The Contribution of the Groton Naval Sub Base and the Electric Boat Company to the Economies of Connecticut and Southeastern Connecticut

State of Connecticut

Economic Impact Analysis

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THE CONTRIBUTIONS OF THE NEW LONDON NAVAL SUB BASE AND THE ELECTRIC BOAT COMPANY TO THE ECONOMIES OF CONNECTICUT AND SOUTHEASTERN CONNECTICUT

A Department of Economic and Community Development Economic Impact Analysis

At the direction of Governor M. Jodi Rell, the Connecticut Department of Economic and Community Development (DECD) has conducted a study to estimate the contributions that the U.S. Naval Submarine Base New London in Groton, Connecticut (New London Naval Sub Base) and the Connecticut operations of the Electric Boat Company make to the Connecticut and Southeastern Connecticut economies. This report presents the results of that analysis.

I. INTRODUCTION

The New London Naval Sub Base and Electric Boat Company are a significant part of the Connecticut and Southeastern Connecticut economies. The results of this study confirm this fact. The co-location of the New London Naval Sub Base and Electric Boat Company in New London County create synergies that provide enormous benefit to our nation's national defense and manufacturing base.

These two entities contribute approximately $3.3 billion to the state's Gross State Product (GSP) and are responsible for approximately 31,500 direct and indirect Connecticut jobs.

Purpose of Study

The primary purpose of this study is to estimate the contribution made by the New London Naval Sub Base and the Electric Boat Company's shipbuilding and ship maintenance operations to the economies of Connecticut and Southeastern Connecticut.

This study was designed to estimate the contributions of the New London Naval Sub Base and the Electric Boat Company to the Connecticut and Southeastern Connecticut economies. The process began with a review of the body of existing work that had been done in this area, primarily several impact studies that specifically address the New London Naval Sub Base and Sub School, the Electric Boat Company (or both) and/or the economic landscape of Southeastern Connecticut. (A brief summary of these studies is included in this report.) The DECD then developed an impact analysis methodology for measuring the subjects' economic contributions. Modeling scenarios were devised and the variables necessary to run simulations were selected. Data was collected from numerous sources and the analysis was conducted.

This report is not intended to make recommendations about the base itself or Electric Boat directly, nor is it intended to be an analysis of strategic advantages or political realities. Rather, its sole purpose is to provide an economic impact analysis (EIA) of two important assets to the regional and state economies.

Assumptions and Inputs

In an effort to estimate the contribution of the New London Naval Sub Base and the Connecticut operations of the Electric Boat Company, seven scenarios were developed and modeled using two different models, the Regional Economic Modeling, Inc. (REMI) Policy Insight™ model, and the federal Bureau of Economic Analysis' Regional Input-Output Modeling System (RIMS II). Data to support these scenarios was collected from numerous sources and analyzed.

The scenarios modeled are as follows:

1. The contributions of the New London Naval Sub Base and the Naval Sub School.

2. The contribution of the New London Naval Sub Base.

3. The contribution of the Naval Sub School.

4. The contributions of the New London Naval Sub Base, Naval Sub School, and the Electric Boat Company.

5. The contributions of the New London Naval Sub Base, Naval Sub School, and the Electric Boat Company (with reduced activity).

6. The contribution of the Electric Boat Company.

7. The contribution of the Electric Boat Company (with reduced activity).

These scenarios were selected because they break the Naval Facility down into its major constituent components. This allows for the analysis of different combinations of activities, ultimately eliciting a range of impacts that represent the full spectrum of value that the state and local economies derive from the presence of the Naval facility and the Electric Boat Company.

Due to the unique and interdependent relationship between the New London Naval Sub Base and the Electric Boat Company, it is important to measure the contributions of each entity and their combined contribution. Two of the aforementioned scenarios examine the combined economic impact of the sub base and the company.

Sources for the supporting data include the New London Naval Base, the Electric Boat Company, the Sub Base Realignment Coalition, the U.S. Department of Defense (DOD) and publicly available documents.

II. REVIEW OF PREVIOUS STUDIES

The contributions of the New London Naval Sub Base and the Electric Boat Company have been measured by numerous studies over the years. **Note:** None of the data appearing in this section was used in the current estimation of the contribution of the New London Naval Sub Base and/or the Electric Boat Company.

A Summary of the Findings of Previous Economic Impact Studies of the New London Naval Sub Base and/or the Electric Boat Company.
The University of Connecticut's Connecticut Center for Economic Analysis (CCEA) prepared several studies from 1993 to 1995 examining the potential effects of spending and employment reductions that would be the result of the closure and/or realignment of the New London Sub Base. All of these studies employed the REMI Policy Insight Model, developed by Regional Economic Models, Inc., the "REMI" model.

Groton-New London Submarine Base Closing: An Economic Impact Study[1], *3/17/93*
This study examined the loss of 4,655 military positions at the New London Naval Sub Base. This loss was combined with the alternative of relocating 3,542 Orlando, Florida naval training positions to Connecticut for a net loss of 1,113 military positions and 1,114 civilian positions, or 2,227 "direct" jobs. Four cases were examined: (1) Gain Orlando/Previously "normal" defense expenditure reductions, (2) Gain Orlando/1993 expenditure level cuts, (3) No Orlando previously projected cuts, (4) No Orlando/1993 projected cuts. With Orlando, total State employment falls 2,714 by 2000. Without Orlando, employment drops by 8,414 (Cases I and III). With Orlando, jobs fall by 698 by 2000, and without Orlando by 2,201 (Cases II and IV).

Defense Spending Cuts in New London County: An Economic Impact Study[2], *5/11/93*
Having acquired, with DECD funding, the New London County REMI model, the CCEA examined the impact on New London County and Connecticut both in terms of job loss and population loss under four scenarios: "Worst case 1"—all known defense cuts and base closure resulting in 31,323 lost jobs (21% of New London County workforce); "Navy recommendation case 2" – all known defense cuts and base closure, but Orlando moves to Groton resulting in 26,122 lost jobs (17.6%); "status quo case 3" – retain the sub base but cut Electric Boat employment to 7,500 by 1997 resulting in 23,651 lost jobs (16%); "best case 4" – retain base with all known and planned cuts including the Electric Boat Company cuts resulting in a loss of 20,052 jobs (13.6%). All had "an enormous effect."

Navy's Recommendations for New London County to the BRAC Commission[3], *5/5/95*
In this study CCEA examined the impact of three realignment and closure scenarios. Case A: Navy recommendations are carried out in combination with already executed cuts and the Electric Boat Company, closing of the Naval Undersea Warfare Center, and transfer of the Naval Nuclear Training School to South Carolina. This results in 14,003 jobs lost and an $837 million reduction to GSP. Case B: same as Case A, but with the addition of the Training School transferred to Groton. This results in 11,020 jobs lost and a $916 million reduction to GSP. Case C: Only the NUWAC is closed. This results in the loss of only 2,015 jobs and an $89 million reduction in GSP.

More recently, in 2004 the Southeastern Connecticut Enterprise Region (seCTer) and the Southeastern Council of Governments contracted with Mt. Auburn Associates, PPSA, and CERC to prepare a *Comprehensive Economic Development Strategy* (CEDS) for the U.S. Economic Development Administration. This report, while not specifically focused on the

contribution of the New London Sub Base or the Electric Boat Company to the economy of southeastern Connecticut, does include the contribution of these two entities in its examination of the southeastern economic landscape. The authors of the study modeled the impact of the closure of the Sub Base using the IMPLAN econometric model. The results of their econometric analysis concluded that the "economic impacts associated with the closing of the Submarine Base would be quite severe and long lasting. Our analysis suggests that if both the base and the Electric Boat were to close, local impacts in New London would include the direct and indirect loss of $2.4 billion in industry sales, the direct loss of more than 15,000 jobs, as many as another 8,000 due to the ripple effect, and a 15 percent drop in the gross regional product."[4]

III. NEW LONDON SUB BASE HISTORY AND CHARACTERISTICS

History

The Naval Submarine Base New London is the Navy's first Submarine Base and is currently the home of the nation's "Submarine Force." In 1868, the State of Connecticut gave the Navy 112 acres of land along the Thames River to build a Naval Station. The base was originally used as a coaling station by Atlantic Fleet small craft, however on October 13,1915, the monitor Ozark, a submarine tender, and four submarines arrived in Groton and shortly there after additional submarines and support craft arrived and the facility was named as the Navy's first Submarine Base. Following World War I the Navy established schools and training facilities at the base.[5, 6]

Location

The New London Naval Sub Base is located on the eastside of Thames River in Groton, Connecticut, across from the city of New London. Although the base is physically located in Groton, Connecticut, the base originally had its main offices and housing in the larger city of New London, and hence was christened as Naval Submarine Base New London.[7]

The location of the Sub Base provides many benefits to the Navy. It is located in a "protected harbor" which offers protection from adverse weather. It is in close proximity to the Electric Boat Company – the leading submarine builder and servicer and it provides Naval personnel and their families access to a high quality of life.

