) use the study's planning assumptions for other mobilization-preparedness areas. Specific questions include whether NSC study assumptions are consistent with defense planning assumptions and data, with past U.S. economic experience and economic projections by other groups, and with estimates of supply and demand by industry and other experts.

Study participants and industry and economic experts have expressed serious concerns about study assumptions, methodology, and results. For example, key study participants said that they did not agree with NSC's assumptions, and that the NSC study did not adequately show the impact of alternative assumptions. Our initial tests confirmed this, and showed that stockpile-goal levels can vary widely as assumptions change.

The NSC study group initially computed a stockpile goal of \$230 million. NSC then modified assumptions by making adjustments to increase material requirements for the defense and industrial sectors and reduce world supply, which increased the goal to \$691 million. However, NSC's adjustments were limited. For example, study participants reported that no changes were considered for such factors as oil availability and essential civilian requirements. Also, the reported adjustments for such assumptions as defense-sector requirements covered only part of the assumptions' plausible ranges.

We believe that analyses on several additional assumptions are needed, which could provide the basis for decision makers to choose a different goal than the \$691 million NSC proposed. The analyses would involve key assumptions, such as for defense expenditures, nonresidential investment in equipment, the degree of civilian austerity, availability of oil,

wartime production capabilities of the critical materials mining and processing industries, and the availability of critical materials imports to the United States.

Plausible changes in many of the study's assumptions could cause computed stockpile goals to vary widely. For example, outside experts have suggested that, in a major conventional war, the U.S. wartime economy and associated defense expenditures could far exceed the levels assumed in the NSC study. If the increased expenditures caused a 50-percent increase in material requirements for the defense sector, this one change alone could cause the overall stockpile goal to increase to almost \$1 billion--well beyond the \$691 million proposed by the NSC study. As another example, NSC's study places much greater reliance on foreign sources of supply than was done in prior stockpile studies, or was recommended by some study participants. The impact of these kinds of assumption changes needs to be clearly identified through additional analyses.

BASIS FOR INTERIM STOCKPILE
PURCHASES OR DISPOSALS

While we believe that final congressional action on approving a stockpile goal should not be made until we have completed our evaluation, and the Administration has responded to our findings, there appear to be some low risk interim actions that can be taken based on areas where the NSC and 1979 studies are in agreement.

Both the NSC study and a 1979 interagency study, coordinated by the Federal Emergency Management Agency, agree that about \$3.4 billion worth of materials on hand are excess to national security needs, and could be sold or bartered. On the other hand, the current inventory of at least one material--germanium--falls short of both its current and NSC-proposed goals. Furthermore, material experts among the study participants and advisory committees say that some materials being stockpiled, such as cobalt, may need to be upgraded. Your Committees may wish to discuss with one or more of these organizations, such as the National Materials Advisory Council or the General Services Administration, the desirability of using proceeds from future disposal sales, or moneys already in the National Defense Stockpile Transaction Fund, to upgrade such materials.

* * * * *

We discussed our preliminary results with NSC and Office of Management and Budget (OMB) officials who coordinated the NSC study. They told us that stockpile goals were driven primarily by defense planning assumptions, and that they believed the NSC study's assumptions to be consistent with defense planning. A detailed discussion would involve classified information; however, we can point out that the defense guidance addresses a likely range of wartime effort including levels

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greater than assumed by NSC. Also, unlike the NSC study, which accepts increased reliance on foreign sources of material supply, the defense guidance indicates that a growing reliance on foreign sources poses a threat to national security.

Analyses of different assumptions than those used in NSC's proposed \$691 million stockpile goal would, in our opinion, show a much broader range of stockpile goal options. Differing assumptions for a variety of factors have been suggested by top study participants and other experts. In response to our request for further analyses of defense and other assumptions, NSC and OMB officials said that they would consider analyzing key assumptions on a case-by-case basis, but they have not yet begun such analyses.

We are sending copies of this briefing report to the Chairmen, Senate and House Committees on Armed Services, the Senate and House Committees on Appropriations, the Senate Committee on Governmental Affairs, and the House Committee on Government Operations; to the Assistant to the President for National Security Affairs; and to the heads of the 12 agencies which participated in the NSC study. Copies will be made available to other interested parties upon request.

If you have any questions, please call Martin M Ferber, Associate Director for Manpower, Reserve Affairs, and Logistics, at 275-4001.



Frank C. Conahan
Director

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ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
GNP	Gross National Product
NSC	National Security Council
OMB	Office of Management and Budget

RESULTS OF NSC STOCKPILE STUDYBACKGROUND

The objective of the Strategic and Critical Materials Stock Piling Act, as amended (Public Law 96-41, 50 U.S.C. 98 et seq.), is to ensure that materials are stockpiled to minimize dependence on foreign sources of supply in times of national emergency. The Act requires that the stockpile inventory be sufficient to cover U.S. needs for not less than 3 years of a national emergency.

The President approves stockpile policy, which is to be followed in determining the stockpile goals. The goals are the difference between emergency supply and estimated 3-year requirements for each strategic material, such as cobalt and titanium.

Since the passage of the Stockpiling Act in 1946, stockpile goals and actual inventories have varied widely. For example, the stockpile was initially expected to support requirements for 5 years; later the time was reduced, first to 3 years and then to 1 year, and--in 1976--was increased again to 3 years. Goals have been relatively stable since the major reassessment of stockpile policy and goals which President Ford approved in 1976, and President Carter reaffirmed in 1977. Stockpile goals were recalculated in 1979 using then-existing policy guidance, with some changes to improve methodology.

NSC STUDY RESULTS

The most recent NSC stockpile study--begun in June 1983--proposed major reductions in the stockpile. The Administration announced the results of the study on July 8, 1985. The study considered 45 stockpile materials, which constitute \$15.6 billion (97 percent) of the total current stockpile goals of \$16.1 billion. The study recommended a stockpile goal of \$0.7 billion to meet national security needs.¹ If the study recommendations are adopted:

- Two materials (germanium and one form of mica) would have goals increased a total of \$125 million (from about \$51 million to \$176 million).
- Thirteen materials would remain in the stockpile, but have their goals reduced by \$3.9 billion (from \$4.4 billion to \$0.5 billion).

¹Unless otherwise noted, all dollar values are as of May 31, 1985, the reference date used in the NSC study report.

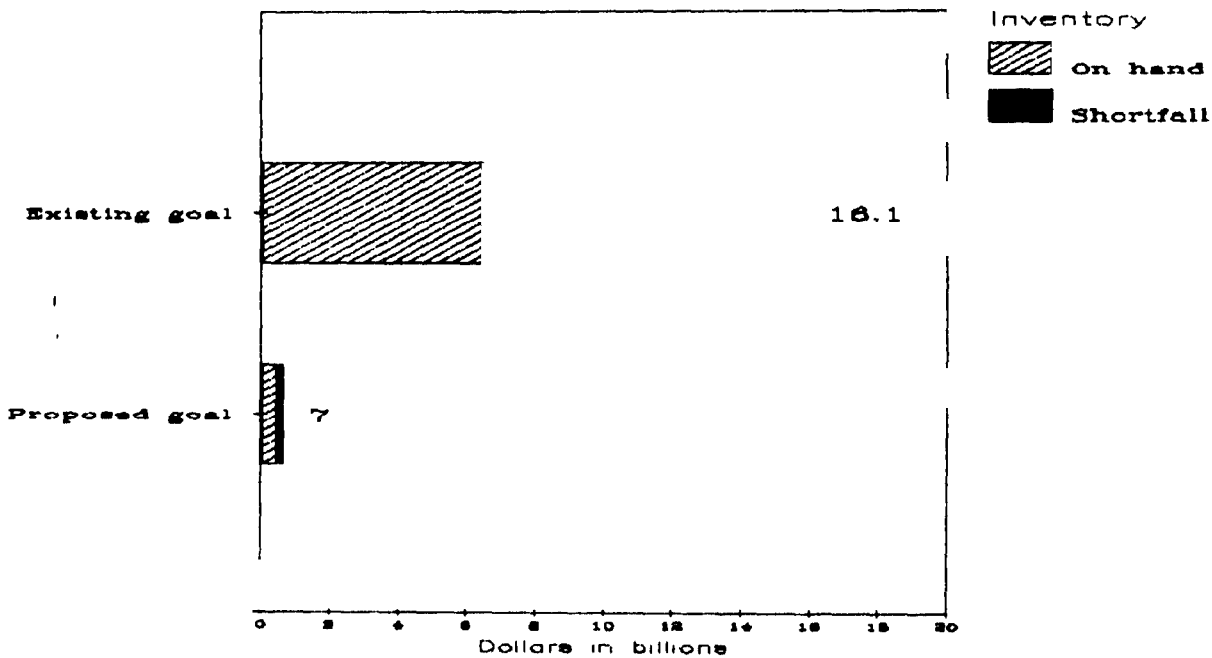
-- Thirty materials, with a stockpile value of \$11.1 billion, would be eliminated.

