

# **REPORT TO CONGRESS**

## **THE SUBMARINE INDUSTRIAL BASE AND THE VIABILITY OF PRODUCING ADDITIONAL ATTACK SUBMARINES BEYOND THE FISCAL YEAR 2017 SHIPBUILDING PLAN IN THE 2017–2030 TIMEFRAME**

**July 2017**

PREPARED BY  
PROGRAM EXECUTIVE OFFICE, SUBMARINES  
614 SICARD STREET  
WASHINGTON NAVY YARD, DC 20376

**The estimated cost of this report or study for the  
Department of Defense is approximately \$6,700 in  
Fiscal Year 2017. This includes \$3,000 in expenses  
and \$3,700 in DoD labor.  
Generated on 20170317 RefID: 2-EF9D24F**

## **Table of Contents**

### **Executive Summary**

- 1.0 Reporting Requirement**
- 2.0 Background and Submarine Acquisition**
- 3.0 The Capacity of the Submarine Shipyards and Vendor Base and Factors Limiting Submarine Production**
- 4.0 The Viability of Adding SSNs to Navy Shipbuilding Plans**
- 5.0 The Impact of Increasing Attack Submarine Production during the 2017–2030 Timeframe on Navy Undersea Force Levels**
- 6.0 The Impact of Increasing Attack Submarine Production on Overall VIRGINIA and COLUMBIA Program Costs and Workload Profiles**
- 7.0 Potential Efficiencies and Economies That Might Be Achieved in Increasing SSN Production**
- 8.0 Summary**

## **EXECUTIVE SUMMARY**

The VIRGINIA Class Submarine (VCS) program is healthy and maintaining a construction rate of two SSNs per year. The Navy is committed to maintaining this rate as long as feasible within budgetary constraints.

The Navy assesses that procurement of additional attack submarines beyond those in the FY 2017 shipbuilding plan is viable, and would have a positive effect on the overall submarine industrial base cost and workload profiles. In particular, the procurement of VCS with the Virginia Payload Module (VPM) at a steady cadence of two per year during the procurement years of the COLUMBIA Class SSBNs is achievable, and would provide benefit to Navy's attack submarine force inventory. Maintaining a two per year VCS procurement cadence will result in the procurement of seven additional SSNs over the FY 2017 – FY 2030 timeframe. This ramp up in production will require increased management and investment, jointly managed by both the Navy and the shipbuilders, to ensure all aspects of the nuclear shipbuilding enterprise are prepared. The key areas of concern are shipbuilder facilities, work force readiness (manpower ramp up), and supplier/vendor industrial base health.

As increased VCS procurements will present facilities, manpower, and vendor base challenges additional to those already presented by the baseline FY 2017 shipbuilding plan, the Navy is working closely with the shipbuilders to ensure that these issues can be managed successfully and without negatively impacting the COLUMBIA Class program. A stable construction plan and adequate funding lead time are critical to stabilize the vendor base health, and will also be needed to allow for facilities and manpower ramp ups at the shipyards to meet the increased workload volume. Maintaining a steady VCS procurement cadence would result in added labor and economic order quantity (EOQ) efficiencies, optimization of production facilities, and elimination of costly production surges and gaps, reducing VCS costs across the respective block buys.

The Navy continues to work with Congress to ensure authorities are in place to maximize acquisition efficiency and cost savings opportunities. In particular, near-term Congressional support in the form of multi-year procurements (MYP), EOQ, and buying across shipbuilding programs will be required in order to provide adequate lead time for industrial base preparations. During the years of COLUMBIA procurement, additional shipbuilding funding will be required in order to procure additional attack submarines without negatively impacting other Navy ship procurement programs.

The Navy is committed to working closely with Congress and industry to provide continued stability, acquisition efficiency, and cost savings opportunities to best support the production of additional attack submarines beyond the Navy's current shipbuilding plan.

## **1.0 Reporting Requirement**

House Report 114-537, accompanying H.R. 4909, the National Defense Authorization Act for Fiscal Year (FY) 2017, directed the Secretary of the Navy to submit a report on:

The submarine industrial base and the viability of producing additional attack submarines beyond the fiscal year 2017 shipbuilding plan in the 2017–2030 timeframe. This report should address the following specific elements:

- (1) The capacity of the submarine shipyards and vendor base and factors limiting submarine production;
- (2) The viability of adding SSNs to Navy shipbuilding plans;
- (3) The impact of increasing attack submarine production during the 2017–2030 timeframe on Navy undersea force levels;
- (4) The impact of increasing attack submarine production on overall Virginia and Ohio Replacement program costs and workload profiles; and
- (5) Potential efficiencies and economies that might be achieved in increasing SSN production.