Salary.com, a national Web site specializing in salary and compensation data, recently conducted a national survey to find the best and worst "U.S. cities in terms of affordability." The survey looked at "a variety of financial factors, ranging from median salaries to unemployment rates and the cost of living. Those factors determined this year's 'best and worst' rankings of what it termed 'profitable cities,' or <u>those places where workers can get more out of their paychecks</u>."[8]

Dan Malachowski of Salary.com asks the question: "Have you ever considered becoming a resident of the historic whaling port of New London, Connecticut?" He describes the community as follows: "An old colonial town founded in 1646, New London is set between New York and Boston and is home to the U.S. Coast Guard Academy, as well as Connecticut College." He goes on to state that, "this colonial gem is not stuck in the past. New London topped our list with salary ranges above the national average, a low cost of living, and a low unemployment rate."[9]

In contrast, San Diego, another city home to a naval facility, made it into the bottom five cities on the list because of its high cost of living.[10]

Land and Facilities

Along with 36 acres at Fife Park, the main base currently occupies more than 687 acres containing approximately 230 major buildings with an approximate replacement value of $914,000,000. The base also has over 530 acres of family housing comprised of 2,101 Navy housing units plus 75 units at the Navy Lodge and 12 barracks with 1652 units, plus 150 units at the Groton Chalet. The base is home to more than 70 tenant commands. Approximately 12,000 family members and 12,000 retirees utilize the bases facilities annually along with over 15,000 additional USA/USAF/USCG/USMC personnel. The base has a combined annual electricity/water/gas/sewer bill of $17,870,000.[11]

The base is also homeport to 1 Floating Drydock (ARDM-4) operated by Electric Boat, Naval Research-1, the Navy's Nuclear-Powered Research Submarine and the Naval Research -1 Support Ship.[12]

Personnel and Payroll
There are 7,800 military personnel stationed at the base and over 650 reservists drill there annually – which amounts to 167 full-time equivalent jobs in the economy (see methodology). The base employs 1,400 civilians and over 1,000 contractors. Annual military and civilian payroll is approximately $452,000,000.[13]

Submarines Stationed:
The base is homeport to 18 Nuclear Attack Submarines: [14]

- 14 LOS ANGELES Class (7 SSN-688 (2 VLS), 7 SSN-688I)
- 3 SEAWOLF Class (SSN-21)
- 1 VIRGINIA Class submarine – VIRGINIA (SSN-774)

Major Tenant Commands
There are more than 70 Tenant Commands located on the New London Sub Base. The major commands include:

- **Commander Navy Region Northeast**
  This command is "headed by a flag officer, exercises military command over and provides primary support to Navy shore installations from New Jersey to Maine. Falling within Northeast Region's area of responsibility are: Naval Submarine Base New London; Naval Air Station, Brunswick, Maine; Portsmouth Naval Shipyard, Kittery, Maine; Naval Weapons Station, Earle, NJ; Naval Air Engineering Station Lakehurst, NJ; Naval Support Unit Saratoga Springs, NY; and Naval Station Newport, RI."[15]

- **Commander Submarine Group TWO**
  This command is "headed by a flag officer, exercises command of Commander, Submarine Forces, U.S. Atlantic Fleet forces administratively assigned and operation control of units of other forces when assigned. The primary purpose of Group TWO is to provide support, maintain personnel and material readiness, standards and work for increased economy and efficiency."[16]

- **Naval Submarine Support Center**
  This command is "responsible to centralize administrative control and support functions, economize resources and provide a common pool of experts by providing complete functional support to the Squadron Commander of Submarine Squadrons TWO and FOUR, and Submarine Development Squadron TWELVE, in the areas of Administration, Medical, Legal, Chaplain, Supply, Combat Systems, Engineering, Communications, and operations."[17]

- **Submarine Squadron TWO**
  "Squadron TWO's mission is to carry out the assigned tasks designated by Commander Submarine Force U.S. Atlantic Fleet; to provide operation direction as well as administrative and logistic support to assigned ships."[18]

- **Submarine Squadron FOUR**
  The “Commander, Submarine Squadron FOUR's mission is to carry out the assigned tasks designated by Commander, Submarine Force, U.S. Atlantic Fleet and to provide operational and engineering support to assigned ships.”[19]

- **Submarine Development Squadron TWELVE**
  “In addition to providing operational and engineering support to assigned ships, Squadron TWELVE is tasked as tactical development authority for Submarine Forces Atlantic and Pacific. This is a unique responsibility, which is dedicated to the formulation and improvement of submarine tactics and to the measurement of the effectiveness of the newest submarines.”[20]

- **Naval Submarine Support Facility's**
  This command’s “primary mission is direct support to submarines assigned to Squadrons TWO, FOUR and TWELVE. Visiting ships are often supported. NSSF is organized along the lines of an afloat submarine tender Intermediate Maintenance Activity and employs more than 1200 sailors and civilian specialists.”[21]

- **Naval Submarine School**
  This command is the “oldest fleet functional school in the navy and the only Submarine training school in the Navy. Submarine School instructs over forty thousand Sailors annually in courses ranging from one day to over six months in length. As the "Center of Excellence for the Submarine Force" Submarine School conducts all levels of training for both officers and enlisted personnel.”[22]

- **Naval Undersea Medical Institute**
  This command is “tasked with providing training in undersea medicine and radiation health to designated medical department personnel, and to provide technical support in matters related to undersea medicine and radiation health to naval operating forces and activities.”[23]

- **Naval Ambulatory Care Center**
  “The Naval Ambulatory Care Center in Groton, Connecticut is an outpatient medical treatment facility that provides primary medical care and coordinates access to other levels of health care services for active duty, retirees and eligible family members entitled to care. Inpatient care and limited specialty care services are provided through a partnership agreement with local civilian hospitals.”[24]

- **The Naval Submarine Medical Research Laboratory**
  This command “constitutes the Navy's only submarine platform designated medical research and development laboratory dedicated to the unique problems engendered by the operational submarine fleet. This Laboratory maintains a library, which constitutes one of the most complete libraries of submarine and diving information in the world.”[25]

- **Naval Security Group Activity Groton**
  The “NSGA Groton provides cryptologic direct support systems installation, maintenance, and personnel augmentation support to U.S. Atlantic Fleet submarines.”[26]

- **Meteorology and Oceanography**
  This command "provides meteorological support and services to local commands, and supports waterfront units with environmental services and products for training, underways, and deployments. The Component's website offers local and regional weather information, and updates on tropical cyclone warnings and base Conditions of Readiness status during hurricane season."[27]

Recent Activity and Current Situation
The Sub Base has recently completed numerous infrastructure improvements. Approximately $98.5 million in investments were made at the base in fiscal year 2004 and to date, an additional $50 million has been awarded for improvements in fiscal year 2005. Major projects included: Barracks Renovation, renovation of Warehouse B-33, and the construction of the new Navy Lodge.[28]

Lower Base
Improvements to the Lower Base include the conversion of Pier 17 North Conversion and Waterfront Re-capitalization efforts.[29]

The Pier 17 North Conversion project is a $1.4 million upgrade to pier 17 North to accommodate Virginia Class ships. Improvements to the pier include: new fendering, steel supports, electrical upgrades, jib cranes and bollards and mechanical systems. This project was 99% complete as of April 2005.[30]

The Waterfront Re-capitalization Project includes a $30 million upgrade to all Sub Base piers to accommodate Virginia Class. This project starts with the demolition of Piers 4, 6, and 13. A new pier will be built in the current area of Pier 6. As of April 2005 contracting was in final stages in Philadelphia. Work on this project is to commence in the summer of 2005.[31]

