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NAVAL ENERGY FORUM

"Creating Spartan Energy Warriors: Our Competitive Advantage"

Washington, DC

13 – 14 October 2011

Agenda

Thursday, October 13, 2011

WHY THIS TIME IS DIFFERENT

- RADM Philip Cullom, Director, Energy and Environmental Readiness Division (OPNAV N45), Director, Navy Task Force Energy Part 1, Part 2

REACHING OUR ENLISTED SAILORS

- Master Chief Petty Officer of the Navy Rick D. West

NEW ENERGY FUTURE

A GLOBAL VIEW TO ENERGY'S FUTURE

- Mr. Vinod Khosla, Khosla Ventures

INTERAGENCY SYNERGIES — DoN & SBA

- Ms. Karen Mills, Administrator, Small Business Administration

RETOOLING OUR FLEET: SUCCESSES AND CHALLENGES

MARITIME INITIATIVES/SUCCESSES

- RDML Ann Phillips, Director, Surface Warfare Division (OPNAV N86)

EXPEDITIONARY INITIATIVES/SUCCESSES — INDIA 3/5 OVERVIEW

- Maj. Sean Sadlier, USMC, U.S. Marine Corps Expeditionary Energy Office

COMBAT ENABLERS — IT'S ABOUT THE WARFIGHTER

U.S. MARINE CORPS INITIATIVES/SUCCESSES

- Col. Bob Charette, USMC, Director, U.S. Marine Corps Expeditionary Energy Office

SHORE INITIATIVES/SUCCESSES

- RADM William French, Commander, Navy Region Southwest

Friday, October 14, 2011

PANEL: INFORMATION SYSTEMS EFFICIENCY

N2/6 PERSPECTIVE

- RDML Matt Klunder, Director of Intelligence, Surveillance and Reconnaissance Capabilities Division (OPNAV N2/N6F2)

SHIPBOARD SYSTEMS

- Dr. Timothy McCoy, Director, Electric Ships Office

A TOTAL OWNERSHIP COST VIEW OF ACQUISITION

- Ms. Jo Decker, Assistant Deputy Chief of Naval Operations for Fleet Readiness and Logistics

CAPABILITIES AND RESOURCES

- VADM John Terence Blake, Deputy Chief of Naval Operations, Integration of Capabilities and Resources (OPNAV N8)

OUR PAST IS PROLOGUE

- Mr. James Hornfischer, New York Times Bestselling Author

THE FUTURE OF POWER AND ENERGY

- Dr. Richard Carlin, Head, Sea Warfare and Weapons Department, Office of Naval Research

PANEL: EXTERNAL PERSPECTIVES ON ENERGY INNOVATION

- BG Bob Barnes, USA (Ret), Senior Policy Advisor, The Nature Conservancy
- Mr. Paul Bollinger, General Manager of Government Solutions, Boeing Energy

INTERAGENCY/INDUSTRY COOPERATION

- Dr. Arun Majumdar, Director, Advanced Research Projects Agency - Energy (ARPA-E)

NDIA
National Defense Industrial Association

PROMOTING NATIONAL SECURITY SINCE 1919

U.S. DEPARTMENT OF THE NAVY ENERGY SECURITY

NAVAL ENERGY FORUM

Creating Spartan Energy Warriors: Our Competitive Advantage

FORUM HIGHLIGHTS:

- Keynote Addresses by Secretary of the Navy Ray Mabus, Chief of Naval Operations Admiral Jonathan Greenert, Admiral John C. Harvey, and other Distinguished Guests
- Presentations on importance of culture change, successes/challenges for our fleet and shore infrastructure, investments in alternative fuels, information systems, energy efficient acquisition, and game changing solutions
- Special remarks by Mr. Jim Hornfischer, *New York Times* bestselling author

OCTOBER 13-14, 2011

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A WELCOME MESSAGE

Welcome to the 2011 Naval Energy Forum. Since I announced the Navy's energy goals at this forum two years ago, we have made remarkable progress in our efforts to achieve greater energy security for the Navy and the nation. I am committed to positioning our Naval forces for tomorrow's challenges, and changing the way the Department of the Navy uses, produces, and acquires energy is one of our greatest challenges because it is also one of our greatest vulnerabilities.

Our investments in more efficient and alternative sources of energy will directly affect our combat capability. For example, we import more fuel into Afghanistan than any other supply. For every fifty fuel convoys in Afghanistan, a Marine is killed or wounded while protecting the supply route. Improved efficiency means fewer trucks on the road, and fewer Sailors and Marines in that vulnerable position. Likewise, shipboard energy efficiency means more time performing missions and less time spent refueling in potentially dangerous ports, or at sea. Our naval vessels are most at risk during refueling, as the USS Cole was when it was attacked in 2000 in the Yemeni port of Aden.

Energy efficiency can also affect combat capability by saving money. The Department of Defense is struggling to find ways to save money while maintaining the strongest military in the world. We can protect our readiness capabilities and our operations from budget cuts if we can reduce our energy costs, and reducing our dependence on foreign oil will result in savings. Political unrest in oil-rich nations often results in fuel price spikes, which cost the Navy millions of dollars. The Navy's fuel costs jump $30 million for every $1 increase in a barrel of oil, and price fluctuations over the last two years resulted in $1.1 billion in budgeting uncertainty for the Navy. So much uncertainty is particularly problematic in today's budget climate. We must have the resources required to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. That is why avoiding these fuel price spikes and elevations is essential to the Navy's core mission, and why developing alternative fuels is a priority. We have already seen a return on our investments in more efficient energy use. Last year, we launched the first hybrid ship in the Navy, the USS Makin Island. In its maiden voyage, the Makin Island saved almost $2 million in fuel costs. Over the lifetime of the ship, we can save $250 million at last year's fuel prices.

We also continue to make progress in our efforts to test and certify all of our aircraft and ships on drop-in biofuels. At this year's NAS Patuxent River Labor Day Air Show, all six of the Navy's Blue Angels performed using a 50/50 blend of camelina-based biofuel and aviation gas. The F/A-18 Hornet flew at 1.7 times the speed of sound on this 50/50 blend with no difference in the performance of the aircraft. We have successfully tested the MH-60 Seahawk, the RCB-X (Riverine Command Boat), V-22 Osprey, EA-6B Prowler, T-45 trainer and AV-8 Harrier. We will complete testing on all of our aircraft by the fall of 2011, and will have certified all of our ships and planes by the end of next year. Energy efficiency measures we are pursuing on our shore installations will also realize additional cost savings. We have done a lot. But we have more to do.

Advances in energy efficiency and alternative energy will go a long way toward achieving the ambitious energy goals that I announced at this forum in 2009, but the full value of these initiatives will not be achieved without changing the way we as a Navy and a nation look at energy. During this Forum, I encourage you to share your expertise, challenge old assumptions, and think creatively about how all of us can work together to secure our future as a nation and as a Navy. The military can, and should, continue to lead the way. For 235 years, the United States Navy and the United States Marine Corps have been innovators in energy. The Navy does not pursue energy innovation because it is a fad or a popular catch phrase. We do it because it makes us better war fighters.

Secretary of the Navy Ray Mabus

THURSDAY, OCTOBER 13, 2011

7:00am - 7:55am Registration Open - Atrium Ballroom Foyer Ground Level
Continental Breakfast Available in Atrium Ballroom Foyer Concourse Level

7:55am - 8:00am **WELCOME — COLORS** - Atrium Ballroom

8:00am - 8:05am **WHY THIS TIME IS DIFFERENT**
- RADM Philip Cullom, *Director, Energy and Environmental Readiness Division (OPNAV N45), Director, Navy Task Force Energy*

8:05am - 8:10am **INTRODUCTION OF CHIEF OF NAVAL OPERATIONS**
- VADM William R. Burke, *Deputy Chief of Naval Operations for Fleet Readiness and Logistics (OPNAV N4)*

8:10am - 8:40am **OPENING KEYNOTE**
- ADM Jonathan W. Greenert, *Chief of Naval Operations*

EFFECTING CULTURE CHANGE — HOW TO CREATE SPARTAN ENERGY WARRIORS

8:40am - 9:05am **FLEET PERSPECTIVE**
- ADM John C. Harvey, Jr., *Commander, U.S. Fleet Forces Command*

9:05am - 9:15am **REACHING OUR ENLISTED SAILORS**
- Master Chief Petty Officer of the Navy Rick D. West

NEW ENERGY FUTURE

9:15am - 10:00am **A GLOBAL VIEW TO ENERGY'S FUTURE**
- Mr. Vinod Khosla, *Khosla Ventures*

10:00am - 10:15am **BREAK - VISIT DISPLAYS IN ATRIUM**
Refreshments Available in Atrium Ballroom Foyer Concourse Level

10:15am - 10:30am **INTERAGENCY SYNERGIES — DoN & SBA**
- Ms. Karen Mills, *Administrator, Small Business Administration*

10:30am - 11:00am **KEYNOTE ADDRESS**
- Honorable Ray Mabus, *Secretary of the Navy*

RETOOLING OUR FLEET: SUCCESSES AND CHALLENGES

11:00am - 11:30am **MARITIME INITIATIVES/SUCCESSES**
- RDML Ann Phillips, *Director, Surface Warfare Division (OPNAV N86)*

11:30am - 12:00pm **AVIATION INITIATIVES/SUCCESSES**
- VADM David Architzel, *Commander, Naval Air Systems Command*

12:00pm - 1:15pm **LUNCH IN THE ATRIUM - VISIT DISPLAYS**

1:15pm - 1:45pm **EXPEDITIONARY INITIATIVES/SUCCESSES — INDIA 3/5 OVERVIEW**
- Maj. Sean Sadlier, USMC, *U.S. Marine Corps Expeditionary Energy Office*

COMBAT ENABLERS — IT'S ABOUT THE WARFIGHTER

1:45pm - 2:20pm **U.S. MARINE CORPS INITIATIVES/SUCCESSES**
- Col. Bob Charette, USMC, *Director, U.S. Marine Corps Expeditionary Energy Office*

2:20pm - 2:50pm **SHORE INITIATIVES/SUCCESSES**
- RADM William French, *Commander, Navy Region Southwest*

2:50pm - 3:05pm **BREAK - VISIT DISPLAYS IN ATRIUM**
Refreshments Available in Atrium Ballroom Foyer Concourse Level

3:05pm - 3:40pm **PANEL: INVESTMENT IN ALTERNATIVE FUELS**
- Mr. Tom Hicks, *Deputy Assistant Secretary of the Navy (Energy)*
- Dr. Henry Kelly, *Acting Assistant Secretary and Principal Deputy Assistant Secretary for the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy*
- Ms. Sarah Bittleman, *Senior Advisor to USDA Secretary Tom Vilsack*

3:40pm - 3:50pm **DISCUSSION (Q&A)**

VIEW FROM THE HILL

3:50pm - 4:45pm **REMARKS**
- Former Senator John Warner (R-VA)
- Pending

4:45pm - 6:00pm **RECEPTION IN THE ATRIUM - VISIT DISPLAYS**

FRIDAY, OCTOBER 14, 2011

7:00am - 8:00am Registration Open - Atrium Ballroom Foyer, Ground Level
Continental Breakfast Available in Atrium Ballroom Foyer, Concourse Level

8:00am - 8:15am **OVERVIEW: DAY TWO**
- RADM Philip Cullom, *Director, Energy and Environmental Readiness Division (OPNAV N45), Director, Navy Task Force Energy*

8:15am - 8:40am **OPERATIONAL ENERGY — THE DoD PERSPECTIVE**
- Honorable Sharon Burke, *Assistant Secretary of Defense for Operational Energy Plans & Programs*

PANEL: INFORMATION SYSTEMS EFFICIENCY

8:40am - 9:05am **N2/6 PERSPECTIVE**
- RDML Matt Klunder, *Director of Intelligence, Surveillance and Reconnaissance Capabilities Division (OPNAV N2/N6F2)*

9:05am - 9:25am **SHIPBOARD SYSTEMS**
- Dr. Timothy McCoy, *Director, Electric Ships Office*

9:25am - 9:35am **DISCUSSION (Q&A)**

9:35am - 9:45am **BREAK - VISIT DISPLAYS IN ATRIUM**
Refreshments Available in Atrium Ballroom Foyer Concourse Level

ENERGY EFFICIENT ACQUISITION

9:45am - 10:20am **PANEL: A CONGRESSIONAL STAFF PERSPECTIVE**
- Mr. John H. Quirk V, *Professional Staff Member, Senate Armed Services Committee*
- Jamie R. Lynch, *Professional Staff Member, House Armed Services Committee*
- Dr. Gavi Begtrup, *Policy Advisor to Rep. Gabrielle Giffords (D-AZ)*

10:20am - 10:40am **ENERGY AND ACQUISITION REFORM**
- Mr. Jim Thomsen, *Principal Civilian Deputy Assistant Secretary of the Navy (Research, Development & Acquisition)*

10:40am - 11:00am **A TOTAL OWNERSHIP COST VIEW OF ACQUISITION**
- Ms. Jo Decker, *Assistant Deputy Chief of Naval Operations for Fleet Readiness and Logistics*

11:00am - 11:20am **CAPABILITIES AND RESOURCES**
- VADM John Terence Blake, *Deputy Chief of Naval Operations, Integration of Capabilities and Resources (OPNAV N8)*

11:20am - 12:00pm **OUR PAST IS PROLOGUE**
- Mr. James Hornfischer, *New York Times Bestselling Author*
Book Signing to Follow

12:00pm - 1:00pm **LUNCH IN THE ATRIUM - VISIT DISPLAYS**

GAME CHANGING SOLUTIONS

1:00pm - 1:10pm **REMARKS BY U.S. SECRETARY OF AGRICULTURE**
- Honorable Tom Vilsack, *Secretary of Agriculture*

1:10pm - 1:40pm **THE FUTURE OF POWER AND ENERGY**

- Dr. Richard Carlin, *Head, Sea Warfare and Weapons Department, Office of Naval Research*

1:40pm - 2:30pm **PANEL: EXTERNAL PERSPECTIVES ON ENERGY INNOVATION**

- BG Bob Barnes, USA (Ret), *Senior Policy Advisor, The Nature Conservancy*
- Mr. Paul Bollinger, *General Manager of Government Solutions, Boeing Energy*
- Mr. Amory Lovins, *Cofounder, Chairman and Chief Scientist, Rocky Mountain Institute*

2:30pm - 3:00pm **INTERAGENCY/INDUSTRY COOPERATION**

- Dr. Arun Majumdar, *Director, Advanced Research Projects Agency - Energy (ARPA-E)*

3:00pm - 3:15pm **CLOSING REMARKS**

- RADM Philip Cullom, *Director, Energy and Environmental Readiness Division (OPNAV N45), Director, Navy Task Force Energy*

HONORABLE RAY MABUS
SECRETARY OF THE NAVY

Ray Mabus is the 75th United States Secretary of the Navy. As Secretary, he leads America's Navy and Marine Corps and is responsible for an annual budget in excess of $150 billion and almost 900,000 people. Prior to joining the administration of President Barack Obama, Mabus served in a variety of top posts in government and the private sector. In 1988, Mabus was elected Governor of Mississippi. As the youngest governor of Mississippi in more than 100 years at the time of his election, he stressed education and job creation. He passed B.E.S.T. (Better Education for Success Tomorrow), one of the most comprehensive education reform programs in America, and was named one of Fortune Magazine's top ten education governors. He was appointed Ambassador to the Kingdom of Saudi Arabia for the Clinton Administration in 1994. Prior to becoming Governor he was elected State Auditor of Mississippi and served as a Surface Warfare Officer in the U.S. Navy aboard the cruiser USS Little Rock. Secretary Mabus is a native of Ackerman, Miss., and received a Bachelor's Degree from the University of Mississippi, a Master's Degree from Johns Hopkins University, and a Law Degree from Harvard Law School.

ADM JONATHAN W. GREENERT
CHIEF OF NAVAL OPERATIONS

Adm. Jonathan W. Greenert is a native of Butler, Pa. He graduated from the U.S. Naval Academy in 1975 and completed studies in nuclear power for service as a submarine officer. His career as a submariner includes assignments aboard USS Flying Fish (SSN 673), USS Tautog (SSN 639), Submarine NR-1 and USS Michigan (SSBN 727 - Gold Crew), culminating in command of USS Honolulu (SSN 718) from March 1991 to July 1993. Subsequent fleet command assignments include Commander, Submarine Squadron 11; Commander, U.S. Naval Forces Marianas; Commander, U.S. 7th Fleet (August 2004 to September 2006); and, Commander, U.S. Fleet Forces Command (September 2007 to July 2009). Greenert has served in various fleet support and financial management positions, including deputy chief of Naval Operations for Integration of Capabilities and Resources (N8); deputy commander, U.S. Pacific Fleet; chief of staff, U.S. 7th Fleet; head, Navy Programming Branch and director, Operations Division Navy Comptroller. Most recently he served as 36th vice chief of naval operations (August 2009 to August 2011). He is a recipient of various personal and campaign awards including the Distinguished Service Medal (6 awards), Defense Superior Service Medal and Legion of Merit (4 awards). In 1992 he was awarded the Vice Admiral Stockdale Award for inspirational leadership. He considers those awards earned throughout his career associated with unit performance to be most satisfying and representative of naval service. Greenert became the 30th Chief of Naval Operations Sep. 23, 2011.

VADM DAVID ARCHITZEL
COMMANDER, NAVAL AIR SYSTEMS COMMAND

Vice Admiral Architzel assumed his current duties in May 2010, after serving as the principal military deputy to the assistant secretary of the Navy (Research, Development, and Acquisition). Previous flag assignments included program executive officer for Aircraft Carriers; commander of Operational Test and Evaluation Force, Norfolk; commander, Navy Region Mid-Atlantic; commander, Naval Safety Center, Norfolk; commander, Iceland Defense Force; and commander, Fleet Air Keflavik. At sea, Architzel served as the executive officer, USS Dwight D. Eisenhower (CVN 69) and Pre-Commissioning Unit John C. Stennis (CVN 74). He served as the commanding officer, USS Guam (LPH 9); flagship for commander Amphibious Squadron (CPR) 2; and the sixth commanding officer of USS Theodore Roosevelt (CVN 71). A career naval aviator, Architzel has accumulated more than 5,000 flight hours, 4,300 of those hours in the S-3, and the remainder in some 30 other aircraft types in his role as a test pilot at NAS Patuxent River. He served in Sea Control Squadron (VS) 30, deploying aboard USS Forrestal (CV 59), and as maintenance officer in VS-28, deploying aboard USS Independence (CV 62). He later returned to VS-30 as the executive officer and subsequently as commanding officer.

BG BOB BARNES (USA), RET

SENIOR POLICY ADVISOR, THE NATURE CONSERVANCY

BG (ret) Bob Barnes serves as The Nature Conservancy's Senior Policy Advisor (Department of Defense) and is a member of The Conservancy's energy and climate change teams. Bob's duties include coordinating all relationships between The Conservancy and DoD with special emphasis on cooperative programs that facilitate military readiness and also advance The Conservancy's natural resource conservation and sustainability objectives. Bob retired from the Army in 2001 after 32 years of service. His final assignment was as the Assistant Judge Advocate General for Civil Law and Litigation, where his responsibilities included supervising the Army's Environmental Law Division and the defense of the Army in all civil (including environmental) litigation. Key earlier assignments included serving as the senior attorney for Forces Command, the Army's largest command, and as Deputy Legal and Legislative Counsel to the Chairman of the Joint Chiefs of Staff during Operations Just Cause (Panama) and Desert Shield/Storm (Gulf War).

DR. GAVI BEGTRUP

POLICY ADVISOR TO REP. GABRIELLE GIFFORDS (D-AZ)

Gavi Begtrup is the Policy Advisor for Congresswoman Gabrielle Giffords of Arizona. He advises the Ranking Member of the House Space and Aeronautics Subcommittee on a variety of issues, including science and technology, energy and environment, and space. In that role he spearheads the Congresswoman's efforts on renewable energy, especially solar, and defense energy issues, culminating in the Department of Defense Energy Security Acts of 2010 and 2011 (DODESA). Dr. Begtrup has a background in physics and made his way to Congress through a AAAS Congressional Science fellowship. Prior to working on "the Hill," he was a Mirzayan Science and Technology Policy Graduate Fellow at the National Academies of Science, where he worked on breakthrough science projects, and has worked as a policy analyst at the ASysT Institute at Analytic Services Inc., a homeland security non-profit. Dr. Begtrup is a native of Nashville, TN and the son of veterans. He earned his B.S. in Physics and Mathematics from Western Kentucky University and his Ph.D. in Physics from the University of California, Berkeley.

MS. SARAH BITTLEMAN

SENIOR ADVISOR TO USDA SECRETARY TOM VILSACK

Sarah Bittleman is a Senior Advisor to USDA Secretary Tom Vilsack specializing in energy, Environmental Protection Agency issues, Title I programs and other areas related to production agriculture. Bittleman previously worked for the Department of the Interior, the U.S. Senate and the House of Representatives on a range of policy and strategic development issues involving agriculture, energy, natural resources and climate change. She holds a Master of Public Administration from East Carolina University, a Juris Doctorate from Tulane University of Law School and a BA in Political Science from Union College in New York.

VADM JOHN TERENCE BLAKE

DEPUTY CHIEF OF NAVAL OPERATIONS, INTEGRATION OF CAPABILITIES AND RESOURCES

Vice Admiral Blake graduated from the U.S. Naval Academy in 1975. His sea duty assignments include: USS New (DD 818), USS Sarfield (DD 837), USS Joseph Strauss (DDG 16), USS John Young (DD 973), USS Chandler (DDG 996), USS Leahy (CG 16), and USS Blue Ridge (LCC 11). Blake commanded USS O'Brien (DD 975), served on the 7th Fleet Staff as current operations and assistant chief of staff for Operations, Commanded USS Normandy (CG 60) and served as Commander, Carrier Strike Group Eleven. His shore assignments include: Flag Aide to Commander, Navy Recruiting Command; Navy Staff (N80) Head, Sea Control Section and program manager for the Navy Shipbuilding account; (J8) division chief and head of the Combat Identification Joint Warfare Capability Assessment Team; director, Programming Division (N80); director, Operations Division, Office of Budget in the Office of the Assistant Secretary of the Navy (Financial Management/Comptroller); director, Operations Division, Fiscal Management Division, OPNAV; deputy director for Resources and Acquisition (J8) and Deputy Assistant Secretary of the Navy for Budget.

MR. PAUL BOLLINGER

GENERAL MANAGER OF GOVERNMENT SOLUTIONS, BOEING ENERGY

Paul Bollinger became general manager of Government Solutions for Boeing Energy in August 2010. Boeing Energy is a division of Global Services & Support within Boeing Defense, Space & Security (BDS). Bollinger is responsible for Boeing Energy's development of energy programs and services for federal, state and municipal government agencies, as well as other public entities. Before joining Boeing, Bollinger served in several significant government service positions, beginning as special assistant to the Assistant Secretary for Installations, Environment & Logistics for the U.S. Air Force. In this role he had primary responsibility in the Pentagon for ensuring the success of the Air Force Synthetic Fuel Certification program. He also established the Alternative Fuels Certification Office at Wright-Patterson Air Force Base. Bollinger later served as Deputy Assistant Secretary for Energy and Partnerships for the U.S. Army. In this role, he was the Senior Energy Executive responsible for the execution of the Army's Energy Security Implementation Strategy. He also oversaw the $13 billion Residential Community Initiative that worked with the private sector to build and maintain 89,000 housing units for soldiers and their families.

VADM WILLIAM R. BURKE

DEPUTY CHIEF OF NAVAL OPERATIONS FOR FLEET READINESS AND LOGISTICS (OPNAV N4)

Vice Admiral Burke graduated from the United States Naval Academy in 1978 with a Bachelor of Science in Systems Engineering. In 1985, he completed an MBA at Marymount University. In 1999, he earned an MS in National Security Strategy at the National War College in Washington, D.C. His submarine assignments include USS Lafayette (SSBN 616), USS Key West (SSN 722), USS Omaha (SSN 692), USS Cavalla (SSN 684), and command of USS Toledo (SSN 769). He commanded Submarine Squadron 2 from July 2001 to July 2003. His Washington D.C. shore assignments include a tour in chief of naval operations' Attack Submarine Division, assistant deputy for House Liaison in the Navy Office of Legislative Affairs, chief of Training, Doctrine, and Assessment and assistant deputy director for Combating Terrorism (JCS J34), and head of Warfighting Assessments Branch (N812), and executive assistant to the vice chief of naval operations. Promoted to rear admiral in September 2005, his flag assignments include commander, Logistics Group Western Pacific/commander, Task Force 73/commander Navy Region Singapore; director, Assessment Division (N81/N00X) and the director, Quadrennial Defense Review (QDR/N00X). In April 2010 he was promoted to vice admiral and reported for duty as deputy chief of naval operations for Fleet Readiness and Logistics (N4).

HONORABLE SHARON BURKE

ASSISTANT SECRETARY OF DEFENSE FOR OPERATIONAL ENERGY PLANS & PROGRAMS

As the Assistant Secretary, Ms. Burke is the principal advisor to the Secretary and Deputy Secretary of Defense on operational energy security and reports to the Under Secretary of Defense for Acquisition, Technology, and Logistics. She is the inaugural Assistant Secretary for the office, which was created to strengthen the energy security of U.S. military operations. The mission of the office is to help the military services and combatant commands improve military capabilities, cut costs, and lower operational and strategic risk through better energy accounting, planning, management, and innovation. Operational energy, or the energy required to train, move, and sustain forces, weapons, and equipment for military operations, accounted for 75 percent of all energy used by the Department of Defense in 2009. Prior to her appointment at the Department of Defense, Ms. Burke was a Vice President and Senior Fellow at the non-partisan and independent Center for a New American Security (CNAS), a defense policy think tank. Ms. Burke has extensive previous U.S. government service.

DR. RICHARD CARLIN

DEPARTMENT HEAD, SEA WARFARE AND WEAPONS DEPARTMENT, OFFICE OF NAVAL RESEARCH

Dr. Richard T. Carlin became Department Head for the Sea Warfare and Weapons Department at the Office of Naval Research (ONR) in September 2007. As Department Head, Dr. Carlin overseas a broad range of S&T programs for surface ships, submarines, and undersea weapons with an annual budget of approximately $500M per year. Immediately prior to his current position, he was the Director for the Undersea Weapons and Naval Materials Division with responsibilities in undersea weapons and countermeasures, advanced energetics, structural materials (alloys and composites), materials for power systems, acoustic transducers, maintenance reduction technologies, and blast mitigation materials. During his career at ONR, he also served as the Acting Chief Scientist in 2004 and as Director for the Mechanics and Energy Conversion Division from 2001 to 2005. Prior to his appointment as a Division Director, Dr. Carlin was the ONR Program Officer for Electrochemistry S&T and Undersea Weapons Propulsion with programs covering numerous electrochemical and thermal power technologies. Additionally, Dr. Carlin serves as the Navy S&T representative on various energy advisory groups, including the Hydrogen and Fuel Cell Interagency Task Force, DDR&E Energy Security Task Force, and Naval Task Force Energy.

COL BOB CHARETTE, USMC

DIRECTOR, U.S. MARINE CORPS EXPEDITIONARY ENERGY OFFICE

As the Director, Expeditionary Energy Office (2009-Present) Col Charette is tasked with analyzing, developing and directing the USMC Energy Strategy. Charette was born in Scranton, PA. He enlisted in the Marine Corps Reserves in 1985 and attended boot camp at Parris Island, SC. He then attended Officer Candidate School in Quantico, VA and was commissioned August 1986. He has earned a Bachelors of Science degree in Chemistry from Delaware Valley College (1986), Masters of Business Administration from the University of Phoenix (2002), and a Masters of National Security Strategy from the National War College (2007). Participated directly in the following combat operations; Operation Desert Storm, Kuwait/Iraq (1991), Operation Southern Watch, Iraq (1995), Operation Deliberate Force, Bosnia (1995), Operation Enduring Freedom, Afghanistan (2001-2002), Operation Iraqi Freedom, Iraq (2005). He also participated in three deployments to the Western Pacific, two in support of the Unit Deployment Program (1992 and 1996). In addition, Col Charette has made three deployments afloat, one aboard USS Theodore Roosevelt (CVN-71) with Carrier Air Wing 8 (1995), and two aboard the USS Carl Vinson (CVN-70) with Carrier Air Wing 9 (2003 and 2005).

RADM PHILIP CULLOM

DIRECTOR, OPNAV N45; DIRECTOR, NAVY TASK FORCE ENERGY

Rear Admiral Cullom graduated with distinction from the U.S. Naval Academy with a bachelor's degree in physics. He also holds a master's degree in business administration with distinction from Harvard Business School. At sea, he has served aboard USS Truxtun (CGN 35), USS Jesse L. Brown (FF 1089), USS Dwight D. Eisenhower (CVN 69), and USS Mobile Bay (CG 53), participating in numerous exercises and counter-narcotics patrols as well as Operations Desert Storm and Southern Watch. From 1998 to 1999 he commanded USS Mitscher (DDG 57) during the Kosovo crisis. As commander, Amphibious Squadron Three, he served as sea combat commander for the first Expeditionary Strike Group (ESG 1) in support of Operations Iraqi Freedom and Enduring Freedom (2003-2004). From June 2007 to August 2008, he commanded the Eisenhower and George Washington Strike Groups, as Commander, Carrier Strike Group Eight. Ashore, he has served in various technical, policy, and strategy positions. Joint assignments included Defense resource manager within the J-8 Directorate of the Joint Staff and two positions at the White House as Special Assistant to the Director of the Office of Management and Budget, and Director for Defense Policy/Arms Control at the National Security Council. As a Flag Officer, he has served as Director of Deep Blue, the Strategy and Policy (N5SP) Division, and Fleet Readiness Division (N43). In July 2010, he assumed his present duties as Director, Energy and Environmental Readiness Division on the Navy Staff.

MS. JO DECKER

ASSISTANT DEPUTY CHIEF OF NAVAL OPERATIONS FOR FLEET READINESS AND LOGISTICS

Ms. Decker is currently the senior civilian responsible for policy, program, and resource allocation for world-wide U.S. Navy Readiness and Logistics. Prior to this assignment she was the Special Assistant to the Under Secretary of the Navy. From April 2008 to June 2010 Ms. Decker was the Director of the Office of Program Appraisal. From May 2005 to April 2008 she served as Assistant Deputy Chief of Naval Operations for Integration of Capabilities and Resources (N8). From March 2001 to May 2005 Ms. Decker served as Assistant Chief of Naval Personnel for Military Personnel, Navy (MPN) Financial Management. In that position she was the civilian line executive and Chief Financial Officer/Advisor to the Chief of Naval Personnel (CNP) for all matters relating to the MPN appropriation, as well as Navy's allocation of the Defense Health Appropriations, and Retired Pay Accounts. Ms. Decker has held positions of significant responsibility since early in her civil service career in 1983 including executive positions as Deputy/Acting Comptroller of Naval Air Systems Command, Chief Financial Officer for the Office of Naval Intelligence (ONI) and Director, Assessments and Evaluation, ONI.

RADM WILLIAM FRENCH

COMMANDER, NAVY REGION SOUTHWEST

Rear Admiral French was commissioned through the Naval Reserve Officer Training Corps Program in May 1979. He earned a Master of Science degree from Naval Postgraduate School in 1986 and a Master of Arts from the Naval War College in 1999. A submarine officer and graduate of the Navy's Nuclear Power Training, French has served at sea in USS Spadefish (SSN 668), as operations officer in USS Sea Devil (SSN 664), and engineer in USS Tecumseh (SSBN 628). He served as executive officer of USS Helena (SSN 725) and commanded USS Salt Lake City (SSN 716). Ashore, French served as Submarine Officer Community manager at the Bureau of Naval Personnel; as deputy commander of Submarine Squadron 11; as chief of the Strategy and Policy Division at United States Strategic Command in Omaha, Neb.; as director, Submarine Officer Distribution and Nuclear Propulsion Program manager at the Bureau of Naval Personnel; and commanded Submarine Squadron 3 in Pearl Harbor. During his squadron command tour, all six of the squadron's submarines deployed, five of which conducted operations in direct support of Operation Iraqi Freedom. French's first flag officer assignment was serving as commander, Navy Region Northwest, followed by command of Navy Region Marianas while concurrently serving as U.S. Defense representative to Guam, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia and Republic of Palau. French currently serves as Commander, Navy Region Southwest.

ADM JOHN C. HARVEY, JR.
COMMANDER, U.S. FLEET FORCES COMMAND

Born and raised in Baltimore, Md., Adm. John C. Harvey was commissioned from the U. S. Naval Academy in 1973 and immediately commenced training in the Navy's Nuclear Propulsion program. Harvey has served at sea aboard USS Enterprise (CVN 65), USS Bainbridge (CGN 25), USS McInerney (FFG 8), as reactor officer aboard USS Nimitz (CVN 68), and as executive officer on USS Long Beach (CGN 9). He commanded USS David R Ray (DD 971), USS Cape St. George (CG 71) and Cruiser-Destroyer Group Eight/Theodore Roosevelt Strike Group. He has deployed to the North and South Atlantic; the Mediterranean, Baltic and Red seas; the Western Pacific, Indian Ocean, and the Persian Gulf. Ashore, he served three tours at the Bureau of Naval Personnel in a variety of billets including surface nuclear officer detailer, CGN/CVN placement officer, surface nuclear program manager in N13, legislative adviser to chief of naval personnel (CNP), executive assistant to CNP and as director, Total Force Programming and Manpower Management Division (OPNAV N12). He has also served as the senior military assistant to the under secretary of defense (Policy), and on the Navy staff as deputy for Warfare Integration (OPNAV N7F). Most recently, he served as the 54th chief of naval personnel/OPNAV N1 and as the director, Navy staff (OPNAV). Harvey assumed command of U.S. Fleet Forces Command in July 2009.

MR. THOMAS W. HICKS
DEPUTY ASSISTANT SECRETARY OF THE NAVY (ENERGY)

Tom Hicks is the Deputy Assistant Secretary of the Navy for Energy. He serves as the Secretariat focal point on all matters pertaining to the Department of Navy's energy conservation, energy efficiency, energy resources, and green initiatives. Previously, Mr. Hicks held several executive roles at the U.S. Green Building Council (USGBC). Most recently, he spearheaded a new strategic venture on behalf of USGBC - the Building Performance Initiative - to ensure that all green buildings meet or exceed their energy and environmental performance goals. As Vice President of the Leadership in Energy and Environmental Design (LEED) green building rating system, he led the development and implementation of all LEED rating systems. He also served as Vice President for International Programs. Prior to USGBC, he was a Senior Program Manager at the U.S. Environmental Protection Agency within the Energy Star for Buildings program.

MR. JAMES HORNFISCHER
NEW YORK TIMES BESTSELLING AUTHOR

James D. Hornfischer is the author most recently of the *New York Times* bestseller, *Neptune's Inferno: The U.S. Navy at Guadalcanal*, which the *Wall Street Journal* called "extremely readable, comprehensive and thoroughly researched.. In the end, what one takes away from Mr. Hornfischer's vivid and engaging account is a feeling for the uncertainty, complexity and extreme physical and psychological demands of war at sea in 1942." Hornfischer is also the author of *Ship of Ghosts* and *The Last Stand of the Tin Can Sailors*, winner of the Samuel Eliot Morison Award. When he's not writing, he works as a literary agent, representing nonfiction authors such as H. W. Brands, Ron Powers, Alex Kershaw, and Annie Jacobsen. In his 18 years as a literary agent, he has helped put 16 books on the *New York Times* bestseller list, including three #1s. A native of Massachusetts, he lives in Austin with his wife and their three children.

DR. HENRY KELLY

ACTING ASSISTANT SECRETARY AND PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR THE OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF DEFENSE

In his role, Dr. Kelly oversees a broad energy portfolio, helping hasten the transition to a clean energy economy. The EERE portfolio includes critical efforts to drive innovation, including the SunShot Initiative, which aims to reduce the installed cost of utility-scale solar systems to a dollar-a-watt. At a dollar-a-watt, solar energy is cost competitive—without subsidy—with other energy sources. Dr. Kelly also manages programs that will help put one million electric vehicles on the road by 2015, make the nation's buildings 20% more efficient, and help the United States obtain 80% of its electricity from clean energy sources by 2035. Prior to his arrival at DOE, Dr. Kelly served as the President of the Federation of American Scientists where he led a team that conducted analysis and advocacy on science, technology, and public policy, including global security issues, energy policy, and education technology. Dr. Kelly draws on vast experience in a variety of government positions. For seven years he worked in the Clinton White House as the Assistant Director for Technology for the Office of Science and Technology Policy. There he helped negotiate and implement administration research partnerships in energy and the environment, information technology, and learning technology. These partnerships included new automobile and truck technology, housing technology, bioprocessing technology, and information technology.