## **2.0 Background and Submarine Acquisition**

This report assesses the submarine industrial base and the viability of producing additional attack submarines beyond the FY 2017 Shipbuilding Plan. Subsequent to the approval of the Navy's FY 2017 Annual Long Range Plan for Construction of Naval Vessels, the Navy added an additional VIRGINIA Class submarine (VCS) in FY 2021 as part of the FY 2018 President's Budget (PB18). Currently the Navy plans to procure attack submarines at a rate of two per year as long as feasible within budgetary constraints. The feasibility of producing additional attack submarines beyond FY 2023 is dependent upon the ability of the industrial base to accommodate the increased workload volume. The assessment of the submarine industrial base focuses on two programs: VIRGINIA Class attack submarines (SSNs) constructed with the VIRGINIA Payload Module (VPM) and COLUMBIA Class ballistic missile submarines (SSBNs).

The VCS program is in full rate production and Congress has authorized construction at a rate of two per year. Fourteen ships have been delivered and eleven additional ships are under construction. The program was originally planned to be a 30-ship class, but the program's Acquisition Program Baseline was updated in February 2017 to extend the class to 48 ships. VPM, a hull section inserted amidships, will provide additional strike capacity starting with the second hull in FY 2019. The Navy's intention is to add to that baseline in future budgets by maintaining a two per year procurement rate throughout the remainder of VCS program.

The COLUMBIA Class program is an Acquisition Category ID Major Defense Acquisition Program, which completed Acquisition Milestone B in January 2017 and is currently in the Engineering and Manufacturing Development phase. The planned acquisition of 12 COLUMBIA SSBNs will recapitalize the current class of 14 OHIO Class SSBNs to meet national sea-based strategic deterrent requirements.

General Dynamics Electric Boat (GDEB) was selected as the prime contractor for COLUMBIA Class with the responsibility for design and delivery of the 12 COLUMBIA Class submarines. Huntington

Ingalls Industries – Newport News Shipbuilding (HII-NNS) will participate in the design and construction of major COLUMBIA Class assemblies and modules leveraging their expertise with VCS construction. Both shipbuilders will continue to deliver VCS throughout the period with GDEB continuing its prime contractor responsibility for the program. Given the priority of the COLUMBIA Class, deliveries of VCS will be adjusted with HII-NNS performing additional deliveries.

Figure 1 shows the FY 2017 Submarine Shipbuilding Plan augmented by the FY 2021-2 VCS added in PB18.

FY	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL
SSN	VA BLK IV		VA BLOCK V					VA BLOCK VI					VA BLK VII		
	2	2	2	2	2	2	2	1	2	1	1	1	1	1	22
SSBN					COLUMBIA Class BLOCK I				COLUMBIA Class Follow-on Ships						
					1			1		1	1	1	1	1	7
TOTAL	2	2	2	2	3	2	2	2	2	2	2	2	2	2	29

Figure 1: FY 2017 Submarine Shipbuilding Plan for FY 2017-2030 modified by the PB18 addition of the FY21-2 VCS

The Navy continues to explore every possible opportunity to affordably procure ships and reduce risk across its programs. The Navy continues to focus on maintaining a viable submarine industrial base, while engaging closely with its shipbuilders GDEB and HII-NNS to optimize capacity and capability across the shipbuilders and alleviate workload instabilities. The shipbuilders in turn have engaged with their sub-vendors to assess their capability and capacities.

## 2.1 The 2016 Navy Force Structure Assessment

In December 2016, the Chief of Naval Operations completed a Force Structure Assessment (FSA) to determine the right balance of existing types of forces – ships currently under construction and planned procurement – needed to address the evolving and increasingly complex threats the Navy must counter in the global maritime commons. The FSA detailed a long-term requirement for 355 ships in the battle force, assuming the Navy continues to replace the ships we have today with ships of similar capability and employs them using similar concepts of operations. For attack submarines, the 2016 FSA identified 66 SSNs as the objective force to provide the global presence required to support national tasking and prompt warfighting response, as compared to 48 SSNs in the 2012 FSA.