Maintenance dredging in areas between Pier 10, 12, and 13 as well as on the north and South sides of Pier 31 is to be completed in 2005.[32]

SUBSCOL Campus
In February 2005 the DOD announced that M. A. Mortenson Co., of Minneapolis, Minnesota, is being awarded a $13,167,000 contract for the construction of the new Mk10 Submarine Escape Trainer. It is anticipated that the ground breaking for the trainer will occur in August of 2005 and the project completed by May of 2007. This project provides approximately 22,800 SF of classrooms, mechanical, electrical, and other support space for the escape columns and escape hatches.[33]

Upper Base
Improvements to the Upper Base include new security gates, a new dental clinic, a new facility for IBU-22, the renovation of the Naval Ambulatory Care Center and a new public private housing venture.[34]

The new security gateway opened in November of 2004. The gate allows for four lanes of entering traffic under an 18-foot tall canopy and provides for commercial vehicle inspection at the gate rather than on the base. The project is phase one of a two-phase, $6.5 million design and build project begun in 2003 by James N. Gray Company of Kentucky. The second phase, Gate 1 renovations, has just begun and should be completed by fall 2005.[35]

The Navy Region Northeast and GMH Military Housing-Navy Northeast LLC entered into the Navy's newest and largest public-private venture (PPV) housing project in November of 2004 with the goal of providing quality and affordable housing for military families in the Northeast. The project privatized approximately 5,600 Navy homes spanning seven Naval installations, five states, and 13 communities. For the New London Naval Sub Base, some 2,100 existing Navy Family Housing homes have been turned over to GMH and many are part of a six year, $300 million Initial Development Plan (IDP). Under the New London Naval Sub Base IDP, more than 1,000 old homes will be razed, and replaced by more than 900 new homes. Additionally 275 homes will be renovated. The groundbreaking ceremony for this project was held in February of 2005.[36]

The Naval Sub Base, Submarine School And Various Tenant Commands

The co-location of the Sub Base with the Sub School and the various research and development tenant commands creates a synergistic effect that results in the "whole being greater than the sum of its parts." The close proximity of these entities results in the free flow of information and ideas that create greater operational efficiencies and enrich the educational environment.

The location of all of these functions in New London County also affords the base's naval personnel and their families access to the high quality of life available in southeastern Connecticut, including excellent schools, significant cultural and recreational amenities and, according to Salary.com, unmatched affordability.[37]

The Groton location also fosters the close working relationship between the base and the Electric Boat Company. This relationship produces both tangible and intangible synergistic efficiencies that provide enumerable benefits to the Navy and to U.S. national defense.

The proximity of the Electric Boat Company's facility on the eastside along with the company's unique Quonset Point, R.I. construction facility give the base a distinct synergy for Navy production and operations. The Electric Boat Company has a variety of docks reserved for shipbuilding, refitting and repair along with barges, including berthing barges for the personnel of vessels undergoing refitting or repair. For a century, the Electric Boat Company has been at the forefront of submarine technological development and innovation.

IV. CONTRIBUTION OF THE NEW LONDON SUB BASE AND SCHOOL TO THE CONNECTICUT AND SOUTHEASTERN CONNECTICUT ECONOMIES

Scenario 1 illustrates the combined contributions of the Navy Base and Sub School complexes. Scenarios 2 and 3 show the independent contributions of each.

Table 3: REMI Model Results Summary for the New London Naval Sub Base and Sub School

REMI Model Results Summary Table

Scenario	Gross State Product ($ billions)	Personal Income ($billions)	Direct Employment	Indirect Employment	State Revenues ($ millions)	Local/Regional Revenues ($ millions)
1	$ 1.292	$ 0.666	10,367	3,673	$ 44.7	$ 0.601
2	$ 0.841	$ 0.431	6,794	2,537	$ 28.6	$ 0.519
3	$ 0.434	$ 0.230	3,573	1,137	$ 15.6	$ 0.139

Note: Scenarios are not cumulative because they were run independently of each other within a dynamic model.

Table 4: RIMS II Model Results Summary for the New London Sub Base and School

RIMS II Model Results Summary Table

Scenario	Gross State Product ($billions)	Personal Income ($billions)	Direct Employment	Indirect Employment
1	$ 1.678	$ 0.839	10,367	6,517
2	$ 1.049	$ 0.525	6,627	3,931
3	$ 0.516	$ 0.258	3,573	1,624

GSP is productivity ($99,379) x Total Employment
Personal Income is 1/2 GSP

The results of Table 4 largely confirm the REMI Policy Insight™ model results in Table 3. Scenario 3 (the School alone) has the smallest economic impact. The relatively modest variation in magnitude of the impacts under each methodology is mostly attributable to the averaging of multipliers across industries. What is notable is that the size and relative order in both methodologies is consistent.

In summary, the data indicate that the contribution of the combined New London Sub Base and Sub School to the state's economy is approximately $1.3 billion in GSP and approximately 14,040 direct and indirect jobs.

V. THE ELECTRIC BOAT COMPANY

The Electric Boat Company is a subsidiary of the General Dynamics Corporation. The Electric Boat Company is part of General Dynamics' Marine Systems Group. The company's primary operations are the shipyard in Groton, Connecticut and the automated hull-fabrication and outfitting facility in Quonset Point, Rhode Island. The combined operations have a current workforce of approximately 11,300 employees. The company's Connecticut work force is currently 8,750 employees: 8,250 at the Groton shipyard and 500 on-site at the New London Naval Sub Base.[38]The Electric Boat Company's Groton shipyard is a 2.9 million square foot facility.[39]

Overview[40]

The U.S. Navy considers that Electric Boat, by virtue of its vast experience and innovation, is the world's premier resource for submarine technology. Electric Boat has maintained this position since designing the very first submarine for the U.S. Navy, HOLLAND, over one hundred years ago. The experience and innovation offered by Electric Boat has been, and remains, the dominating influence in development of nuclear powered submarines in this modern era.

The inherent strength of Electric Boat derives in great measure from its enduring dedication to one product, for one customer. Electric Boat designs, builds, and supports submarines for the U.S. Navy. This dedication means that submarine technology is Electric Boat's number one priority. Electric Boat is focused on what it does best, and only on what it does best. This dedication provides the U.S. Navy with the best submarines in the world.

Electric Boat designed the first nuclear submarine, NAUTILUS as well as the first strategic missile submarine, GEORGE WASHINGTON. Of the 19 nuclear submarine classes developed, Electric Boat designed 15, and shares design responsibility on one other, SEAWOLF, with Newport News. Electric Boat designed the nuclear propulsion plant in every submarine class, save one, and designed every single strategic missile submarine this nation has produced. Electric Boat pioneered the modular construction process, more than 20 years ago, and is now using the third generation improvement of this process on the Virginia Class and SSGN Programs

Of the 197 nuclear submarines delivered or under construction for the U.S. Navy, Electric Boat is responsible for 98. Six other shipyards are/were responsible for the remainder.

Electric Boat's design history and experience in building 16 lead ships in the nuclear era has produced a "world class" technology base in specialized areas such as propulsion plant design, structural acoustics, hydrodynamics, weapons handling, manufacturing, and modular construction.

Electric Boat's Groton shipyard occupies 118 acres along the Thames River in Groton, Connecticut supporting both new construction and maintenance activity.

New construction work centers around the Land Level Ship Construction Facility (LLSCF) built in the early 1970's to support the Trident ballistic missile submarine program. The LLSCF receives hull sections and modules from Quonset Point, assembles them into a completed submarine, and then positions the ship for float-off using electric/hydraulic transfer cars and a pontoon in the associated graving dock.

Two additional dry docks, piers and shops also support overhaul and repair activities for active submarines, primarily those assigned to the New London Naval Sub Base.

"COATS" stands for CCSM Off-hull Assembly and Test Site. The $11.5M facility for land-based integration and test of Virginia Class combat system modules and electronic equipment at the Groton shipyard was dedicated in July, 1999.

COATS represents a shipyard industry first. The Combat System Module is: fully assembled off hull and populated with non-propulsion electronics equipment; provides for controlled testing of the combat system module without impacting hull construction; and provides friendly shock environment for commercial electronics. Once the COATS test phase completes, the CCSM module is transported to the ship for insertion and integration with ship and hull systems.