MR. VINOD KHOSLA

KHOSLA VENTURES

Vinod came to the U.S. to get his master's in biomedical engineering at Carnegie-Mellon University. His start-up dreams attracted him to Silicon Valley, where he got an MBA at Stanford University in 1980. Upon graduation he was one of the three founders of Daisy Systems, which was the first significant computer-aided design system for electrical engineers. Khosla, driven by the frustration of having to design the computer hardware on which the Daisy software needed to be built, started the standards-based Sun Microsystems in 1982 to build workstations for software developers. At Sun he pioneered "open systems" and RISC processors. Vinod has a passion for nascent technologies that can have a beneficial effect and economic impact on society. His greatest passion is being a mentor to entrepreneurs, helping them build technology-based businesses. His current passion is social entrepreneurship, with a special emphasis on microfinance as a poverty alleviation tool. He is a supporter of many microfinance organizations in India and Africa. He has been experimenting with education and global housing. Vinod is also passionate about alternative energy, petroleum independence, and the environment.

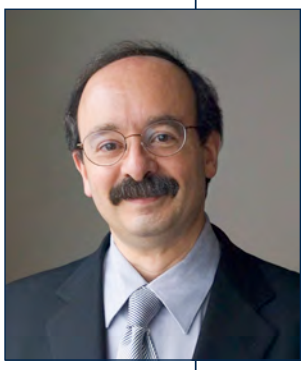
RDML MATT KLUNDER

DIRECTOR, OPNAV N2/N6F2

Rear Admiral Klunder graduated from the U.S. Naval Academy in 1982 and earned his wings of gold at Meridian, Miss., in September 1984. Subsequent flying tours were based in NAS Miramar, Calif.; NAS Patuxent River, Md.; Naval Air Facility Atsugi, Japan; and NAS Lemoore, Calif., where he was qualified in numerous aircraft including the E-2C Hawkeye and F/A-18 E/F Super Hornet. Klunder has served at sea in Airborne Early Warning Squadron (VAW) 112, VAW-115 as a department head, VAW-115 as commanding officer, and Carrier Air Wing 2 as air wing commander. He has made eight deployments and multiple surge operations. Klunder's shore tours include serving as a flight instructor, Naval Air Training and Operating Procedures Standardization officer and Commander Naval Air Force, U.S. Pacific Fleet evaluator at VAW-110; test pilot/project officer at Force Warfare Test Directorate; senior operations officer and Single Integrated Operational Plan officer at the Joint Staff J-3/National Military Command Center; as Joint Staff liaison officer and section chief at the U.S. State Department; as Combined Air Operations Center deputy director at Al Udeid Air Base in Qatar; and deputy director for Information, Plans, and Security for OPNAV N3/N5. In July 2010, Klunder reported as director of Intelligence, Surveillance and Reconnaissance Capabilities Division, OPNAV N2/N6F2 following his assignment as the 83rd commandant of midshipmen at the U.S. Naval Academy.

MR. AMORY LOVINS

COFOUNDER, CHAIRMAN & CHIEF SCIENTIST, RMI



Recovering physicist Amory Lovins, Hon. AIA, FRSA, is cofounder, Chairman, and Chief Scientist of Rocky Mountain Institute (www.rmi.org); advisor to major firms and governments worldwide on advanced energy efficiency; author of 31 books and over 450 papers; and recipient of the Blue Planet, Volvo, Zayed, Onassis, Nissan, Shingo, and Mitchell Prizes, MacArthur and Ashoka Fellowships, 11 honorary doctorates, and the Heinz, Lindbergh, Right Livelihood, National Design, and World Technology Awards. A Swedish engineering academician, honorary U.S. architect, and former Oxford don, he has taught at nine universities, most recently Stanford Engineering School (www.rmi.org/stanford). His latest books are Small Is Profitable (2009, www.smallisprofitable.org) Winning the Oil Endgame (2004, OSD- and ONR-sponsored, www.oilendgame.com), and Reinventing Fire (2011, www.reinventingfire.com). In 2009, Time named him one of the world's 100 most influential people, and Foreign Policy, one of the 100 top global thinkers. His security background spans nonproliferation, critical infrastructure, strategic doctrine, radical platform design, and three decades' leadership in military energy efficiency at the OSD and Service levels, including two DSB panels. He keynoted SECNAV's 07 Jun 11 Current Strategy Forum at NWC.

DR. ARUN MAJUMDAR

DIRECTOR, ADVANCED RESEARCH PROJECTS AGENCY - ENERGY

Dr. Arun Majumdar became the first Director of ARPA-E, the country's only agency devoted to transformational energy research and development, in October 2009. Dr. Majumdar also currently serves as Senior Advisor to the Secretary. Prior to joining ARPA-E, Dr. Majumdar was the Associate Laboratory Director for Energy and Environment at Lawrence Berkeley National Laboratory and a Professor of Mechanical Engineering and Materials Science and Engineering at the University of California, Berkeley. His highly distinguished research career includes the science and engineering of energy conversion, transport, and storage ranging from molecular and nanoscale level to large energy systems. In 2005, Dr. Majumdar was elected a member of the National Academy of Engineering for this pioneering work. At Berkeley Labs and UC Berkeley, Dr. Majumdar helped shape several strategic initiatives in the areas of energy efficiency, renewable energy, and energy storage. He also testified before Congress on how to reduce energy consumption in buildings. Dr. Majumdar has also served on the advisory committee of the National Science Foundation's engineering directorate, was a member of the advisory council to the materials sciences and engineering division of the Department of Energy's Basic Energy Sciences, and was an advisor on nanotechnology to the President's Council of Advisors on Science and Technology.

DR. TIMOTHY MCCOY

DIRECTOR, ELECTRIC SHIP OFFICE

Dr. Timothy J. McCoy serves as Director of the Electric Ship's Office (PMS-320) within the Program Executive Office for Ships in Washington, DC. There, he is responsible for developing electric power and propulsion systems for the US Navy's fleet. Prior to entering government service, he worked in industry as R&D Director and President of a defense contractor. Previously, he served on active duty in the US Navy. Dr. McCoy's experience includes development of integrated electric power and propulsion systems, shipboard control systems and design and construction for several classes of ships including AOE-6, DDG-51, DDG-1000 and LPD-17. Dr. McCoy holds a BSME from the University of Illinois, a Naval Engineer's Degree, SMEE and PhD from MIT and has taught ship design and systems engineering while on the MIT faculty. He is a registered Professional Engineer, is a member of ASNE, IMarEST, SNAME and a senior member of the IEEE. He has published over 35 technical papers and is an Adjunct Professor in the Electrical and Computer Engineering Department at Carnegie Mellon University.

MS. KAREN MILLS

ADMINISTRATOR, SMALL BUSINESS ADMINISTRATION

Karen Mills was sworn in April 6, 2009, as the 23rd Administrator of the U.S. Small Business Administration after being appointed by President Barack Obama and unanimously confirmed by the U.S. Senate. She leads a team of 3,000 employees whose mission is to help entrepreneurs and small business owners grow and create jobs by providing greater access to capital, counseling, federal contracting opportunities, disaster assistance and more. Among its priorities, the SBA manages a portfolio of more than $90 billion in loan guarantees. Each year, the agency helps leverage nearly $100 billion in federal contracts to small businesses and supports free counseling and technical assistance to more than 1 million entrepreneurs. In addition, SBA provides disaster assistance to homeowners, renters, and businesses with the help of 2,000 additional on-call employees. Throughout her career, Mills has owned, managed, mentored, and invested in small and growing businesses across the country. She earned an A.B. in economics from Harvard University and an M.B.A. from Harvard Business School where she was a Baker Scholar. Additionally, she served as a member of the Council on Foreign Relations.

RDML ANN PHILLIPS

DIRECTOR, SURFACE WARFARE DIVISION (OPNAV N86)

Rear Admiral Phillips, Director of Navy Surface Warfare Division, is responsible for requirements and resources for building the Navy's surface fleet of tomorrow. She graduated from the University of North Carolina at Chapel Hill, and received her commission in 1983 through the Naval Reserve Officers Training Corps. At sea, Rear Admiral Phillips served in aircraft carriers, destroyers, destroyer tenders, and repair tenders. She served as the first commanding officer of USS Mustin (DDG 89). She commanded Destroyer Squadron 28, in Norfolk, Va. She was the Flag Secretary to Cruiser-Destroyer Group 3 deploying with Carl Vinson Task Group, supporting Operation Desert Strike. She served as the executive officer on board USS Kinkaid (DD 965). Rear Admiral Phillips was the EA to Commander 6th Fleet/commander, Joint Command Lisbon in Lisbon, Portugal. She served on the staff of the Chief of Naval Operations, as an action officer in the Surface Warfare Division – DD 21 Program. She also served on the Chief of Naval Operations Strategic Studies Group, SSG XXVIII as a fellow from October 2008 to July 2009.

MR. JOHN H. QUIRK V

PROFESSIONAL STAFF MEMBER, SENATE ARMED SERVICES COMMITTEE

Prior to joining the staff of the Committee on Armed Services in January 2006, John served as a Captain in the U.S. Army with assignments to Fort Leonard Wood, Fort Lewis, and Schofield Barracks. John deployed in support of Operation Iraqi Freedom from 2004-2005 with the 84th Engineer Combat Battalion (Heavy) which operated as a theater-wide asset throughout Iraq. While deployed he served as an Executive Officer and Battalion Staff officer with responsibilities for unit readiness, training, budget, construction, and movement. Prior to deployment John served as a Platoon Leader executing military construction missions within the U.S. Army Pacific area of operations. John holds a Bachelor's of Science from Loyola University Maryland and is a graduate of the U.S. Army Engineer School at Fort Leonard Wood, Missouri. John is also contributing writer for the Mensa Research Journal.

MAJ SEAN SADLIER, USMC

U.S. MARINE CORPS EXPEDITIONARY ENERGY OFFICE

On December 2, 1994, Maj Sadlier received a commission in the United States Marine Corps. In March 2002, Maj Sadlier received a Master of Science degree in Information Technology Management. From April 2002 until April 2005, Maj Sadlier served as the Information Management Officer at the Marine Air Ground Task Force Staff Training Program, Quantico. Maj Sadlier served as the Operations Officer for Combat Logistics Battalion 31 until September 2005. After returning to Camp Lejeune, Maj Sadlier began serving as the Executive Officer for Marine Expeditionary Unit Service Support Group 24. He was assigned to 2d Maintenance Battalion as the Officer in Charge of the Remain Behind Element from January to August 2007. Reinforced until March 2008. During May 2008, Maj Sadlier executed orders to Deputy Commandant Installations and Logistics (LPO) as the Assistant Operations Officer until March 2010 when he assumed duties as a Logistics Analyst, Expeditionary Energy Office; he is currently serving in the same billet and deployed for 10 months to Regional Command (Southwest) as the E2O LNO in support of expeditionary energy initiatives.

MR. JIM THOMSEN

PRINCIPAL CIVILIAN DEPUTY, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT & ACQUISITION)

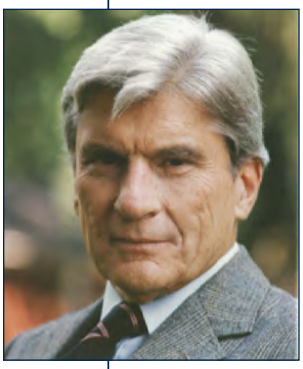
Mr. Thomsen currently serves as the Principal Civilian Deputy, Assistant Secretary of the Navy for Research, Development & Acquisition. As the Principal Civilian Deputy to the Honorable Sean Stackley, Mr. Thomsen's responsibilities include oversight and policy support for all Navy and Marine Corps research, development and acquisition programs for Shipbuilding, Aviation, Space, and Weapons systems. This responsibility includes more than $100B annually and hundreds of technical development and procurement programs for the Department of Navy. Concurrently in his position as Principal Deputy, Mr. Thomsen is serving a special assignment to the Under Secretary of Defense for Acquisition, Technology & Logistics. Since July 2010, Mr. Thomsen has served as co-executive director for the Under Secretary's Better Buying Power initiative for Defense Acquisition. Prior to his current position, Mr. Thomsen served as the Program Executive Officer (PEO) for Littoral and Mine Warfare, as well as Executive Director of the same organization. As the PEO, Mr. Thomsen was responsible for the execution of more than $3B annually on technical programs that included Counter-IED Electronic Warfare Systems in response to Operation Iraqi Freedom and Operation Enduring Freedom; Mission Modules for the Littoral Combat Ship; Mine Warfare Systems; Special Warfare Operations Systems; Anti-Terrorism Naval Ship Systems; and all Naval Undersea Surveillance Systems. Mr. Thomsen has held several technical and management positions within the Navy's Engineering Commands.

HONORABLE TOM VILSACK

SECRETARY OF AGRICULTURE

Tom Vilsack was appointed by President Barack Obama as the 30th Secretary of the U.S. Department of Agriculture (USDA) and sworn into office on January 21, 2009. As Secretary of Agriculture, Vilsack is working hard to strengthen the American agricultural economy, to revitalize rural communities, to protect and conserve our natural resources, and to provide a safe, sufficient and nutritious food supply for the American people. Because USDA's work affects every American everyday, we are proud to be the 'Every Way, Every Day' USDA. As Agriculture Secretary, Vilsack has worked to implement President Obama's ambitious agenda to turn around the economy and put Americans back to work. USDA has supported struggling farmers and ranchers, provided food aid to 1 in 4 Americans, and worked to create jobs and build a foundation for future economic growth. At USDA, Secretary Vilsack is working to ensure that America's forests and private working lands are conserved, implementing new strategies to restore our forests and clean our water supply. These efforts are already creating private sector jobs protecting and rehabilitating our forests and wetlands. Under Vilsack's leadership, USDA is working to improve the health of America's children, targeting child hunger and obesity with efforts to encourage balanced meals, nutritious eating and increased physical activity. He has ordered a top to bottom review of USDA's food safety standards and has begun to implement policy changes to ensure the safety of the American food supply.

FORMER SENATOR JOHN WARNER



During his 30 years in the Senate, John Warner served on the Senate Armed Services Committee, including three periods as Chairman, and was viewed as one of the most influential senators on military and foreign policy issues. Most recently, he was the lead co-sponsor with Senator Joseph Lieberman (I-Conn.) on climate change legislation. The Senator volunteered for two periods of active military duty: the first as an enlisted sailor in the final years of World War II (1945-46), and the second as a Lieutenant in the U.S. Marines during the Korean War (1950-52). After completing his law degree at the University of Virginia School of Law, he clerked for The Honorable E. Barrett Prettyman, U.S. Court of Appeals for the District of Columbia Circuit. From 1955 to 1960, the Senator was an Assistant U.S. Attorney for the District of Columbia. He was appointed, and confirmed by the Senate, as Under Secretary, and later as Secretary, of the U.S. Navy, positions he served in for a total of more than five years during the Vietnam War. He won election to his first of five Senate terms in November 1978. On January 3, 2009, he completed his fifth consecutive term and retired, establishing a record of being the second longest-serving U.S. Senator in the history of the Commonwealth of Virginia.

MCPON (SS/SW) RICK D. WEST

MASTER CHIEF PETTY OFFICER OF THE NAVY

Master Chief Petty Officer of the Navy Rick D. West graduated from Northwest Georgia High School in 1981 and immediately entered the U.S. Navy. West received recruit training and Quartermaster training at Orlando, Fla., followed by Enlisted Submarine School at Groton, Conn. His first duty assignment was aboard USS Ethan Allen (SSN 608) where he completed submarine qualifications. Other assignments include USS Thomas Edison (SSN 610), USS Sea Devil (SSN 664), Commander Naval Activities United Kingdom, USS Tecumseh (SSBN 628)(Blue), and Commander, Submarine Force, U.S. Pacific Fleet Staff (TRE Team).West was then assigned as Chief of the Boat aboard the San Diego-based fast-attack submarine, USS Portsmouth (SSN 707), where he completed two Western Pacific deployments and the crew earned two Battle Efficiency "E" awards. Upon completion of a CMC tour at Submarine Squadron ELEVEN, he was selected as COMSUBPAC Force Master Chief from January 2001 to 2004. During this time, West also attended the Senior Enlisted Academy in Newport, R.I. West then reported as the CMC to USS Preble (DDG 88), where he deployed to the Persian Gulf and qualified as an Enlisted Surface Warfare Specialist. West was selected during his tour on the Preble to serve as the Pacific Fleet Fleet Master Chief from February 2005 to June 2007. He then served as the 14th Fleet Master Chief for Commander, U.S. Fleet Forces Command from June 2007 to December 2008. West became the 12th Master Chief Petty Officer of the Navy on Dec. 12, 2008.

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- OPNAV N45 TASK FORCE ENERGY
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Boeing Energy is increasing the efficiency and security of local, regional and national energy systems. Applying advanced technologies to improve the environmental footprint and energy needs of military installations and government buildings and structures, Boeing Energy provides solutions for military installations implementing "net zero" and other energy security programs in accordance with U.S. Department of Defense energy mandates.

Boeing Energy is collaborating with Siemens to jointly develop smart, secure microgrid management solutions that will help the DOD lower operational costs while increasing energy efficiency.

Secure microgrid management solutions would lower operational costs, provide energy security, and increase reliability by addressing both the supply and demand side of the energy equation. The integration of energy efficiency, distributed and renewable generation, and legacy utility and third-party applications into a highly optimized control system would provide the tools necessary to help the DOD achieve its energy security and sustainability goals.

Employing advanced levels of cyber security, interoperability, scalability and system openness for the microgrid of the future, Boeing Energy is also developing solutions for commercial utility customers that understand and are concerned about non-traditional threats to the integrity of their electrical grid. Boeing Energy's military-grade cybersecurity, technologies and methods defend the electrical grid from hostile attack, hack, or other potential operational shocks.

Boeing Energy is working on a number of projects to make a real difference in how the Department of Defense accesses and uses energy. Boeing Energy has been awarded several U.S. Department of Energy grants emphasizing development of US-based smart grid technologies and systems.

In addition to grant project work, Boeing Energy has also teamed with KEMA, a global authority in strategic and technical energy consulting, to collaborate on the development of smart grid technologies and other opportunities related to secure, reliable and sustainable energy infrastructure.

Boeing also is a leading member of the Renewable and Sustainable Energy Institute (RASEI), which is an interdisciplinary joint research effort between the University of Colorado at Boulder and the U.S. Department of Energy's National Renewal Energy Laboratory (NREL). Boeing is leading the institute's efforts to develop solutions for creating a national smart grid that modernizes energy distribution and use.

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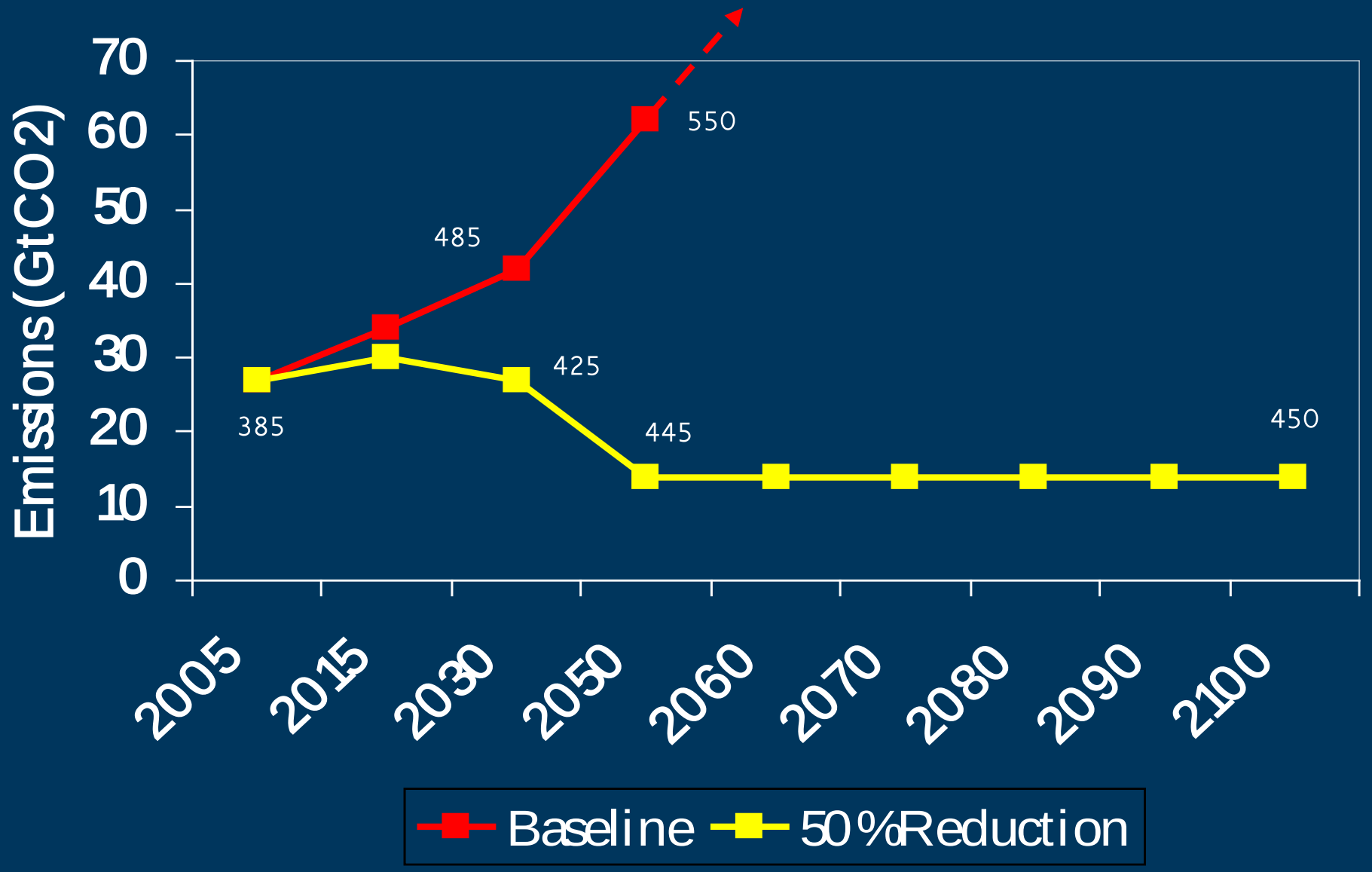
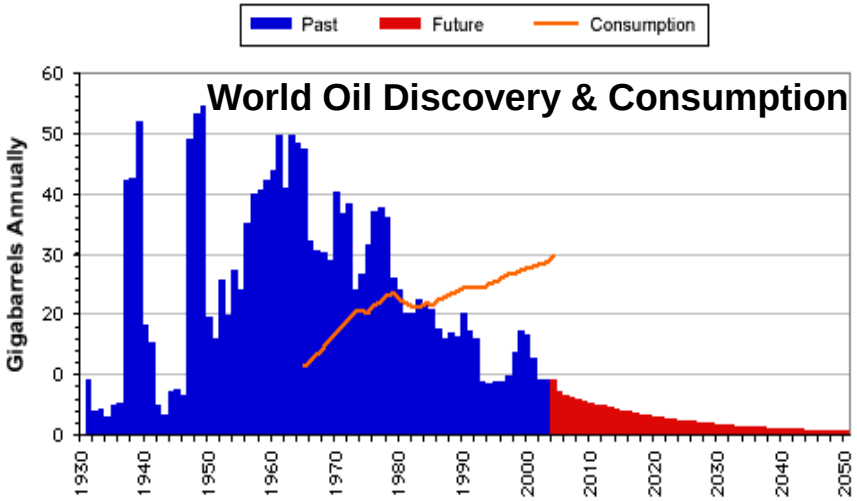
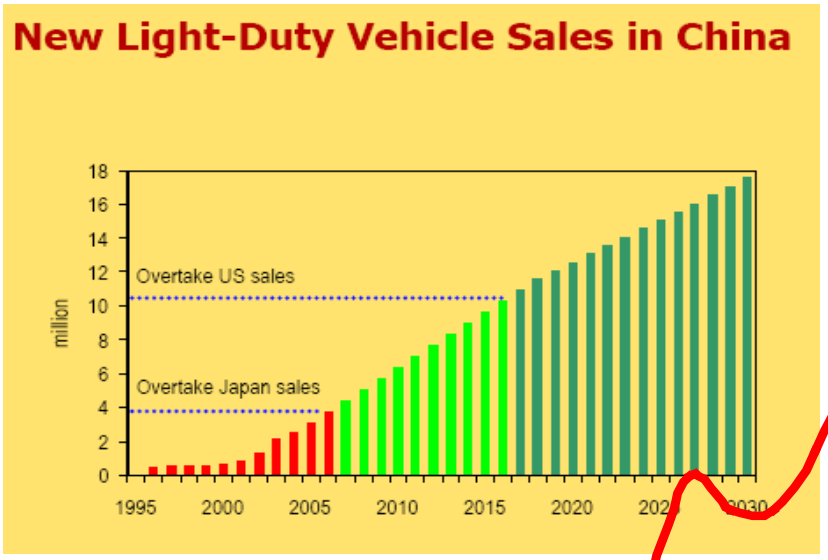
Stabilizing at 450 ppm CO2

Global; International Energy Agency 2008



Cost of U.S. Petroleum Imports





Billions of Dollars

500
450
400
350
300
250
200
150
100
50
0

1970
1975
1980
1985
1990
1995
2000
2005

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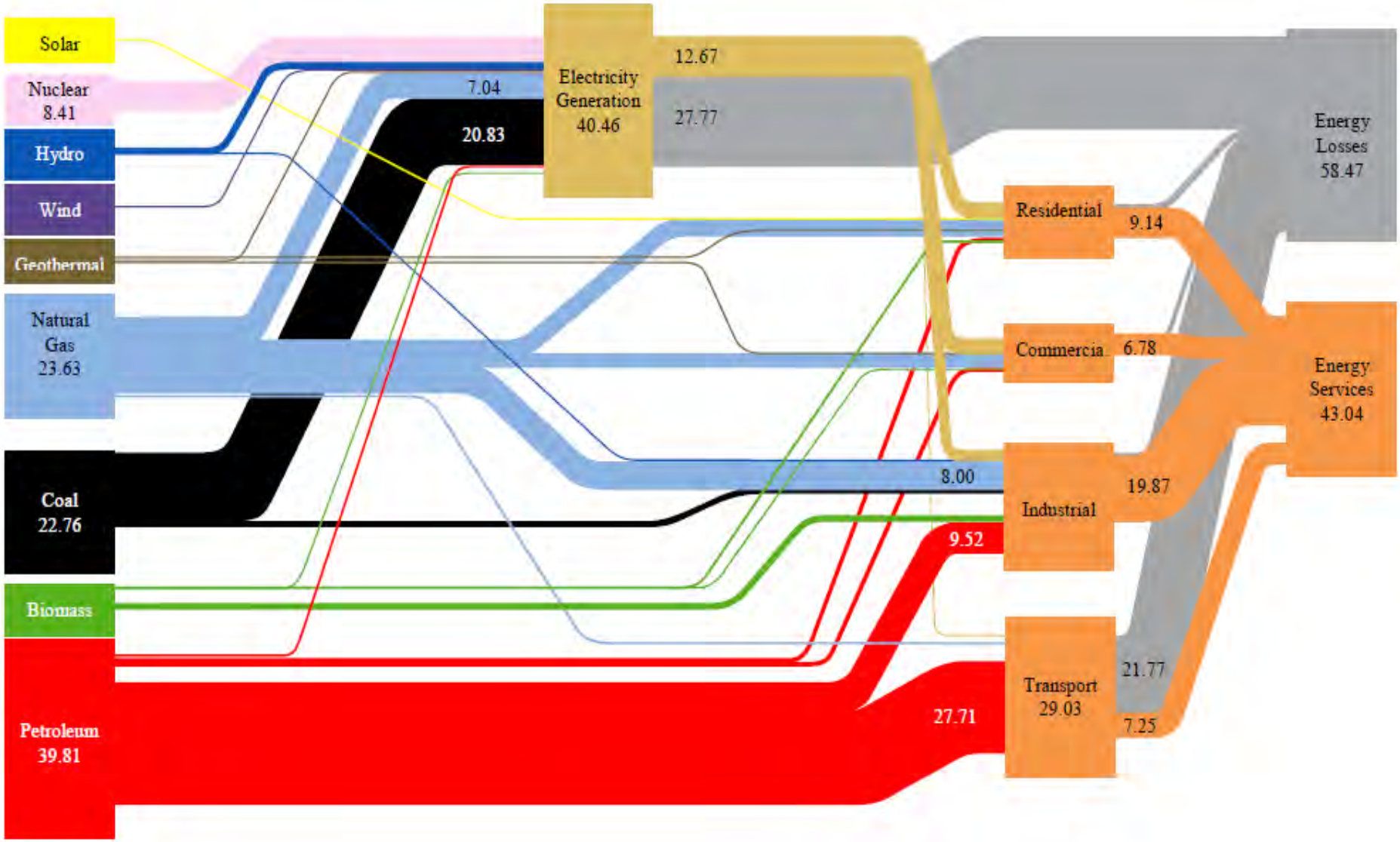
Energy Services

2008 Quadrillion Btu's/System Percentage



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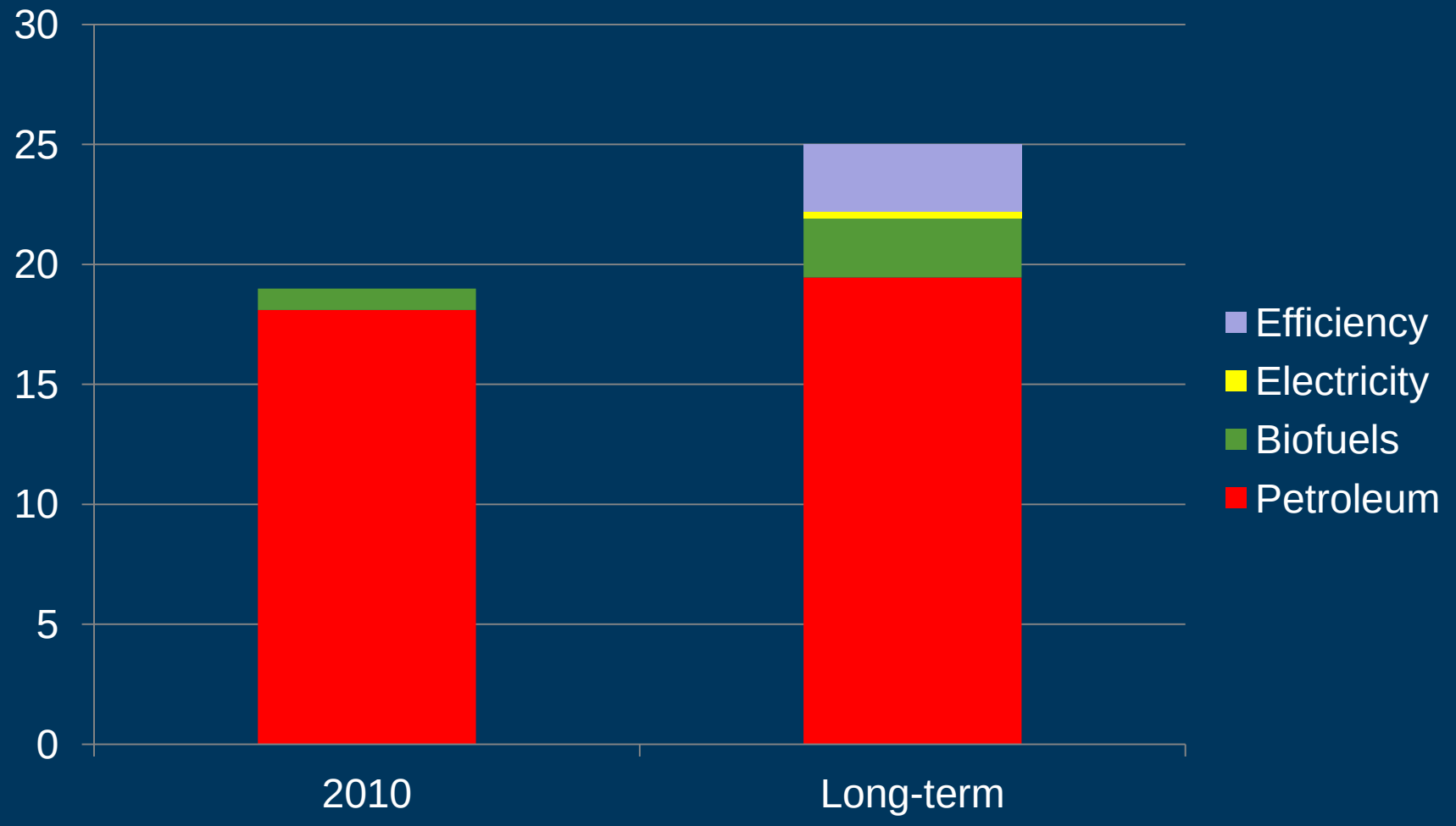
Transportation Energy Projection

Millions of Barrels per Day



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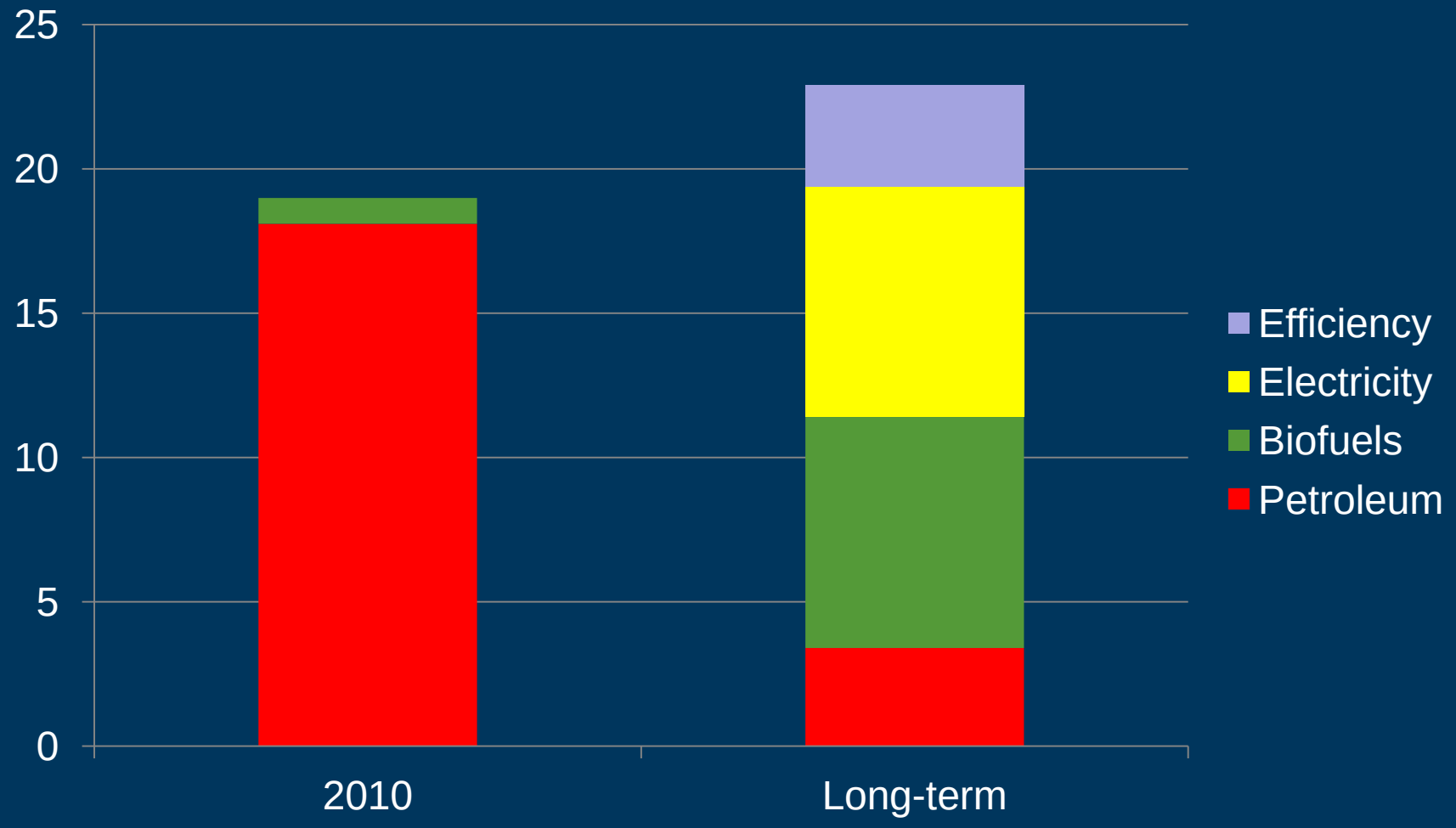
Low Carbon Transportation Energy