## 3.0 The Capacity of the Submarine Shipyards and Vendor Base and Factors Limiting Submarine Production

While the Navy has assessed that the submarine industrial base is capable of meeting the submarine demand currently programmed, efficiently building submarines will present challenges if VCS production continues at two per year for the life of the program. As shown in figure 1, two VCS per year is the current construction rate. Maintaining that rate for the VCS industrial base will provide a steady, level workload. The challenge will be the addition of VPM in VCS while simultaneously adding COLUMBIA construction. The construction risk is ensuring the industrial base is adequately preparing

the facilities, manpower, and supplier base for the increased workload across the nuclear shipbuilding enterprise.

GDEB, HII-NNS, and the unique submarine industrial base can, with adequate lead time, sustain a two per year VCS (with VPM) pace during the COLUMBIA Class construction period. Both shipyards have developed a Facilities Master Plan (FMP), a Resource Master Plan (RMP) and an Enterprise Material Procurement Plan designed to be flexible and scalable to support increased demand in the Navy 30-Year Shipbuilding Plan. Producing seven additional VCS during the FY 2017–2030 timeframe will be a challenge to the submarine industrial base that can be solved only if the shipyards are given sufficient time to adjust facility plans, develop their work forces, and expand the vendor base.

For amplifying information on the industrial base capacity to simultaneously build COLUMBIA Class and VCS, please reference the 21 April 2016 Report to Congress titled *Assessment of the Industrial Base Impact of Building OHIO Replacement Submarines, VIRGINIA Class Submarines with VIRGINIA Payload Module (VPM), and VIRGINIA Class Submarines without the VPM Simultaneously, and the Feasibility of Accelerating VPM.*

### **3.1 Factors limiting Submarine Production and Shipbuilder Actions to Address**

The three major factors that limit the ability to increase submarine construction at GDEB and HII-NNS are facilities, labor resources, and vendor base capability and capacity.

#### **3.1.1 Facilities**

Both shipbuilders have already identified and planned for the facilities projects necessary to support the demands placed on the submarine industrial base by simultaneous production of VCS (with VPM) and COLUMBIA at a total of two submarines per year. These projects, including new facilities at all three yards, are in various stages of planning and completion, and remain on track to support the existing programs of record.

However, sustaining a two per year VCS cadence through the COLUMBIA years (for a total of three submarines in many years) will require additional resources beyond those scheduled in the current FMPs, as existing facility footprint used for VCS would no longer be able to be repurposed and consumed by COLUMBIA. GDEB's Quonset Point facility would need to accelerate and increase its module construction and outfitting facilities, GDEB's Groton facilities would require approximately an additional 275,000 Sq. Ft. of building space in two facilities, and HII-NNS would require procurement of an additional automated fixture as well as approximately 495,000 Sq. Ft. of associated building and assembly space. Completion dates for various facilities improvements range from 2020 – 2025 to support two VCS per year, plus one COLUMBIA.

#### **3.1.2 Labor Resources**

GDEB and HII-NNS have demonstrated that they are capable of hiring and training workers to meet increased volume of submarine shipbuilding. Both GDEB and HII-NNS have RMPs in place to support the need for skilled shipyard trade labor and trade supervision resources in support of an increased SSN volume. Navy estimates for maintaining two per year VCS are addressed in section six of this report.

Supporting higher manning levels at GDEB facilities would require additional site infrastructure as well as a scaling-up of workforce development efforts. GDEB is currently working with the states of Connecticut and Rhode Island to ensure pre-employment resource pipelines are sized to provide proficient trade labor in the quantities and rates needed to support continued two per year VCS production.

At HII-NNS, maintaining a two per year VCS build rate results in a more level loaded labor requirement than that of the FY 2017 Shipbuilding Plan. With a timely demand signal, HII-NNS does not foresee any labor resource issues from the additional workload.

### **3.1.3 Vendor Base Capability and Capacity**

The shipbuilders are actively addressing the limitation of vendor base capability and capacity. Improved communication with vendors on future demand and schedules will allow the vendor base to better optimize its operations, plan investments, mitigate risk, and potentially reduce costs.