Final hull assembly is accomplished at the Groton Shipyard. The Land Level Ship Construction Facility (LLSCF) is capable of launching and dry-docking submarines weighing up to 17,500 tons, and can receive individual hull sections and units weighing up to 1,400 tons using the Sea Shuttle transporter.

The LLSCF provides a controlled environment for the accurate alignment and fit-up of hull sections and modules. A rail-tracked grid embedded in the facility, and electro-hydraulic transfer cars, enables sections or the entire ship to be moved about the facility. Overhead cranes and covered utility pits provide efficient support for final assembly and outfitting activity.

After launch, approximately one year prior to ship delivery, waterborne testing and sea trials take place. This period is used to groom and test the ship's systems, train the Navy crew in their operation and maintenance, and eventually turn over the completed systems and compartments to the Navy. Along with the various dock trials, acoustic trials, and weapons launch tests, propulsion plant tests, and other waterborne evolutions, the ship typically undergoes three sea trials before delivery to the Navy.

Current Business

Virginia Program[41]

The VIRGINIA Class submarine was designed by Electric Boat. It is the latest class of advanced capability fast attack submarines to be designed and delivered to the United States Navy. From its inception, the challenge of the VIRGINIA Program was to find the optimum balance between capability and affordability.

The VIRGINIA Class has been designed with reconfigurable spaces and features that make it adaptable and responsive to the changing and evolving threat. The VIRGINIA is the first naval combatant to be designed to meet the Post Cold War challenges of a new, uncertain threat environment – those conflicts in the near shore littoral environment. It supports seven critical post Cold War missions: covert intelligence, surveillance and reconnaissance (ISR); anti-submarine warfare; special forces warfare; precision strike warfare; anti-surface ship warfare; mine warfare; and provides support for Joint Forces.

The VIRGINIA Class Design/Build (Integrated Product and Process Development) contract was the first of its type for a DOD Cat 1 acquisition program. At the time of the contract award in January, 1996, Electric Boat, with no precedent to follow, worked hand-in-hand with the Navy

and led the development of new tools, processes and procedures, and trained shipyard workforce and oversight organizations to promulgate the required cultural change in the entire submarine enterprise. VIRGINIA literally has raised the performance bar for submarine technology and shipbuilding management and is providing the model for shipbuilding of the future. One indication of our success was when we received the Pentagon's David Packard Award for acquisition excellence. It was the first U.S. Navy warship to be designed using advanced computer-aided design and visualization technology that supports integrated design and manufacturing from a single product model database.

Each ship of the Class is being constructed by both General Dynamics Electric Boat in Groton, Connecticut and Quonset Point, Rhode Island, and by Northrop Grumman Newport News in Newport News, Virginia. Construction is being accomplished under a unique co-production teaming agreement whereby the construction of the ship's 18 major modules has been assigned to respective yards and the delivery of each ship is alternated between each yard. Today, the class design is complete and the program is in low rate production at one ship per year. Electric Boat is the prime contractor for the entire construction program.

On October 12, 2004, the Electric Boat Company delivered the lead ship, U.S.S VIRGINIA (SSN774), just 3.5 months from a contract delivery date established over ten years earlier. The lead VIRGINIA, SSN774 was the first Electric Boat Company submarine delivery in 6 years - - and the first lead ship in 7 years. The second ship, SSN775, will be the first NGNN submarine delivery in 8 years – and the first lead ship delivered by them in 28 years.

Seawolf[42]

The SEAWOLF Program was designed to counter high performance Soviet submarines at the end of the Cold War. The need for a large number of SEAWOLF Class submarines was obviated by the collapse of the Soviet Union in 1989. Initially planned to be a 30 ship class, the program was reduced to three ships. The U.S.S JIMMY CARTER (SSN23) is the third and final SEAWOLF Class submarine. Following closely on the heels of the delivery of the U.S.S VIRGINIA, U.S.S JIMMY CARTER was delivered to the U.S. Navy on December 22, 2004. This marked the second delivery by Electric Boat in three months.

Differentiating the SSN23 from all other submarines is its Multi-Mission Platform (MMP), which includes a 100-foot, 2500-ton hull section that enhances payload capacity, enabling the ship to accommodate the advanced technology required to develop, test and deploy the next generation of weapons, sensors and undersea vehicles.

SSN23 MMP Design/Build program success has been unprecedented. Key to this success was the ability of experienced design and engineering personnel to roll off of VIRGINIA and immediately onto another major design program -- the MMP, a project as complex as the construction of an entire Los Angeles Class submarine. Beginning with a notion that was little more than a Power Point slide, Electric Boat moved from concept design, to completion of detail design in 29 months -- half the time historically needed to advance through this development cycle. Five months later, this unique 2,500-ton module was delivered to the Groton shipyard for assembly with the host ship.

SSGN[43]

Electric Boat is also the prime contractor for the conversion of four Trident SSBN submarines to SSGN configuration taking place at the Norfolk Naval Shipyard and at Puget Sound Naval Shipyard. This effort leverages Electric Boat's experience as the designer and sole builder of

Trident SSBN submarines. Trident SSGN conversion will provide key capabilities for covert strike and clandestine Special Operations Force (SOF) missions.

The SSGN will provide up to 154 Vertical Launch Weapons from missile tubes previously housing ballistic missiles. Additionally, the SSGN will include an enhanced VIRGINIA Class communications suite and a dedicated command and control space for better mission planning. The platform will also be modified to host two Special Operating Forces lockout chambers using dual Dry Deck Shelters and/or Advanced SEAL Delivery Vehicles. The reconfigured ship will be able to house 66 SOF personnel and provide a dedicated SOF command and control planning center. SSGN will also function as an experimental test-bed to develop innovative operations concepts and payload/sensor alternatives for incorporation on future submarines. The large missile tubes inherent on this platform provide the volume to demonstrate and deploy non-traditional submarine payloads in an operational environment. The use of SSGN as a test bed for future capability to be included in future undersea systems forms the foundation for the transformation of the submarine force into the future.

Life Cycle Support, Maintenance and Modernization[44]

Electric Boat provides centralized life-cycle support for U.S. Navy submarines and submersibles via an experienced design, construction and fleet support organization supporting all classes of submarines. Electric Boat provides on-site fleet support at Kings Bay, Bangor, Norfolk, Puget Sound, Groton and Portsmouth and fly away teams at other locations as requested. Support provided includes design, engineering, planning, maintenance, material procurement and installation services that directly support the safe and reliable operation of the U.S. submarine force.

Additionally, in 1998 the Electric Boat Company began re-establishing itself as a major depot level submarine maintenance, modernization and repair activity. Supporting that transition has been a robust engagement with NAVSEA, the Naval Shipyards and other field activities in the various initiatives supporting the Navy's ONE SHIPYARD concept. Fundamental to this engagement is Electric Boat's commitment to align its maintenance related processes with those of the Navy. Electric Boat is now performing depot level availabilities including Interim Dry Dockings (IDDs), Selected Restricted Availabilities (SRAs, Depot Modernization Periods (DMPs), and scheduled Pre-Inactivation Restricted Availabilities (PIRAs) of LOS ANGELES and SEAWOLF Class submarines in its Groton shipyard and at the Naval Submarine Base.

Much of the cost debate for naval ships has been focused on acquisition cost. A truer metric may in fact be total ownership, or total life cycle costs. Nuclear submarines inherently possess low total operating costs due to their minimal manning; and, they require no at-sea logistics train, no protective escorts, and little support infrastructure ashore. Today, technology advancements have led to the development of a life of the ship core, eliminating the need for major refueling overhauls on our attack submarines. On VIRGINIA, crew manning for at-sea operations, one of the key drivers of program life cycle cost, has been reduced by 12% from 134 to 118. In fact, on the VIRGINIA program, there has been a 30% reduction in total ownership cost from previous submarine classes.

Tango Bravo[45]

The Tango Bravo Program is a collaborative effort between the Defense Advanced Research Projects Agency (DARPA) and the United States Navy to execute a technology demonstration program to break through the "technology barriers" and enable innovative design options for a

future submarine. This effort is also aimed at decreasing platform infrastructure and the cost of the design and production of that future ship.