Millions of Barrels per Day



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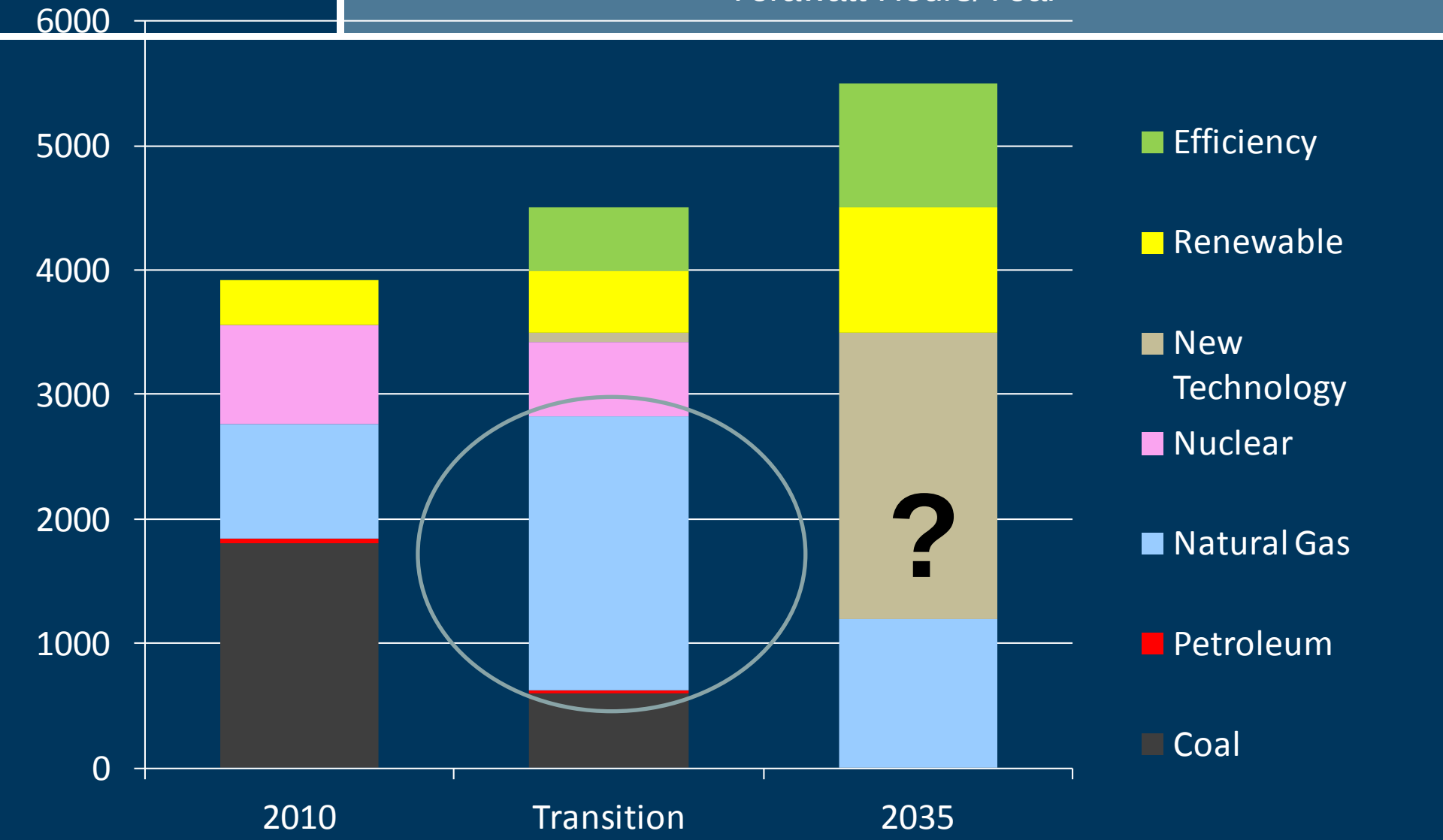
Electric Power Generation

Terawatt Hours/Year



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Low Carbon Power Options

- Fossil fuels with carbon capture and sequestration
- New, inherently safer and modular, nuclear technology
- Solar and wind with energy storage
- Deep geothermal energy

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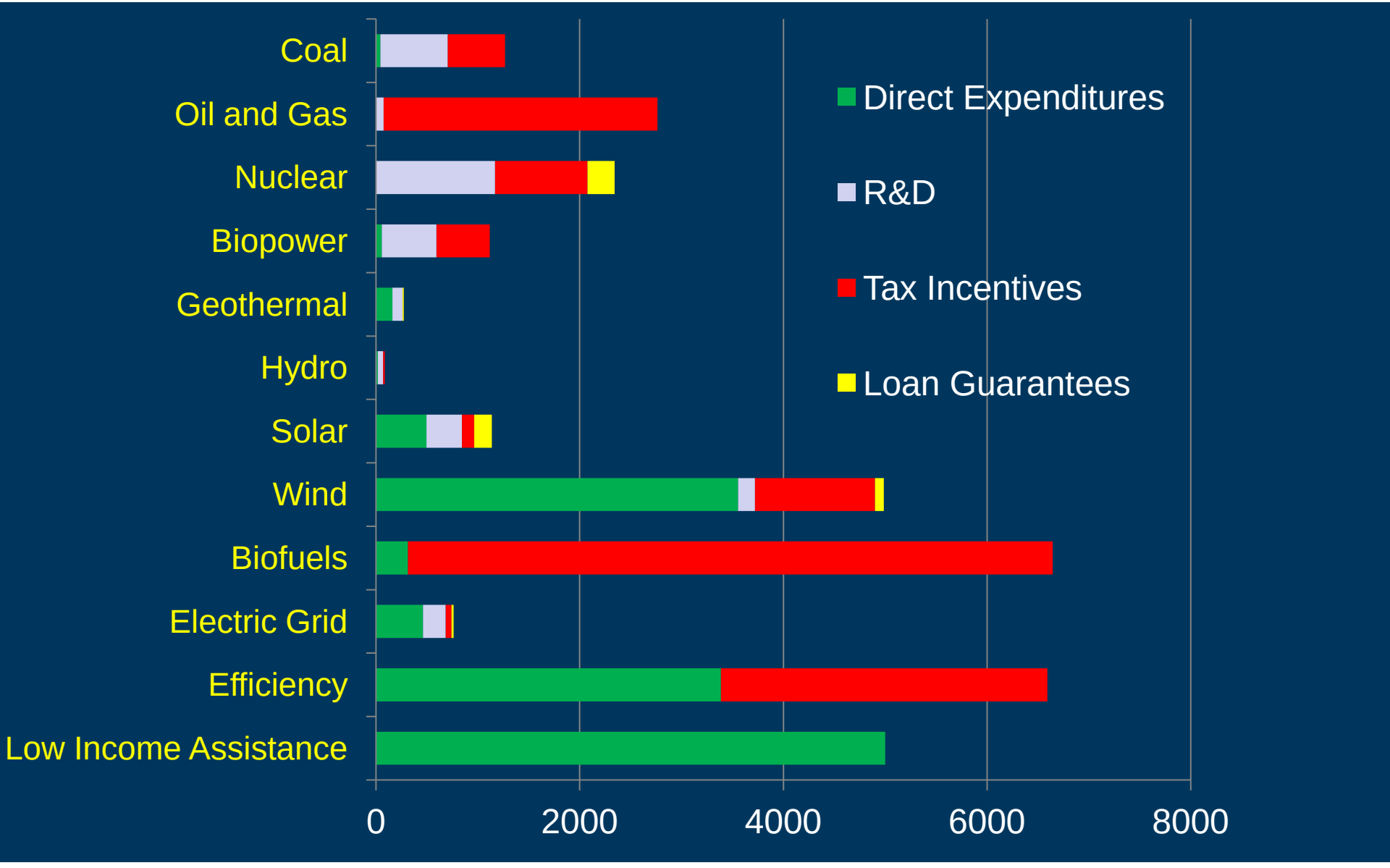
2010 Federal Energy Subsidies = $37B

Millions of Dollars



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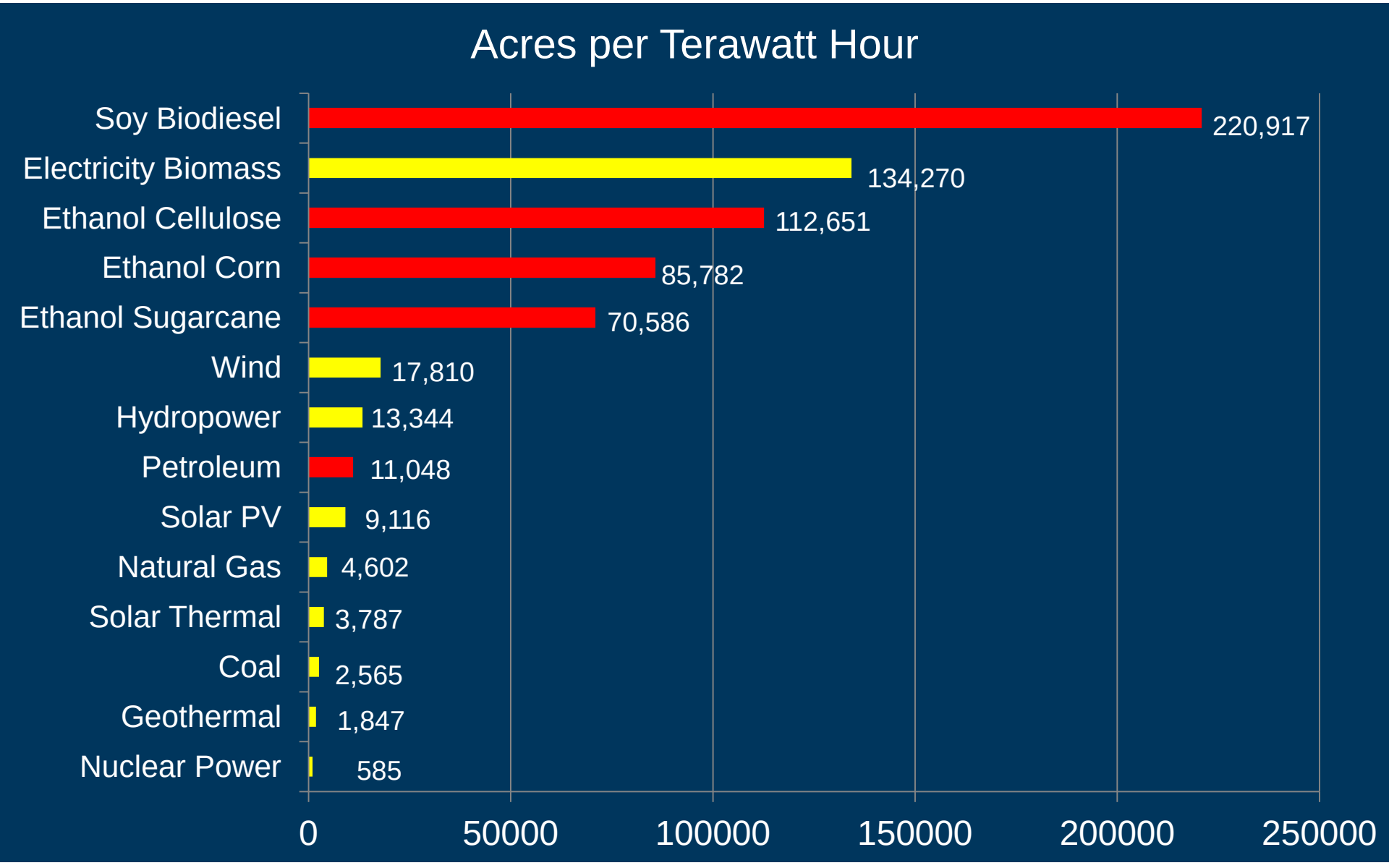
Energy Sprawl



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Summary: High-Level Strategies

- Put a price a greenhouse gas emissions
- Improve residential and commercial building and appliance efficiency
- Increase solar, wind and geothermal power production
- Develop new low-carbon baseload power generation technologies
- Improve vehicle fuel efficiency
- Convert urban personal vehicle fleet to electricity
- Develop low-carbon biofuel for long-distance transportation

Capabilities & Resources
2011 Naval Energy Forum

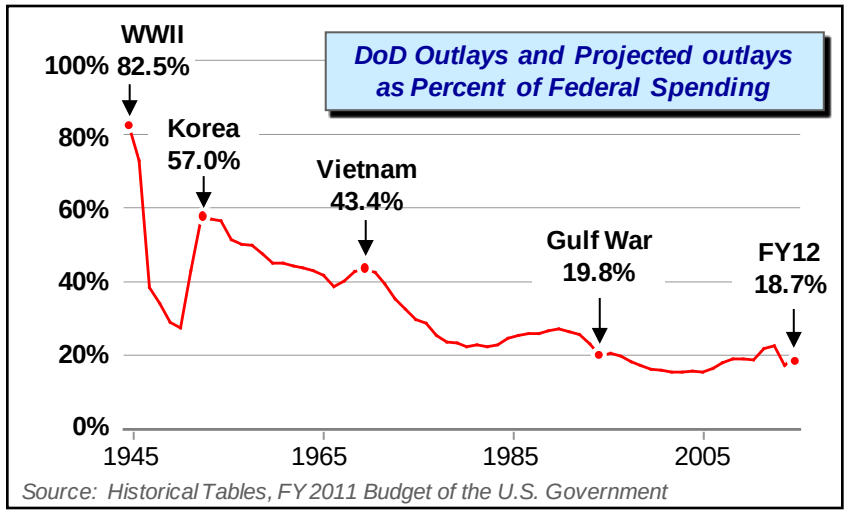
VADM John T. Blake
Deputy Chief of Naval Operations
Integration of Capabilities and Resources (OPNAV N8)
14 October 2011

This briefing contains Planning, Programming, and Budgeting/Execution System (PPBE) data and is not to be disclosed outside of the Department of Navy (DON) and other governmental agencies directly involved in the Naval planning and resource allocation process. Disclosure of PPBE information to Congress and the General Accounting Office (GAO) is covered by statute or other procedures.

Challenge

- Current national fiscal environment and impact to Department of Defense and Navy funding
- Pressure of increasing manpower and entitlement costs on total Navy budget
- Pressure of increasing fuel and energy costs on Navy budget

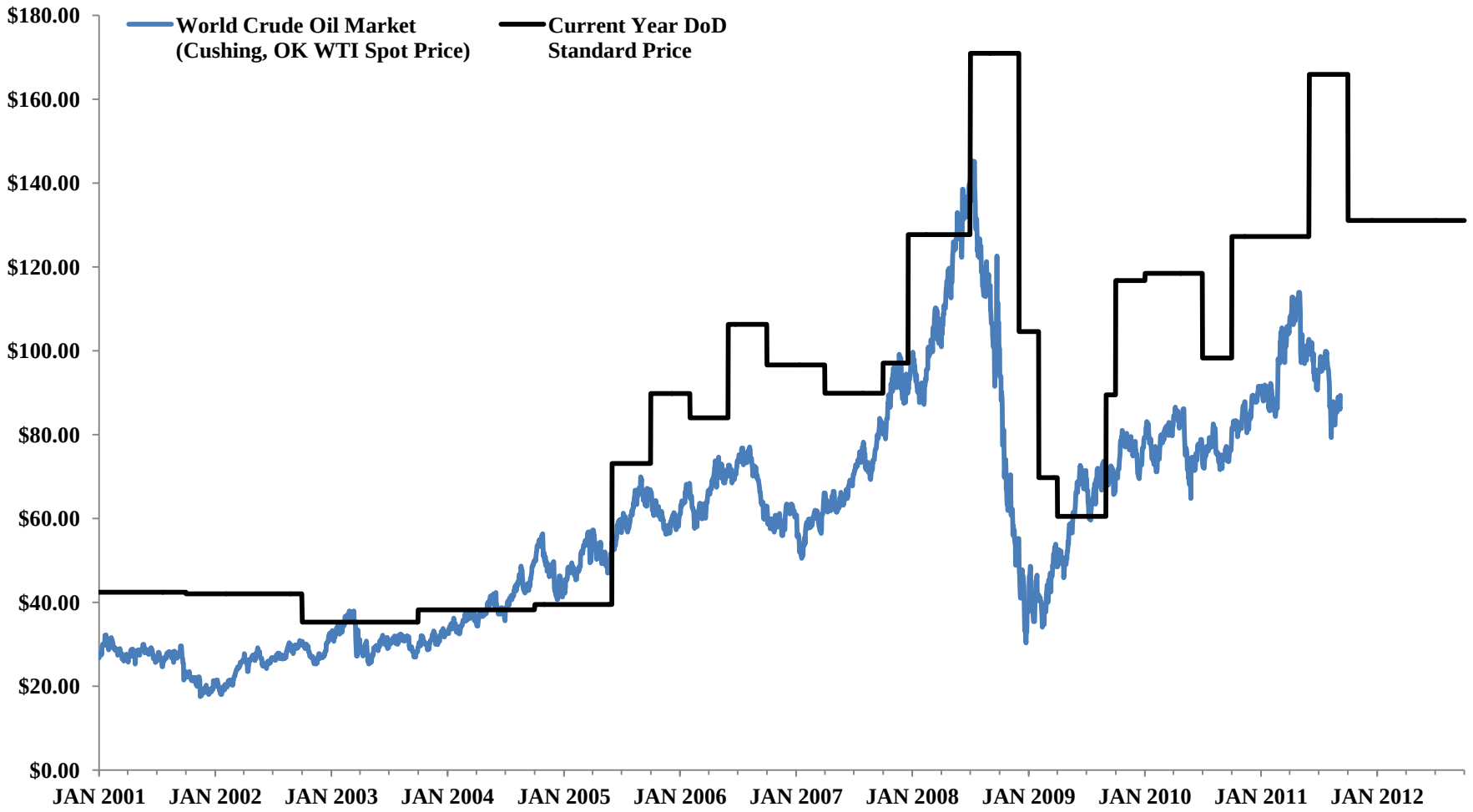
Fiscal Pressures and Navy Budget



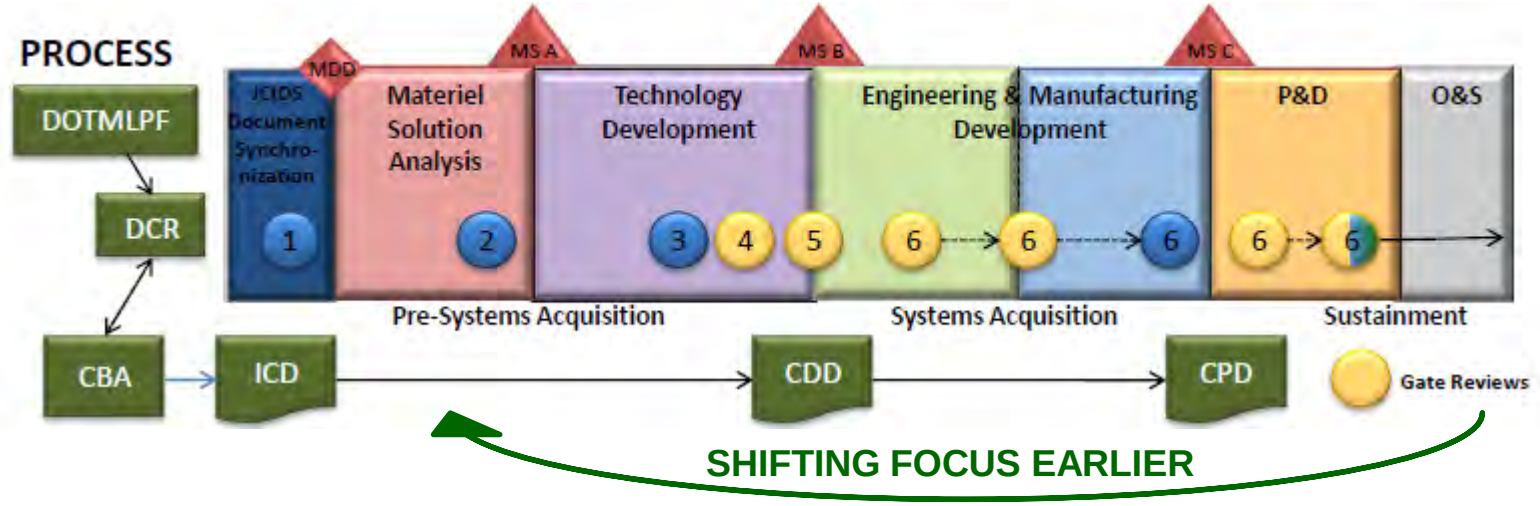
*This chart reflects the programmed BES position for the FYDP of each budget cycle. The actual PB for each year is reflected in black.

Fuel Prices

Cost per barrel (TY$)



Requiring Energy Efficiency



OLD: COMMANDS MANAGE ENERGY EFFICIENCY POST-DELIVERY

- Fuel use monitored during deployments and commands rewarded for savings
- Rewards inspired innovative field work, but systems still inherently inefficient

NEW: DESIGNS BUILT TO BE ENERGY EFFICIENT

- Consideration of energy efficiency in weapons systems requirements development
- Ensuring energy is central to Analysis of Alternatives Tradeoffs
- Adding Energy Efficiency as a Key Systems Attribute to Capability Design Documents

Investing in Energy

Current Outlook

- **Investing over $900M in FY12 for Tactical and Shore Energy Initiatives**
- **Investment Priorities Directed to High Return, Low Risk Tasks; Additional Funding Greatly Augments RDT&E**
- **Investment Supports CNO and SECNAV Goals**
  - **Certifies Alternative Fuels**
  - **Significant Progress on Consumption Reduction**

Future Challenges

- **Ability of Producers to Meet Demand and Price Levels Necessary for Navy Alternative Fuel Goals**
- **Continued progress in technology maturity and identification of appropriate avenues to fund investments**
- **Data management required to confirm return on investment (ROI) forecasts, and inform future investments to the right areas**

Energy Investments in Action

Security

- Increasing use of alternative energy reduces Navy's dependency on petroleum
- Ensures Naval presence is a credible part of global strategy

Warfighting Capability

- Increased efficiency = increased time on station = less frequent resupply = persistent combat power
- Reducing logistics demand at sea and on shore protects military lives and equipment

Building Partnerships

- Congress
- Department of Defense
- Other Government Agencies
- Industry

Questions?

Discussion

14 October 2011

Boeing Energy

"External Perspectives on Game Changing Solutions"

Boeing Energy
Paul P. Bollinger Jr.
General Manager Government Solutions

Urgent Decisions in Rapidly Changing World

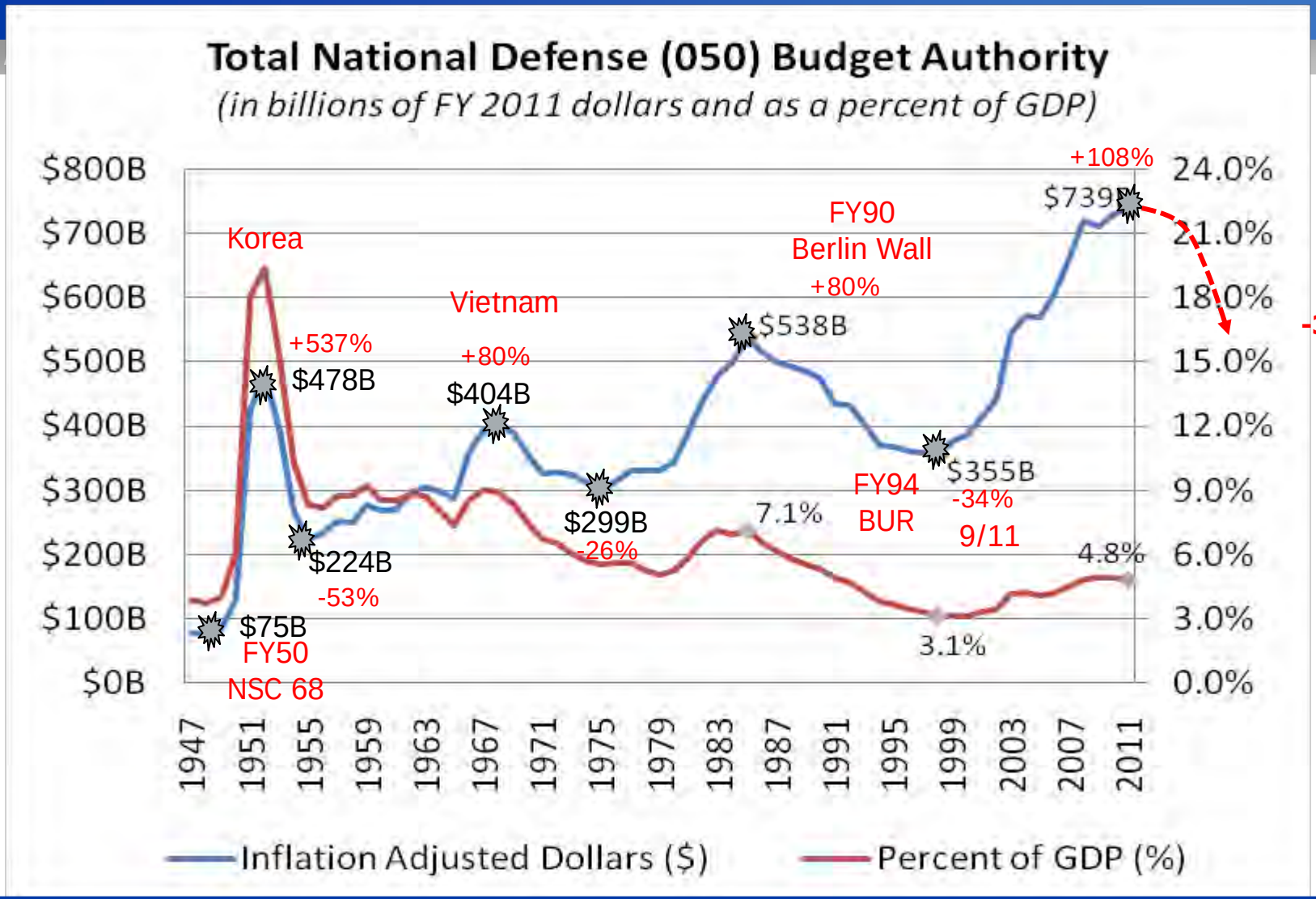
Game-changing environment that will require game-changing solutions

- **Increasing volatility of energy sources / influencers**
  - Unrest in Middle East / North Africa
  - Wars in Iraq, Afghanistan, Libya …
  - Globalized markets & China's increasing global influence
- **Increasing energy demand**
  - Growth of China and India markets
  - US electricity consumption rising
- **Increasing energy costs**
  - Rising price of oil
  - Rising costs of electricity
  - Rising costs of energy waste
  - Aging infrastructure
- **Decreasing funds**
  - Global financial crisis
  - Decreasing budgets
  - Impending defense draw-down

"Gentlemen, we have run out of money. Now we have to think."

Sir Winston Churchill, WWII

A New Paradigm – Defense Build-ups & Draw-downs



In the Past – Previously Had Excess Equipment and Manpower
Now We Have Huge Deficits and Active War(s)

HASC Assessment of Budget Cuts

Boeing Energy

Warrior Reduction

	Today	Estimated Force Based on Current Funding	If Super-Committee Fails
Marine Corps	202,000	173,000	145,000

Platform Reduction

	1990	2000	Today	Estimate Based on Current Funding	If Super-Committee Fails
Army Maneuver Battalions	172	98	100	78	60 - 70
Navy Ships	546	316	288	263	238
USAF Fighters	4355	3602	1990	1739	1512
Strategic Bombers	282	153	135	118	101
Strategic and Tactical Air Lift	872	743	651	572	494

Challenges to Budget, Acquisition and Commercialization of Energy Technology

- **"If the payback is not for 10-years, then it may be difficult for DOD to support."** Frank Kendall, P.Dep. Under Sec. OSD, AT&L

- **"Federal procurement is biased to cheapest product, not most efficient."** Dr. Arun Majumdar, Director, ARPA-E

- **"Investors often refer to a „Valley of Death" which new initiatives must transit. I tend to think of not one but two such valleys."**
  - The first when an idea offers considerable promise yet retains substantial risk of technical failure; and
  - The second when the idea's basic feasibility has been proven but its economic viability at scale is still uncertain.

  These are the tipping points where constructive government intervention can make all the difference." Norm Augustine, former CEO, LM

"We have seen the enemy and he is us." **Pogo**

As of March 2011

One Model: Military Housing Privatization Initiative *(MHPI)*

- **Military needed to improve housing for service members, without efficient funding mechanisms to do so**
- **Congress established MHPI in 1996**
- **MHPI designed with incentives to attract private sector financing, expertise, and innovation**
- **Provided necessary housing faster and more efficiently than traditional Military Construction limitations would allow**

Over 188,480 homes built or renovated under this program.

One Model: ~~Military Housing~~ Privatization Initiative
Energy Surety

Boeing Energy

- Military needed to ~~improve housing~~ modernize energy for ~~service members~~ mission assurance, without efficient funding mechanisms to do so
- Congress established ~~MHPI~~ ESPI in ~~1996~~ 2013
- ~~MHPI~~ ESPI designed with incentives to attract private sector financing, expertise, and innovation
- Provided necessary ~~housing~~ energy modernization faster and more efficiently than traditional Military Construction limitations would allow

Does an ESPI program modeled after MHPI make sense?

Second Model: Base-Wide ESPC

- Unlike MHPI Energy Model, third party must generate savings to earn revenue
- No competition between MilCon and SRM (Sustainment, Restoration and Modernization) dollars
- Expansion of current model that has proven successful
- Prevents ESCO from cherry picking projects
- Concerns are high transaction costs and tendency of ESCO"s to use off the shelf technology to reduce risk

Does a base-wide ESPC make sense based on past performance?

Privatizing Military Energy

- **Focus on long-term costs (including operations & maintenance), not just near-term capital costs**
  - Improve budget scoring (CBO and/or OMB)
  - Leverage Section-2922A (30-year authority)
- **Incentives, Issues and Accountability**
  - Near-term savings returned to the savers
  - Long-term third-party financiers need ROI
  - Tie energy targets to performance evaluations
  - Acceptance under existing utility processes
  - Public Utility Commission regulations
  - Lack of a national Renewable Energy Credit
- **This will not be a "clean sheet" program**
  - Current ESPC, UPC, EUL, PPA contracts impact "Enterprise Approach"

Can the challenges be overcome for energy modernization?

The Microgrid Model

- **Microgrids can bring game-changing value in BOTH security AND efficiency**
  - Incorporate legacy equipment with cutting-edge control systems
  - Improve efficiency and performance in addition to security – but the security costs must be spread out over many years
- **Microgrids can be phased-in if designed with a long-term vision**
- **Microgrids increase efficiency, facilitate renewables, and provide security.**

"Microgrids are a Triple Play." Dr. Dorothy Robyn, Dep. *Under* Sec. OSD I&E

Final thoughts…

- **Energy Security is like insurance…*but at what price?***
- **Government has unique opportunity to focus on long-term benefits that exceed short-term paybacks**
- **BENS Microgrid Task Force (March 2012)**
- **OSD ESTCP Test & Evaluation Demonstration Projects**

Every dime spent on a kilowatt hour of wasted energy is a dime not spent supporting the Mission or the Warfighter!

Spartan Energy Warriors

"Energy and persistence conquer all things."

Benjamin Franklin

1706-1790

Naval Energy Science & Technology Research

RADM Nevin P. Carr

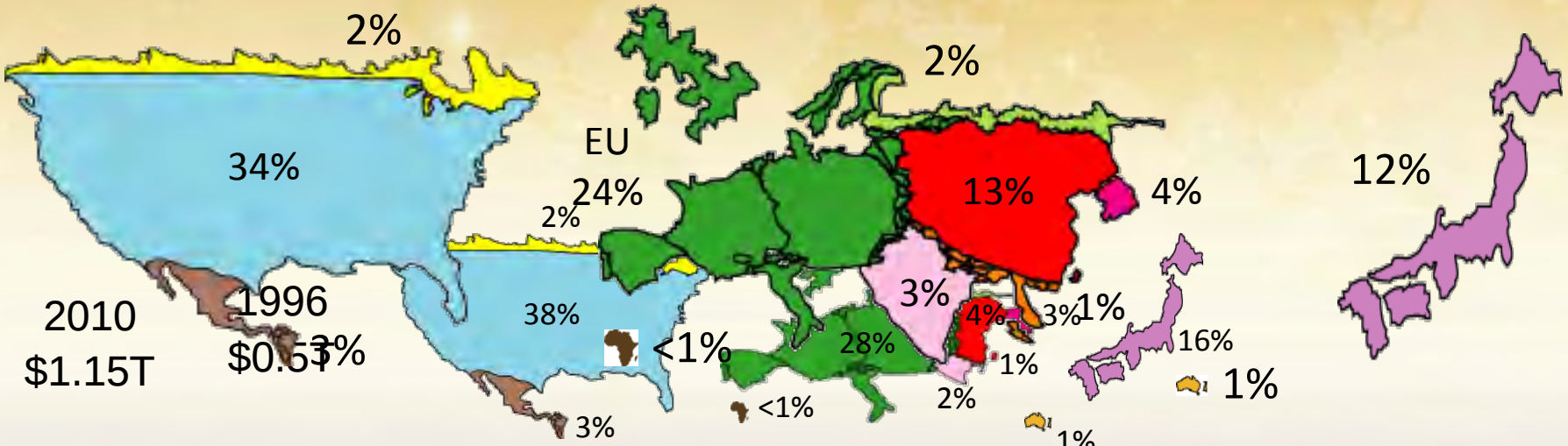
Chief of Naval Research

October 14, 2011

Revolutionary Research . . . Relevant Results

OFFICE OF NAVAL RESEARCH

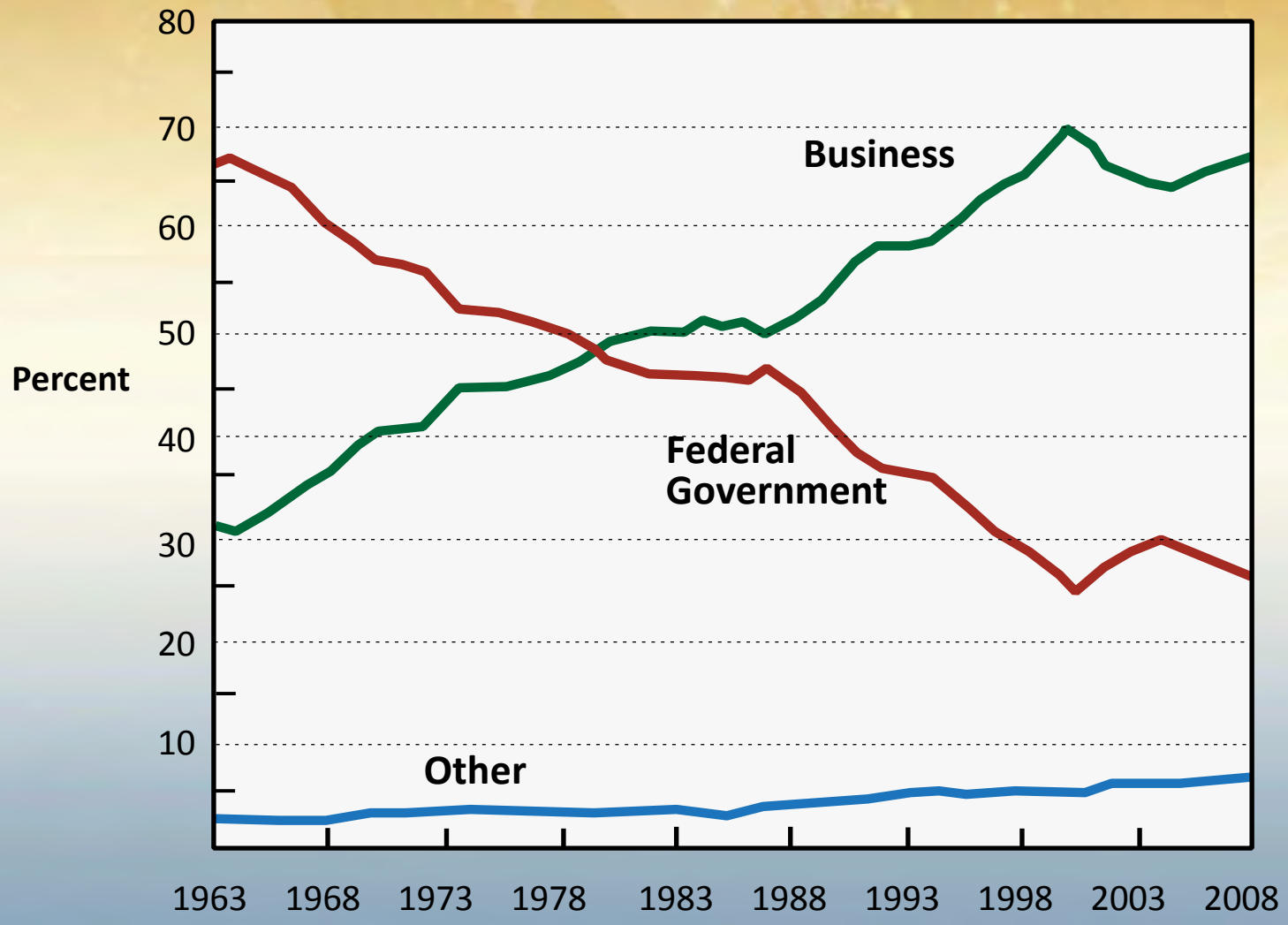
Global R&D Trends



* UIS S&T database; World Bank - PPP data

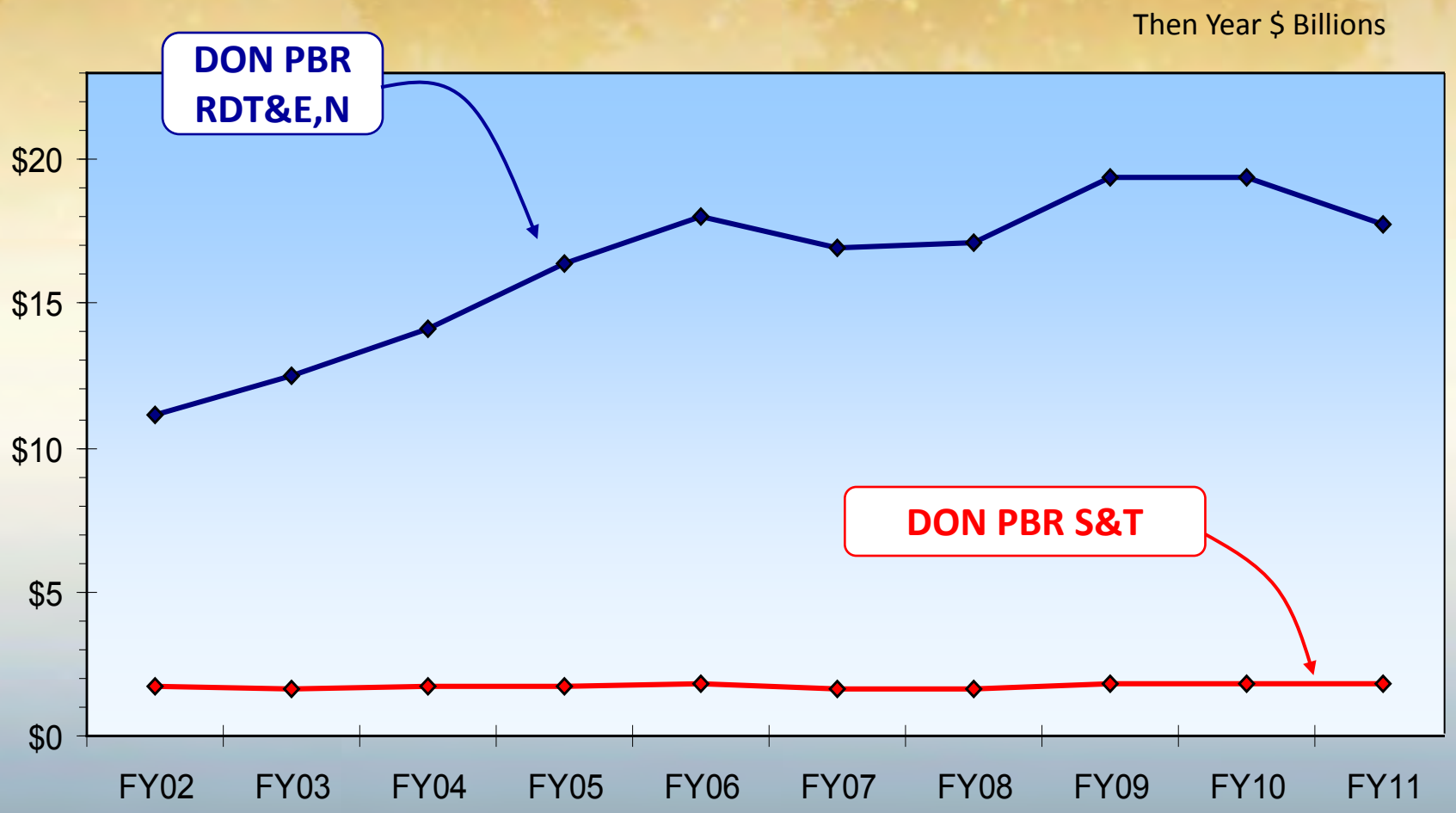
** OECD 2010 PPP; 2010 Global R&D Report (Battelle)