Of \$10.1 billion worth of materials now on hand in the stockpile, about \$9.5 billion would be excess to the proposed new goals. Of the excess, the study proposed that \$3.2 billion be declared surplus and sold, and \$6 billion would be retained as a supplemental reserve. (See p. 11 for a further discussion of the reserve.) The remaining materials, valued at about \$0.3 billion, were not studied, but the Administration has since also proposed the sale of about \$37 million of such materials.

The Administration proposed that receipts from the sale of materials are to be used to fill stockpile shortfalls or to be returned to the Treasury. With regard to purchases, only the germanium inventory is now below proposed goals, but more materials might be later proposed for purchase because over 20 materials (some not included in the NSC study) are being examined to determine possible need.

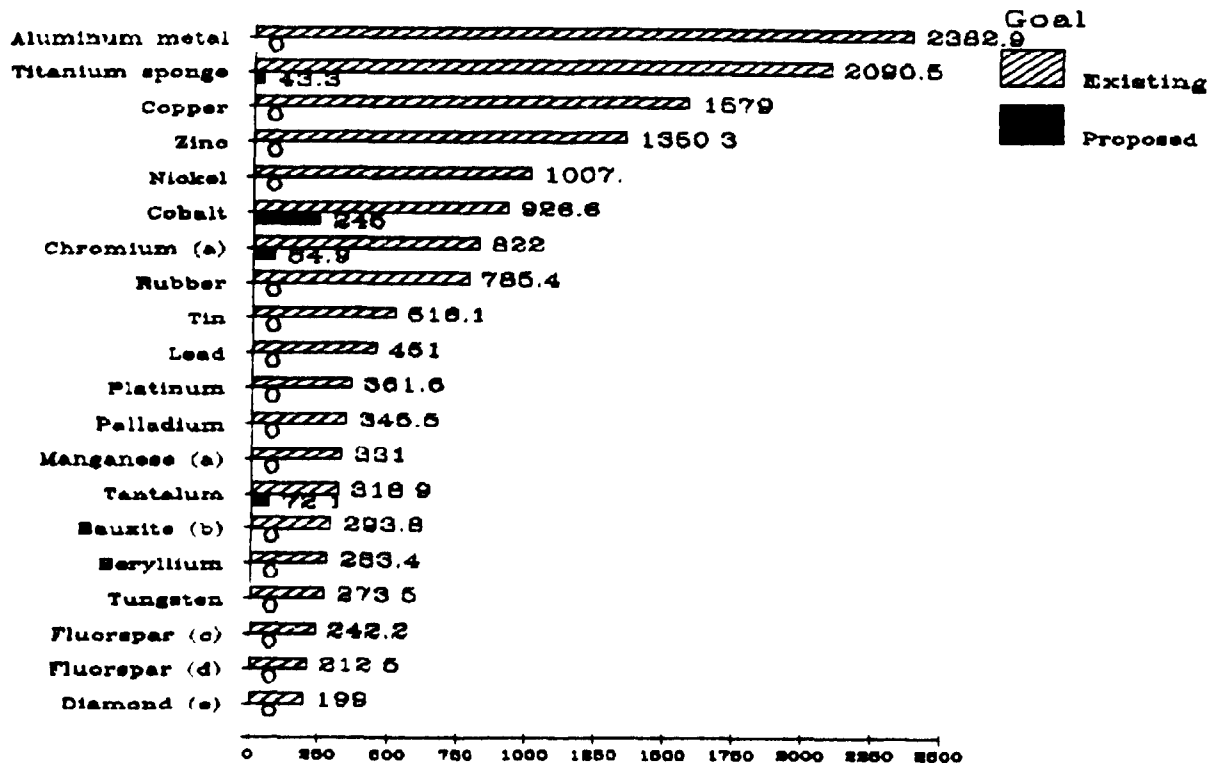
Figure I.1 compares total current and proposed stockpile goals. Under both goals, the current inventory has too much of some materials and too little of others. Figure I.2 compares the value of major items under goals now in effect with NSC's proposed goals.

Figure I.1: Total Existing and Proposed Stockpile Goals

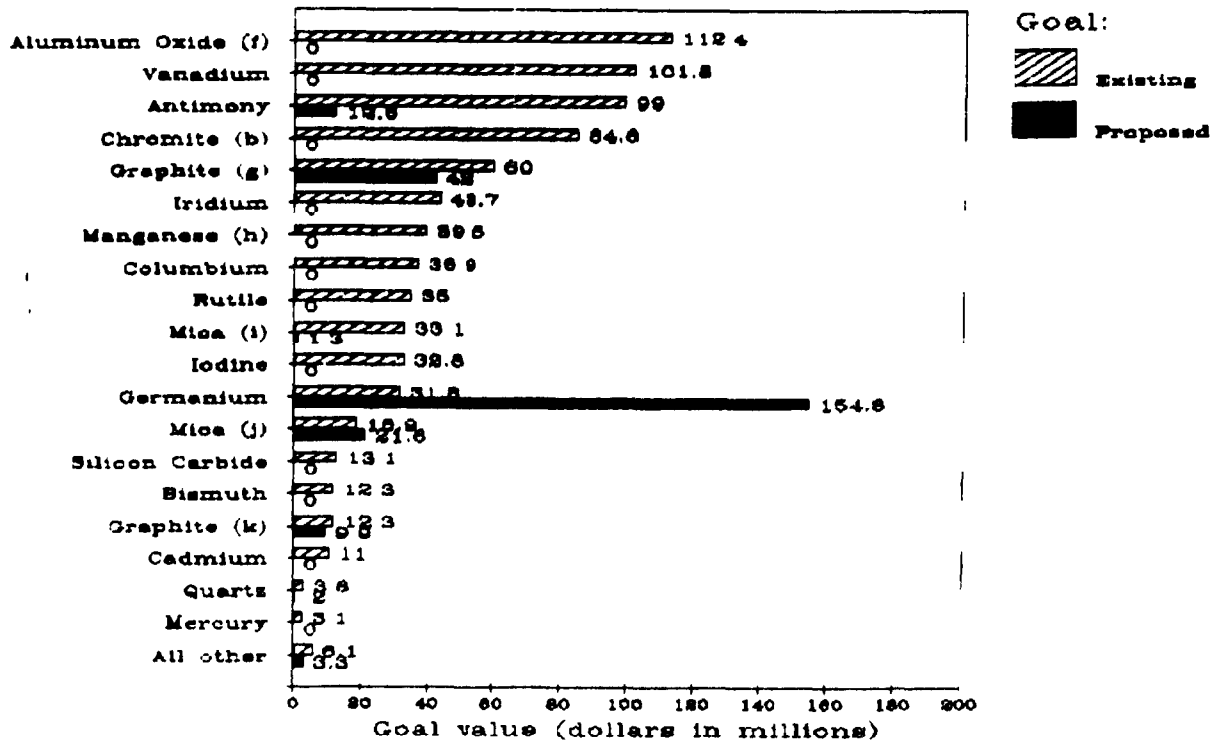


On hand inventory in the above chart consists of only those materials needed to meet existing and proposed goals. Excess inventories are not shown in this chart.