In October 2004, Tango Bravo proposals were sought in five technology demonstration areas: (1) shaftless propulsion, (2) external weapons stow and launch, (3) hull adaptable sonar array, (4) radical ship infrastructure reduction, and (5) reduced crew/automated attack center. Electric Boat was notified in March 2005, that they had been selected for three Tango Bravo contract awards, subject to successful negotiations. The $600 million programmed in the current Navy plan for an undersea superiority system could be used to advance these technologies and integrate them into a future VIRGINIA, or to start a design effort to produce a lower cost nuclear submarine. Combined, these technologies could lead to a complete re-architect of the submarine for the first time since the Nautilus. This new architecture could remove the constraints in present submarines imposed by the shaft line and torpedo room/torpedo tubes. The initiative also could provide for the insertion of new technologies to ensure submarine relevance in the future threat environment where it will deploy.

Spiral integration of these technologies, such as external weapons, could be developed in parallel with a new forward end. Shaftless propulsion, likewise, could become a design/build effort resulting in a new stern and engine room section. By continuing VIRGINIA production, ships of opportunity will provide an integrating platform.

Several studies have recently been conducted on future fleet architectures. All have recognized the enduring value of submarines for future naval operations. Furthermore, under all known force level scenarios, including the most recent Navy 30-Year Interim Report to Congress, procurement of 2 ships per year will be needed to maintain undersea superiority and replace the aging fleet of LOS ANGELES Class (SSN688 Class) attack submarines as they retire over the next several decades. The 30-Year report neglects to indicate a new SSBN/SSGN design will be needed in the next decade. Absent new design work, the submarine design industrial base will not be around to perform this effort.

Electric Boat/Naval Submarine Base Synergies[46]

While there has been a relationship between the operational submarines at the New London Naval Sub Base and the ship designers and builders at Electric Boat Corporation ever since the arrival of the tender *Ozark* and her charges in October 1915, only in the last six years has the interdependence become essential to both facilities.

The Submarine Base and its tenant commands depend on Electric Boat to provide the skilled tradespersons, supervision, and engineering support required to perform most Intermediate-level maintenance on the ships stationed there. Similarly, Electric Boat needs the work on the submarines at the Base to maintain its skilled workforce above the “critical mass” level in the current submarine Low Rate Procurement (LRP) environment.

Carrying the Navy’s Regional Maintenance concept one step further, the Electric Boat Company has entered into extremely successful partnerships with the New London Naval Sub Base and Portsmouth Naval Shipyard (PNSY). While some of the relationships and activities are cemented in contractual terms and conditions, it is the genuine spirit of co-operation and joint dedication to Fleet readiness, which is most significant. Several specific initiatives are discussed below.

New England Maintenance Manpower Initiative (NEMMI)[47]
Starting in 1999, NEMMI has resulted in the phased transition of 431 non-submarine qualified military billets at the Naval Submarine Support Facility (NSSF) at the New London Naval Sub Base to 263 civilian Electric Boat Company shipyard employees. This has allowed non-submarine sailors to be reassigned to ships or stations other than at Groton, while the joint civilian / Navy workforce at NSSF still provides quality shore billets for submarine-qualified sailors. The Electric Boat Company is also now providing the equivalent of 4 divers to assist the Navy dive team.

The integrated workforce is responsible to Commanding Officer, NSSF for work completion and certification, but can draw on the resources of Electric Boat for surge capacity or unique skills and capabilities. Currently, the average Electric Boat Company journeymen at NSSF has over 24 years of shipbuilding experience - - a tremendous training environment for the assigned sailors.

Nuclear Regional Maintenance Department (NRMD)[48]
Implemented in March 2001, the Electric Boat Company is managing the New London Naval Sub Base nuclear repair work with a combined Electric Boat Company / military team. The Electric Boat Company provides a core staff of 27 responsible for planning and execution of work under the Electric Boat Company's nuclear license, and coordinates the activities of the 76 assigned military personnel.

The permanently assigned workforce is augmented as needed from the Electric Boat Company Groton shipyard to support major evolutions or periods of high workload. It is not uncommon to have 100 additional Electric Boat Company workers supporting NRMD activities. All assigned military and civilian personnel report to Electric Boat Company supervision.

Thames River Drydocks[47]
Prior to 2001, there were two floating drydocks at the New London Naval Sub Base, which supported short-term and emergent repair periods on the ships assigned to Groton. In addition, Electric Boat had three graving docks, which were needed to support the Cold War submarine production rate of up to three attack and one ballistic missile submarine per year. However, as the Electric Boat Company shifted to low rate production in the mid-90s, these three docks were significantly under-utilized.

In August 2001, the Navy inactivated the floating drydock Oak Ridge (ARDM-1) at the New London Naval Sub Base, avoiding the expense of an upcoming major overhaul of the 1944 vintage drydock. This left insufficient Navy drydock capacity for the volume of work. As a result, in February 2002 the Navy leased the use of one of the Electric Boat Company's drydocks. The dockings at the Electric Boat Company carried out to date under this contract have utilized New London Naval Sub Base, Electric Boat Company, Portsmouth Naval Shipyard, and other contractor personnel all working together to provide the best and quickest maintenance service. Due to the present high volume of maintenance work contracted directly to Electric Boat, this lease is not currently in effect, but can be resumed should the Navy require the asset.

This cooperative arrangement was carried a step further in July 2002, when the Electric Boat Company and the Navy entered into a Government-Owned / Contractor-Operated (GOCO) contract for the Electric Boat Company to maintain and operate Shipping Port (ARDM-4), the remaining Navy floating drydock at the New London Naval Sub Base. Thirty-six core Electric

Boat Company personnel reporting to Electric Boat Company supervision maintain and operate the Shipping Port on a day-to-day basis, while surge personnel from the shipyard support docking evolutions. The utilization rate for Shipping Port has been extremely high, with the 12 dockings to date resulting in a ship in dock over 75 percent of the time in FY03 and FY04, and a projected occupancy rate of over 90 percent in FY05.

Naval Submarine Base New London and Electric Boat Corporation[48]
The net result of these actions - - NEMMI, NRMD, and Drydocks - - is a balanced, flexible asset pool, which provides maximum service to the Fleet at minimum cost, while still supporting the construction of nuclear submarines. The number of sailors required has been dramatically reduced, there is more efficient utilization of facilities, the Navy has quick access to the capability and capacity resident at the Electric Boat Company, and critical skills are being maintained in the Electric Boat Company workforce.

In a recent statement issued by John P. Casey, President of the Electric Boat Company to the Commissioner of DECD, Mr. Casey remarked, "*We have stated publicly on numerous occasions that Electric Boat fully intends to remain in business. We have a significant backlog with the Virginia Class submarine program as well as design and engineering work associated with a variety of Navy programs. We would be a somewhat different business if the Base were to be lost, however, we expect to remain the Navy's preferred provider of nuclear submarine capability*."[49]

The Navy's submarine base in Groton, Connecticut, and Electric Boat, within short commuting distances of each other, work closely together to maintain the Navy's nuclear submarine force. This partnership is significant and can support not only scheduled routine maintenance and modernization, but also emergent or unscheduled work requiring technical expertise, depot level capabilities and a skilled resource-pool to accommodate surge requirements. The complementary Sub Base/Electric Boat Company relationship affords the Government savings as well as efficiency and skilled resource flexibility, creating a synergy that is critical to the Navy and national defense.

VI. CONTRIBUTION OF THE ELECTRIC BOAT COMPANY TO THE CONNECTICUT AND SOUTHEASTERN CONNECTICUT ECONOMIES

The Electric Boat Company is also a critical part of the Connecticut and Southeastern Connecticut economies.

The Electric Boat Company in total represents approximately 17,458 jobs in Connecticut. "Direct" employment is 8,250. There are 500 more contractors working for the Electric Boat Company that are located onsite at the New London Naval Sub Base, for a total Connecticut job count of 8,750. Including these 500, there are a total of approximately 9,208 "indirect" (spin-off) jobs. However, the Electric Boat Company, in close proximity to the Sub Base and Sub School, is ultimately the source of employment for a total of 1,000 contractors in Connecticut's economy (500 at the base and 500 in "all industries" in work related to the Electric Boat Company and the base).

Moreover, the Electric Boat Company's annual average contribution to GSP is approximately $2.0 billion. GSP is the single most comprehensive statistic, other than the number of direct and indirect jobs. It measures the final product and services produced in the state in any given year. Even beyond these economic facts, the Electric Boat Company has a long and proud history of contribution to Connecticut.

Scenarios 6 and 7 measure the separate impact of Electric Boat alone and the contribution of a portion (in this case 1/2) of the current level of EB activity alone.