R&D Investment Trends



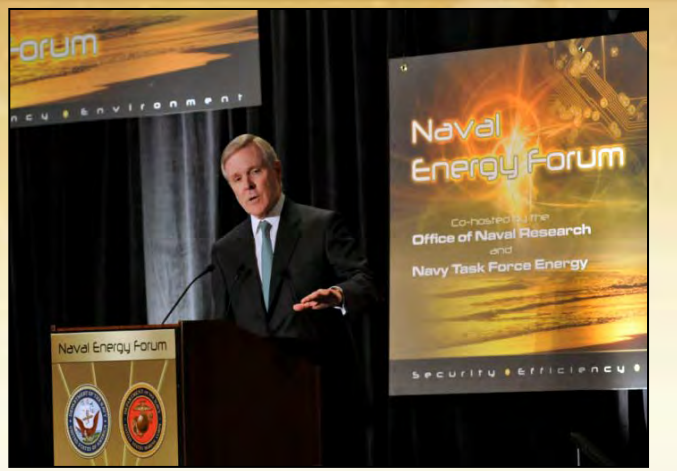
Source: National Science Foundation, Division of Science Resource Statistics, *Science and Engineering Indicators 2010*

RDT&E 6.1 – 6.7 Trend



SECNAV's Energy Goals

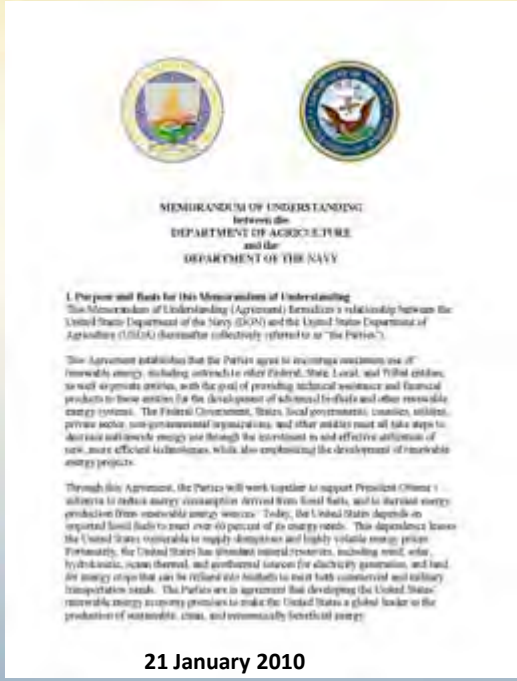
- **Energy Efficient Acquisition: Evaluation of energy factors are mandatory when awarding contracts for systems and buildings.**



- **Sail the "Great Green Fleet": DON will demonstrate a Green Strike Group in local operations in 2012 and sail it by 2016.**
- **Reduce Non-Tactical Petroleum Use: By 2015, DON will reduce petroleum use in the commercial fleet by 50%.**
- **Increase Alternative Energy Ashore: By 2020, DON will produce at least 50% of shore-based energy requirements from alternative sources; 50% of DON installations will be net-zero**
- **Increase Alternative Energy Use DON-Wide: By 2020, 50% of total DON energy consumption will come from alternative sources**

Interagency Cooperation

Encourage Maximum Use of Renewable Energy



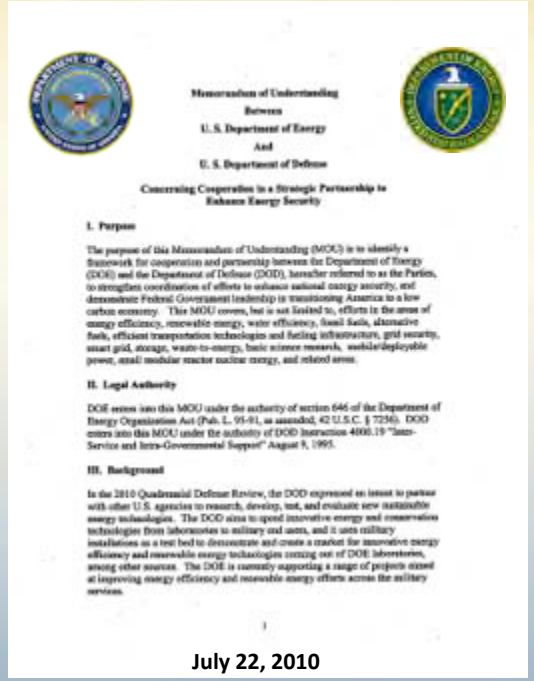
MEMORANDUM OF UNDERSTANDING
between the
DEPARTMENT OF AGRICULTURE
and the
DEPARTMENT OF THE NAVY

I. Purpose and Basis for this Memorandum of Understanding

21 January 2010

Navy & Agriculture

Strategic Partnership to Enhance Energy Security



Memorandum of Understanding
Between
U. S. Department of Energy
And
U. S. Department of Defense

Concerning Cooperation in a Strategic Partnership to Enhance Energy Security

I. Purpose

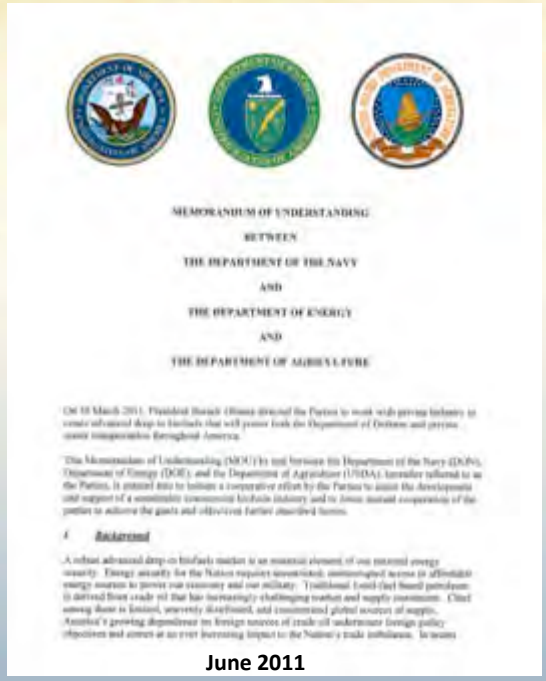
II. Legal Authority

III. Background

July 22, 2010

Defense & Energy

Development and Support of a Sustainable Biofuels Industry

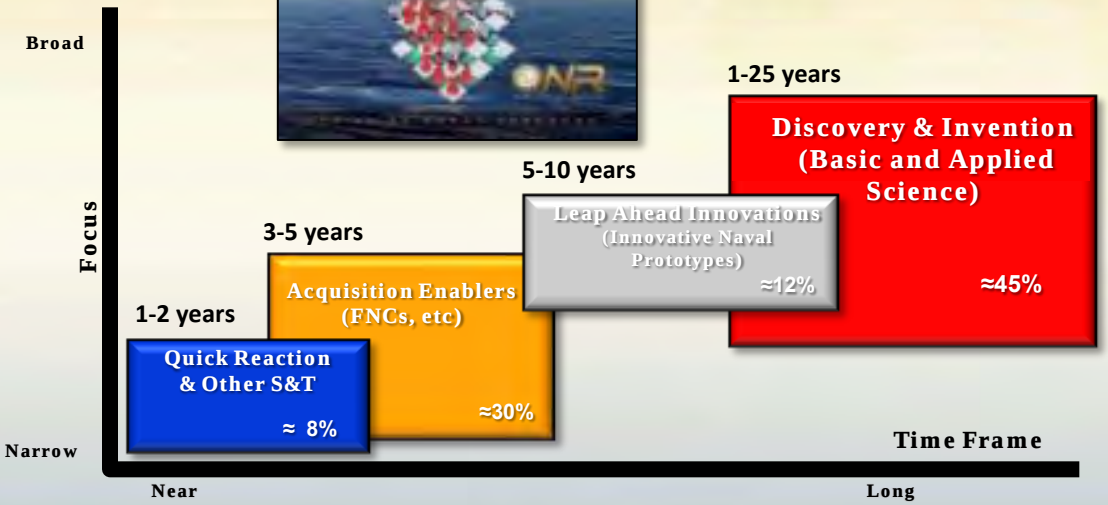


MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF THE NAVY
AND
THE DEPARTMENT OF ENERGY
AND
THE DEPARTMENT OF AGRICULTURE

June 2011

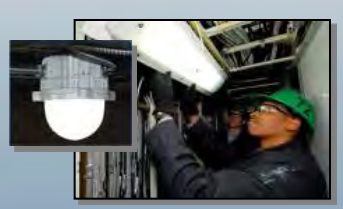
Navy, Energy & Agriculture

Naval Strategic Plan



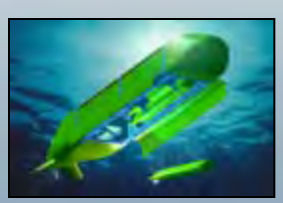
Focus Areas:

- Assure Access to Maritime Battlespace
- Autonomy & Unmanned Systems
- Expeditionary & Irregular Warfare
- Information Dominance
- Platform Design & Survivability
- *Power & Energy*
- Strike & Integrated Defense
- Total Ownership Cost
- Warfighter Performance



Tech Solutions

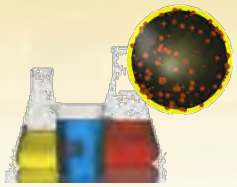
FNCs



INPs

Power & Energy Chain

Fuel



Fuels Chemistry

Alternative Fuels

Nuclear

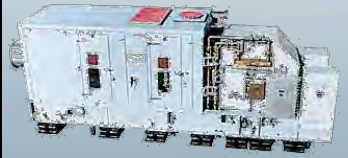
NAVSEA 08
Naval Reactors

Power Generation

"Ion Tiger"
UAV Fuel Cell

Fuel Cells

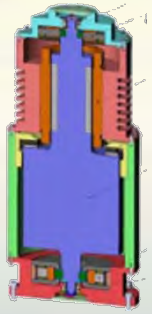
Aircraft Engines



Gas Turbine Generators

Energy Storage

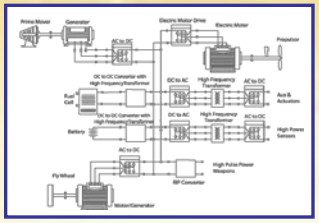
Batteries



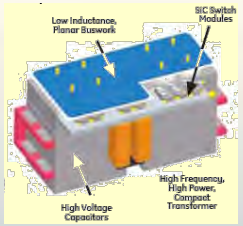
Flywheels

Capacitors

Distribution & Control



Electrical Architectures
& Pulse Forming
Networks



High Voltage Silicon
Carbide (SiC) Switches

Memristors

Power Loads

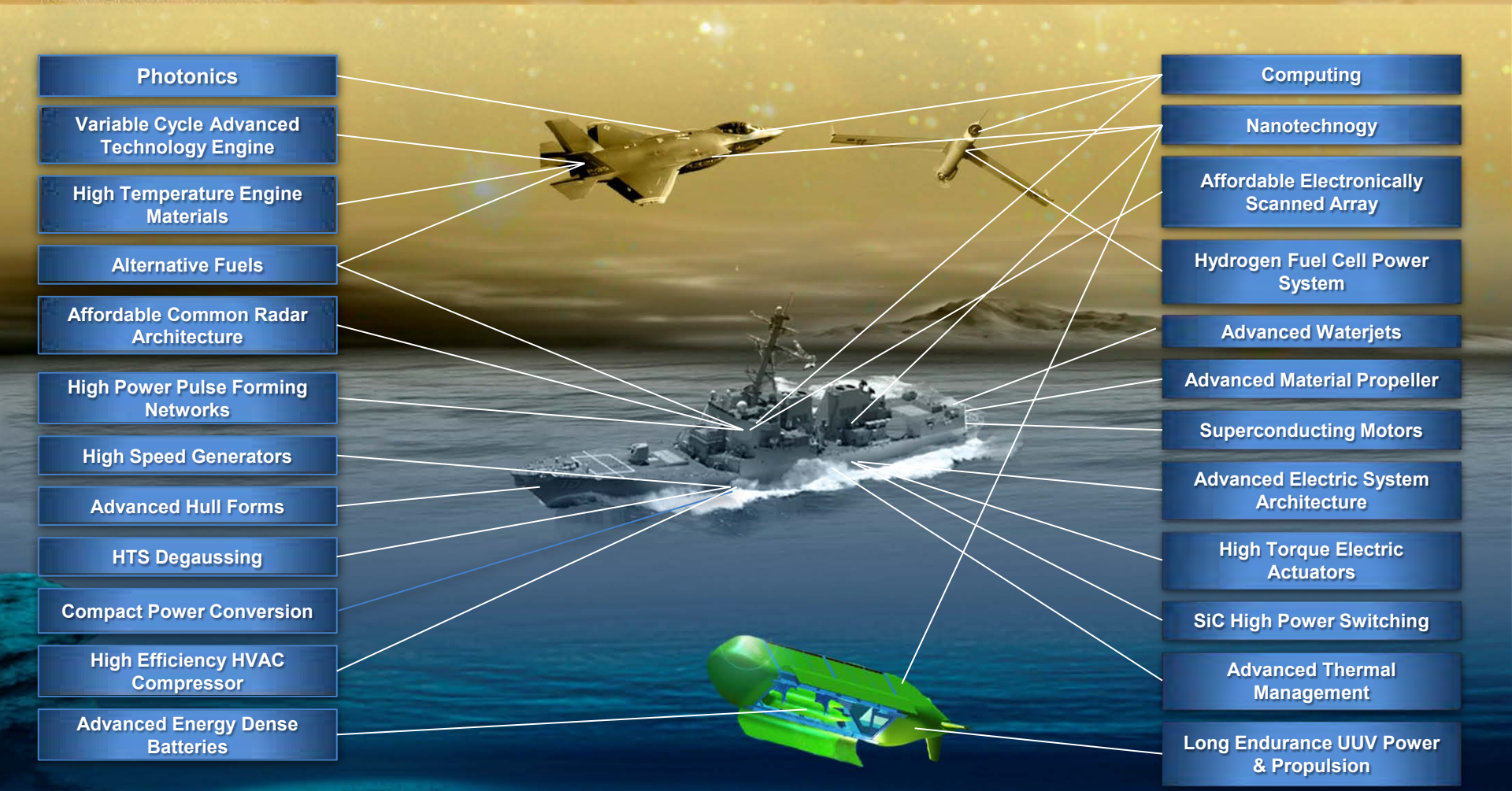
Electric
Weapons

Powering & Resistance

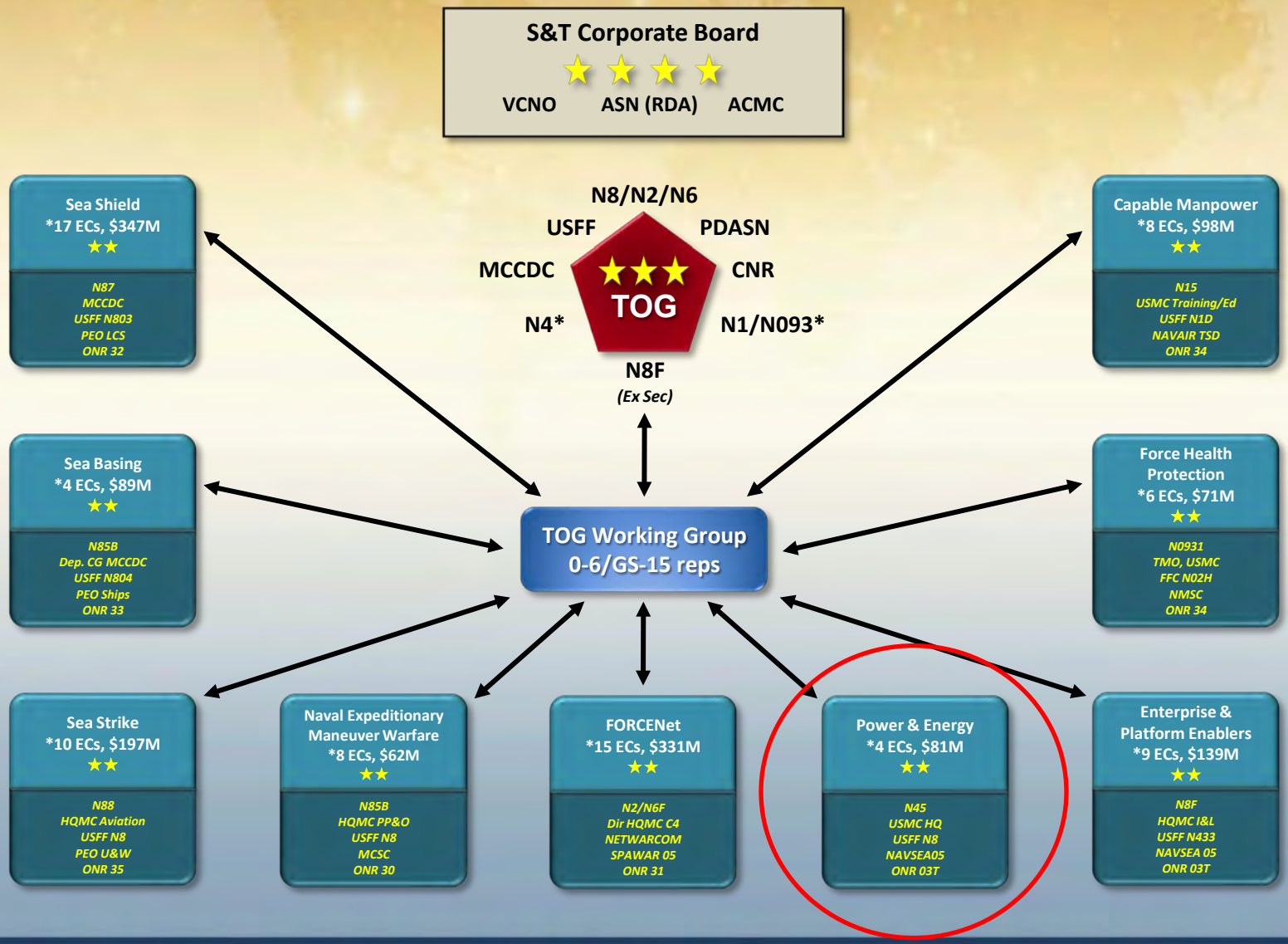
UV Sensor Loads

Reconfigurable Blades / Blade
Loading

Applications



Technology Oversight Group



* FY11-15

Future Naval Capabilities

FY11 and Prior

- Axial Flow Waterjet
- Compact Power Conversion
- Turbine Engines Reduced Cost of Operations – Materials
- Turbine Engines Reduced Cost of Operations – Engines
- Affordable Common Radar Architecture
- Advanced Material Propeller
- Affordable Electronically Scanned Array
- Advanced Power Generation
- Squad Electric Power Network
- Common Operating Picture Logistics Planning and Decision Support Tool

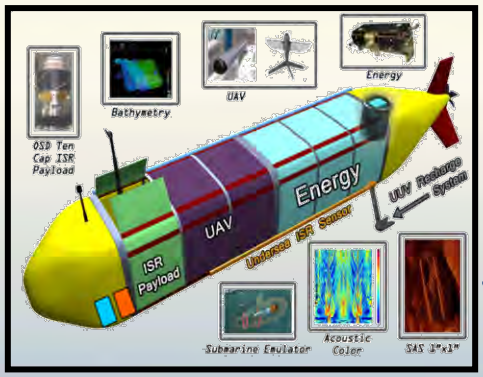
FY 12 New Starts

- P&E-FY12-01: Renewable-Sustainable Expeditionary Power
- P&E-FY12-03: Long Endurance Undersea Vehicle Propulsion
- P&E-FY12-04: Fuel Efficient Medium Tactical Vehicle Replacement (MTVR)

Unmanned Undersea Vehicles

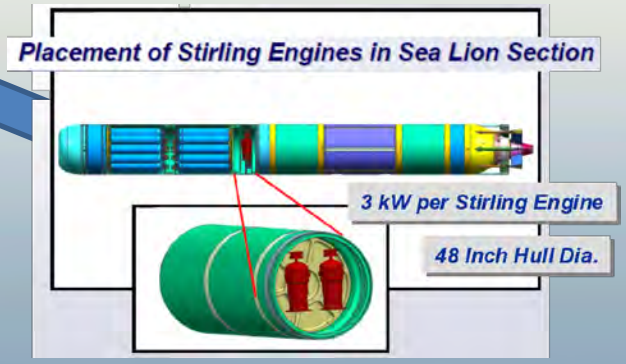
Provide long-endurance power systems for unmanned undersea vehicles for extended range mission requirements

Large Displacement UUV FY12 INP
48” diameter, 60-90 Day endurance



- Stirling Engine
- Fuel Cells
- Batteries
- Al Combustor

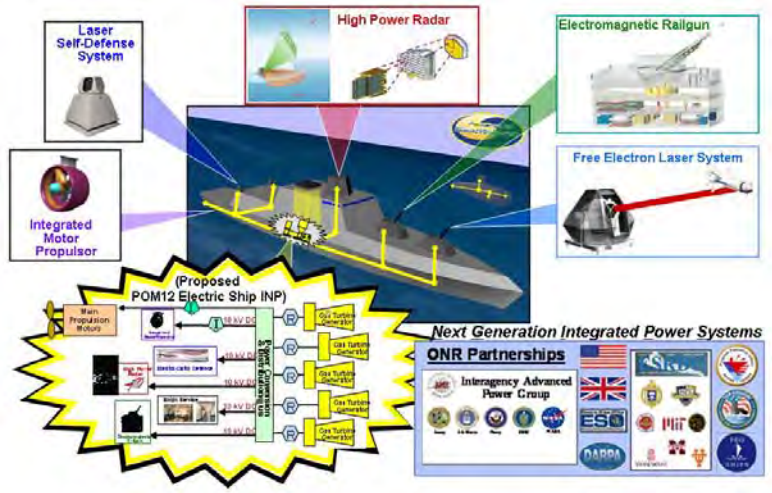
ONR Swampworks
48” diameter



Long-Endurance UUV Propulsion FNC
21”, 30 Hr endurance

Navy Ship Electric Power Systems

All Electric Ship

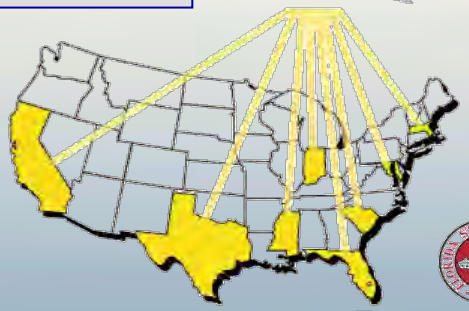


- **Develop efficient power generation, energy distribution and control concepts to provide power for ship warfare, propulsion and support systems**

Electric Ship Research and Development Consortium

ESRDC

- **A consortium of virtually linked academic institutions with hardware-in-the-loop capability coupled with physics based models for system design, testing, and validation**
- **Develop advanced power concepts leading to increase performance, reliability, lower cost and lethality**
- **Develop new tools for electrical systems test and evaluation leading to reduced shipbuilding cost**
- **Develop EE power electronics S&T workforce with emphasis on naval applications**



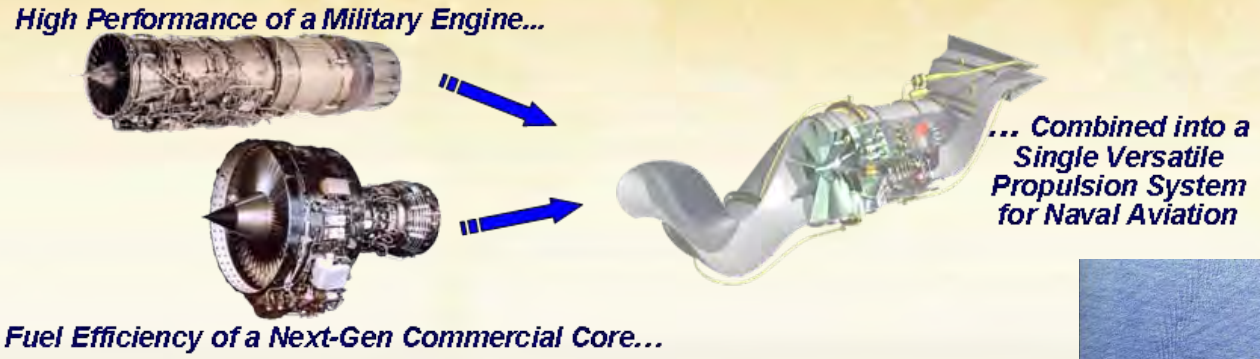
PURDUE UNIVERSITY

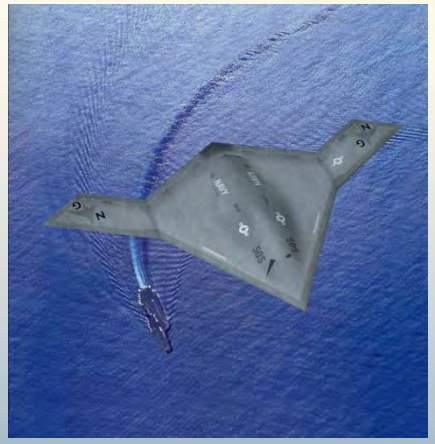
UNITED STATES NAVAL ACADEMY

NAVAL POSTGRADUATE SCHOOL

Variable Cycle Advanced Technology

Provide advanced aircraft propulsion technology for the next generation carrier-based aircraft





Payoffs:

- Reduced fuel consumption
- Lower life cycle costs
- Higher performance and increased durability
- Improved environmental compliance

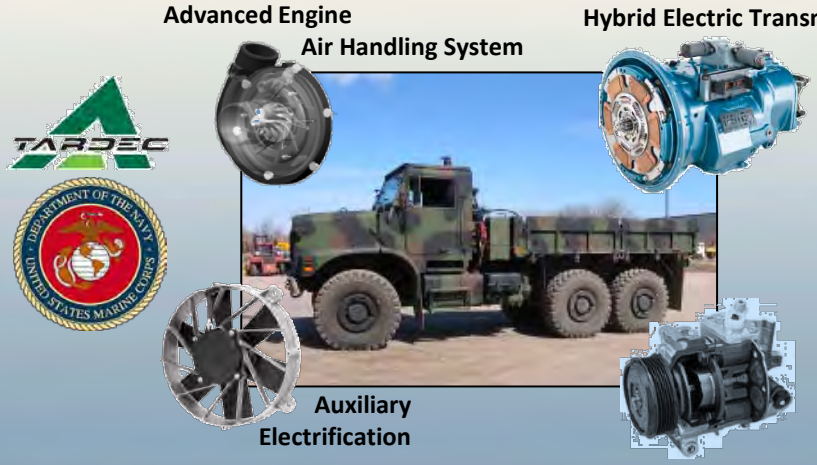
Ground Vehicles

Non-tactical hydrogen-powered General Motors Fuel Cell Vehicles

- Evaluation ongoing at Camp Pendleton and Marine Corps Base Hawaii
- Coordinating with other Services and DoE

Marine Corps Base Camp Pendleton

MARFORPAC & Marine Corps Base Hawaii



Fuel Efficiency Technologies for Tactical Vehicles

- Improve vehicle fuel efficiency
- Provide on-board electric power generation for hybrid drive, on-board mission systems and external power
- FY-12 FNC: "Fuel Efficient Medium Tactical Vehicle Replacement"

Biofuels Research

Accelerate the adoption of biofuels by supporting Navy certification process, and understand and mitigate the impact of emerging biofuels on naval power systems and operations

Biofuels Supply Chain

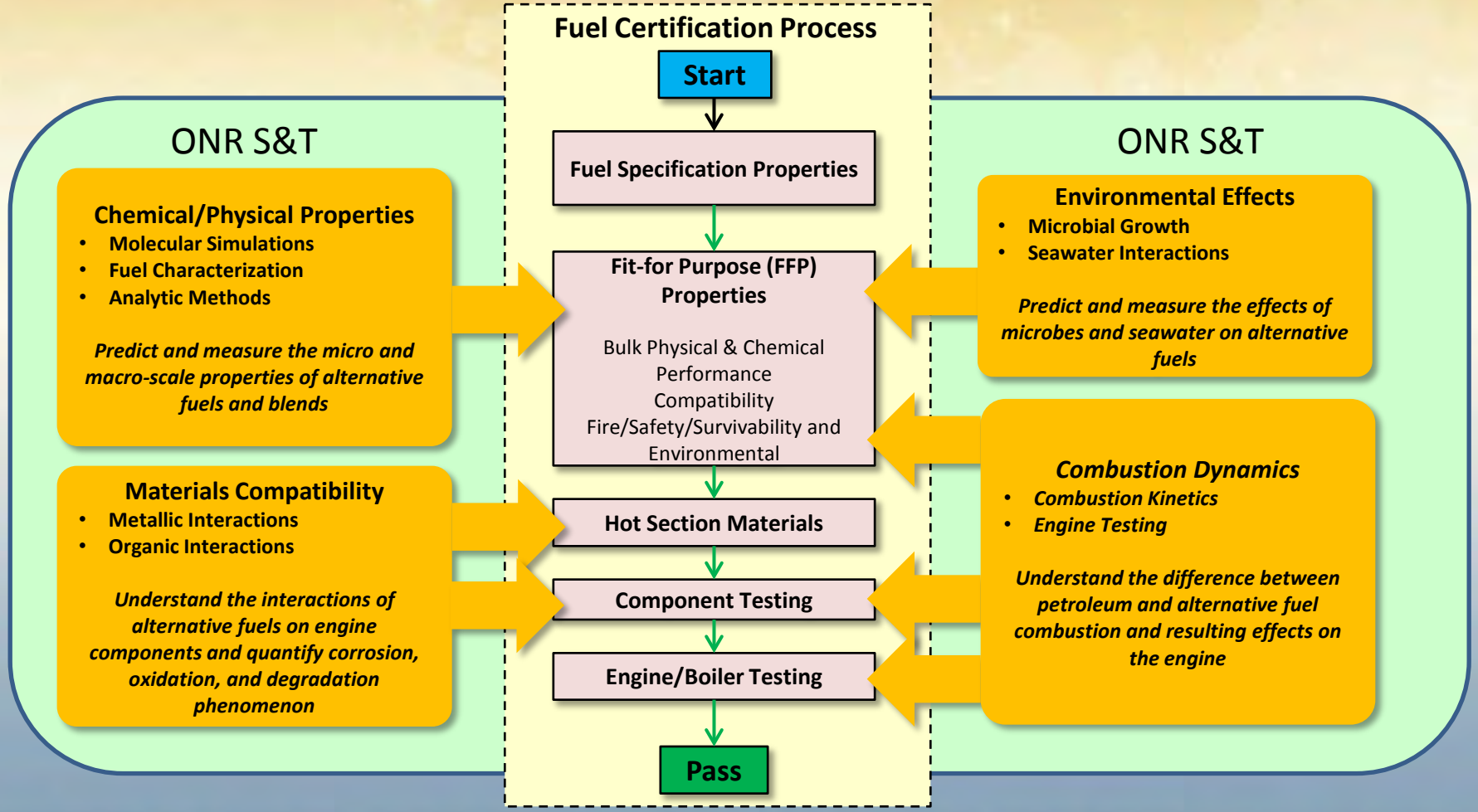
Feedstock Production	Feedstock Logistics	Biofuels Conversion	Fuel Testing & Approval	Large Scale Deployment
				
USDA	USDA/DoE	• DoE/ARPA-E • DARPA	• DoD/NAVAIR • FAA • CAAFI • DLA	• DoD Military Systems

ONR Alternative Fuels Focus

- Engine & fuel cell performance
- Materials compatibility
- Fuel stability
- Sustainable biofuels production

Program Thrusts

Alternative Fuels Program predicts and understands fuel properties to augment important steps/issues for testing and certification



ARPA-E / DoD Collaboration

Hybrid Energy Storage Module Development

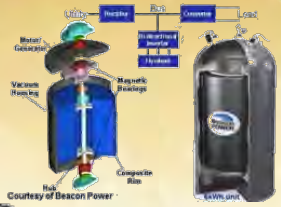
ARPA-E: Advanced Energy Storage Devices

FY11 FY12 FY13 FY14

Materials R&D → Device R&D

- Workshop
- Threshold Req.
- Joint BAA

- Advanced Flywheels
- Metal-air Battery



DoD: Hybrid Energy Storage System Level Development

FY11 FY12 FY13 FY14 FY15 FY16

Sub Scale Validation → Full Scale Energy Storage Validation

- Workshop
- Threshold Req.
- Joint BAA

- Develop Control/Logic
- Develop Fault Isolation
- Power Converter Design
- Advanced Thermal Mgt.