Figure I.2: Existing and Proposed Stockpile Goal Values for Major Materials



(Note change in scale)



- a Chemical and metallurgical group
- b Refractory
- c Acid grade
- d Metallurgical grade
- e Industrial stones
- f Abrasive grain group
- g Natural Malagasy
- h Battery grade
- i Muscovite block
- j Muscovite splittings
- k Natural Ceylon

Figure I.3 shows the status of existing inventory held toward meeting the goal versus that which is excess.

Figure I.3: Stockpile Inventory Status Under Existing and Proposed Goals

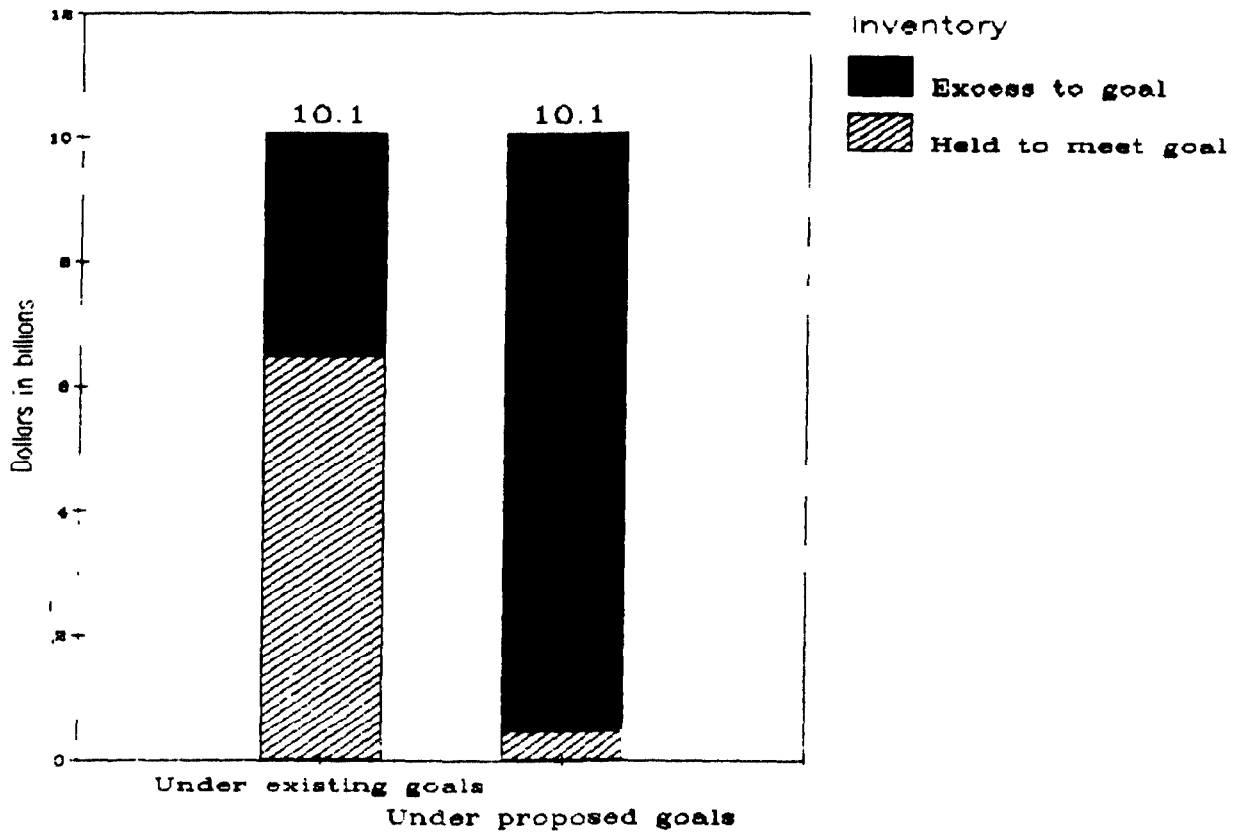
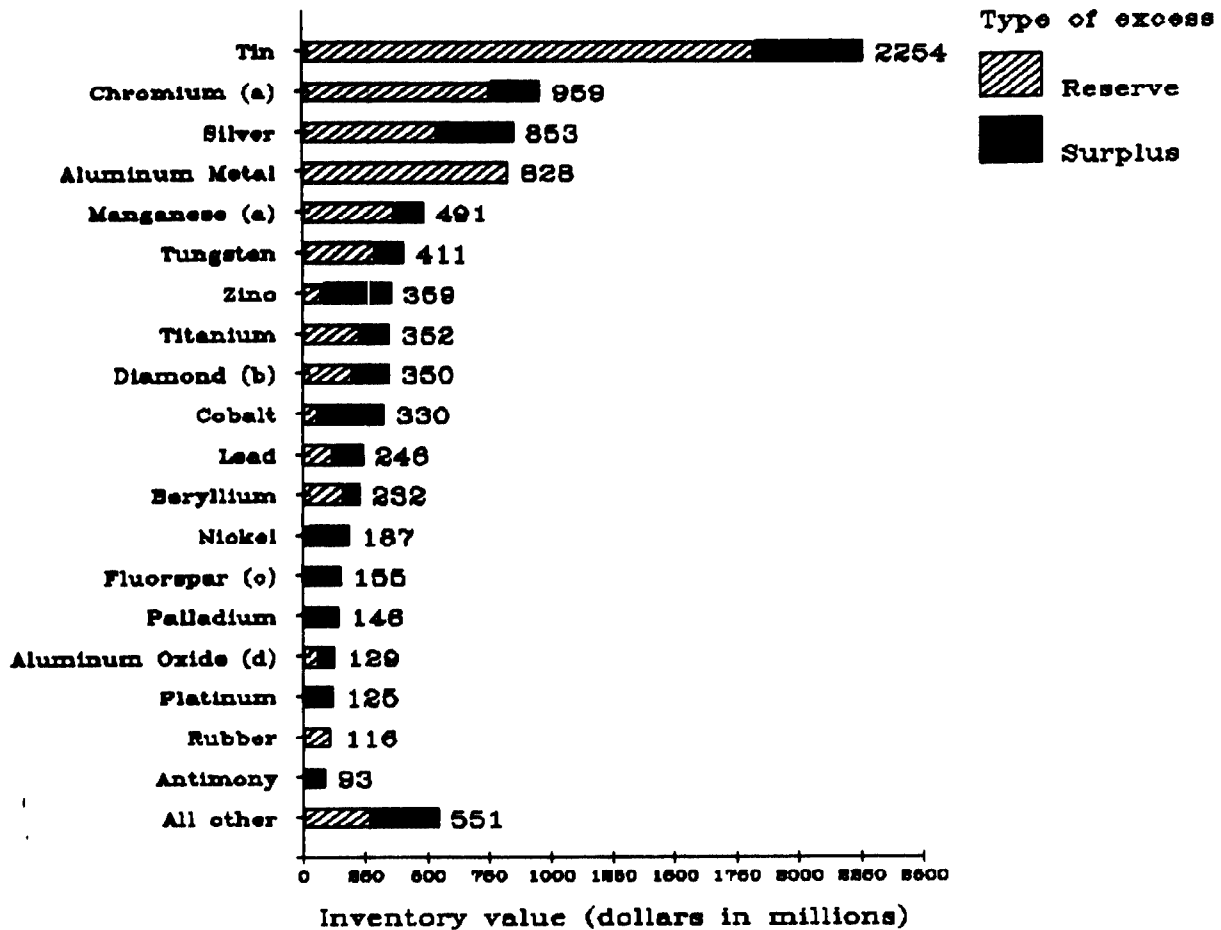


Figure I.4 shows which materials are considered excess to national security needs under NSC's proposed goals. The excess, which totals \$9.5 billion, is further broken down in the chart as to how much is surplus (eligible for sale within 5 years), and how much is to be held at least temporarily in a supplemental reserve. For more information related to this chart, see table I.1, which lists stockpile materials in order of greatest excesses under NSC's proposed goals.