Increasing VCS volume at the shipyards, especially in Block VI and VII, would cause the vendor base to increase labor and make incremental increases in facilities and capital equipment. Existing vendors, given sufficient stability in the Navy Shipbuilding Plan and with adequate funding lead time, should be able to develop their workforce and commit capital investment to support increased demand. Incentives and/or capital investment for facilities and workforce development will be needed in the near term due to the relatively short period of time before beginning COLUMBIA construction.

Major initiatives are in process or under consideration to address vendor base challenges. Of particular note among these, Multi-Program Material Procurement is an efficiency that will benefit from additional attack submarines by allowing shipbuilders and critical vendors to realize savings from the purchase of bulk materials for common parts across submarine platforms. Multi-Program Material Procurement will have the cumulative effect of stabilizing workforce hiring and increasing productivity, reducing the labor needed for simultaneous VCS and COLUMBIA Class procurement, and enable the Navy to achieve cost and schedule benefits.

The shipyards are in the process of surveying the existing vendor base, including assessing their plans to scale up capacity and capability. Certain industrial sectors have known risks and will require close monitoring to ensure combined program success, such as castings, forgings, large machinery, and engineered components with extensive assembly and testing. Obsolescence and the diminishing number of quality vendors also require close attention and management. Given the recent increases in demand associated with the transition to two VCS per year (starting in 2011) and the impending increase driven by the concurrent build of COLUMBIA Class and VCS (with VPM), it is critical for the Navy and shipbuilders monitor and address supplier health, provide funding to allow for the most efficient build, and to continue proactive engagement with vendors.

## **3.2 Impacts of Adding SSNs on the Nuclear Propulsion Vendors**

All nuclear propulsion vendors and their sub-tiers are in a position to be able to support the construction of additional VCS given appropriate time to plan and make necessary capacity adjustments. This takes into account that the nuclear industrial base was sized in the mid-2000s for supporting two VCS per year

and one aircraft carrier construction every four to five years. Three large nuclear propulsion vendors will commence preparations during calendar year 2017 to support the increased VCS construction efforts during SSBN recapitalization. These vendors require a mix of facility, equipment, personnel, subcontracting, and/or sub-tier investments to prepare for the increased level of production.

#### 4.0 The Viability of Adding SSNs to Navy Shipbuilding Plans

Procurement of additional attack submarines during the years of COLUMBIA class acquisition would require a higher Shipbuilding and Conversion, Navy (SCN) top line during years of execution or adjustments to the naval vessel procurement plan.

Additional Congressional authorizations and appropriations, for example advance procurement and EOQ, would be required in the near-term to provide adequate lead time for industrial base preparations.

The Navy has requested increases in top line funding commensurate with the funding required to procure the COLUMBIA. In order to procure these vessels, without impacting remaining procurement plans, the Navy will continue to need increases in top line beyond the Future Years Defense Program (FYDP) or will have to look elsewhere in its procurement plans for relief. Affordability is key and the Navy is working with Congress in discussing the types of authorities (multi-year procurements (MYP), EOQ, buying across shipbuilding programs, etc.) and the design and build of the COLUMBIA to drive affordability into the programs and balance the industrial base.

#### 5.0 The Impact of Increasing Attack Submarine Production during the 2017–2030 Timeframe on Navy Undersea Force Levels

The Navy is assessing a potential increase to the number of attack submarines above the levels in the FY 2017 Shipbuilding Plan. Maintaining the build plan to two VCS per year through 2030 would yield seven additional SSNs as compared to the FY 2017 Shipbuilding Plan as shown in Figure 2.

FY	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL
SSN	VA BLK IV		VA BLOCK V					VA BLOCK VI					VA BLK VII		28
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SSBN					COLUMBIA Class BLOCK I				COLUMBIA Class Follow-on Ships						7
					1			1	1	1	1	1	1	1	
TOTAL	2	2	2	2	3	2	2	3	2	3	3	3	3	3	35

Figure 2: FY 2017 Shipbuilding Plan plus PB18 addition of 2nd VCS in FY 2021. Continues VCS at two per year through FY 2030 highlighting the alignment of COLUMBIA Class with VCS Blocks V–VII

Key benefits include:

- Creates alignment between the programs prior to steady production of two VCS and one COLUMBIA per year in FY 2026.
- Provides contract stability that encourages shipbuilders and vendor investment in facilities and workforce development, which supports best pricing.