- Common Requirements Document
- Full Scale System Fabrication
- OEM Demonstration
- In Field Demonstration

Silicon Carbide (SiC) Wide Band-Gap High Power Electronics

Revolutionary Research . . . Relevant Results

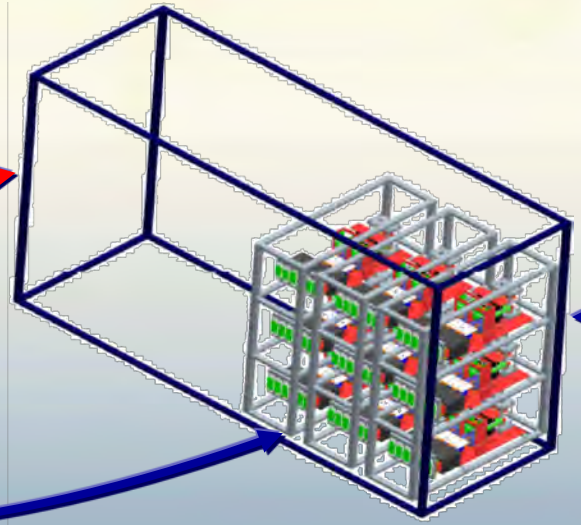
1MW ,10kV, 100 amp SiC Module

Single Phase AC-AC building block

Present PCM-4

Weight: 35,000 lbs

Volume: 168”W x 60” D x 81”H



SiC PDM-4/1A

Weight: 3,500 lbs

Volume: 60”W x 60” D x 60”H

3 MW Application

SiC Ship Service Power System

70% Smaller & 89% Lighter

Increased efficiency
Reduced weight and volume
Improved thermal management

Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS) JCTD

Reduce the "unacceptably high risk" of extended electric grid outages by developing the capability to island installations while maintaining operational surety, security & cyber defense

Approach

- Circuit level demo at Joint Base Pear Harborl-Hickam using renewables with hydrogen storage & fuel cells
- Ft Carson microgrid including renewables, vehicle-to-grid storage, energy mgt, cyber defense
- Camp Smith, HI complete installation smart grid, islanding, battery storage, cyber defense

Joint Base Pearl Harbor-Hickam Renewable H_2 Production & Fueling Station

Deployable H_2 Modules (operating since Nov 2006)

- Hydrogen Fuel Processor (H_2FP) uses two electrolyzers and pressure management (H_2PM) produces up to 50kg/day @ 5,000 psi

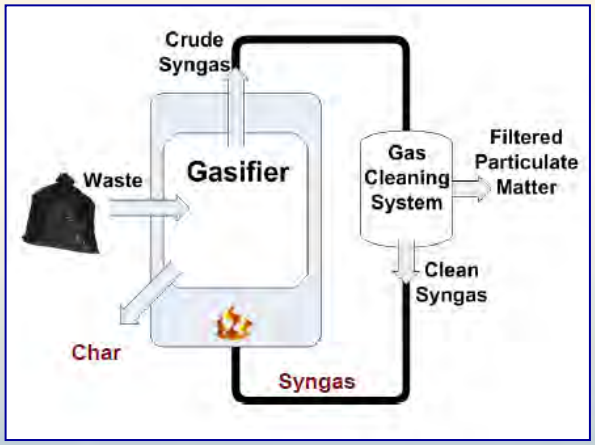
146 kW Photovoltaic Array (operating since May 2009)

- Provides power to base grid when station is not operating.

Five 10 kW Vertical Axis Wind Turbines

- Renewable energy for hydrogen station; power to base grid when station is not operating.

Micro Auto-Gasification System (MAGS)



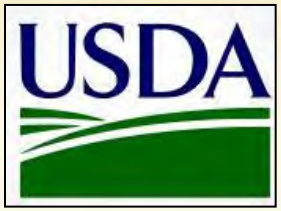
- Terragon Environmental Technologies, Inc gasification system
  - Treats organic waste, plastics, chemicals, wood products, and bio-hazardous waste
  - Processes 1,500 lbs daily [~1,000 Marines]
  - Waste heat available for other uses – hot water, space heating
  - Uses fuel source to start process – then self-sustaining
- ONR developed for expeditionary ops
- ONR-MARFORPAC is evaluating at Camp Smith in Hawaii


Revolutionary Research . . . Relevant Results


ASD(R&E)


DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA


UNITED STATES
MARINE CORPS


USDA


TARDEC


Office of Naval Research
USN
ONR
Science & Technology


DEFENSE CONTRACT MANAGEMENT AGENCY
DEPARTMENT OF DEFENSE

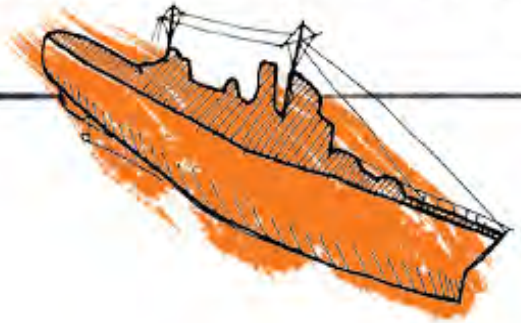

DEPARTMENT OF THE ARMY
UNITED STATES OF AMERICA
1775


arpa·e


DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA


AIR FORCE RESEARCH LABORATORY
AFOSR
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

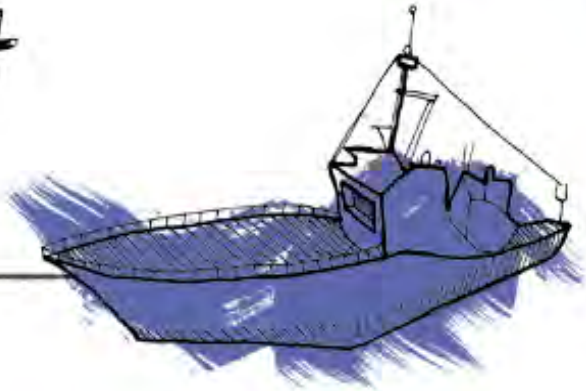
What if...you could get any resource you needed?



...remove any obstacle?

...change any practice?

How can the Navy best meet future energy demands?



ONR
Revolutionary Research . . . Relevant Results

NAVY ENERGY

mmowgli

Coming in 2012

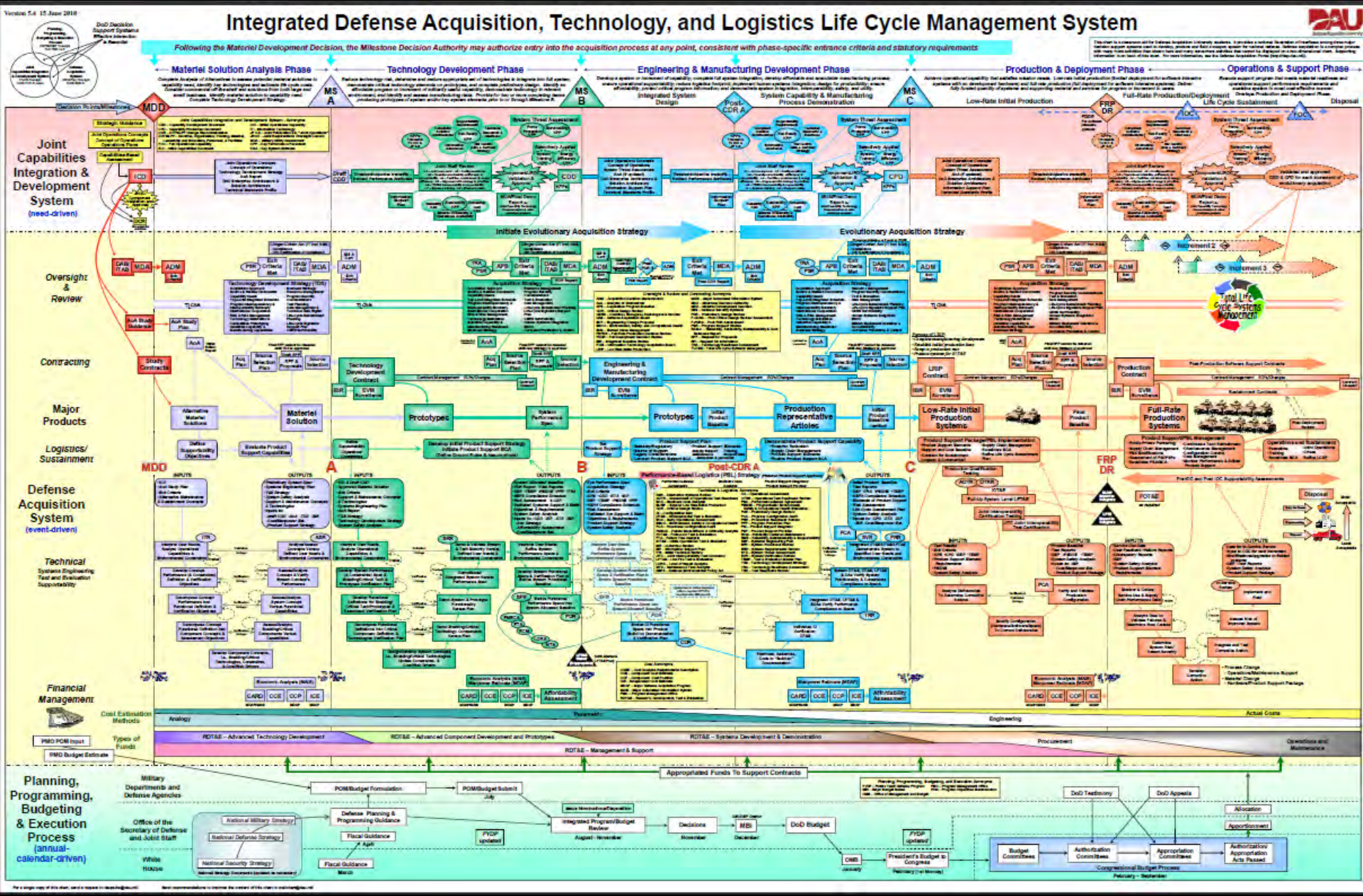
Pre-register at:

http://www.onr.navy.mil/energymmowgli/

And share early ideas with #energyMMOWGLI


DEPARTMENT OF THE NAVY
UNITED STATES MARINE CORPS

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System



Naval Energy Forum

13 Oct 11

Col Bob "Brutus" Charette
Director, Expeditionary Energy Office (E^2O)

Exponential Growth in Technology On the Battlefield

380% Weight Increase

2,400% Cost Increase

Vietnam

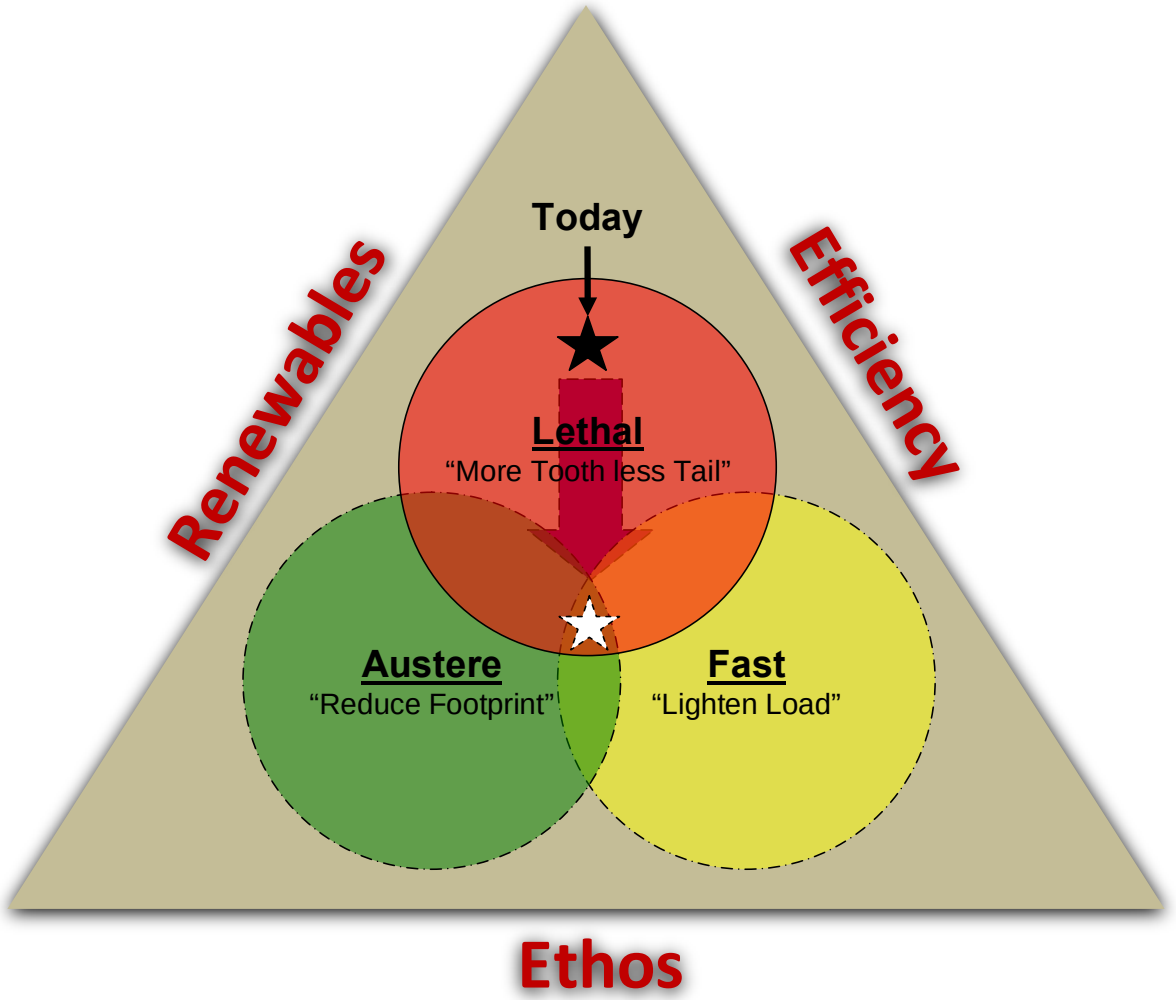
Today

Logistics Convoy Study

24 Mar 10 – 30 Jun 10

- 299 Fuel/Water Convoys (98 Days)
- **6 Marines WIA** hauling Fuel/Water
- **1 Marine WIA per 50 Fuel/Water Convoys**

Reducing Risk
Increasing Effectiveness

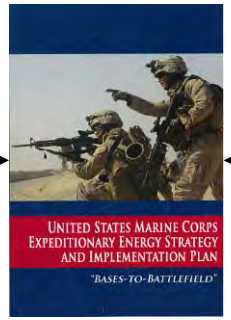


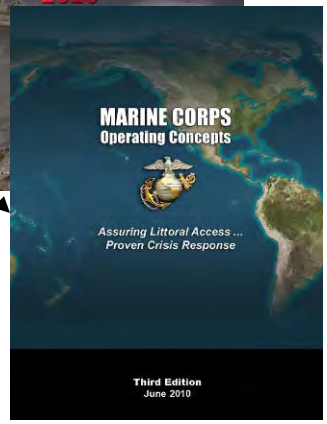
Framework to Create a More Capable MAGTF

Mission

By 2025 we will deploy Marine Expeditionary Forces that can maneuver from the sea and sustain C4I and life support systems in place; the only liquid fuel needed will be for mobility systems which will be more energy efficient than systems are today.

E2W2 CBA/ICD





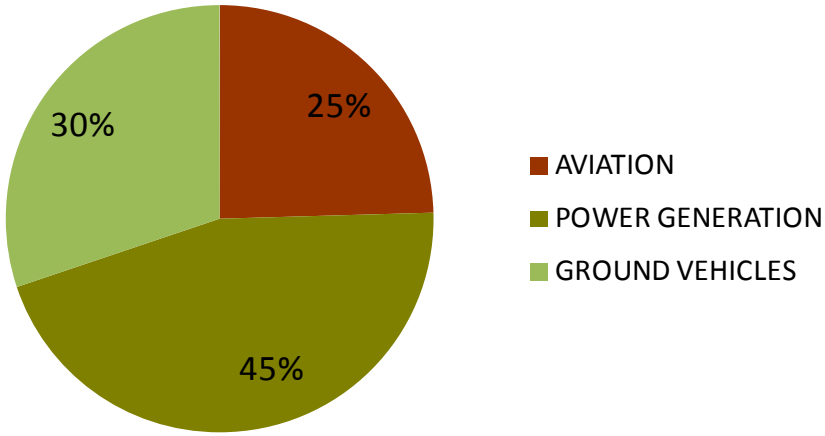
Three Pillars Required to Accomplish the Mission

Energy Strategy and Supporting Requirements Documents Written in Parallel to Achieve CMC's Priority; …to "Implement New Capabilities…"


More Efficient, Alternative Fuel-Capable Aircraft & Renewable-Powered UASs
Minimized Aviation Resupply Missions
Self -Sufficient FARP – Water & Energy Alternative Fuel
Joint or Coalition Force, Interoperable Energy, Water & Waste Capabilities
Fuel, Battery, & Water Resupply Convoys Minimized
Self - Sufficient COP/PB - Renewable Energy Powered COC & Life Support, Locally Sourced Water Renewable Energy, Water Purification
Common Operational Energy Picture
Monitor, Analyze, Manage
Precision Air Delivery
Afloat C2 & Logistics Support
Dispersed Maneuver Force
Improved, Fuel Efficient Vehicles Operating on Alternative Fuels
Dismounted Ops - Reduced Battery & Water Load & Resupply Renewable Energy, Water Purification
Plan for Energy, Water, & Waste Efficiency
Self -Sufficient Bn FOB – Renewable Energy Powered COC & Life Support, Locally Sourced Water Minimum Footprint Ashore

Expeditionary Energy Goals "Starting Point"

25%	*Doctrine, Training, Organization, and Leadership = Behavior Change "Spartan Ethos"*
10-15%	*Increased Efficiency of Ground Vehicles and Equipment*
5-10%	*Renewable / Alternative Energy*
10%	*Increased Efficiency in Aviation*
~50%	*Reduction by 2025*



Starting Baseline

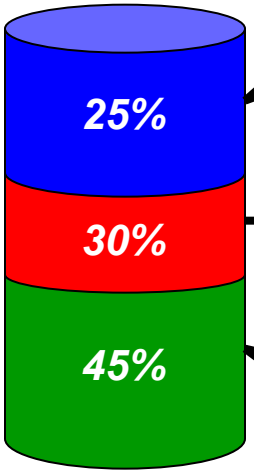
OEF 2010

(Will be adjusted as we gain greater insights into actual use across the MAGTF)

Baseline will be adjusted as we gain better insights into challenges and opportunities.

Today's Deployed MAGTF

1 Gallon
JP-8



$7.68 / Gallon
18,980 Fuel Trucks / Year
$729M / Year

0.5% Improvement ~0.5M gals/yr.

95 Fuel Trucks or $3.6M

5% Improvement ~4.7M gals/yr.

949 Fuel Trucks or $36M

15% Improvement ~14M gals/yr.

2,847 Fuel Trucks or $109M

25% Improvement ~24M gals/yr.

4,745 Fuel Trucks or $182M

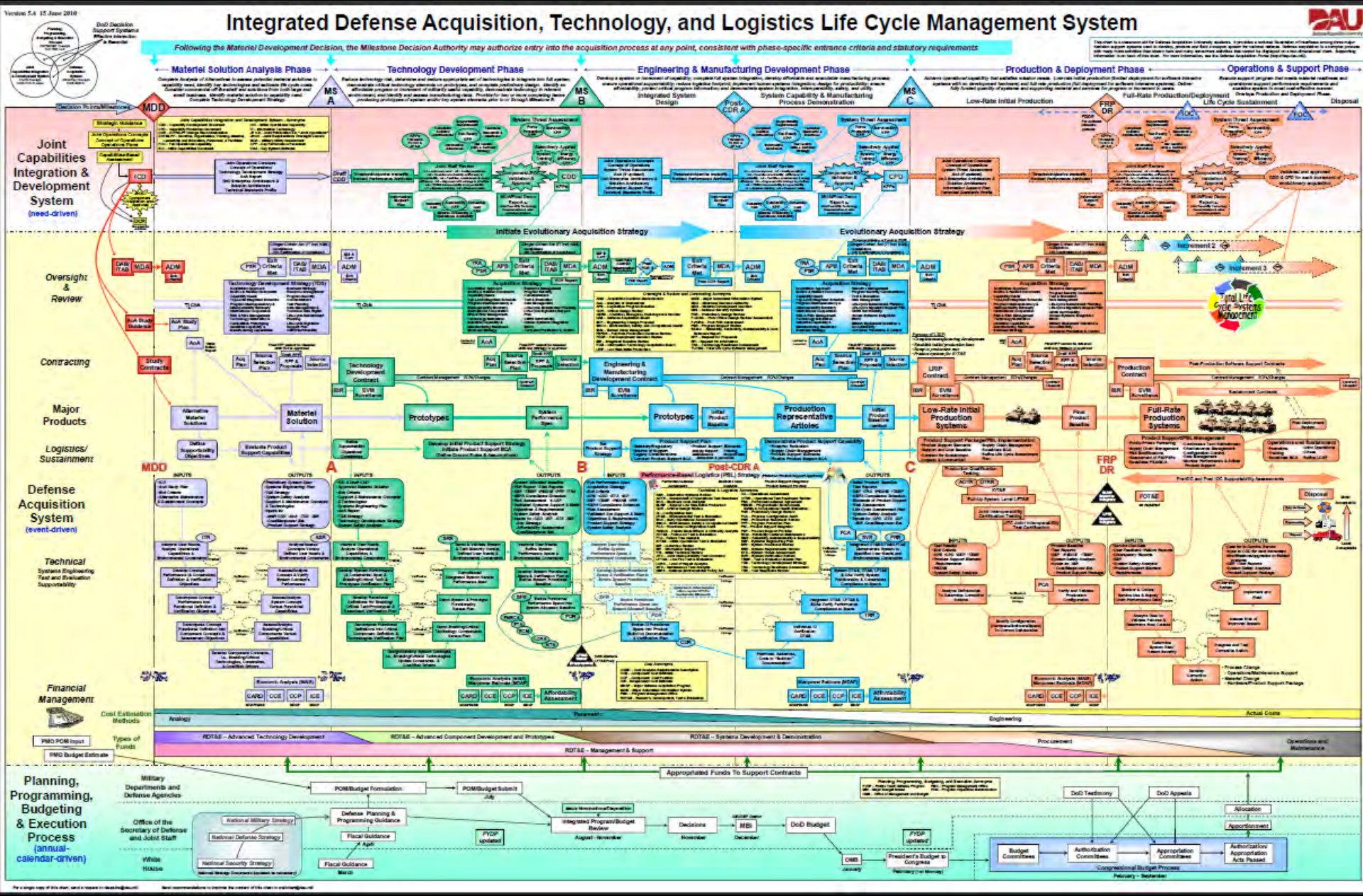
Small Improvements in Energy Efficiency…Big Impact!

"We Are Looking For A Few Good Technologies"

- *Temp Independent Electronics*
- *Efficient Cooling / Heating of Personnel*
- *Energy Storage*
- *Energy Harvesting*
  - *Solar*
  - *Kinetic*
  - *Thermal*
  - *Waste*
  - *Etc…*
- *More Efficient Electronics / Vehicles / Equipment*
- *Vehicles as a Power Source*
- *New Leadership and Training*

We don't create markets, we protect our Nation!

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System



Energy and Total Ownership Cost

Ms. Jo Decker
Assistant Deputy Chief of Naval Operations
(Fleet Readiness & Logistics) N4B

13 October 2011

Lifecycle Cost and TOC

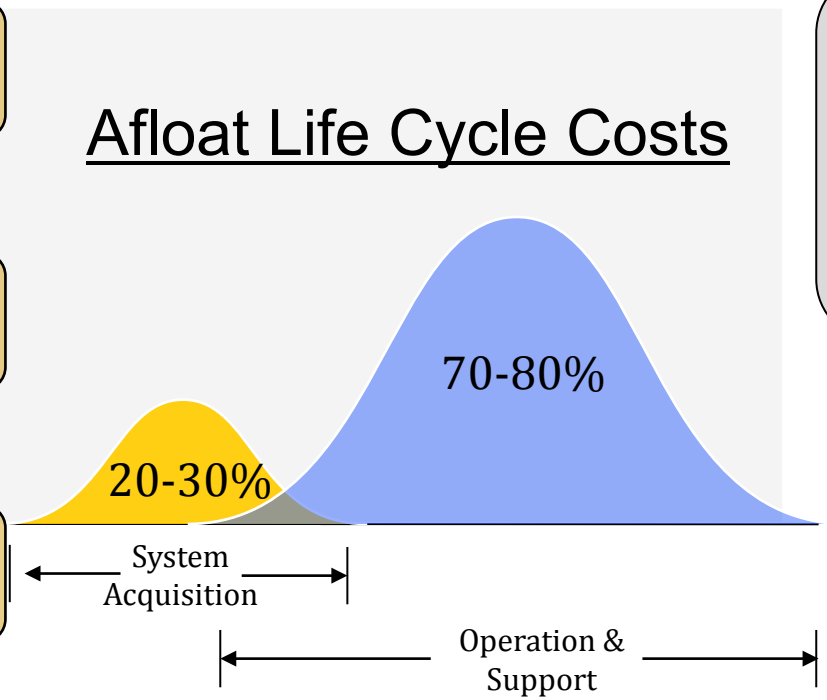
System Acquisition Costs

Concept Refinement

Technology Development

System Development & Demonstration

Production & Deployment



Operations & Support

Maintenance

Fuel

Supply

Training and Training Support

Transport

Configuration Management

Manpower and Personnel

Engineering

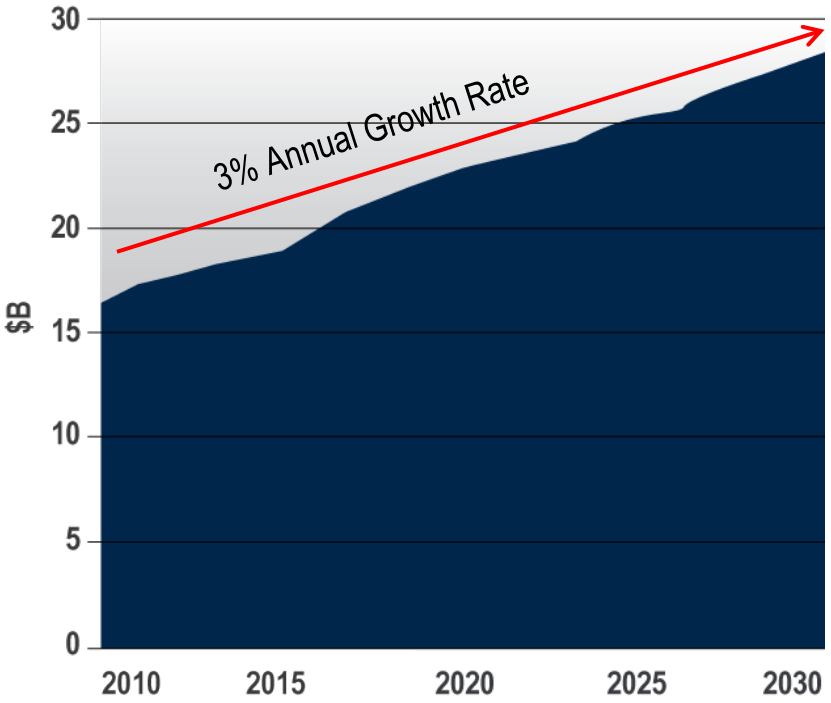
Facilities

Information Technology

Energy Cost Growing

Navy TOC: Aviation, Ship, & Sub OM&R*

Reflects Flying Hour, Aviation Depot, Ship Ops, Ship Maintenance Programs

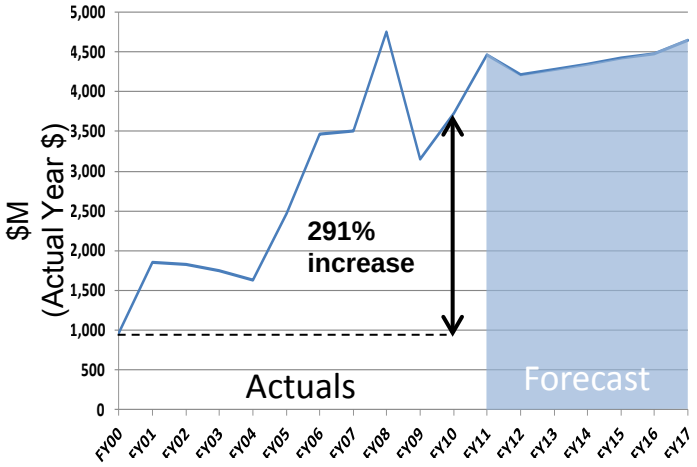


* Study performed in 2007/2008

- Operating and maintaining our Fleet is on a trend that is unsustainable

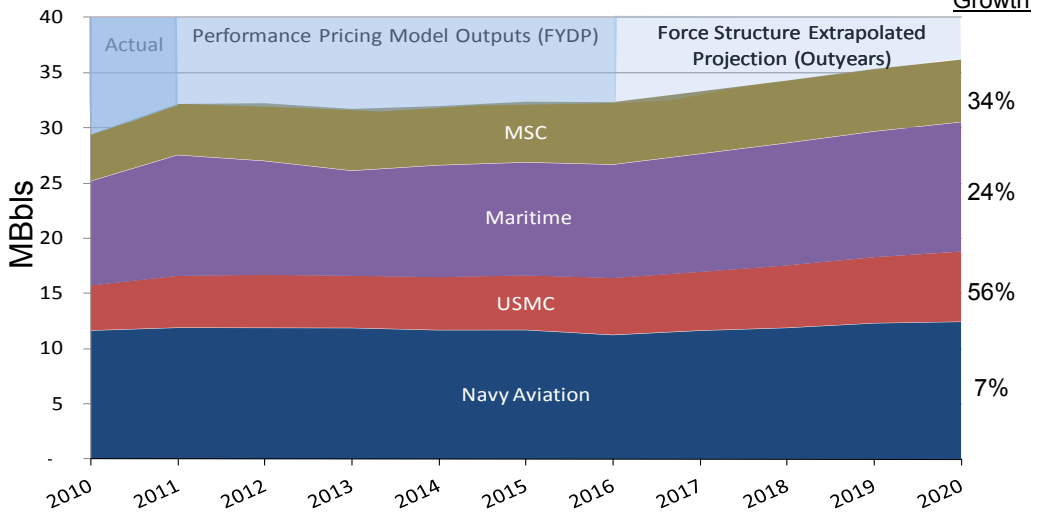
Growing energy costs and consumption are the most dynamic component of TOC

Navy Fuel Bill



- An ever increasing percentage of our operating costs
- $1 change in a barrel of oil leads to $30M change to fuel budget
  - Volatility of oil prices increasing

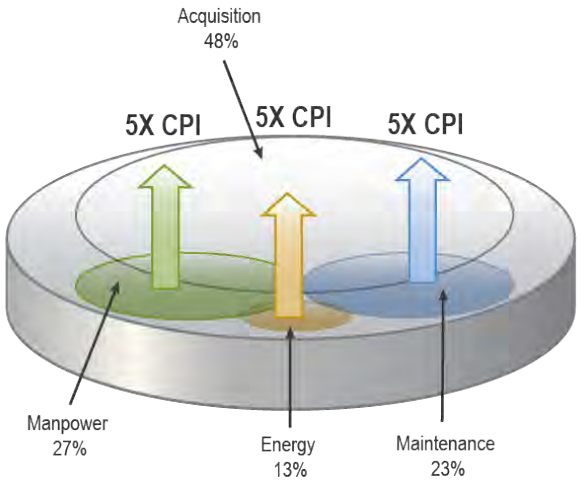
Navy Fuel Consumption



23% increase across the decade

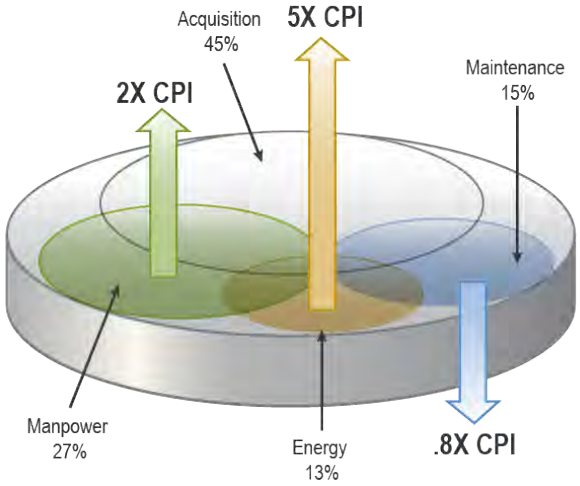
Total Ownership Cost Challenges

Typical Rotary Wing Platform (1996–2009)



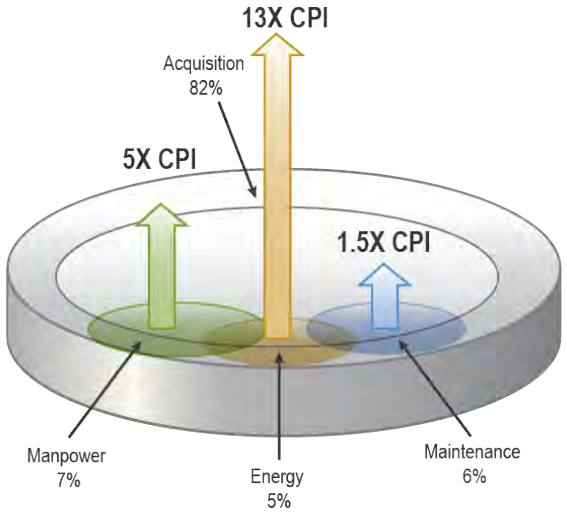
- CPI increased 39%
- Maintenance costs increased 187%...
  Nearly five times CPI!
- Military Manpower costs increased 208%...
  Over five times CPI!
- Energy Costs increased 200%... *Five times CPI!*

Typical Surface Combatant (1991–2009)



- CPI increased 59%
- Private sector depot port rates increased 49%...
  Slightly less than CPI
- Military Manpower costs increased 114%...
  Almost double CPI
- Energy Costs increased 292%... *Five times CPI!*

Typical Fixed Wing Platform (2001–2009)



- CPI increased 23%
- Maintenance costs increased 35%...
  One and one-half times CPI
- Military Manpower costs increased 130%...
  Five times CPI!
- Energy Costs increased 300%... *Thirteen times CPI!*

Back to the Future

World War II

Cold War


19 bph


21 bph

Tomorrow's War


24 bph


?? bph

- **Increased efficiency translates to greater combat capability**
  - **Consuming less fuel allows for greater range with same amount of fuel**
  - **Lower fuel consumption means reduced strain on supply lines**

Efficiency is warfighting advantage

RADM William D. French,
Commander, Navy Region Southwest

Navy Shore Energy

For

Naval Energy Forum

13 October 2011

Navy Energy Goals

"Department of the Navy will by 2020 produce at least half of our shore-based energy requirements on our installations from alternative sources."