Table 3: REMI Model Results Summary for the Electric Boat Company

REMI Model Results Summary Table

Scenario	Gross State Product ($ billions)	Personal Income ($billions)	Direct Employment	Indirect Employment	State Revenues ($ millions)	Local/Regional Revenues ($ millions)
6	$ 1.968	$ 1.253	8,250	9,208	$ 117.6	$ 6.398
7	$ 1.001	$ 0.632	4,125	4,672	$ 59.8	$ 3.505

Table 4: RIMS II Model Results Summary for the Electric Boat Company

RIMS II Model Results Summary Table

Scenario	Gross State Product ($billions)	Personal Income ($billions)	Direct Employment	Indirect Employment
6	$ 1.549	$ 0.775	8,250	7,341
7	$ 0.775	$ 0.388	4,125	3,671

GSP is productivity ($99,379) x Total Employment
Personal Income is 1/2 GSP

VII. THE CONTRIBUTIONS OF THE NEW LONDON NAVAL SUB BASE, SUB SCHOOL AND THE ELECTRIC BOAT COMPANY TO THE ECONOMIES OF CONNECTICUT AND SOUTHEASTERN CONNECTICUT

Scenario 4 -- the single largest impact of all seven simulations -- dramatically demonstrates the enormous impact of the Navy Base and Sub School, combined with the Electric Boat Company. Scenario 5 shows the impact of the Navy Base and School together with a reduced (by ½) level of activity at the Electric Boat Company.

Table 5: REMI Model Results Summary for the New London Naval Sub Base, Sub School and the Electric Boat Company

REMI Model Results Summary Table

Scenario	Gross State Product ($ billions)	Personal Income ($billions)	Direct Employment	Indirect Employment	State Revenues ($ millions)	Local/Regional Revenues ($ millions)
4	$ 3.253	$ 1.982	18,617	12,881	$ 162.2	$ 5.764
5	$ 2.299	$ 1.301	14,492	8,407	$ 104.9	$ 2.922

Table 6: RIMS II Model Results Summary for the New London Naval Sub Base, Sub School and the Electric Boat Company

RIMS II Model Results Summary Table

Scenario	Gross State Product ($billions)	Personal Income ($billions)	Direct Employment	Indirect Employment
4	$ 3.368	$ 1.684	18,617	15,275
5	$ 2.622	$ 1.311	14,492	11,890

GSP is productivity ($99,379) x Total Employment
Personal Income is 1/2 GSP

In summary, the data indicates that the joint contribution to the state's economy of the Sub Base, Sub School, and the Electric Boat Company is approximately $3.3 billion in GSP and approximately 31,500 direct and indirect jobs.

VIII. BASE REALIGNMENT AND CLOSURE

In November of 2002, Secretary of Defense, Donald Rumsfeld stated, "Congress authorized a base realignment and closure [BRAC] round in 2005. At a minimum, BRAC 2005 must eliminate excess physical capacity; the operation, sustainment, and recapitalization of which diverts scarce resources from defense capability. However, BRAC 2005 can make an even more profound contribution to transforming the Department by rationalizing our infrastructure with defense strategy. BRAC 2005 should be the means by which we reconfigure our current infrastructure into one in which operational capacity maximizes both warfighting capability and efficiency."[50]

The DOD is in the process of selecting military installations within the United States for either closure or realignment. The process begins with the preparation of a list of installations to be closed or realigned by the DOD. The DOD must follow a proscribed set of criteria when deciding what installations to close or realign (see below).

Once the list has been prepared, the Secretary of Defense must submit it to the congressional defense committees and the BRAC Commission. This is scheduled to occur on or about May 13, 2005. The General Accounting Office must then prepare and submit a report to defense committees on its analysis of the DOD BRAC process and recommendations. This is scheduled to occur by July 1, 2005. The BRAC Commission then will prepare and submit its recommendations to the President. This is scheduled to occur by September 8, 2005. The President must either approve or disapprove the Commission's recommendations in their entirety. If approved, the recommendations are sent to Congress, which has 45 days or until the adjournment of Congress to disapprove the recommendations on an all-or-none basis; otherwise, they become binding. The President is scheduled to either approve or disapprove the list by September 23, 2005. If the President disapproves the list, the Commission has until October 20, 2005 to consider the President's objections and to send a revised report back to the President. If the President had rejected original recommendations, he must forward the revised Commission recommendations to the Congress by November 7, 2005.

Closure and Realignment Criteria

In selecting military installations for closure or realignment, the DOD, giving priority consideration to military value (the first four criteria below), will consider: [51]

Military Value

1. The current and future mission capabilities and impact on operations readiness of the total force of the DOD, including the impact on joint warfighting, training and readiness.

2. The availability and condition of land, facilities, and associated airspace (including training areas suitable for maneuver by ground, naval, or air forces throughout a diversity of climate and terrain areas for the use of the Armed Forces in homeland defense missions) at both existing and potential receiving locations.

3. The ability to accommodate contingency, mobilization, surge and future total force requirements at both existing and potential receiving locations to support operations and training.

4. The cost of operations and the manpower implications.

Other Considerations

5. The extent and timing of potential costs and savings, including the number of years, beginning with the date of completion of the closure or realignment, for the savings to exceed costs.

6. The economic impact on existing communities in the vicinity of military installations.

7. The ability of the infrastructure of both the existing and potential receiving communities to support forces, missions and personnel.

8. The environmental impact, including the impact of costs related to potential environmental restoration, waste management and environmental compliance activities.

The DOD will use the aforementioned selection criteria along with their force-structure plan and infrastructure inventory to make recommendations for the closure or realignment of military installations inside the United States. The 2005 BRAC Commission will also use these criteria for their review of the DOD's final recommendations.

BRAC and the New London Naval Sub Base

The New London Naval Sub Base is subject to the BRAC process, as are all domestic military installations. Connecticut has cause to be concerned as the New London Sub base was considered for closing in previous BRAC rounds and competition for location or realignment of base operations is likely from a number of sites. In particular, Norfolk, Virginia is the home of the Norfolk Naval Station and other Navy facilities and commands. Together they are, by far, the largest naval presence on the east coast. The Atlantic Fleet is based there, as is the Commander Naval Submarine Forces. Two submarine squadrons, attached to New London base Sub Group 2, are based in Norfolk.

In 1988 a nonpartisan commission proposed to close 86 military installations entirely, partially close five others, and realign 54 more. In 1989, Congress adopted these recommendations. In 1991, to increase public comment on the 1988 round of closings, Congress approved the National Defense Authorization Act of 1991 (P.L. 101-501), creating an independent Commission on Base Realignments and Closures (BRAC) and calling for three more rounds of closures in 1991, 1993, and 1995. As the New London Sub Base was among the bases slated for closure, a Sub Base Realignment Coalition was established to prevent the closure. The then Department of Economic Development (DED), working in partnership with the Coalition, initiated a series of actions in order to assess the potential for economic disruption in the communities of New London County.

The President rejected the proposed base closure in 1993. However, in 1995, the Navy successfully recommended to close the Naval Undersea Warfare Center, New London Laboratory and transfer the Nuclear Training School from Groton to South Carolina.

Contribution Implications in Light of the Current Round of Base Realignments and Closures.

The DOD is currently in the process of preparing its recommendations for the closure and realignment of existing U.S. military installations. These recommendations will be forwarded to the Base Realignment and Closure Commission (Commission) on or about May 16, 2005. Based on the DOD report the Commission will prepare its own recommendations. The

Commission will then forward their recommendations to the President. If approved by the President the recommendations will be forwarded to Congress where a joint resolution would be required to vote down the entire list, otherwise is automatically approved.

The state has reason for concern, as the New London Naval Sub Base appeared on the base closure list in previous BRAC rounds.

In light of the possibility of a closure of the New London Naval Sub Base, it is important to examine the economic consequences associated with a closure of the facility. The close physical proximity of the sub base and the Electric Boat Company provide enormous benefits to both entities in the development, construction and maintenance of submarines.

As such, the closure of the New London Sub Base would have the effect of eliminating from the local and state economies one of the largest employers in the county and the state and reduce the workload of the Electric Boat Company.

The effect of the closure of the New London Naval Sub Base would be an annual loss to the Connecticut and Southeastern Connecticut economies of approximately $1.3 billion in GSP and approximately 14,040 direct and indirect jobs. A loss of this magnitude would be disastrous for Southeastern Connecticut and certainly a heavy blow to Connecticut's overall economy.