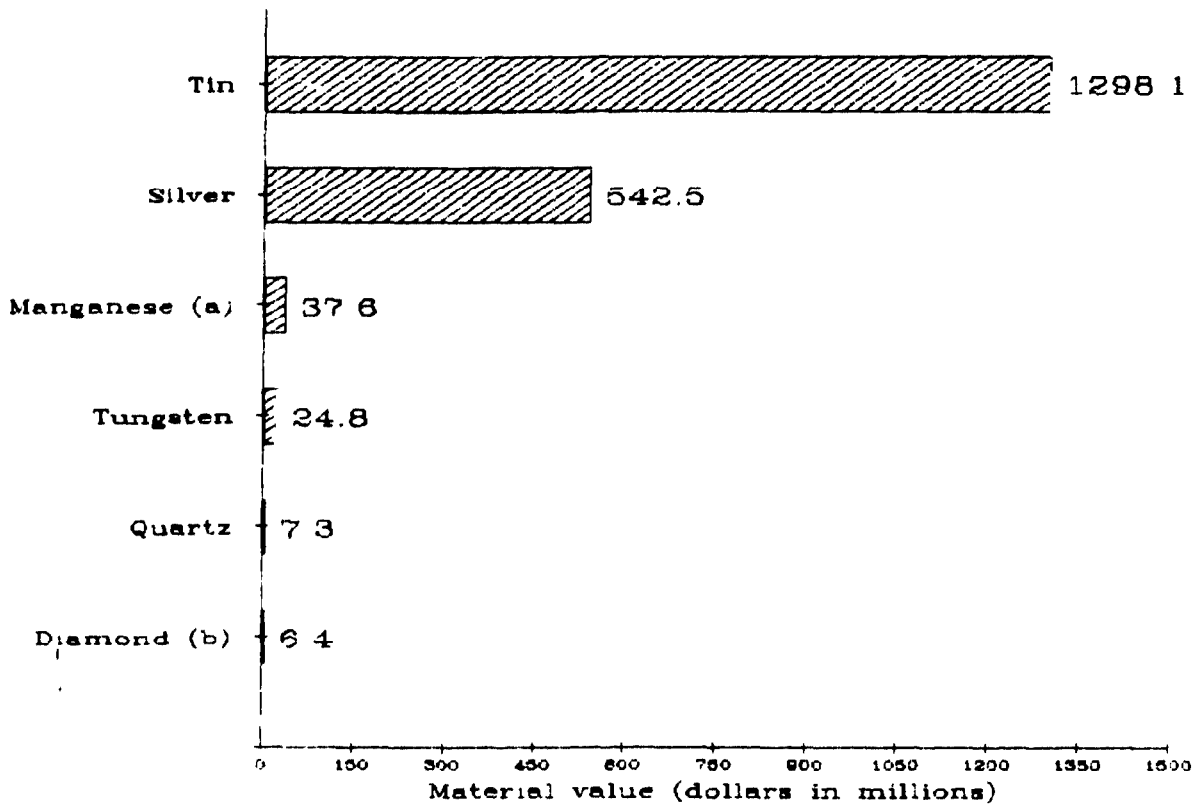
Figure I.4: Planned Disposition of Stockpile Materials Excess to NSC's Proposed Goals



- a Chemical and metallurgical group
- b Industrial stones
- c Acid grade
- d Abrasive grain group

NSC does not clearly define the rationale for holding supplemental reserve commodities as part of the national defense stockpile. Also, \$1.9 billion (almost one third of the entire proposed reserve) exceeds national defense requirements as computed by both the 1979 and NSC studies. For example, the NSC study proposes to retain \$1.8 billion worth of tin in the supplemental reserve, although the study's computed requirement for tin was zero, and the current goal (based on the 1979 study) is only \$0.5 billion. Figure I.5 shows the extent to which the proposed reserve's holdings of six materials would exceed the higher of either the current or the proposed goals.

Figure I.5: Amount by Which Six Materials in the Supplemental Reserve Exceed the Higher of the Existing or the Proposed Goals



a Chemical and metallurgical group
 b Industrial stones

Table I.1: Stockpile Material Values and NSC's Proposed Adjustments

Material	Existing goal	Proposed goal	Variance in goals	Inventory on hand	Existing shortage	Proposed excess			
						Excess	Reserve	Surplus to sell	NSC study
Tin	516.1	0.0	516.1	2253.7	-1737.6	2253.7	1814.2	439.5	Yes
Chromium, Chemical & Metallurgical Group	822.0	84.9	737.1	1043.7	-221.7	958.8	735.5	203.3	Yes
Silver, Fine	0.0	0.0	0.0	852.5	-852.5	852.5	542.5	310.0	Yes
Aluminum Metal Group	2382.9	0.0	2382.9	827.9	1555.0	827.9	827.9	0.0	Yes
Manganese, Chemical and Metallurgical Group	331.1	0.0	331.1	490.6	-159.5	490.6	368.7	121.9	Yes
Tungsten Group	273.5	0.0	273.5	410.5	-137.0	410.5	298.3	112.2	Yes
Zinc	1350.3	0.0	1350.3	358.5	991.8	358.5	80.5	278.0	Yes
Titanium Sponge	2090.5	43.3	2047.2	394.8	1695.7	351.5	232.6	118.9	Yes
Diamond, Industrial, Stones	199.0	0.0	199.0	349.9	-150.9	349.9	205.4	144.5	Yes
Cobalt	926.6	245.0	681.6	575.2	351.4	330.2	65.1	265.1	Yes
Lead	451.0	0.0	451.0	246.4	204.6	246.4	123.0	123.4	Yes
Beryllium Metal Group	283.4	0.0	283.4	232.0	51.4	232.0	164.4	67.6	Yes
Nickel	1007.0	0.0	1007.0	187.4	819.6	187.4	24.2	163.2	Yes
Fluorspar, Acid Grade	242.2	0.0	242.2	155.0	87.2	155.0	0.0	155.0	Yes
Platinum Group Metals, Palladium	345.5	0.0	345.5	145.6	199.9	145.6	0.0	145.6	Yes
Aluminum Oxide, Abrasive Grain Group	112.4	0.0	112.4	128.6	-16.2	128.6	65.0	63.6	Yes
Platinum Group Metals, Platinum	361.6	0.0	361.6	124.9	236.7	124.9	0.0	124.9	Yes
Rubber	785.4	0.0	785.4	115.9	669.5	115.9	115.9	0.0	Yes
Antimony	99.0	12.6	86.4	105.3	-6.3	92.7	0.0	92.7	Yes
Vegetable Tannin Extract, Quebracho	19.0	0.0	19.0	86.8	-67.8	86.8	0.0	0.0	
Tantalum Group	318.9	72.1	246.8	156.5	162.4	84.4	84.3	0.0	Yes
Jewel Bearings	134.8	0.0	134.8	82.1	52.7	82.1	0.0	0.0	
Bauxite, Refractory	293.8	0.0	293.8	57.7	236.1	57.7	57.7	0.0	Yes
Fluorspar, Metallurgical Grade	212.5	0.0	212.5	51.5	161.0	51.5	0.0	51.5	Yes
Mercury	3.1	0.0	3.1	51.4	-48.3	51.4	0.0	51.4	Yes
Copper	1579.0	0.0	1579.0	45.9	1533.1	45.9	45.9	0.0	Yes
Iodine	32.8	0.0	32.8	41.6	-8.8	41.6	31.0	10.6	Yes
Chromite, Refractory Grade Ore	84.8	0.0	84.8	39.1	45.7	39.1	18.0	21.1	Yes
Diamond, Industrial, Crushing Bort	38.5	0.0	38.5	38.5	0.0	38.5	0.0	0.0	
Silicon Carbide, Crude	13.1	0.0	13.1	36.2	-23.1	36.2	0.0	36.2	Yes
Mica Muscovite Block	33.1	1.3	31.8	27.8	5.3	26.5	1.1	25.4	Yes
Asbestos, Amosite	11.9	0.0	11.9	23.8	-11.9	23.8	0.0	0.0	
Morphine, Refined	70.3	0.0	70.3	21.3	49.0	21.3	0.0	0.0	
Asbestos, Chrysotile	5.5	0.0	5.5	19.6	-14.1	19.6	0.0	0.0	
Thorium Nitrate	1.7	0.0	1.7	19.6	-17.9	19.6	0.0	0.0	
Manganese, Dioxide, Battery Grade Group	39.5	0.0	39.5	19.5	20.0	19.5	0.0	19.5	Yes
Columbium Group	36.9	0.0	36.9	18.4	18.5	18.4	18.4	0.0	Yes
Mica Muscovite Film	1.1	0.2	0.9	13.8	-12.7	13.6	0.0	13.6	Yes