-- Secretary of the Navy Ray Mabus

Navy Shore Energy Strategy

Transform Navy From Culture of Consumption to Culture of Conservation *Through Transparency and Accountability*

Navy Energy Culture

Energy Security:
- **Redundancy**
- **Resiliency**
- **Reliability**

ENERGY SECURITY & COMPLIANCE

Energy Efficiency First

The *Right Technology* at the *Right Time*
- **Watch**
- **Partner**
- **Lead**

Renewable Energy & Sustainability

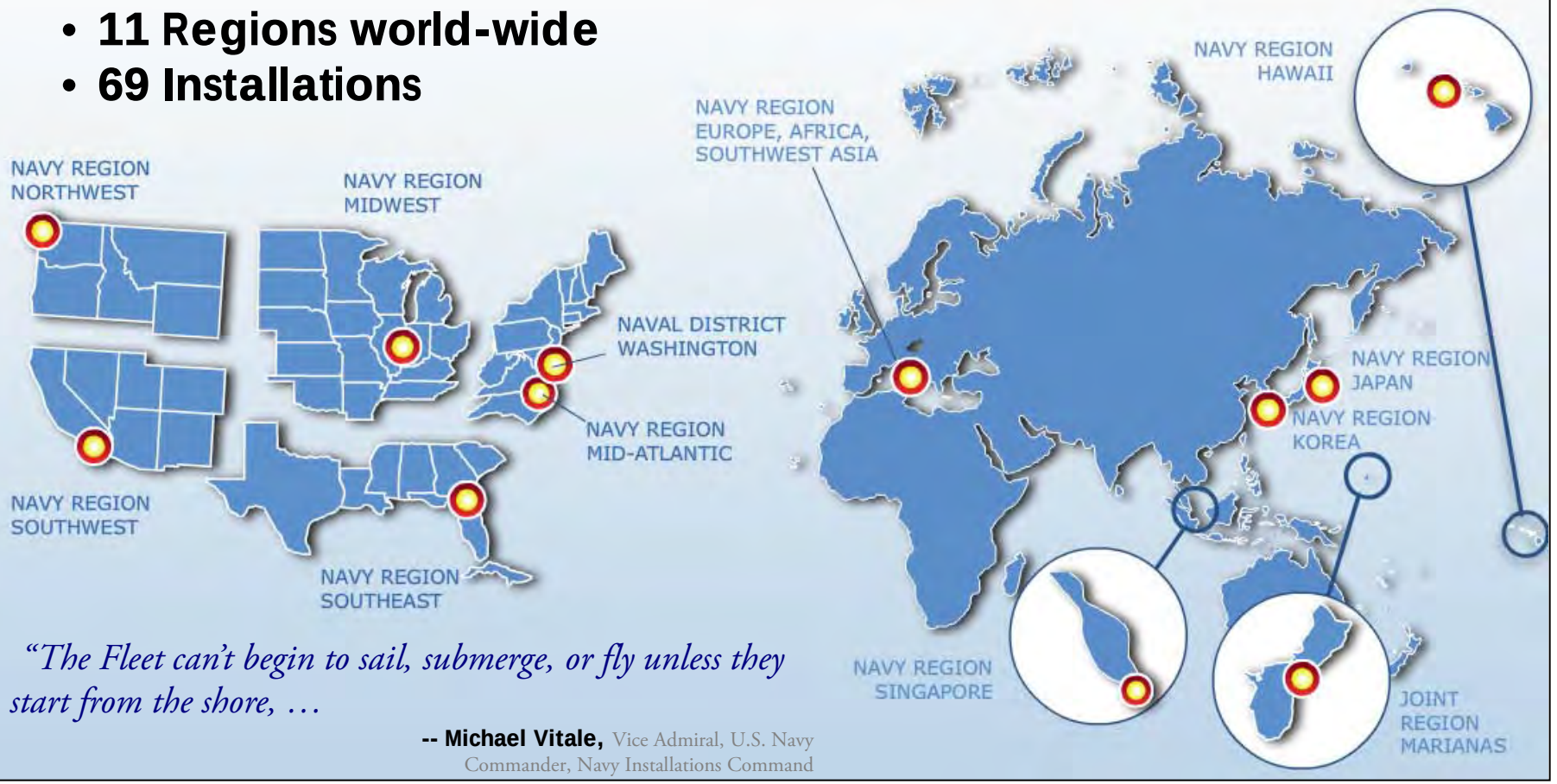
Energy Efficiency

"Compliance" is unique to the Shore

Navy Installations Command

Sustain the Fleet, Enable the Fighter, Support the Family

- **11 Regions world-wide**
- **69 Installations**



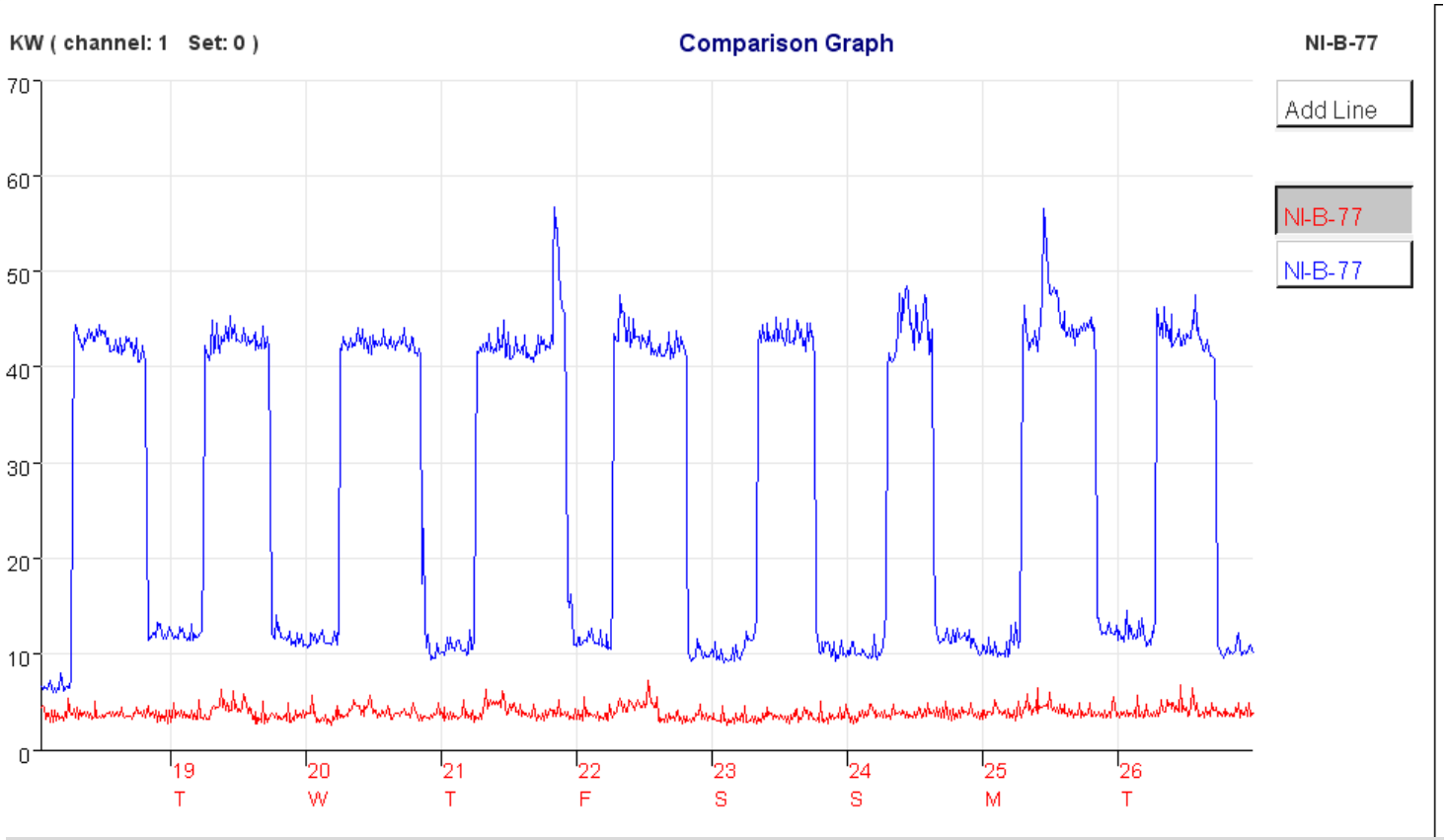
"The Fleet can't begin to sail, submerge, or fly unless they start from the shore, …

-- Michael Vitale, Vice Admiral, U.S. Navy
Commander, Navy Installations Command

Region Southwest

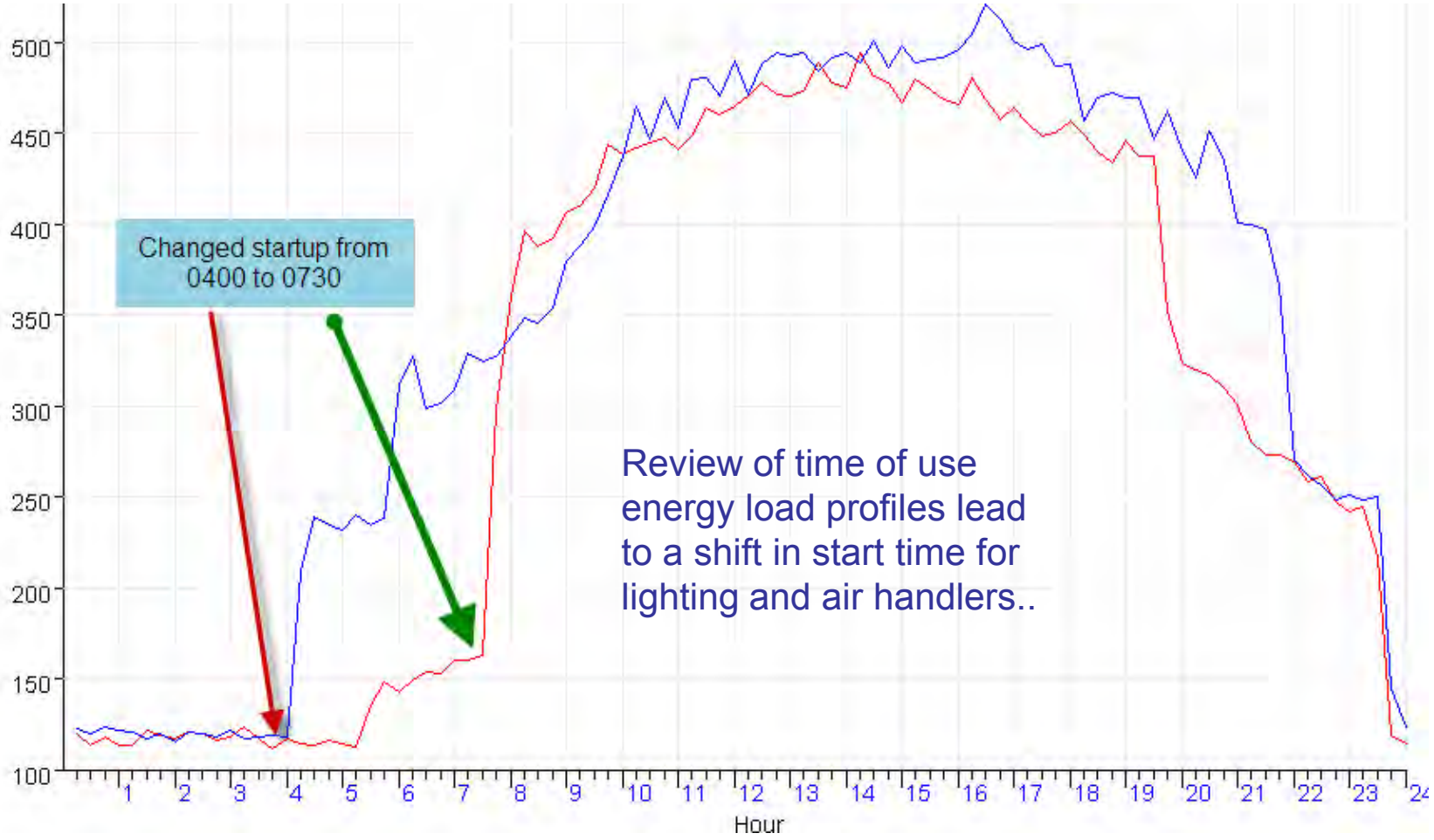
NB Coronado - Warehouse

Warehouse Lighting/ Daylighting



$33,000 annual cost reduced to $5,000

Shore Energy Management

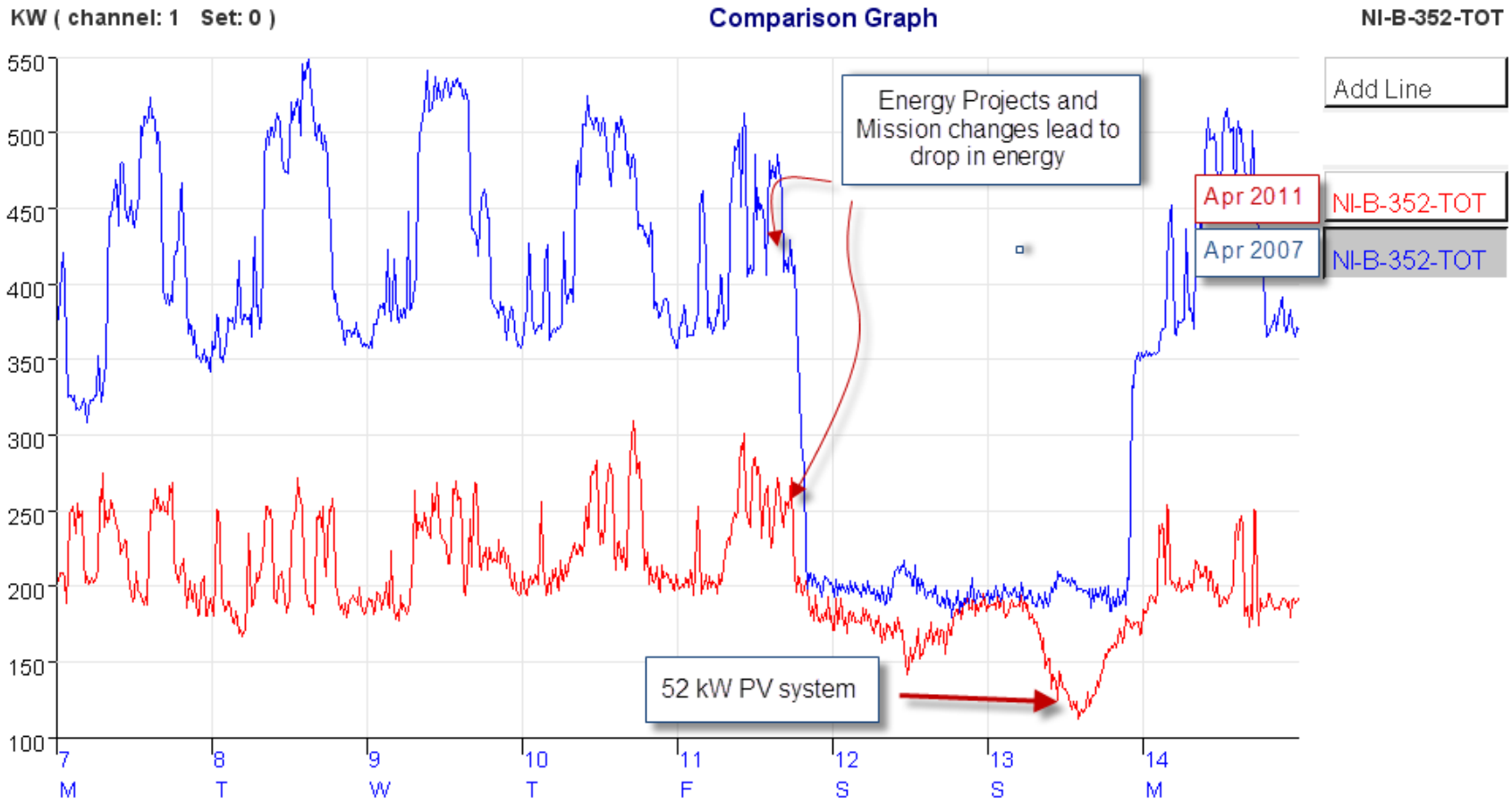


Flight Simulator

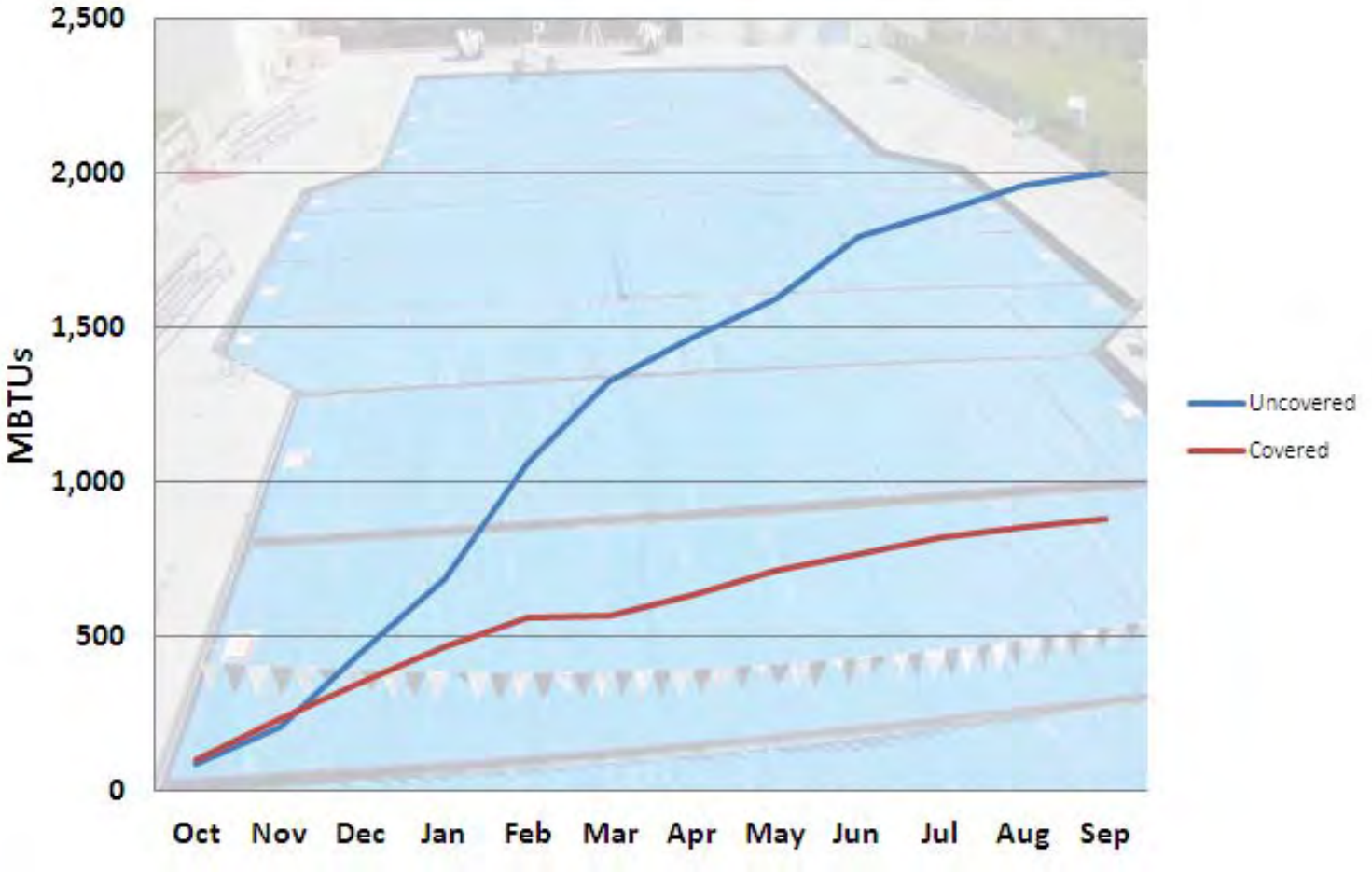
Naval Base Coronado - Building 352

Helicopter Flight Simulator

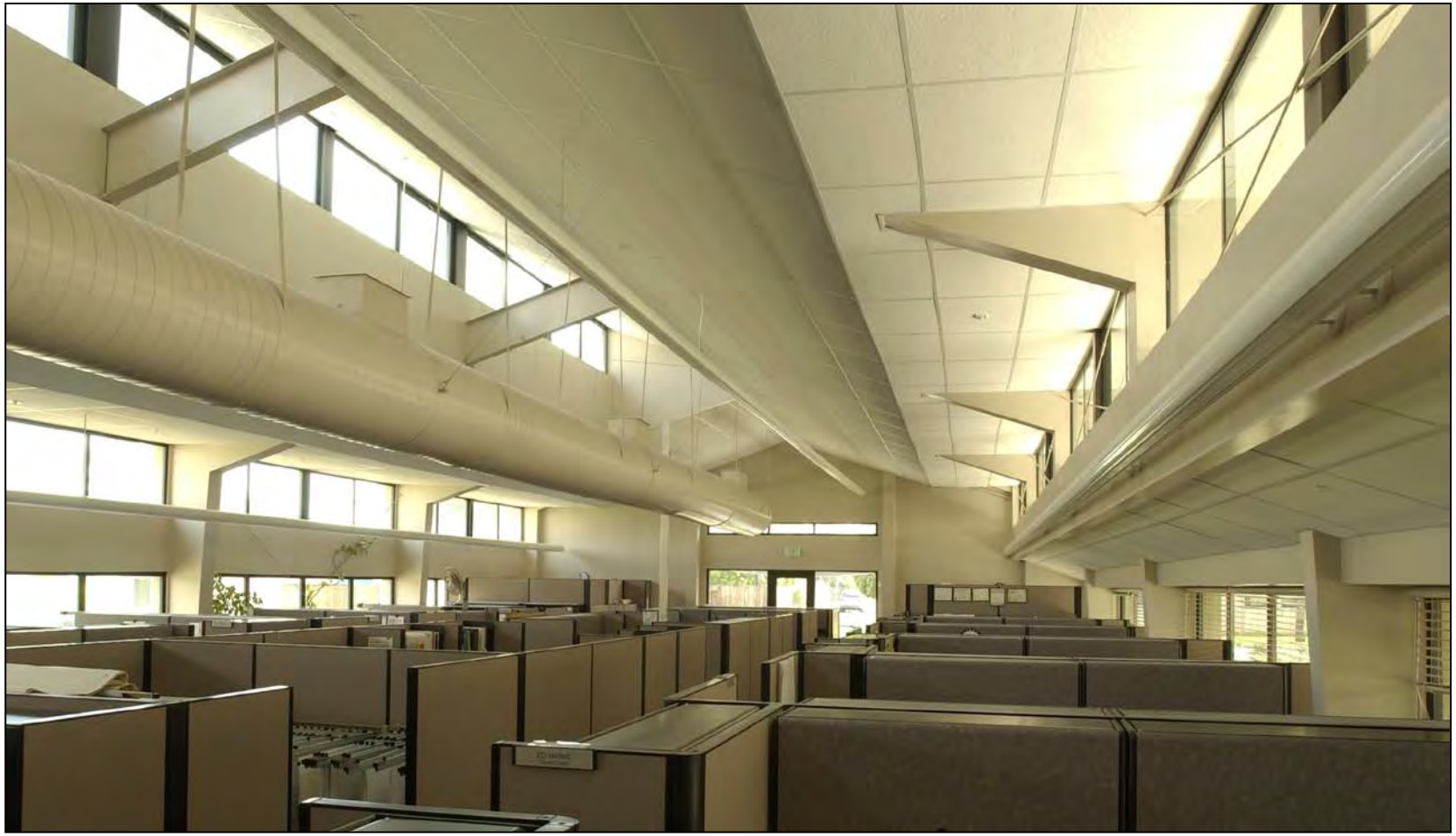
Flight Simulator Building



Swimming/ Training Pools

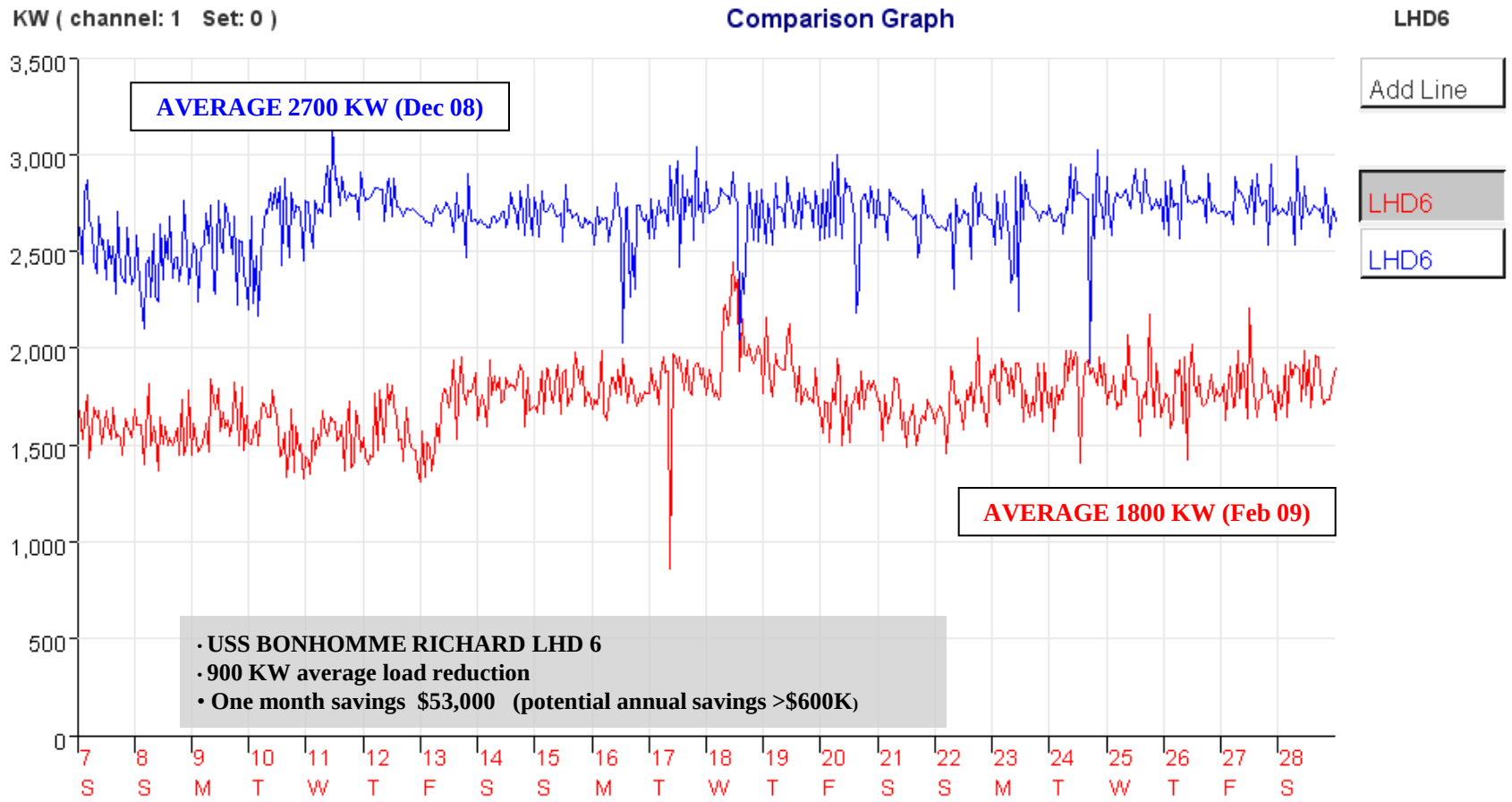


Energy Efficient Buildings



Shipboard Shore Energy Management

Shipboard Shore Energy Management

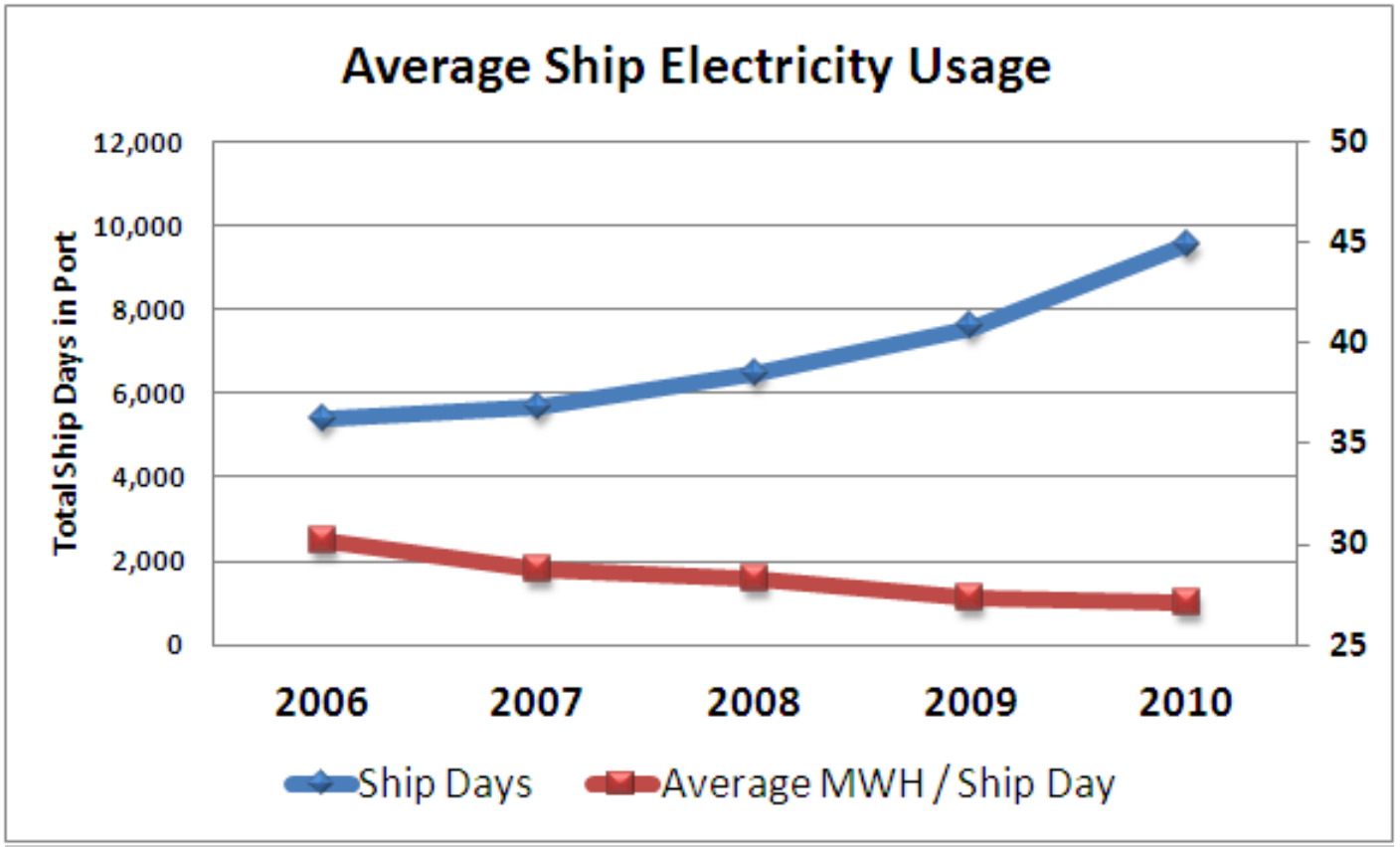


Shipboard Shore Energy Management
FY10 Biggest Losers

FY10 Most Efficient Cold Iron Ship

Cruiser CG - USS Antietam CG-54
Destroyer FLT I - USS John Paul Jones DDG-53
Destroyer FLTII - USS Stockdale DDG-106
Frigate - USS Rentz FFG-46
LHA/LHD - USS Boxer LHD-4
LPD WI Class - USS Dubuque LPD-8
LPD SA Class - USS New Orleans LPD-18
LSD - USS Comstock LSD-45
MCM - USS Devastator MCM-6

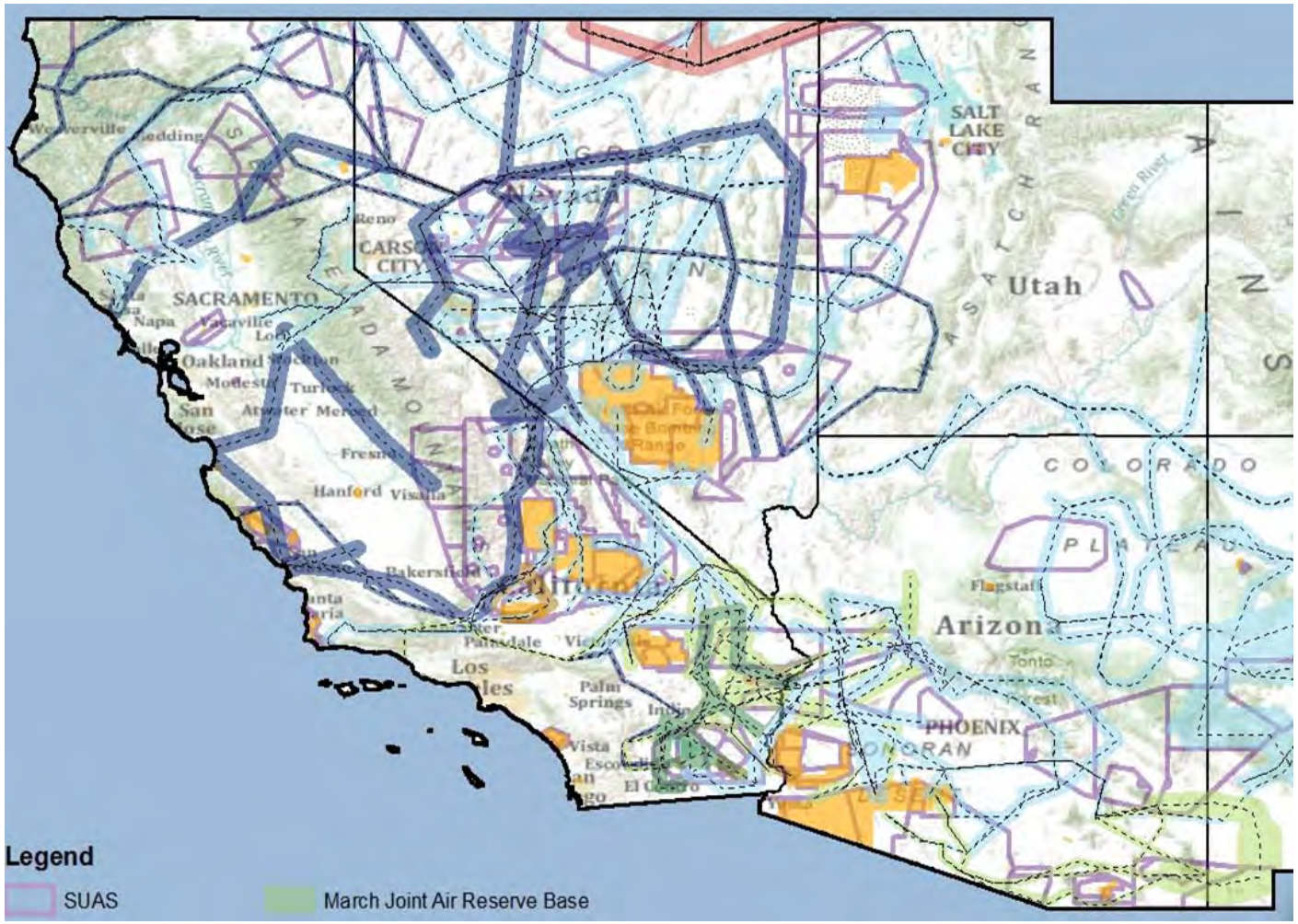
Ships Electricity Usage Trend



>$8M savings over a 4-year period

Renewable Energy

Mission Compatibility Assessment Tool (MCAT)



Navy Smart Grid

Energy Efficiency

Energy Security

NAVY ENERGY

Sustainability

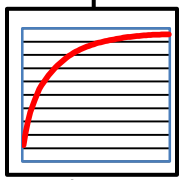
Analysis & Knowledge Mgmt

Energy

Monitoring/ Controlling

Digital Controls

Weather



Equipment Efficiency

Sources

Utility Company Power

Storage

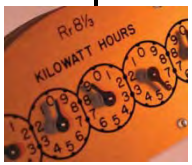
Geothermal

Solar

Future Technologies

Data

SCADA



Legacy Meters

Existing Controls

Advanced Metering (AMI)

Enabling the Warfighter

Naval Energy Forum
Washington, DC, October 14, 2011

"Our Past Is Prologue"

A lecture by James D. Hornfischer, author of
Neptune's Inferno: The U.S. Navy at Guadalcanal
(Bantam Books, 2011)

In the age of sail, before the days of mineral-burning warships, our ships of the line moved with the wind, unconstrained by the scarcity of consumables beyond those required by their crews to subsist.

A hundred years later, in the nuclear age, our naval leaders enjoyed similar freedom from time to time, driving ships powered by the near-limitless capacity of nuclear propulsion.

In between, however, was another era entirely. World War II, as increasingly again now, was a time when all naval commanders had to reckon with the

restrictions imposed by the scarcity of fuel, both in supply and in transport. The operating radius of their ships, and their time on station, were thus constrained. “If an enemy lay beyond that radius, the fleet might as well be chained to a post,” a maritime historian has written.

During the Guadalcanal campaign, from August to November 1942, scarcity of fuel was a factor in every type of operation. In the skies, our fighter pilots fought air-to-air, above and around their own base, giving them a tactical advantage over the Japanese, who were fighting at the outer limit of their range. On the ground, our Marines needed fuel for their vehicles, and, occasionally, chemical recreation. They discovered that torpedo fuel, transported and stored in convenient five-gallon cans, could be mixed with papayas, limes and fruit juice. Blended with ice, it made for a heavy-caliber grog.

We’re here today to talk about larger fuel appetites. Namely the positively gluttonous appetite of our

capital ships.

In early 1942, the U.S. had plenty of fuel. America supplied two of every three barrels of the world's oil, and had 60 percent of the world's refining capacity.

And yet, as the fight for Guadalcanal was kicking off, Admiral Nimitz was beset by theater-wide fuel shortages that compelled him to fight the South Pacific campaign with one hand tied behind his back. The German U-boat campaign required a massive redirection of tankers to the Atlantic. With just 7 fleet oilers in service, and limited fuel supplies deployable to the South Pacific, CINCPAC was forced to choose between operating its fast carrier task forces, or operating its battleships. It did not have the oil to do both.