IX. STUDY METHODOLOGY

Any economic impact analysis must quantify the overall effects (for example, changes in output, employment, income, tax revenue) resulting from a policy or economic shock.

In this case, the methodology should take into account not only the impact of the personnel at the Navy Sub Base in Groton but also the jobs at the neighboring shipbuilding plant at the Electric Boat Company. If the Navy Base were to close, it would have severe implications for the company. The following scenarios were modeled:

1. The contributions of the New London Naval Sub Base and Naval Sub School.
    - Reduce military employment by 7,800[52]
    - Reduce civilian employment by 1,400[53]
    - Reduce contractors by 1,000[54] (500 at the base[Ψ, 55], 500 in all industries*[, 56])
    - Reduce Reserve Center Employment by 167[Ω, 57]
    - $50.3 million loss of local construction industry sales in 2005[58]

2. The contributions of the New London Naval Sub Base.
    - Reduce military employment by 5,427
    - Reduce civilian employment by 700
    - Reduce contractors by 500 at the base
    - $50.3 million loss of local construction industry sales in 2005

3. The contribution of the Naval Sub School.
    - Reduce military employment by 2,373
    - Reduce civilian employment 700
    - Reduce contractors by 500 in all industries

4. The contribution of the New London Naval Sub Base, Naval Sub School, and the Electric Boat Company.
    - Reduce military employment by 7,800
    - Reduce civilian employment by 1,400
    - Reduce contractors by 1,000 (500 at the base[Ψ], 500 in all industries*)
    - Reduce Reserve Center military employment by 167 [Ω]
    - $50.3 million loss of local construction industry sales in 2005
    - Reduce firm employment in Rest of Transportation Equipment by 8,250[59]

5. The contribution of the New London Naval Sub Base, Naval Sub School, and the Electric Boat Company (with reduced activity).
    - Reduce military employment by 7800
    - Reduce civilian employment by 1,400
    - Reduce contractors by 1,000 (500 at the base[Ψ], 500 in all industries*)
    - Reduce Reserve Center military employment by 167[Ω]
    - $50.3 million loss of local construction industry sales in 2005
    - Reduce firm employment in Rest of Transportation Equipment by 4,125

6. The contribution of the Electric Boat Company.
    - Reduce firm employment in Rest of Transportation Equipment by 8,250

7. The contribution of the Electric Boat Company (with reduced activity).
    - Reduce firm employment in Rest of Transportation Equipment by [1/2] 4,125

**Allocated according to the each industry's share of input required to produce $1 of federal military purchases.*

[Ψ] Modeled as "rest of transportation equipment" employment (includes submarines).

[Ω]650 drilling reservists were converted to 167 full time equivalents for modeling purposes.

For each of these scenarios, two different economic models are employed for this methodology. The two models are described next to show their different approaches to the measurement of economic impacts. Each has its strengths and weaknesses. Both methods will be employed for the purposes of comparing the size and direction of the expected change in direct and ripple effects on jobs, gross regional product, and income.

Regional Economic Models, Inc.'s (REMI's) Policy Insight [TM] model is a widely known and internationally applied econometric model. REMI has an underlying baseline or control forecast against which a simulation forecast is run and the differences show the magnitude of the resulting impact. In the model businesses produce goods and services to sell to other firms, consumers, investors, and government using such intermediate goods as labor, capital, and fuel. Population determines the labor supply. Together the demand and supply of labor determine wages. People will move into an area in part if wages go up. Businesses will also substitute capital for labor if wages are higher. Changes in wages in turn impact incomes and that influences consumer spending. The model takes into account these kinds of interactions in the behavior of households and firms. REMI is a dynamic model allowing inputs over a single year or multiple year periods and forecasting results for each year up until 2035 if desired.

Certain key results of the model allow the user to quantify the impact of many differing economic changes that the user may want to introduce, such as the entry or departure of a firm, or in this particular case, the loss of a sub base and accompanying major sub-supplier/employer. The methodology simulates the interaction of many variables simultaneously.

An alternative methodology is the U.S. Bureau of Economic Analysis (BEA) RIMS II model that relies on published "multipliers" (for employment, output, and earnings). BEA's methodology can be used to verify the validity of other methodological approaches, but it is much less sophisticated in that it simply considers the *direct* effect to be the initial injection (or shock to the economy), and the combined *indirect* and *induced* effects to be this value times the multiplier minus one.

Direct impacts are defined as anything that is an immediate consequence of sub-base economic activity. This may include the activities of the Navy, federal civilian employees, payroll to Navy officers and others with a direct involvement in sub base operations. These entities may be located either on- or off-site. Employing labor in daily base operations and federal government capital investments in sub base construction are examples of sub base activities that generate direct impacts.

Indirect impacts are derived from economic activities of primarily off-site enterprises that serve the sub base, e.g. non-defense service providers such as fuel, fabricated metal, food and beverages, other raw materials that support sub base activity. Indirect effects result from

sub base operations and otherwise might not occur at the location under analysis, but are auxiliary to the main operations.

Induced impacts measure the effects of successive rounds of spending from the direct and indirect impacts. An example of an induced impact is a local merchant going out to the movies or to dinner because of income earned from Navy personnel spending in his or her business. Dependents of military personnel can be an important determinant of this impact as their expenditures can be significant to the local economy. These rounds of expenditures induce more local jobs and income in the general economy of the surrounding local area to the extent that such goods and services are locally produced. Only the purchases of locally produced goods and services are relevant to this analysis. For example, a household hiring a local carpenter to construct a garage is local spending. The purchase of a bicycle made in another state or foreign country is not local but rather an import from outside the region.

Finally, DECD was not concerned with separating the induced from the indirect impacts in this study. All of the effect above the multiplier minus one represents the *combined* indirect and *induced* effects.

Consistent with past studies, this study estimates four measures of economic impact:

- **Value added**: new output created within the region resulting when input supplies and materials are processed by labor to produce a product or service. The model result's "gross regional product" represents this concept.

- **Payroll**: a component of value added, representing the payment for the labor involved in creating new output.

- **Employment**: the number of jobs required to create new output.

- **Net New State and Local Tax Revenue**: New revenues minus new expenditures.

Measurement Tools Used in This Study

As indicated earlier, to generate the aforementioned measurements DECD employed two different types of models, REMI's Policy Insight and BEA's RIMS II. By using two different approaches DECD can pool the collective strengths of both while compensating for their individual weaknesses. Briefly, REMI provides a more robust and comprehensive picture of the New London Naval Sub Base and the Electric Boat Company's relationship to the economy, while RIMS II is a more common approach that may allow for comparison to similar studies done for military bases that used RIMS II multipliers and inter-industry relationships.

RIMS II

The U.S. Bureau of Economic Analysis (BEA) Regional Input-Output Modeling System (RIMS) is a frequently used method of estimating economic impacts. The system was developed in the 1970's to answer the call for greater quantification of social benefits in economic terms. For example, the precise dollar value of clean air, good health, highway safety, and recreation associated with reservoir construction, etc. was rarely quantified. Benefit/cost analysis was developed in part to answer that need. RIMS II is the updated version of this kind of quantification but of direct and indirect economic effects. The approach focuses on inter-industry relationships and regional multipliers using data specific to Connecticut's economy.

Application of RIMS II – The Multiplier Approach
The RIMS II multiplier approach to economic impact analysis is fairly straightforward. Depending on the nature of the primary input data available, one can use multipliers in any one of three categories: earnings, output, or employment. Therefore, if the user knows what the payroll for a given project will be, but not the related investment, the earnings multiplier can be used to measure total economic impact. Alternatively, if only the sales are known, an output multiplier can be used to estimate total impact. Finally, if only employment is known, total employment impact can be measured using the employment multiplier. The user should be cautioned however, that total economic impact *is not* the sum of all three. Each is a different and alternative concept of impact and stands on its own. The availability of three multipliers allows the project impact to be viewed from three different perspectives.

Thus we have the following possible relationships:

(Direct Change in Employment) x Employment Multiplier = Total Employment Impact

OR

(Direct Change in Earnings) x Earnings Multiplier = Total Earnings Impact

OR

(Direct Change in Output) x Output Multiplier = Total Output Impact

The BEA's multipliers are based on the principle that every industry sector of the economy uses inputs from and sells output to all other industry sectors to varying degrees. Thus the input-output relationship (a national table) plays a key role in the value of the individual industry multipliers, and it can be important to know exactly what industries are involved in any given project.