Material	Existing goal	Proposed goal	Variance in goals	Inventory on hand	Existing shortage	Proposed excess		
						Excess	Reserve	Surplus to sell NSC study
Platinum Group Metals, Iridium	43.7	0.0	43.7	13.2	30.5	13.2	0.0	13.2 Yes
Rutile	35.0	0.0	35.0	12.9	22.1	12.9	0.0	12.9 Yes
Bismuth	12.3	0.0	12.3	11.7	0.6	11.7	0.0	11.7 Yes
Graphite, Natural, Malagasy, Crystalline	60.0	42.0	18.0	53.6	6.4	11.6	0.0	11.6 Yes
Quartz Crystals	3.6	0.2	3.4	11.1	-7.5	10.9	10.9	0.0 Yes
Ricinoleic/Sabacid Acid Products	18.7	0.0	18.7	10.7	8.0	10.7	0.0	0.0
Vegetable Tannin Extract, Nettle	10.6	0.0	10.6	10.6	0.0	10.6	0.0	0.0
Vegetable Tannin Extract, Chestnut	3.4	0.0	3.4	8.7	-5.3	8.7	0.0	0.0
Quinidine	34.2	0.0	34.2	8.4	25.8	8.4	0.0	0.0
Vanadium Group	101.8	0.0	101.8	8.4	93.4	8.4	8.4	0.0 Yes
Quinine	9.5	0.0	9.5	6.8	2.7	6.8	0.0	0.0
Cadmium	11.0	0.0	11.0	6.0	5.0	6.0	0.0	6.0 Yes
Morphine, Crude	0.0	0.0	0.0	5.3	-5.3	5.3	0.0	0.0
Mica Phlogopite Split.	1.9	1.0	0.9	3.0	-1.1	2.0	0.0	2.0 Yes
Diamond Dies, Small	2.7	0.0	2.7	1.1	1.6	1.1	0.0	0.0
Graphite, Natural, Ceylon, Amorphous Lump	12.3	9.9	2.4	10.7	1.6	0.8	0.8	0.0 Yes
Graphite, Natural, Other	2.0	1.6	0.4	2.0	0.0	0.4	0.0	0.4 Yes
Mica Muscovite Split.	18.9	21.6	-2.7	22.0	-3.1	0.4	0.0	0.4 Yes
Talc, Steatite Block & Lump	0.0	0.0	0.0	0.4	-0.4	0.4	0.0	0.0
Mica Phlogopite Block	1.1	0.5	0.6	0.7	0.4	0.2	0.0	0.2 Yes
Sapphire and Ruby	0.0	0.0	0.0	0.2	-0.2	0.2	0.0	0.0
Cordage Fibers, Abaca	82.2	0.0	82.2	0.0	82.2	0.0	0.0	0.0
Cordage Fibers, Sisal	22.7	0.0	22.7	0.0	22.7	0.0	0.0	0.0
Molybdenum Group	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 Yes
Natural Insulation Fibers	16.5	0.0	16.5	0.0	16.5	0.0	0.0	0.0
Pyrethrum	72.1	0.0	72.1	0.0	72.1	0.0	0.0	0.0
Bermanium	31.8	154.8	-123.0	0.0	31.8	-154.8	0.0	-154.8 Yes
** TOTAL **	<u>16117.8</u>	<u>691.0</u>	<u>15426.8</u>	<u>10057.0</u>			<u>5959.7</u>	

EVALUATION OF METHODOLOGY AND ASSUMPTIONS USED TO SET
STOCKPILE GOALS IN THE NSC STOCKPILE STUDY

NSC METHODOLOGY

The NSC study methodology followed the basic approach of prior studies but used different assumptions and different models (for example, the Wharton econometric model to determine the Gross National Product (GNP), rather than the Chase model).

Key participating agencies included NSC; the Central Intelligence Agency; the Council of Economic Advisors; the Departments of Commerce, Energy, Interior, Defense (DOD), State, and Treasury; the Federal Emergency Management Agency; the General Services Administration; and OMB.

The fundamental approach of the NSC study was to estimate material demand and supply for 3 years of war and compare the two. The study estimated material demand by (1) using macroeconomic models to estimate industry-output dollar levels for a wartime economy, and then (2) converting these industry-output levels into demands for critical materials expressed in physical units. The study estimated material supply by (1) estimating world production capacity of raw materials; and (2) subtracting some, but not all, materials demand from foreign countries; and (3) reducing overseas supply for such reasons as war damage, attrition during transportation, and reliability of foreign sources of supply.

The NSC study projected significantly reduced material demands and some increased supply relative to the prior study, and initially computed a stockpile goal of \$230 million, using October 1984 prices. The goal was subsequently increased to \$691 million, based on limited assumption changes and May 1985 prices. The limited changes increased material requirements for the defense and industrial sectors and reduced world supply.

PRELIMINARY GAO RESULTS

We found that the methodology used in the NSC study was similar, though improved in several respects, to that used in interagency studies in 1976 and 1979. However, some study participants expressed serious concerns about the reasonableness of the NSC assumptions, and about the NSC study's not adequately showing the impact of choosing alternative assumptions.

Our review raises questions about whether NSC study assumptions adequately reflect (1) defense planning assumptions and data, (2) past U.S. economic experience and economic projections by other groups, and (3) estimates of supply and demand made by industry representatives.

Inadequate analyses of the impact of assumption changes on stockpile goals

The NSC study did not include adequate sensitivity analyses to show the impact of changes in major assumptions. Key assumptions questioned by study participants included minerals-production levels, materials-use for a given level of industrial output, and selection of reliable foreign sources. Stockpile goals are extremely sensitive to changes in such assumptions.

Our review suggests that one of the most critical overall assumptions is the war scenario and associated wartime demand. Our tests of plausible upper limits of wartime demand showed potential goals to be far greater than the NSC's \$0.7 billion, even if the other NSC assumptions remain unchanged. These upper limits were determined using input from study participants, and from industry and economic experts. Another assumption, dealing with the capability of the United States to increase material supply, has less impact on stockpile goals, but may have significant impact when combined with the impact of other assumptions.