By the late spring of 1942, the battleships of Task Force One had been fully repaired and modernized. But owing to their fuel gluttony, they had to stay home. At a speed of 15 knots, Task Force One—six

battleships—and her escorts of four to six destroyers would burn 300,000 barrels per month, a number equivalent to the total oil storage capacity in the Pacific in early 1942. A carrier task force was almost as expensive in terms of fuel usage. A task force of two CVs and eight to ten escorts burned 225,000 barrels a month, or 7,500 barrels a day, at long-range cruising speed. A typical oiler of the day carried 65,000 to 140,000 barrels, enough to keep one of those carrier task forces operating at cruising speeds for about 14 days. At battle speed, of course, that number dropped rapidly.

Given the small number of tankers available in the South Pacific—Frank Jack Fletcher had just three of them in the critical early days of August—the use of carriers and battleships anywhere but on the U.S. West Coast was an 'either-or' proposition.

Wanting to employ his newly repaired and modernized BBs in the South Pacific, Admiral King urged "continuous study" of the problem, but

Nimitz vetoed any plan to operating them out of Pearl Harbor. The fuel simply wasn't there.

Even with the battleships at home, Nimitz's COMOPAC, Admiral Robert Ghormley, saw right away that fuel was a critical constraint in operations.

At the end of July, he wrote Nimitz about certain problems that kept him from advancing D-Day on Guadalcanal. "The big one right now is fuel," Ghormley wrote. "We are working on that as hard as we can…. Some tankers are arriving behind schedule, so it is going to be difficult. I fear any chance of advancing Dog day is not possible."

And of course, fuel shortages were at the root of the most famous controversies of the campaign: Admiral Fletcher's employment of his carriers in support of the landings.

Ghormley defended Fletcher's decision to pull them out after D-Day plus 2: "Criticism has been made

that Fletcher could have stayed longer," Ghormley would write. "That is a question of judgment—hindsight is better than foresight. When Fletcher, the man on the spot, informed me he had to withdraw for fuel, I approved. He knew his situation in detail; I did not."

This cautious approach bothered the Marines, of course. It chapped our more battle-minded line officers as well. Serving in the USS *Atlanta* (CL-51), Lieutenant Commander Lloyd Mustin, later VADM Mustin, complained to his diary in August: "We have no high commanders capable of playing ball in the same league with the Japs…. I wish to God, Wild Bill Halsey were back here to put a little fire, drive, and action into things. Completed fueling today. Three days of it. Just steaming in circles, north of Noumea."

The fuel shortage was paid for in blood. Lack of fuel kept our battlewagons sidelined from the brutal surface fighting that took place in the Slot. For three-and-a-half critical months, the only muscle

available for midnight collisions with the Japanese was a squadron of treaty cruisers, “tin clads” as they were known. They were one-third the displacement of the *Kongo*-class battleships they faced.

Of course, Japan had its own problems. Admiral Yamamoto was situated much like we were, waging war 6,000 miles from home. The Japanese struggled with these constraints all the more because of the huge investment of pride they had made in their biggest ships, which were least amenable to operating far from home at a high tempo. The Japanese were always guided by the idea that their battlewagons would fight a decisive battle over the Americans, at a time and place of their choosing. The hardware was in place. And Guadalcanal would indeed prove to be decisive. Yet as this campaign of attrition was playing out, the Emperor’s world-beating super-battleship, the *Yamato,* sat it out at Truk, 1,400 miles from the fighting front. There was never enough fuel on hand to send her into the shooting match.

The IJN, like the USN, was operating in a straitjacket zipped tight by their perilously thin oil lifeline. The destroyers of the Tokyo Express made an average of six runs a month to ferry men, arms, and critical consumables to Guadalcanal's northern coast. The typical run consisted of six destroyer-transports, with two destroyers as combat escorts. But this capacity, 36 loads a month, was inadequate. The Japanese garrison on Guadalcanal calculated its full need at about twenty times that. Providing that level of service would have required the IJN to burn up half of the monthly volume of fuel allotted to it worldwide.

As always, the strength and size of the logistics train governed the pace of operations in the forward area. At SOPAC headquarters in Noumea, New Caledonia, the harbor was choked with loaded cargomen waiting for dock space. The facilities could handle only 24 ships per month. There were often 80 or more waiting to be unloaded.

In late September 1942, Admiral Nimitz made his

first visit. On arrival, he was disappointed to learn that, owing to fuel storage problems, the fast battleship *Washington* was idling at Tongatabu, the forward fueling base, 1,800 miles from Guadalcanal. Nimitz complained to Ghormley that this was "so far removed from the critical area, that she might as well have been in Pearl or San Francisco, insofar as taking advantage of favorable opportunities is concerned."

Closer to where the bombs were exploding, on Guadalcanal, aviation gasoline was urgently needed. The commander of SOPAC's air forces, Rear Admiral Aubrey Fitch, told Ghormley that the combat fleet would have to step up its game before more avgas could come in. "So long as enemy ships patrol the sea area off Lunga day and night, I cannot see how [destroyers or barges] can be brought in with a reasonable chance of success."

Our hold on the island was a three-legged stool. The airfield had to be defended by marines, who depended on naval forces for protection and supply,

and those naval forces depended on the air forces for cover. If one leg of that triad faltered, the whole thing would come crashing down.

As my book NEPTUNE'S INFERNO details, the gallant commanders of our light surface forces threw themselves into the crucible. In five important surface actions, fighting admirals such as Norm Scott and Dan Callaghan applied themselves with a vengeance to the problem of beating the Japanese. Both men died holding up their leg of the stool.

As the fighting grew more desperate, demand for avgas and bunker oil alike escalated. In October, the new COMSOPAC, Vice Admiral William F. Halsey, found he had virtually no fuel reserves at Noumea. He typed an eight-page letter to Nimitz, saying, "We need tankers and more tankers and more tankers."

The Service Force did what it could to keep the appetite of our combat forces at Noumea sated.

In the early days of August, just three oilers—the *Platte*, *Kaskaskia* and *Cimarron*—were available in the theater. By December, the train of supply was finally catching up with demand. Chartered tankers eventually filled the need at Noumea.

The shipment of avgas to the front, meanwhile, continued by day, in a catch-as-catch can manner. We used some unlikely beasts of burden: submarines, tugboats towing barges, and cargo planes. Ground crews on Henderson Field picked through the remains of the destroyed aircraft to drain the last drops from their tanks.

The campaign for Guadalcanal, known widely as Operation Shoestring, scraped by with a bare minimum of materiel and support. By the time the fuel valve to the South Pacific was finally opened wide in late 1942, the major fighting was essentially over. In seven major naval actions—five of them fought ship to ship, in the Slot—the U.S. Navy broke the Japanese will to fight.

We managed to get by with what little we had. In the end it was the Japanese whose combat power, at the point of contact, suffered most for lack of fuel.

And thank goodness for the resourcefulness of the American Navy. The momentum we gained by making Operation Shoestring work would carry us all the way to Tokyo.

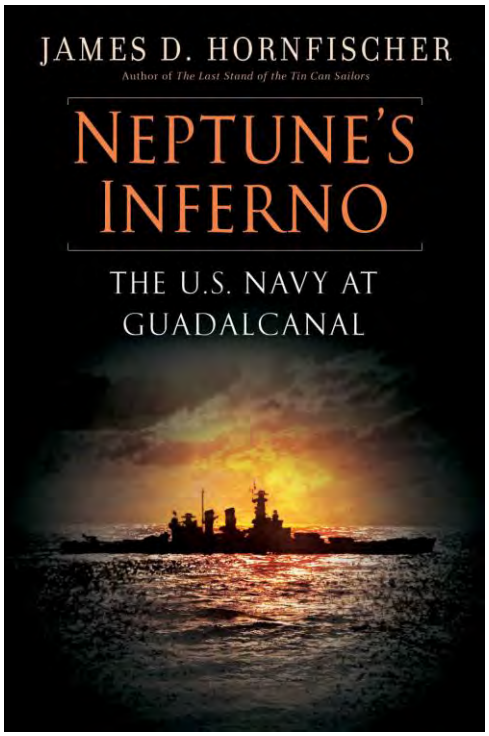
Thank you.

James D. Hornfischer is the author of the *New York Times* bestseller *Neptune's Inferno: The U.S. Navy at Guadalcanal*, and two other acclaimed works of World War II naval history: *The Last Stand of the Tin Can Sailors* and *Ship of Ghosts.*

He has appeared on The History Channel, Fox News Channel's "War Stories with Oliver North" and C-SPAN's "BookTV." A frequent speaker on the subject of the war in the Pacific, the U.S. Navy, and the experience of America's sailors in World War II, he frequently addresses veteran organizations, youth and civic groups, and professional naval associations on the inspiring stories found in his books.

A native of Massachusetts, and a graduate of Colgate University and the University of Texas School of Law, Hornfischer is president of the literary agency Hornfischer Literary Management, located in Austin, Texas.

http://www.jameshornfischer.com



Extrapolating the past

vs.

Inventing the future

“when the train of history hits a curve, the intellectuals fall off.”

- Karl Marx

…when conventional wisdom makes no sense

Should fever be reduced in critically ill patients: “there were seven deaths in people getting standard treatment and only one in those allowed to have fever…”

…at which point the study was halted due to ethical concerns

Source: New Scientist - http://www.newscientist.com/article/mg20727711.400-fever-friend-or-foe.html

“All progress depends on the unreasonable man”

- George Bernard Shaw

“Human salvation lies in the hands of the creatively maladjusted”

- Martin Luther King

experts reality check?

“Heavier-than-air flying machines are impossible”

- Lord Kelvin, President, Royal Society, 1895

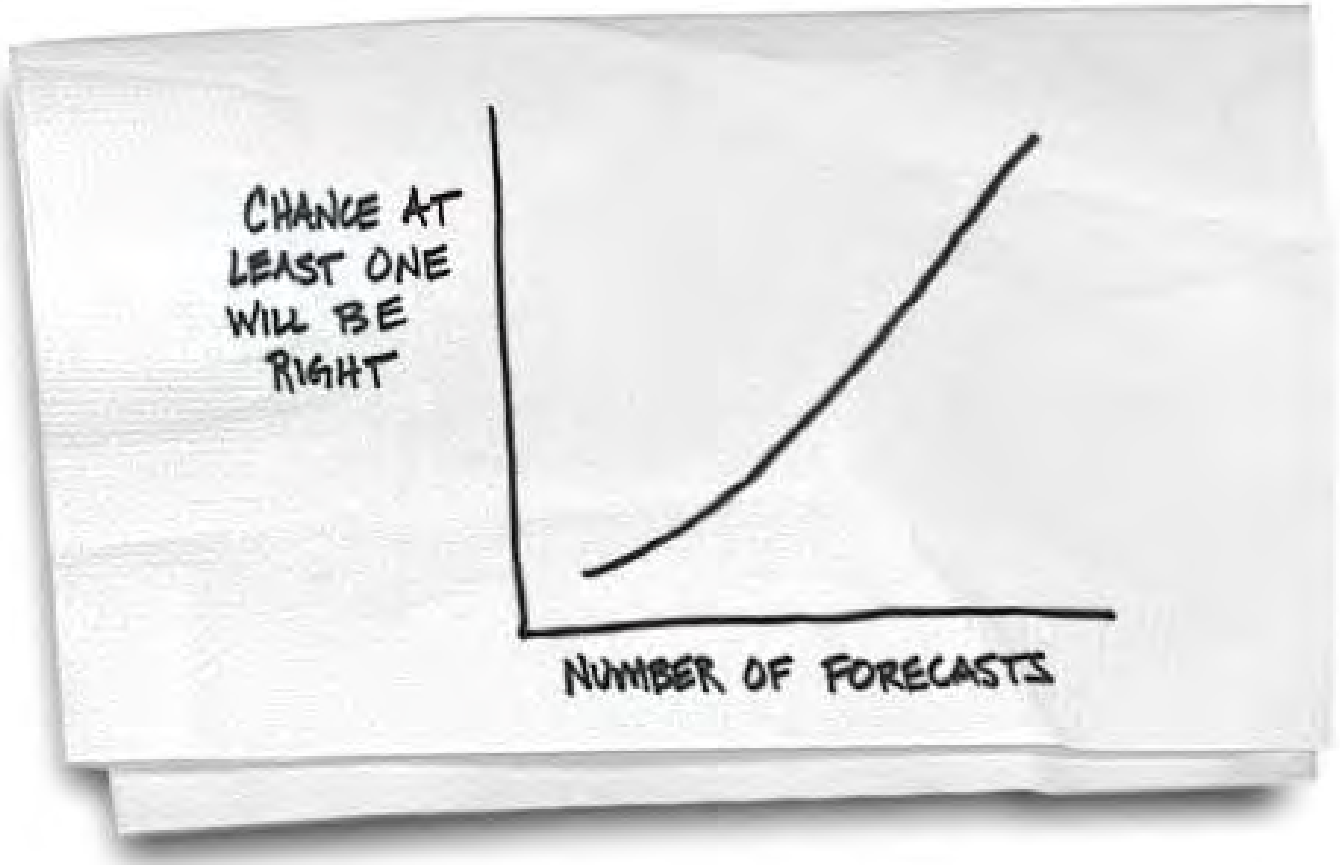
“The telephone has too many shortcomings to be seriously considered as a means of communication.”

- Western Union Internal Memo, 1876

“There is no reason for any individuals to have a computer in their home”

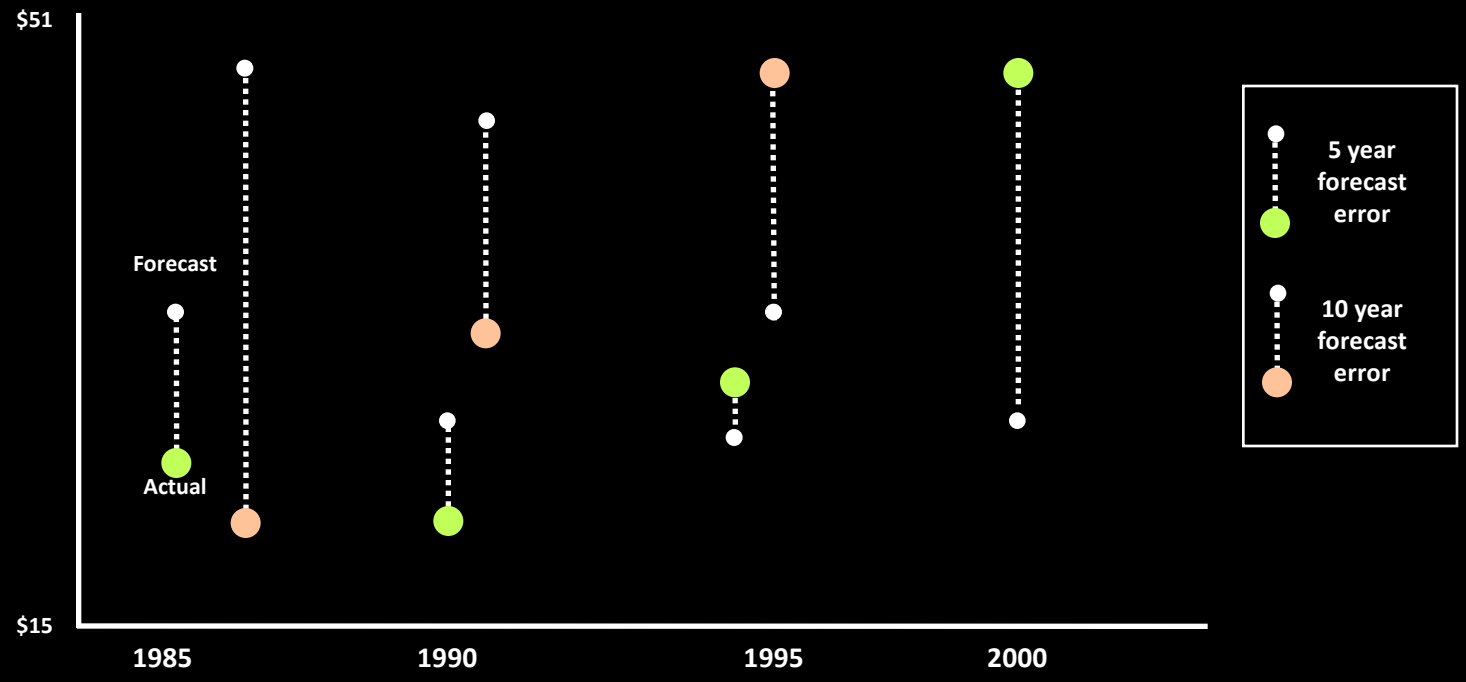
- Ken Olsen, President, Chairman and Founder of DEC, 1977

….forecasting



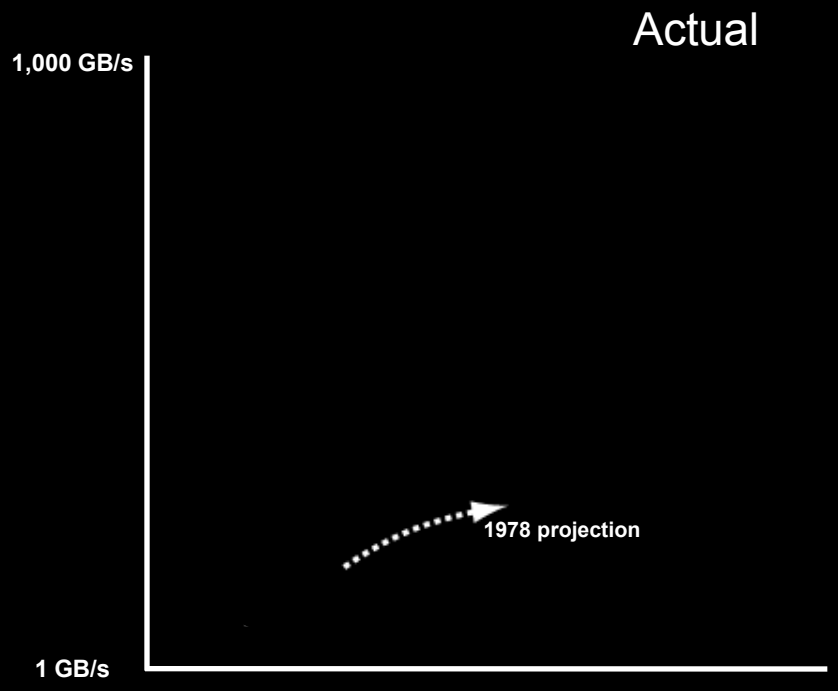
Source: http://bucks.blogs.nytimes.com/2010/09/20/market-forecasts-are-just-guesses/

oil price forecasts (1985-2005)



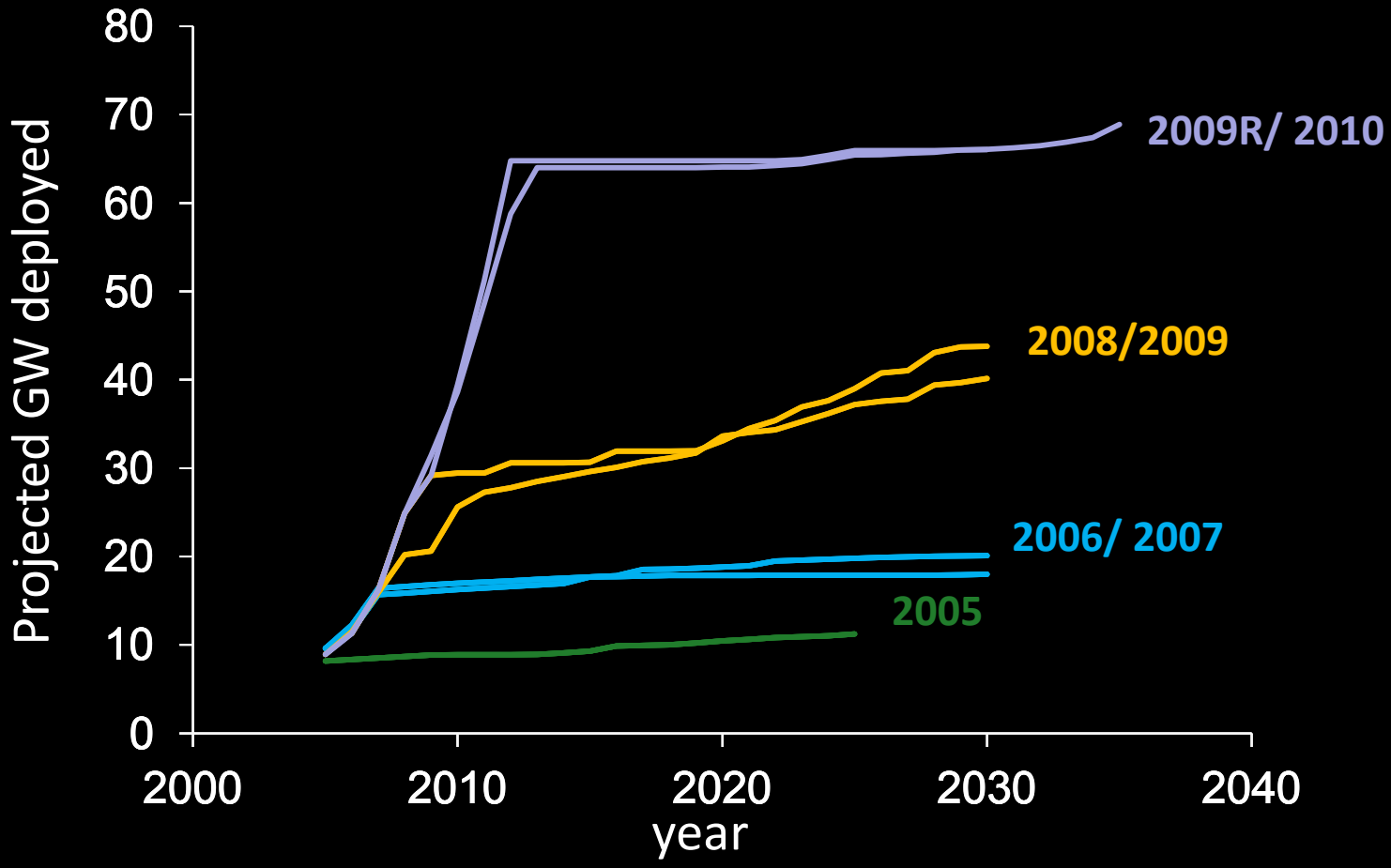
Data/Source: World Oil Prices Barrel) (current $ / - EIA Office of Integration Analysis and Forecasting

telecommunications: actual vs. forecast demand



Source: internal forecasts for major telecommunications company

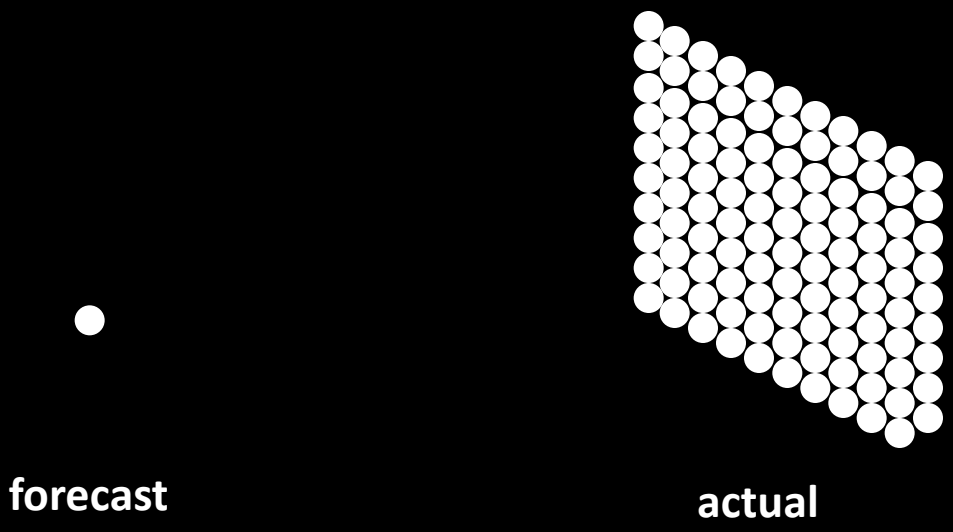
Changing with the wind: EIA wind forecasts



Source: EIA, AEO forecasts

Mckinsey : US mobile subscribers

1980 forecast for 2000



forecast **actual**

Source: American Heritage Magazine - http://www.americanheritage.com/articles/magazine/it/2007/3/2007_3_8.shtml

yesterday's technology, tomorrow's forecast

1980's phone:

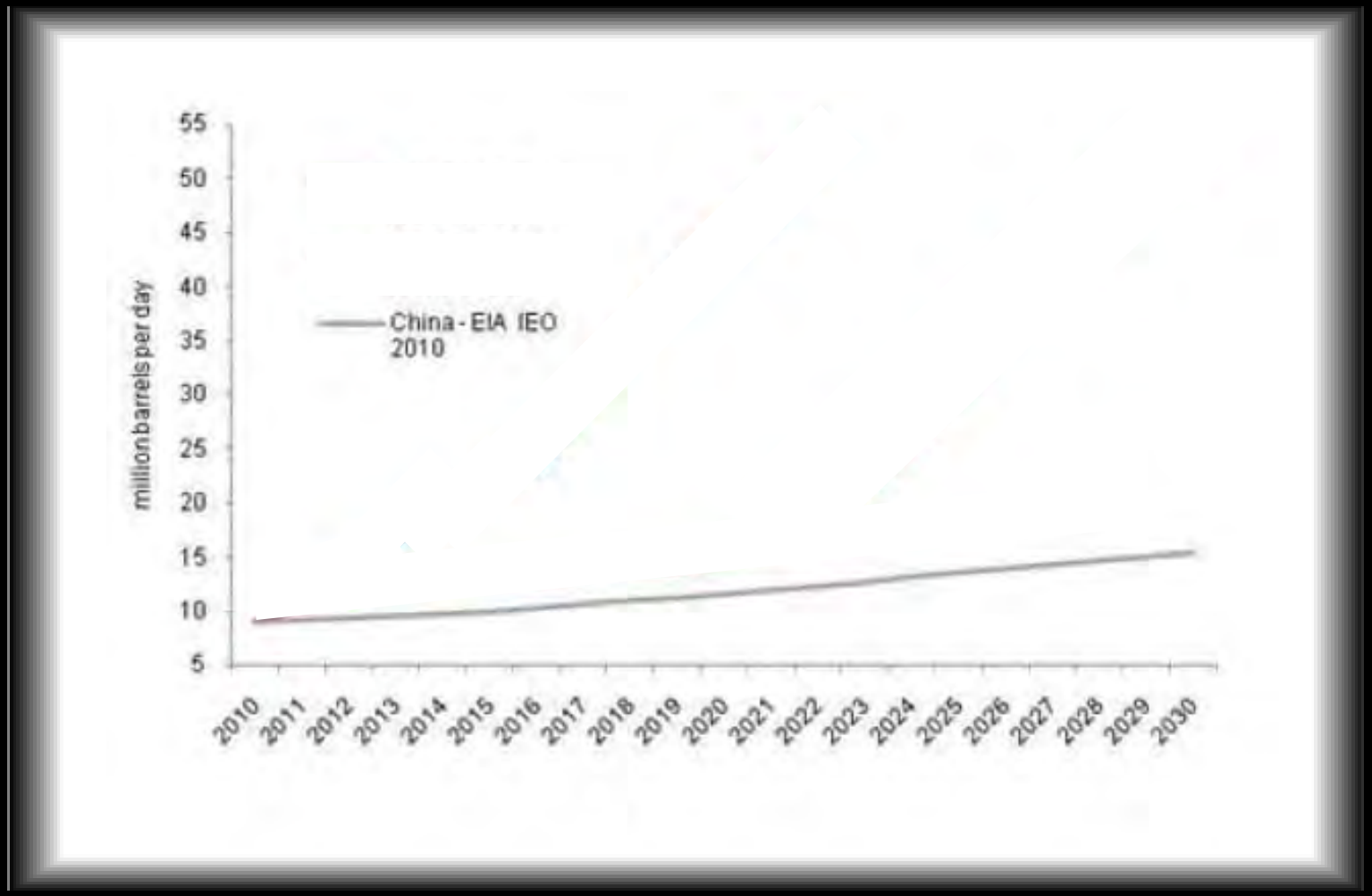
year 2000 phone:

quantitative modeling flaws

models with given inputs are precise but inaccurate

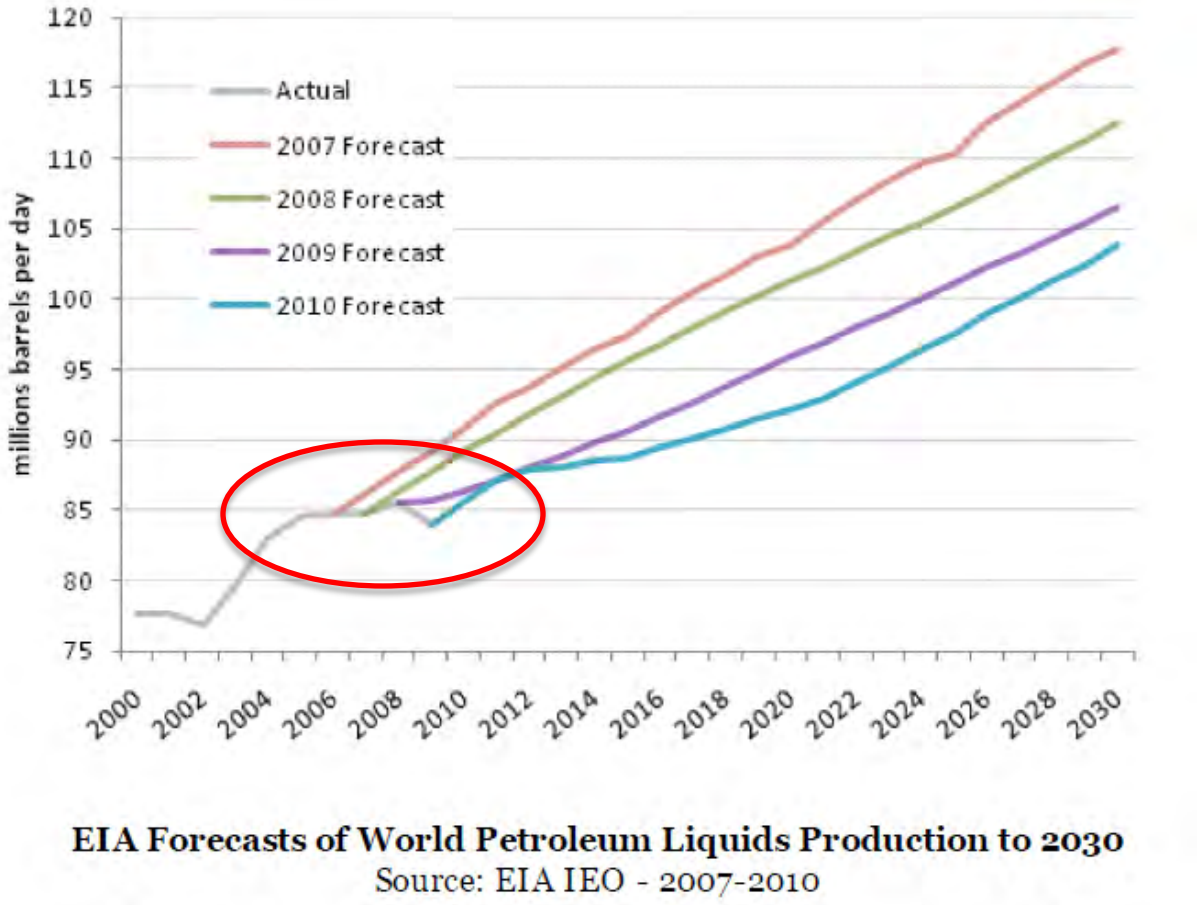
- chasing “false precision”; chasing 3rd order effects
- input the measurable, ignore the immeasurable
- obscured embedded assumptions

China's oil demand, EIA vs. ??



Source: Douglass Westwood

EIA production forecasts trending down



EIA Forecasts of World Petroleum Liquids Production to 2030
Source: EIA IEO - 2007-2010

Source: EIA

the folly of predictions: tetlock study

hundreds of experts.

80,000+ “expert” forecasts & 20+ years

results: experts are poorer forecasters than dart-throwing monkeys

Source: http://www.newyorker.com/archive/2005/12/05/051205crbo_books1

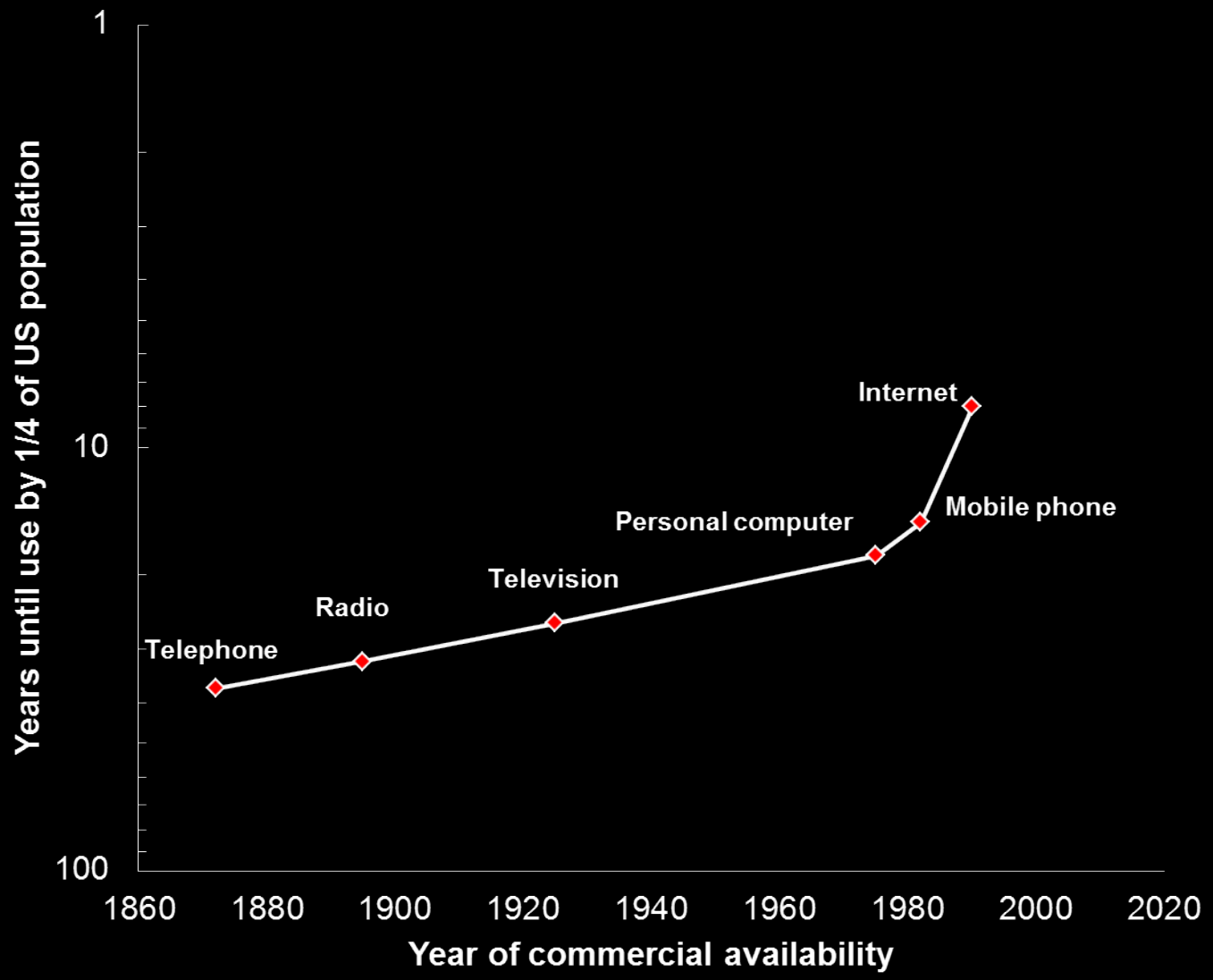
why?

"…. experts were much tougher in assessing the validity of information that undercut their theory than they were in crediting information that supported it."