- Better enables workload leveling across programs.
- Accelerates VCS material procurement, which creates additional economic benefit for the more than 3,000 submarine industrial base vendors across 47 states, and potentially creates opportunity for new vendors that will be needed to support strategic sourcing from the shipbuilders.

Increasing VCS production to two per year during the planned COLUMBIA authorization years and beyond will reduce the SSN gap in the FY 2017 Navy Shipbuilding Plan (based on the 2012 FSA goal of 48 SSNs) by 55 percent. Figure 3 shows this increased SSN production, with the black line depicting the FY 2017 Shipbuilding Plan. The gap would be reduced to 23 SSN-years instead of the current 47 SSN-years. The trough duration would be eight years instead of 18 and the low point for SSNs would be 43 vice 41 in FYs 2028–2029.

As shown in the following graph, implementing a goal of reaching 66 SSNs, as reflected in the 2016 FSA, increases the gap to 442 SSN-years. Maintaining the current two per year SSN production will result in reaching 66 SSNs in FY 2048.

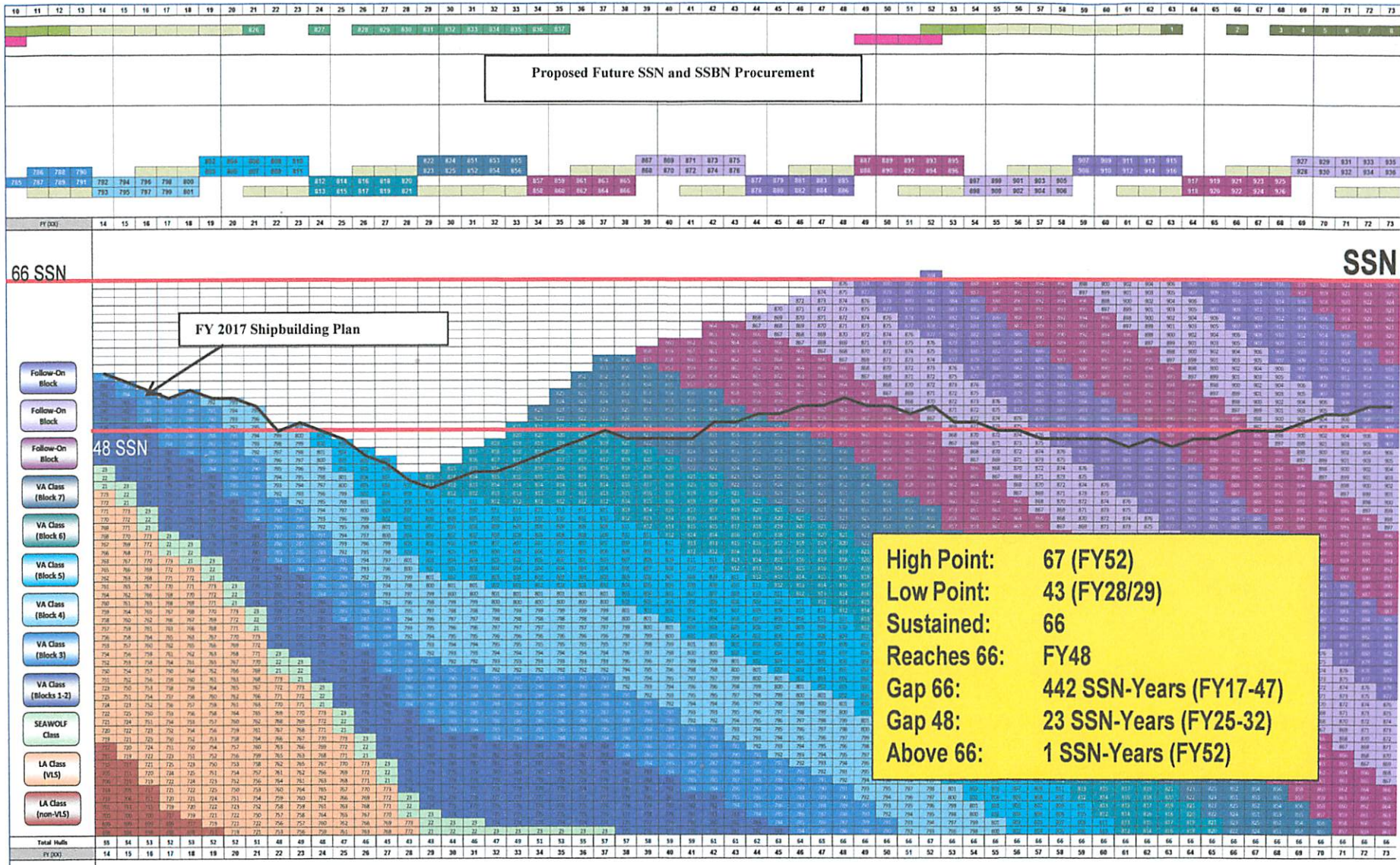


Figure 3: Submarine Force Structure with two SSNs per year

## **6.0 The Impact of Increasing Attack Submarine Production on Overall VIRGINIA and COLUMBIA Program Costs and Workload Profiles**

Beyond the added cost of the ship, adding one VCS to Block V will lead to an estimated additional cost savings of approximately \$230 million across the Block due to added workload and efficiencies. Due to ongoing negotiations for future MYP contracts, the overall cost and savings impact of adding four additional VCS to Block VI and five additional VCS to Block VII to maintain two per year construction has not yet been determined. The Navy estimates that the previous three MYP contracts (FY 2003-2008, 2009-2013, and 2014-2018) achieved savings of greater than 10 percent, as compared to annual procurements. For the fourth contract for FY 2019-2023 (Block V), as noted in the PB18 MYP budget exhibits, the Navy is estimating that the expected savings will be 14.4 percent, or in excess of \$5.4 billion, for the multiyear approach for 10 ships as compared to annual procurement contracts.

The Navy estimates that at GDEB the average FTE between FY 2017 – FY 2030 would increase from approximately 8,400 to 9,000 with the peak being in 2030 with approximately 13,000 FTE, while at HII-NNS the average FTE during the same timeframe would increase from approximately 12,800 to 13,300 (which includes CVN construction), with peak manning hitting approximately 18,000 FTE in 2026 if two per year VCS was maintained through FY 2030.