DOD and NSC wartime scenarios differ

Defense policy guidance as to the likely range of wartime effort differs from NSC's assumptions. Defense policy guidance to the military services instructs them to plan for a range of defense expenditures, including levels greater than those assumed by NSC. Also, the defense guidance indicates that a growing reliance among industrial democracies on foreign sources of supply poses a threat to national security, while the NSC study accepts increased reliance on foreign sources. Our ongoing work also indicates that some major categories of defense requirements may have been omitted from NSC's study. Specific data concerning the additional requirements is classified.

The NSC and OMB officials who coordinated the NSC study said that they believed that the NSC study's scenario was consistent with defense plans, and that any differences must involve the views of low-level DOD analysts. We will explore this issue further in our ongoing work, but the differences are not low level. They involve statements by top study participants and specific guidance by top DOD policy makers, including the Secretary of Defense.

Differences between NSC assumptions and other available data for U.S. economic activity

NSC's economic assumptions include small increases in GNP, which have the effect of reducing stockpile goals. The following two figures show data for wartime growth rates in GNP and the defense share of GNP. Included for comparison with NSC's estimates are actual data from World War II and the Korean War (to show actual U.S. wartime experience), and estimated data from the 1979 study (to show one other projection).

Figure II.1 shows that NSC assumed cumulative GNP increases during the warning year and 3 war years to total 17.8 percent. These increases were less than those assumed by the 1979 study (33.3 percent), and also less than those that actually occurred in the Korean War (25.7 percent) and World War II (65.4 percent). If the higher GNP increases favored by some study participants are assumed, it results in greater levels of production and a greater need for stockpiled material.

Figure II.1: Gross National Product Increases
(4-Year Compounded Increase)

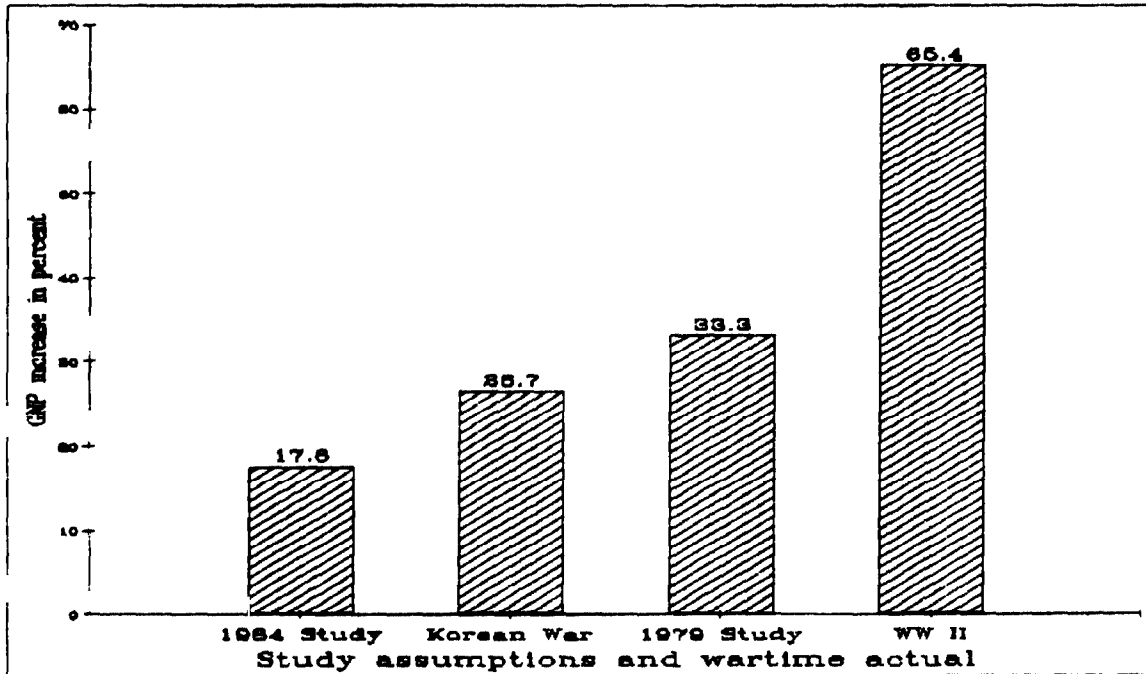
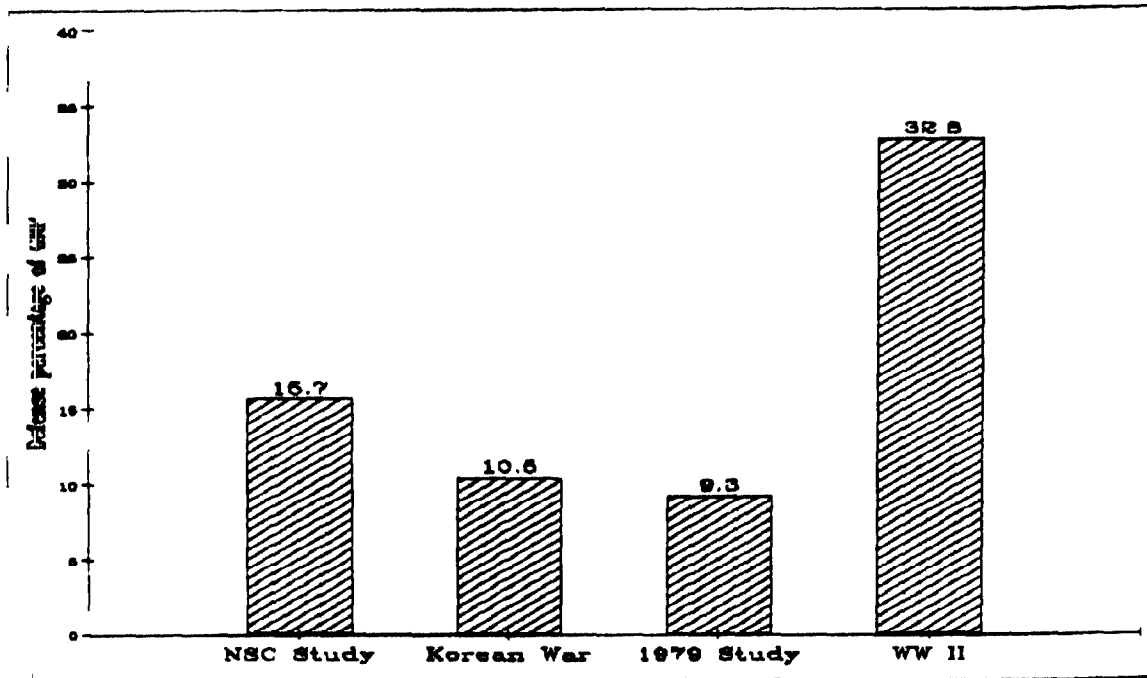


Figure II.2 shows that NSC assumed that a greater portion of GNP was devoted to defense expenditures during the war period than occurred in the Korean War or was assumed by the 1979 study. However, the NSC assumption was still far below actual experience in World War II.

Figure II.2: Defense Expenditures as a Percentage of GNP
(4-Year Average)



Comparing the NSC estimates with other estimates helps identify a reasonable range for analyzing assumptions, but is not intended to suggest that the NSC assumptions and resulting estimates should duplicate past experience or projections. However, comparative data are helpful in evaluating the economic conditions that are possible during wartime mobilization.

Impact of assumptions about defense-sector demand on national defense stockpile goals

To determine a plausible range of defense expenditures for sensitivity testing, we consulted with economic-modeling experts, and estimated defense expenditures using World War II experience with adjustments for changes since World War II. We found that, for sensitivity-testing purposes, the U.S. economy could operate with projected wartime defense expenditures 50 percent greater than the amount NSC used to compute stockpile goals, and that an upper limit could be about twice the amount NSC used.