Likewise, the combined indirect and induced effects are the product of the direct change times the fraction that the multiplier is above (or below) 1.00. For example, an output multiplier of 1.7 means that the indirect effects are:

(Direct Change in Output) x (.7) = (Combined Indirect and Induced Effect)

In this example, a direct change in output (say from a $1.0 million injection of federal defense dollars) has a total output effect on the economy of $1.7 million, or $1.0 million directly and $0.7 as a result of indirect and induced spending.

One limitation of the RIMS II multiplier approach is that the result is for a single point in time (i.e. a snapshot), not over a period of time. The issue for the analysis of the Sub Base and Electric Boat is that policy decisions made today have future consequences. It is often preferred to look at the effects of an economic change over a ten or twenty year horizon as some variables are affected differently over time.

REMI
A dynamic tool for assessing economic impacts is Regional Economic Models, Inc. (REMI) Policy Insight™ model. REMI has provided modeling tools to government organizations (of all levels) and private consultants for over 20 years. Its economic model, Policy Insight, has

at its core an input-output component in order to capture the supply relationships between firms. Built onto this are simultaneously estimated systems of econometric equations for five major inter-linked "blocks," namely Demographic, Labor and Capital Demand, Market Shares, Wages-Prices-Production Costs, and Output. Incorporating the latest in economic theory, allowing the user to enter data in multiple years, and forecasting for multiple years the future value of dozens of economic and demographic variables, the REMI model provides a rich array of results. A forecast horizon that may reach from the present to 2035 can be selected depending on the user's preference.

In sum, there are many other reasons why the REMI model is a suitable and preferred tool of analysis, such as the users ability to use multiple inputs, multiple forecast variables as well as the models sophisticated variable interactions, its dynamic (rather than static or "snapshot") feature, its basis in economic theory, and the model's incorporation of a sufficient number of the variables that are likely to change in a counter factual simulation used to estimate the contribution of a sub base to its host community and state economy. The REMI Policy Insight™ model has been tested and proven successful in a numerous range of applications.

Application of REMI to Military Base Installations

The REMI model is highly sophisticated and extremely adaptable, yet its complexity may pose some initial user questions because of the thousands of policy variables from which the user is able choose. The user must make some key decisions even before running any simulations. Among these would be: What are the most important input variables, and why? Is such data available? What are the likely sources? How will the input data enter the model (e.g. as changes in employment or as changes in investment) and for what period of time?

A strong precedent established by other studies and all previous studies of the New London Naval Sub Base without exception is the choice of employment as the "key driver variable." Based on findings in other military studies that employment makes the largest contribution to changes in the economy as well as frequent REMI recommendations, this application will use Navy and civilian employment as key inputs. Military employees also have dependents that may be part of the labor force by holding jobs in the local goods producing or services producing sectors. Their presence in the labor market and their local purchases are potentially significant contributors to the regional economic impact. This makes a strong case for the use of two primary driver input variables here: federal civilian government employment and federal military government employment.

Another user might have reasoned that "investment" (federal capital spending) at the sub base is an appropriate input variable and let employment adjust itself endogenously in the model since the REMI model "automatically" accounts for changes in employment associated with changes in investment. The REMI model has the powerful capability of forecasting both the interaction and the long-term consequences of major employment changes as a result of other industries' capital spending. The model does not automatically estimate employment associated with government spending, however, because government spending is instead a function of population. However, government spending can still be taken into account in the model as "sales" in the industries in which the spending occurs, provided expenditures by major industry category can be made available for this study.

Composition and Availability of Data

All scenarios:

Federal Civilian Government Employment (number) -- Federal government employment in a local area is a fixed proportion of government employment in the nation. The Civilian Employment (number) policy variable changes the level of local employment in the federal civilian sector by the amount entered. Civilian and Military employment are distinct variables and so must be entered separately. Data on each is required separately. This policy variable is located under Labor and Capital Demand Block, Employment in the policy variable hierarchy.

Federal Military Government Employment (number) – Federal government employment in a local area is a fixed proportion of government employment in the nation. The Military Employment (number) policy variable changes the level of local employment in the federal military sector by the amount entered. Civilian and Military employment are distinct variables and so must be entered separately. This policy variable is located under Labor and Capital Demand Block, Employment in the policy variable hierarchy.

Government Spending (amount) – This captures state and local expenditures that result in direct payments for goods and services. In the absence of any better data it may be possible to use Navy defense expenditures in Connecticut as a proxy for private investment spending.

Industry Sales (amount) – Subcategories of total federal outlays related to the New London Naval Sub Base operations spending and capital spending by major industry (e.g. utilities, construction, food, fuel, machinery, transportation services, maintenance and repair, capital projects, etc.) for a typical year. [In the RIMS II modeling, this will be the basis of the Total Output Impact. If individual industry data are unavailable, U.S. spending for the Navy from the DOD Directorate for Information on contract awards will be used as a proxy.]

Electric Boat Company scenarios:

Transportation Industry (SIC 37) Employment (number) – This input variable will be used in the scenario with the loss of Electric Boat in addition to the closing of the New London Naval Sub Base (i.e. a "worst case" scenario) It will be a count of the job loss at EB. [In the RIMS II modeling, this will be the basis of the Total Employment Impact.]

Data Sources

Quantification of economic impacts requires input data from a number of sources:

- *U.S. Department of Defense (DOD)*

  Federal civilian and federal military government spending by major industry category are needed. Operational spending and capital spending data for a typical year will be requested and allocated to the model's Government Spending and Industry Sales policy variables by category as available.

- *New England Economic Partnership (NEEP)*

NEEP is a consortium of academic, private sector, government, and banking institutions in the six New England states that for the last 30 years has produced (with the assistance of a national forecasting consultant) six proprietary semi annual state and a regional New England-wide forecasts. NEEP confirms the following: 8,200 Navy personnel, 1,400 civilian workers and 1,000 contractors employed by the Groton facility.

- *Bureau of Economic Analysis (BEA)*

  BEA provides the RIMS II multipliers being used for estimating economic impacts as an alternative check on the REMI forecast.

- *Bureau of Labor Statistics (BLS)*

  The BLS is the source of many of the REMI model's control forecast variables.

- *Census*

  Census is the primary demographic data source in the REMI model's control forecast.

- *The Electric Boat Company*

  The company's Connecticut employment is 8,750, 500 of witch are located on-site at the New London Naval Sub Base.

- *Sub Base Realignment Coalition*

  A regional group of political, economic, development, state and local officials whose mission is to build the best possible case for retention of the Sub Base as an integral and significant contributor to the economy. They provided preliminary and supplemental data as it became available to them.

Interpreting Results

Using the REMI model produces results data about the effect of the Sub Base and the Electric Boat Company on the Connecticut and southeastern Connecticut economies. The economic concepts below are among the major results presented in this study and represent the major variables used to assess the overall economic contribution made by the Sub Base and the Electric Boat Company.

Employment – Employment represents one of the most tangible aspects of the military installation to the area, namely full-time jobs for a given year. Employment is one measure of the benefit of the base and can be used to compare this facility to other military base facilities.

Aggregate Personal Income – The total of all income to labor, owners of capital (proprietors' income), and entrepreneurs for their contribution to the production of output. It is a typical measure of the standard of living to the region's population. Higher aggregate personal

income indicates a better standard of living. Higher income also has implications for future demand for goods and services in the rest of the economy.

Gross Regional Product (GRP) – Also called Gross State Product (GSP) when the "region" is the entire state, this is the total dollar value of all final goods and services produced in the region in a given year. It conveys output in dollar terms similar to the way Gross Domestic Product (GDP) does for the nation as a whole.

State and Local Tax Revenues – In-state facilities typically generate both local taxes and local expenditures. This is less true of a military installation because of exemptions of federal property, but state income and sales taxes are impacted and the facility does have implications for local expenditures such as police, fire, schooling, etc. The net of revenues minus expenditures is net new state and local revenues.

In addition to these formally presented results from the model, REMI allows users to see other statistics related to changes in productivity (due to labor and capital access), wage increases because of industry pressures, commodity prices because of excess demand, and numerous others.

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