## **7.0 Potential Efficiencies and Economies That Might Be Achieved in Increasing SSN Production**

Maintaining two VCS per year production during the planned COLUMBIA procurement years would result in expected labor rate savings due to increased volume; labor hour savings from continued learning process and efficiencies in service and support functions; material savings resulting from increased EOQ efficiencies; additional common material procurement across Navy nuclear programs savings; and the continuation of the two VCS per year build plan at a predictable steady state production rate without the impact of breaks.

Two VCS per year production would reduce overhead and lead to the retention of highly trained personnel resulting in improved quality, cost and schedule benefits and a stable, ready, and experienced workforce. Operationally, producing two VCS per year would lead to a reduction of the SSN shortfall, resulting in more capable, proven undersea warfare assets in the Fleet.

## **8.0 Summary**

The Navy assesses that the submarine industrial base is capable of meeting the demand for SSBN and SSN construction outlined in PB18. However, challenges remain in efficiently constructing the planned submarine profile. Both shipbuilders are actively planning to meet the manpower increase required for the lead COLUMBIA submarine. This is an area of ongoing Navy attention with GDEB and HII-NNS.

The Navy is working closely with both shipbuilders to ensure that facilities are available in time to produce COLUMBIA and VCS with VPM and are implementing initiatives to increase insight into the industrial base. Proactive management of all vendors is essential to ensure high quality products and materials are received on time to support construction. The Navy will continue to aggressively pursue

the mutual objectives of improving the affordability of our shipbuilding programs and increasing the health of the submarine industrial base.

The sustainment of the two per year VCS production rate during the procurement years of the COLUMBIA Class SSBNs is achievable and provides significant benefit to the Navy and the SSN force structure. The major challenge will be the cost to procure additional attack submarines.

The Navy is analyzing the budget requirements to maintain the VCS program at a two per year production rate. Using the second FY 2021 VCS in PB18 as an example, the Navy will evaluate the costs associated with adding a second ship in all ensuing years where only one VCS is programmed. The underlying premise is that the addition of any VCS will not adversely impact the schedule and on-time delivery of the COLUMBIA Class program.

The Navy is committed to working closely with Congress and industry to provide continued stability, acquisition efficiency, and cost savings opportunities to best support the production of additional attack submarines beyond the FY 2017 Shipbuilding Plan.