We requested data on sensitivity analyses done by study participants, and were advised that nothing was documented beyond the limited tests described in the NSC report. The NSC tests were limited in that the tests for some assumptions covered only part of the possible ranges. Also, the tests simply adjusted output data for material supply and demand. The proper method of changing assumptions would have been to enter new defense expenditure data in the initial stages of the model-estimation process, and

allow the models to determine what material demand changes resulted. The method used did not measure possible secondary effects, such as production bottlenecks.

We believe that additional sensitivity analyses are needed to better determine the impact of different assumptions favored by key study participants and outside experts. We are attempting to reach a mutually satisfactory arrangement with NSC to perform the additional analyses using the NSC model. In the meantime, we are proceeding with limited and simple analyses of our own.

For example, the limited analyses described below address an expanded range for just two (defense-sector demand and programs to increase U.S. material supply) of numerous interrelated factors. We have been unable to do a full analysis because we do not have access to all of the models used in the NSC study. The data below is intended to show a need for accurate analyses of apparent wide swings in stockpile-goal levels, not to predict actual goals for a given set of assumptions.

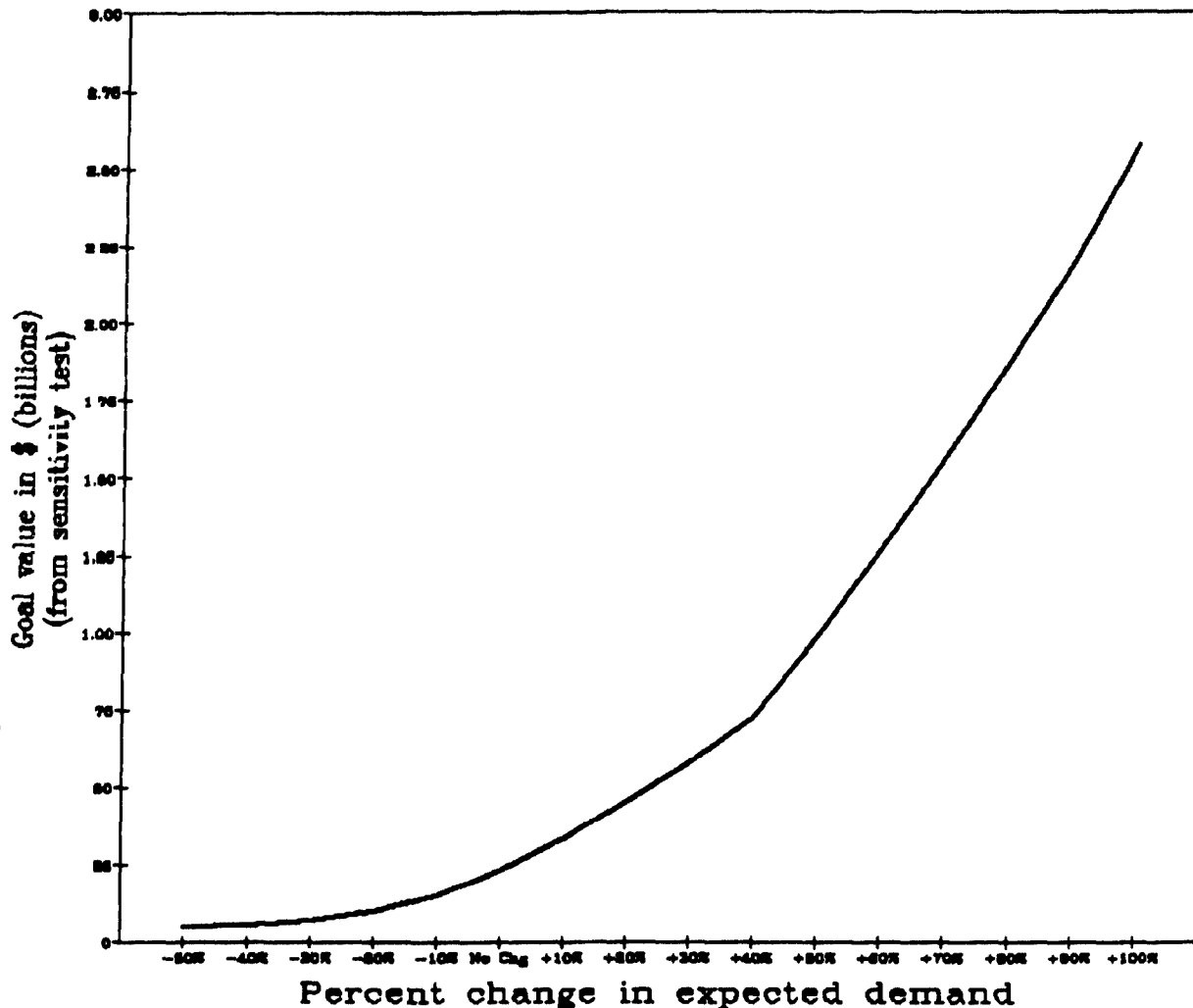
Effect of defense-sector material demand on stockpile goals

We found that different assumptions about defense-sector material demand within a plausible range (as suggested by our analyses and the opinions of study participants and outside experts) produced significant changes in stockpile goals. The significant changes occurred even though other NSC assumptions (such as those about U.S. production capacity and reliable foreign supply) were left unchanged. A 50-percent increase in defense-sector material demand more than quadrupled total stockpile-goal value. Doubling the defense sector material demand resulted in more than a ten-fold increase. Some materials, such as titanium, appeared particularly sensitive to changes in defense-sector demand.

Figure II.3 shows the sensitivity of total stockpile goals to changes over a range of demand from a reduction of 50 percent to an increase of 100 percent.

In commenting on our preliminary results, the NSC and OMB officials who coordinated the NSC study said that the U.S. economy is much different now than in the 1940s. They said that World War II should not be used as a basis for projecting increases in defense spending. We agree. For that reason, the upper limits of our sensitivity test for the defense sector assumed lower GNP growth (about 10 percent) than the 15 percent annual growth during World War II. We recognize that specific estimates of the size of the defense sector would likely fall below that upper limit. Nonetheless, we believe that it is useful to demonstrate ranges of stockpile goals and the assumptions associated with those ranges.

Figure II.3: Impact of Changes in Defense Sector Demand on Stockpile Goals



The NSC and OMB officials also commented that the highest goal resulting from this sensitivity test was still within the stockpile value recommended by the NSC study (\$0.7-billion goal plus \$6-billion supplemental reserve) and well below the current goal of \$16.1 billion. While we are performing additional analyses of how sensitive the stockpile goals are to changes in assumptions about various factors, the comments of NSC and OMB officials do not change our preliminary conclusions that:

- Stockpile goals are more sensitive to assumption changes than NSC concluded. The test described above shows that changes in just one of many possible factors caused goals to vary beyond the upper limit reached in the NSC's tests of several factors.

- The goals for some materials, such as titanium, are particularly sensitive to assumption changes. In our test described above, the upper limit for titanium need was greater than NSC's proposed goal and supplemental reserve combined. Further analyses could show that other materials likewise exceed both NSC's proposed goal and supplemental reserve.
- The combined effect of several key factors could be significantly greater than the effect of one factor alone. This is indicated by our test of the assumptions regarding one aspect of supply, which is discussed below.

Effect of programs to increase U.S. material supply

To alleviate shortfalls in materials available from reliable sources worldwide, NSC explored ways to increase domestic availability of such materials through such programs as opening new mines or reopening closed mines. Such programs are intended to raise supply above the levels achievable through surging existing facilities. Such additional programs alone did not appear to have great impact on stockpile goals, but the effect became significant when considered in conjunction with defense-sector demand.

For its base case, NSC assumed that such programs could increase supply for 29 different stockpiled commodities, generally during each year of a war. Some study participants and industry experts believed that such a large number of programs was not feasible simultaneously, saying that supply for perhaps only two or three materials could be successfully increased. The 1979 study assumed that no more than three materials could be increased through such programs, and those mainly in the third year of the scenario. Also, industry representatives told us that material supply would not be likely to increase as much or as quickly as NSC assumed.

For example, copper industry representatives told us that the U.S. smelter industry may not be able to handle the domestic ore production increases that the NSC study projected. Opening new smelters could raise capacity, but industry estimates of the time required to build a smelter ranged from 2 to 4 years.

If it is assumed that supply was increased for only three materials in the second and third years of the scenario, NSC's initial stockpile goal almost doubles (from \$230 million to \$445 million).

However, when combined with increased defense-sector demand, the impact was substantially greater. With a 50-percent increase in defense-sector demand, the lower assumptions for material supplies raised the stockpile goal by about \$.6 billion (from \$1 billion for increased defense-sector demand alone to \$1.6 billion). The reason for the increased impact is that, in many cases, a material's stockpile goal was zero, both with and without programs to increase supply. Thus, the factor had no impact by itself in those cases. When combined with increased demand, however, the

supply changes were sufficient to affect more materials goals.

Effect of NSC assumptions on other
mobilization preparedness issues

The Administration proposal stated that the NSC study assumptions "also will be used for other appropriate mobilization preparedness areas." Although official documents do not clearly identify the specific areas, NSC study participants stated that two potential uses were in deciding on requests for protection of U.S. industries endangered by foreign competition,² and on providing direct assistance to U.S. industries under the Defense Production Act of 1950.

The use of the NSC study assumptions could affect the implementation of the above Acts. For example, under the NSC assumptions, a lower than previous level of wartime material needs for manufacturing resulted in less need for stockpiled materials. By the same assumptions, it could be argued that with less manufacturing need, U.S. industry would need less assistance or protection from foreign competition. Conversely, assumptions that would require more manufacturing and stockpiling could be used as the basis for more assistance to, or greater protection of, U.S. industry. Thus, our concerns about the effect of assumptions used to set stockpile goals in the NSC study, also apply to the effect of the assumptions on other mobilization preparedness areas.

BASIS FOR INTERIM STOCKPILE PURCHASES OR DISPOSALS

The Administration's Fiscal Year 1987 Annual Materials Plan proposes purchasing 30,000 kilograms of germanium for \$30 million, and selling 37 materials for \$303 million. It also proposes selling 9 additional materials with no specified value. The plan notes that changes to existing legislation are required to implement it.

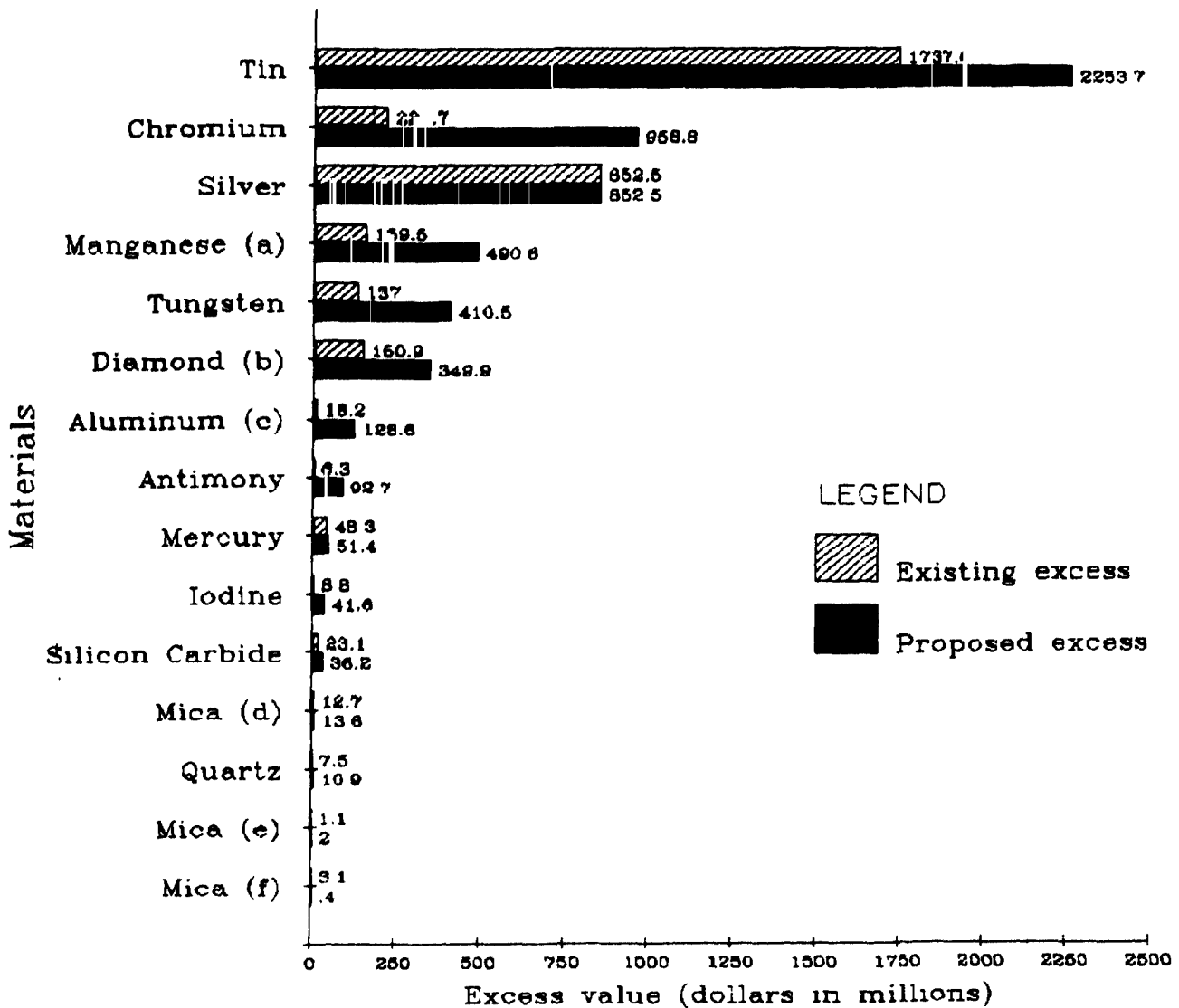
Because of congressional concerns about the adequacy of the NSC study as a basis for setting stockpile goals, decisions on identifying surplus materials for disposal could be further delayed. If some acquisitions and disposals were deemed necessary, however, alternatives may be available. For example, disposals could be considered from the about \$3.4 billion worth of

²Section 232 of the Trade Expansion Act of 1962 provides that the head of a federal agency or some other interested party may ask the Secretary of Commerce to determine the impact on national security of importing products to the United States. The Secretary may investigate and report his findings to the President, who may take such action as he deems necessary.

material where both the 1979 and NSC studies agree that current inventories exceed stockpile needs.

Figure II.4 focuses on the similarities between old and new goals. It shows the materials that both studies concluded were excess to U.S. national security needs. Only about \$146 million of the \$303 million the Administration proposes to sell are surplus under existing goals. (However, we are exploring initial indications that both the NSC and 1979 studies may have understated the requirement for tungsten).

Figure II.4: Stockpile Materials that Are Excess Under Both Existing and Proposed Goals
(Total Agreed Excess--\$3.4 Billion)



- a Chemical and metallurgical group
- b Industrial stones
- c Abrasive grain group
- d Muscovite film
- e Phlogopite splittings
- f Muscovite splittings

Although germanium is the only material that the current inventory falls short of both its current and recommended goals in terms of quantity, other inventory items may need improvements in quality. Commodity experts among the study participants and advisory committees say that some materials, such as cobalt, may need to be upgraded in quality to meet the needs for which the materials are being stockpiled. Using proceeds from the sale or barter of excess materials, or of moneys already available in the National Defense Stockpile Transaction Fund, would seem an appropriate means of accomplishing this upgrading and to purchase any needed materials.

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