- Tetlock

Source: http://www.newyorker.com/archive/2005/12/05/051205crbo_books1

… and its getting even harder to predict



Source:L Coutesy of Ray Kurzweil and Kurzweil Technologies, Inc. Wkimedia commons, Mobile web post 3G

Recommended reading list

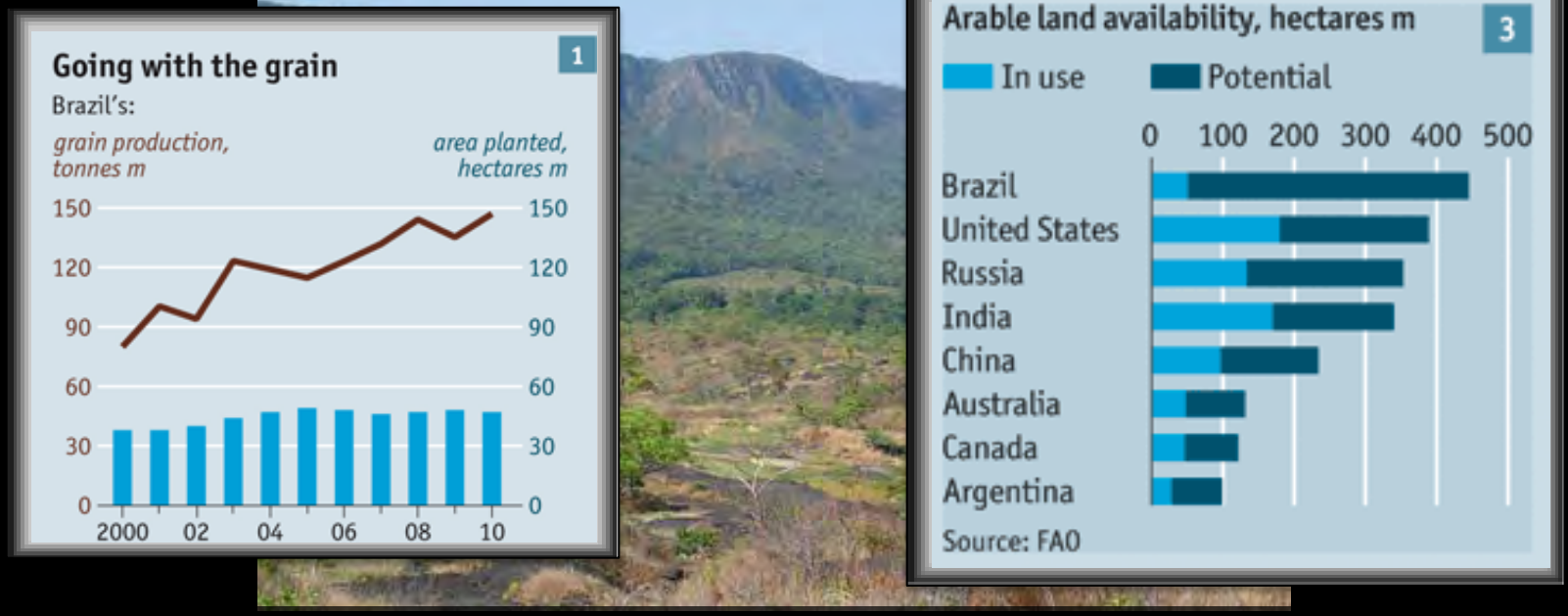
“Expert Political Judgment” – Dr. Philip Tetlock

“Predictioneer’s Game” – Bruce Bueno de Mesquita

“How We Decide” – Jonah Lehrer

so how do we pick?

…Brazilian Cerrado – evolution of a bread basket



the father of the Green Revolution thought these soils were never going to be productive. They seemed too acidic and too poor in nutrients…

…More arable land has been *created* in Brazil than is under cultivation in the US and India combined

Source: Economist, Brazilian Ministry of Agriculture

irrational ideas: “green bikinis”

eco bikini from niksters

by Maureen @ 11:57 am

1 comment »

It’s time to add some eco sizzle to your collection of eco swimwear. This two-piece Eco-Bikini from Nikster features a Bandeau-style top, and Brazilian-cut bottom with white ruffles. Created with soy, organic cotton and spandex fabrics.

made in the old US of A
$100.00 @ nikster.com

Related: previously on altCon

eco swimsuits - green is sexy

hemp on the beach

Ashley Paige - eco chic

- Source - http://www.alternativeconsumer.com/2008/07/29/eco-bikini-from-niksters/

inconsistent ideas: electric cars

“extrapolation of the past”

vs.

“inventing the future”

redefining swans

“black swan”

…rarity, extreme impact,
and retrospective
(though not prospective)
predictability

Source: Nassim Nicholas Taleb, author of “The Black Swan”

“relevant scale” solutions for

... oil

... coal

... materials

... (efficiency of oil & coal use)

kior

“a million year crude production cycle reduced to minutes and market competitive?”

Ecomotors

“Engine that delivers 50%+ vehicle efficiency for lower cost?”

caitin

“no new functional thermodynamic cycle for cooling has been implemented in decades…

… but new lower cost HVAC at 80% less electricity”

soraa

“no-compromise 80% more efficient pay-for-itself lighting”

calera

“ ... turning problem carbon dioxide into a feedstock for building materials”

…batteries

Next Generation Li-ion?

Different ions?

Quantum-nano-thingamajigit?

…agriculture

Sugar & protein from cellulose?

Precision agriculture?

Bio-nitro-thingamajigit?

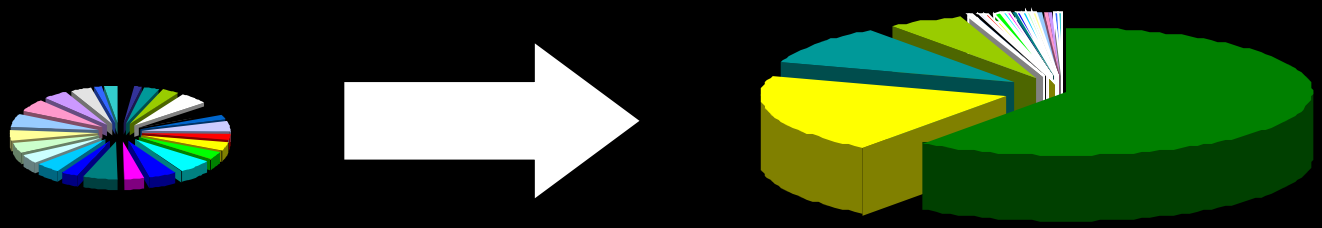
path to black swans...

more shots on goal!

winners take (almost) all =investment viability

5 years out, the group's market cap has grown…

Starting Industry Structure



But leaders far exceed the also-rans

…when 5B people live like 500M do today

Source: EIA

…the sources of innovation

- Google, Facebook, Twitter : Fox, NBC, CBS
- Amazon : Walmart
- First Solar : Shell & BP Solar
- Cree : GE
- DNA Sequencing

…the power of ideas & entrepreneurship

NASA vs. the X-Prize (billions vs. millions)

telecom goliaths vs. the internet (free long distance)

Human Genome Project vs. the entrepreneur

…imagine the possible

artificial leaves to produce energy?

Source: http://blog.greenenergytv.com/blog/define-solar-energy/0/0/the-green-invention-maverick-of-solar-energy-dr-nate-lewis

resource multipliers

computational design of materials

nanostructured materials

synthetic biology / artificial cells / artificial enzymes

non-chemistry batteries

resonance

nuclear

better agronomy

.....

the perennial advantage

Perennial crops:

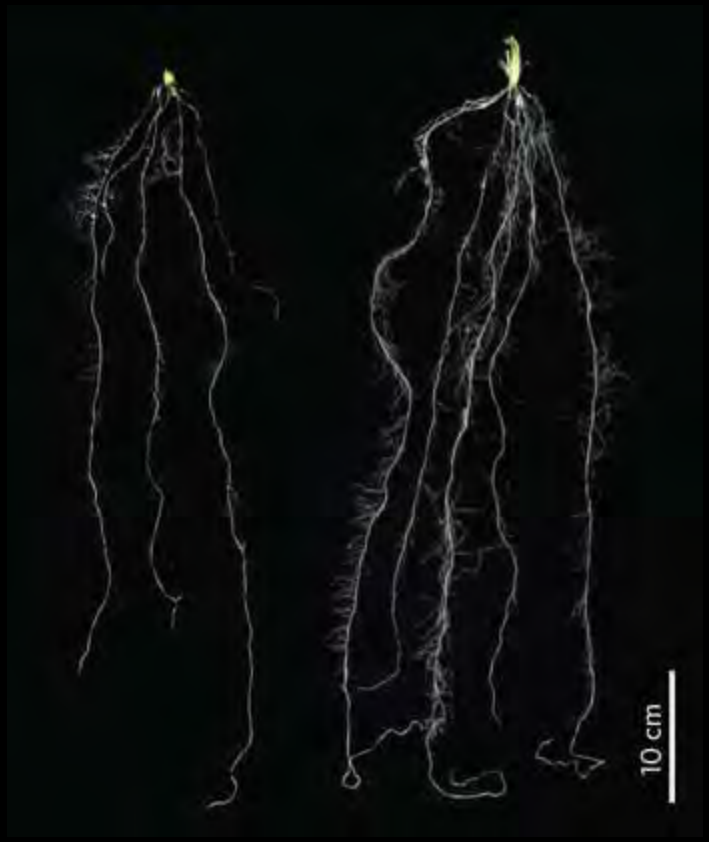
- less land erosion
- Better water/ nutrient management
- Diversity protects against diseases

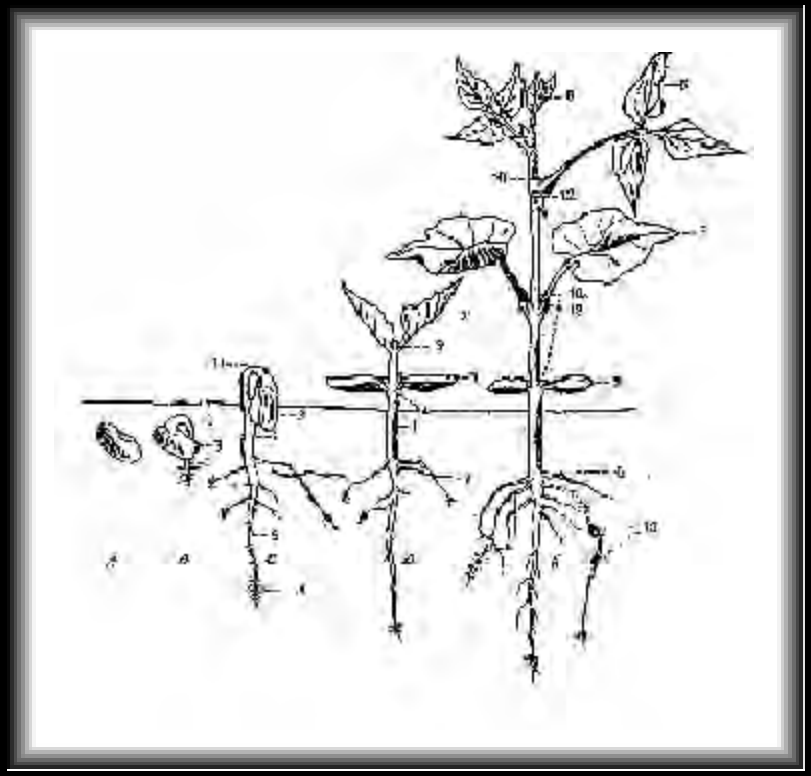
Source: Wes Jackson, Land Institute

the **polyculture** advantage

Source: Wes Jackson, Land Institute

an underground revolution





…engineering roots to maximize local ecosystems?

The 2nd green revolution!

Source: http://www.nature.com/news/2010/100728/pdf/466552a.pdf

Supercrops: fixing photosynthesis?

Less chlorophyl? → yields +30%

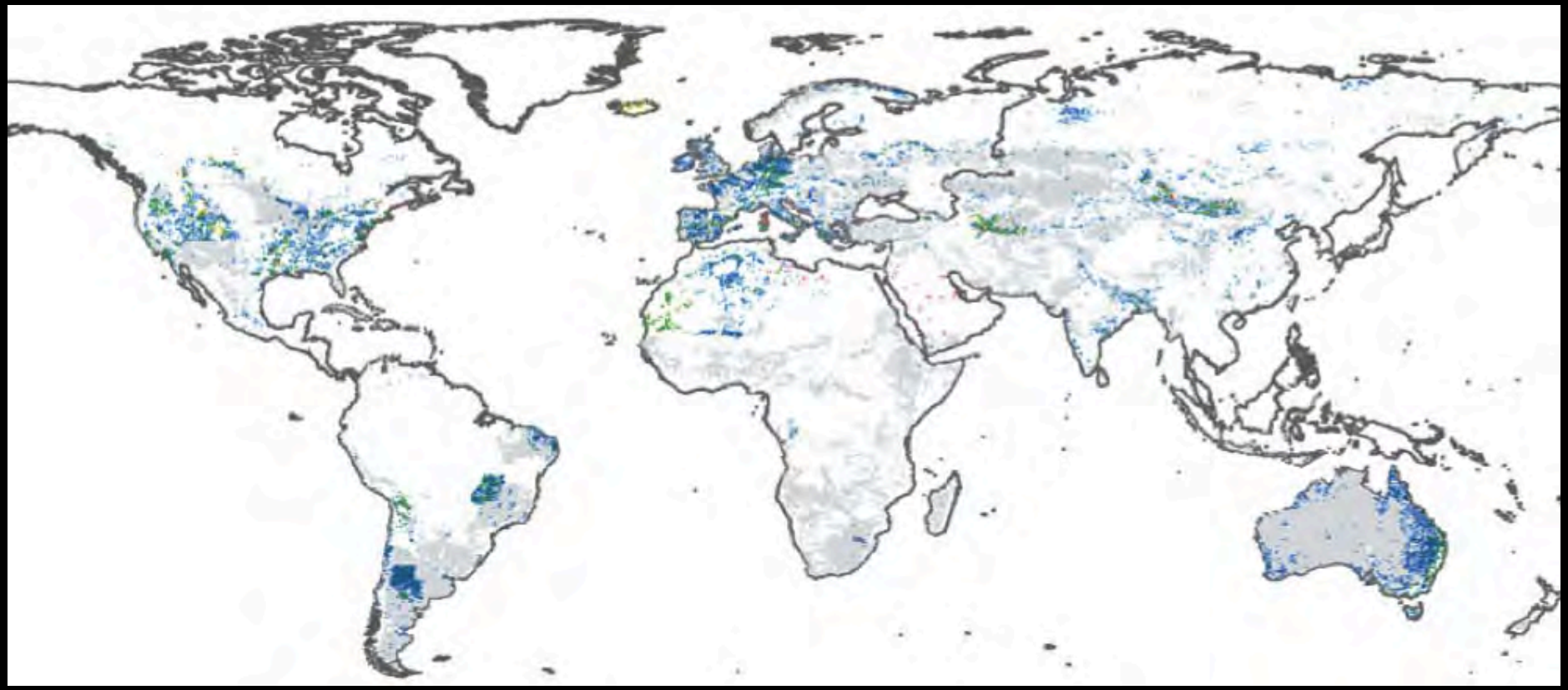
Better rubisco for CO2 uptake? → yields +??%

Convert C3 plants to C4 → yields +25%

…. Black plants?

Source: http://www.newscientist.com/article/mg20727776.600-supercrops-fixing-the-flaws-in-photosynthesis.html?full=true&print=true

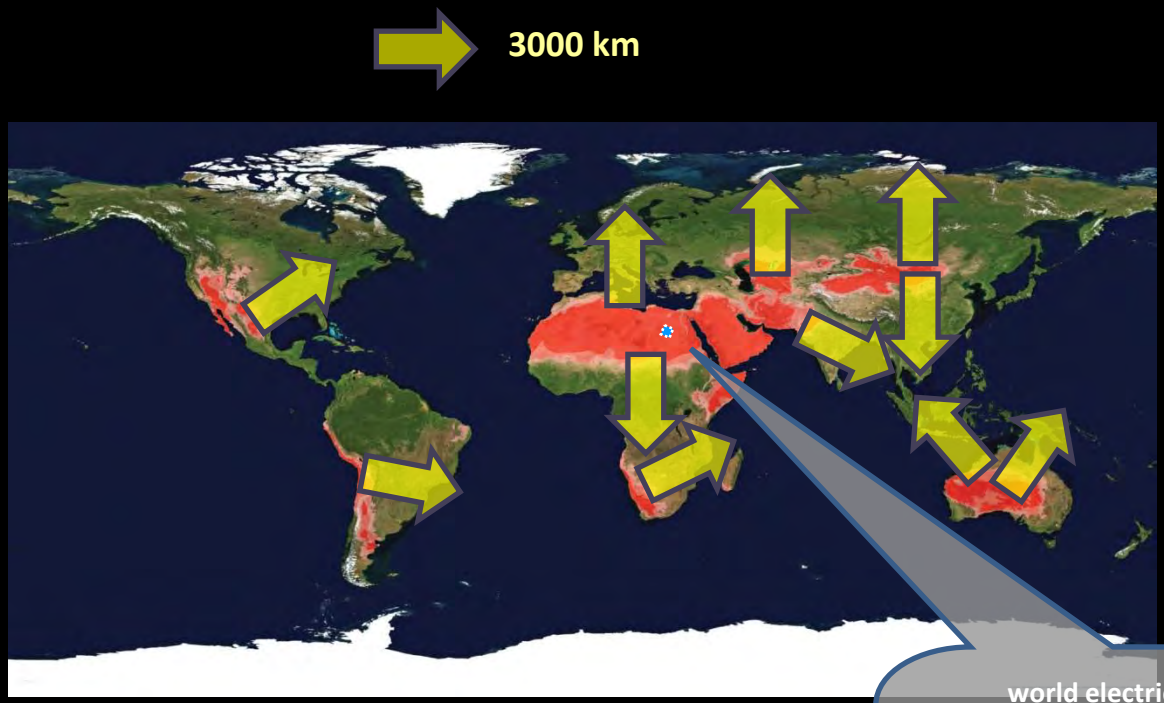
one billion acres…



Source: Chris Somerville, citing Campbell et al., Env. Sci. Technol. (2008) 42,5791

another billion acres?

deserts as solar farms



world electricity demand

(18,000 TWh/y)

can be produced from

300 x 300 km²

=0.23% of all deserts

distributed over "10 000" sites

Source: Gerhard Knies, CSP 2008 Barcelona

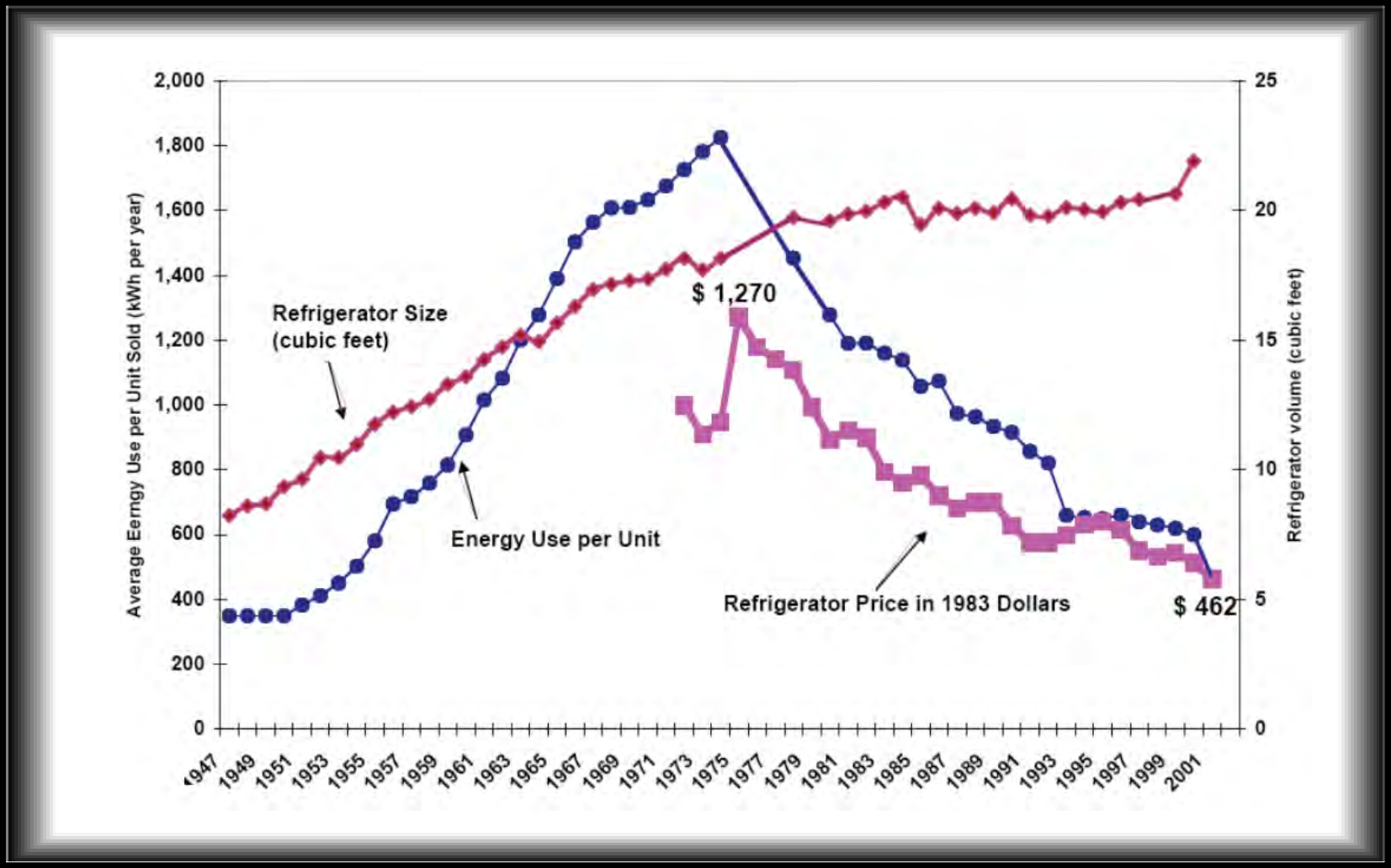
yet another billion acres...

Geothermal?

negawatt energy savings!

negabarrel energy efficiencies!

… the “Rosenfeld” effect



refrigerator costs AND energy use continued to decline!

Source: Amory Lovins, Rocky Mountain Institute citing David Goldstein

as surely as...

1985: **NOT** a PC in every home

1990: **NO** email for grandma

1995: **NOT** the internet

2000: **NO** pervasive mobile

2005: **NO** facebook / iphone

2010+: reason for optimism

to predict the future,

invent it!

“…every strategic inflection point [is] characterized by a ‘10X’ change …”

“There’s wind and then there is a typhoon, there are waves and then there’s a tsunami”

- Andy Grove

The New Green: “Maintech not Cleantech”

… oil

… coal

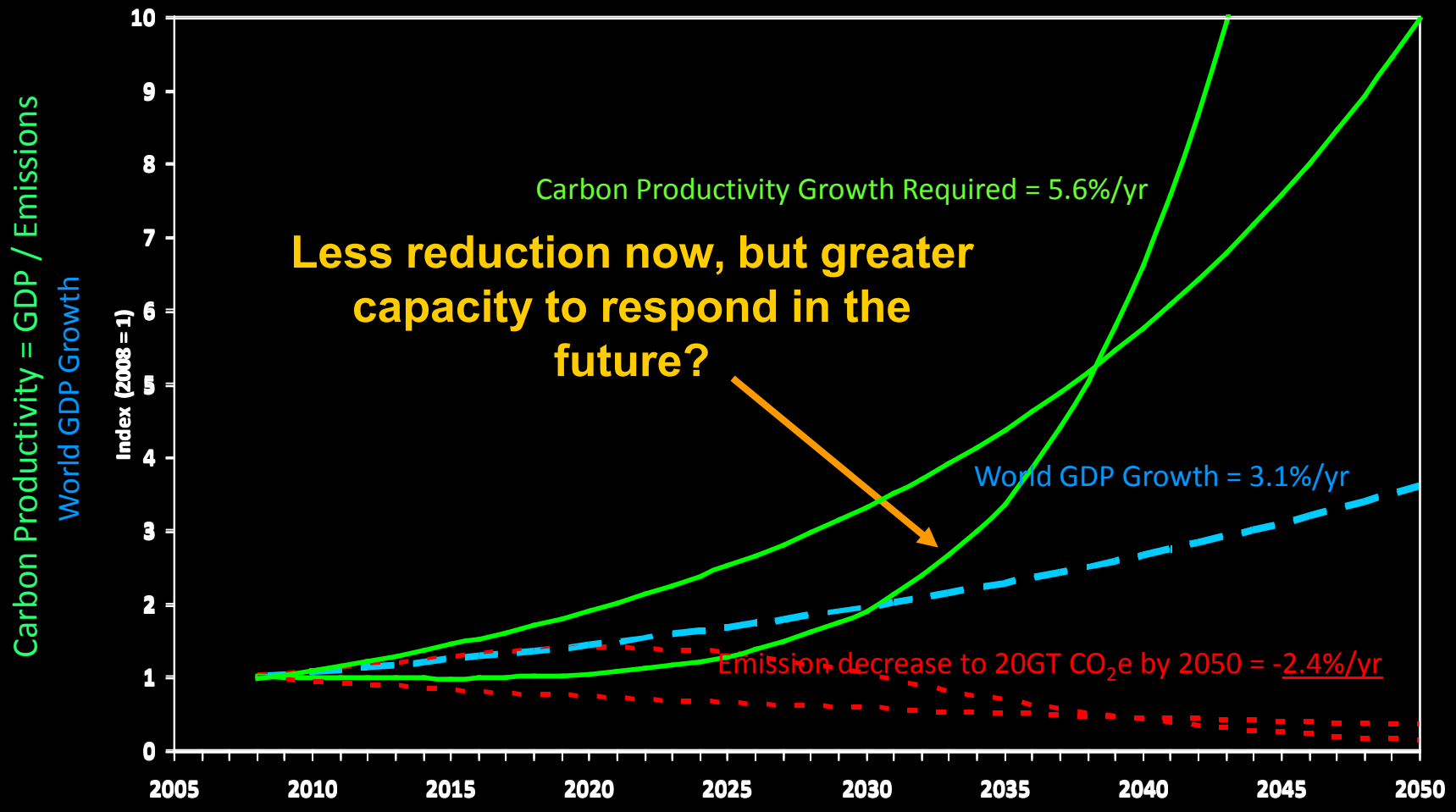
… materials

… efficiency

Reinvent the infrastructure of society

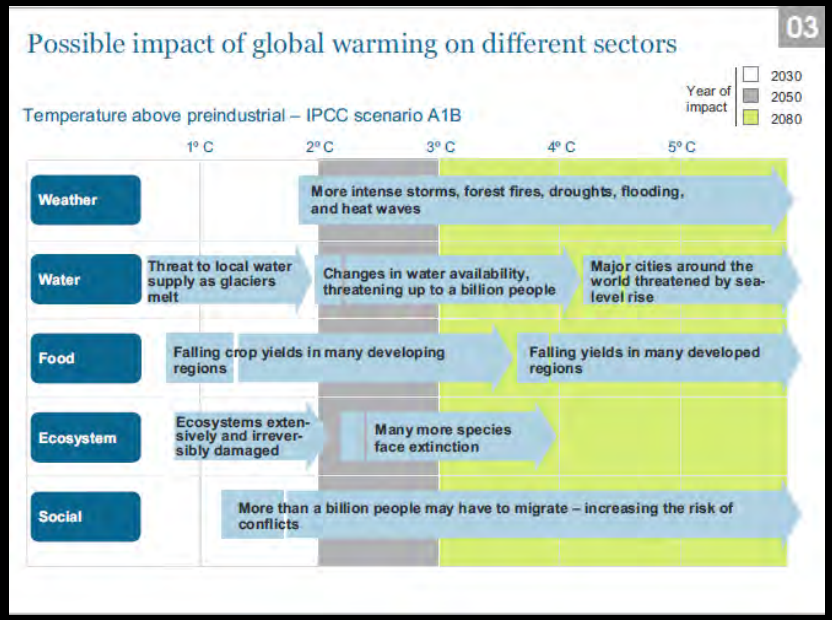
vs. acceptance + adaption cost

carbon reduction capacity: 10X increase in carbon productivity!



Source: "The Carbon Productivity Challenge", McKinsey – Original GDP projection from Global Insight through 2037

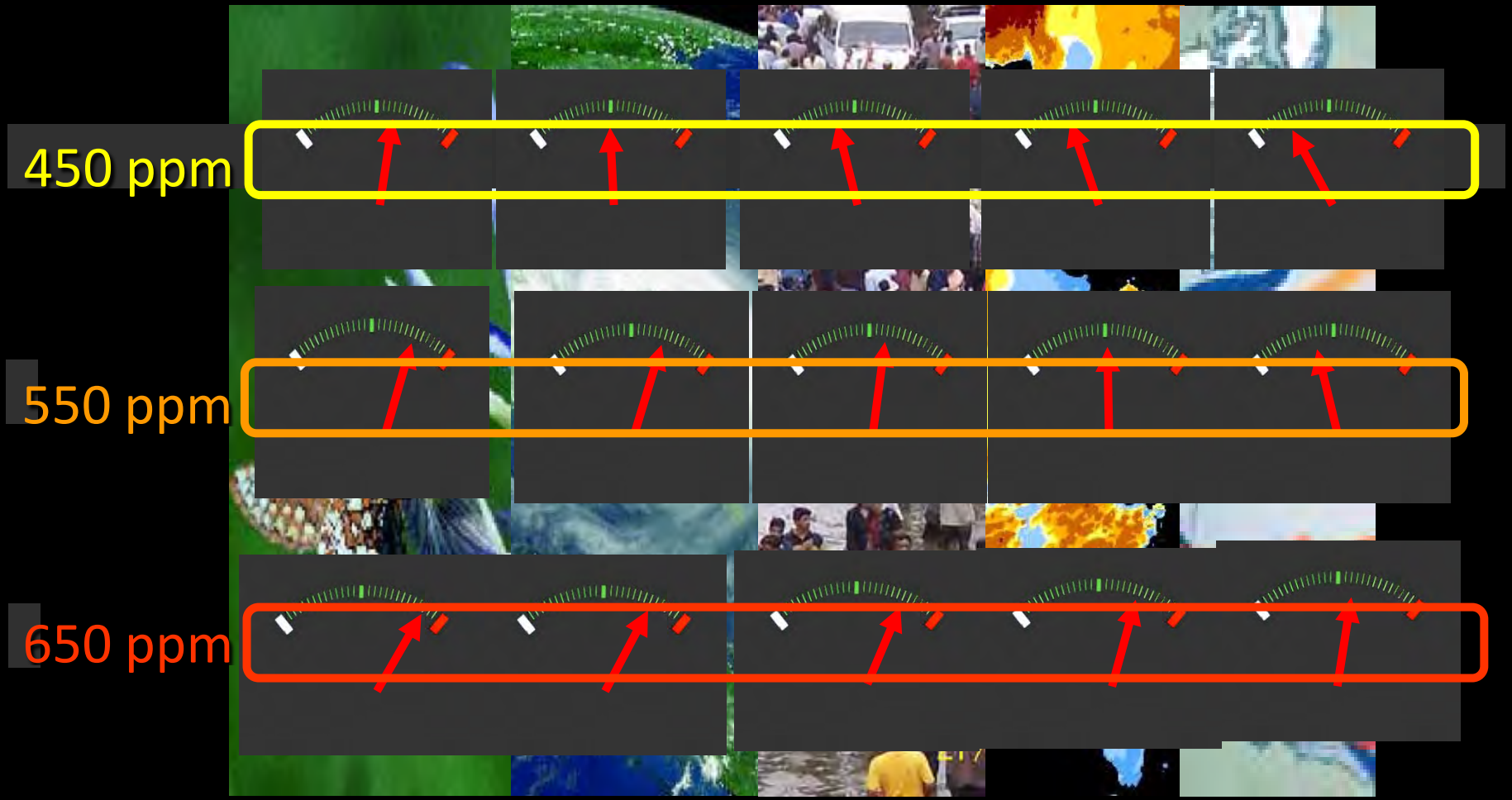
…cleantech is insurance against risk



Could be 1% to 12% of GDP -> $500B-$5T/year at stake… or more?

Source: Swiss Re, ECA 2009

Safe or Not?



Source: IPCC

… defeatism or action?

We insure our homes

Why not our planet?

comments?

vk@khoslaventures.com

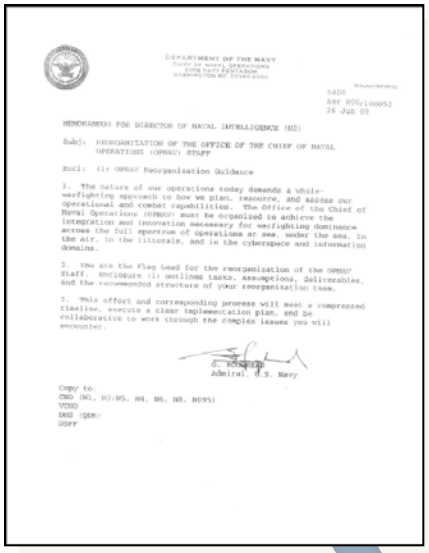
US Navy Intelligence, Surveillance, and Reconnaissance Perspective

National Defense Industrial Association Naval Energy Forum

Rear Admiral Matt Klunder

14 October 2011

N2N6 – Who Are We?



DEPARTMENT OF THE NAVY
CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON DC 20350-2000

5400
Ser N06/100052
26 Jun 09

MEMORANDUM FOR DIRECTOR OF NAVAL INTELLIGENCE (N2)

Subj: REORGANIZATION OF THE OFFICE OF THE CHIEF OF NAVAL OPERATIONS (OPNAV) STAFF

Encl: (1) OPNAV Reorganization Guidance

1. The nature of our operations today demands a whole-warfighting approach to how we plan, resource, and address our operational and combat capabilities. The Office of the Chief of Naval Operations (OPNAV) must be organized to achieve the integration and innovation necessary for warfighting dominance across the full spectrum of operations at sea, under the sea, in the air, in the littorals, and in the cyberspace and information domains.

2. You are the Flag Lead for the reorganization of the OPNAV Staff. Enclosure (1) outlines tasks, assumptions, deliverables, and the recommended structure of your reorganization team.

3. This effort and corresponding process will meet a compressed timeline, execute a clear implementation plan, and be collaborative to work through the complex issues you will encounter.

G. [redacted]
Admiral, U.S. Navy

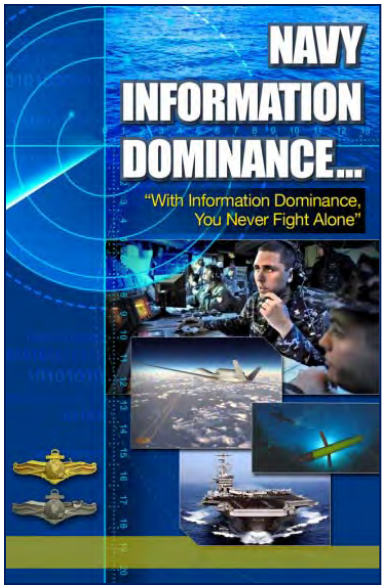
Copy to:
CNO (N1, N2/N5, N4, N6, N8, N09S)
VCNO
DNS (DM)
USFF

Direction

1. <u>Consolidate N2 and N6 and other information capabilities within the OPNAV staff</u>.

2. <u>Establish Fleet Cyber Command</u>.

3. <u>Create an Information Dominance Corps</u>.



Elevating Information to a "Main Battery" Status

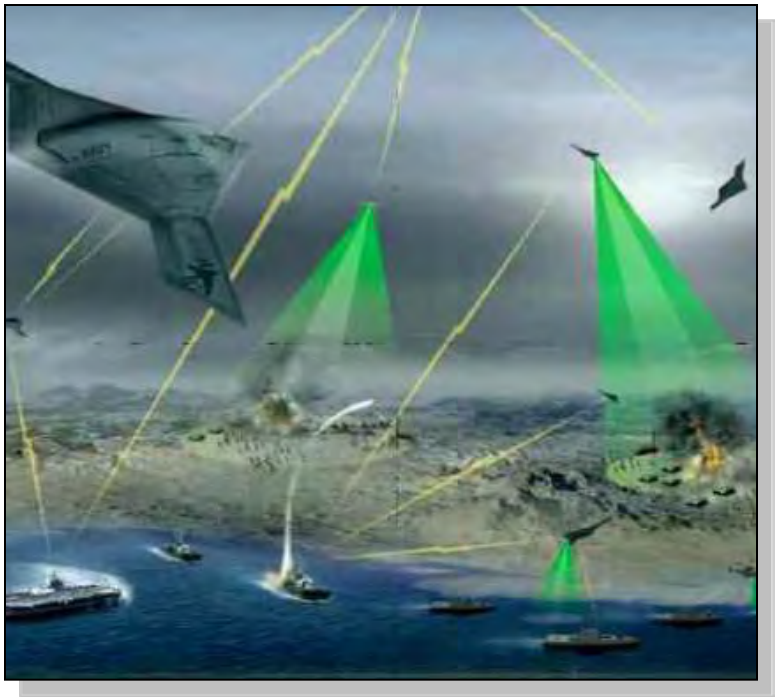
CNO's Sailing Directions

- We will **innovate to use new technologies** and operating concepts to sharpen our warfighting advantage against evolving threats.
- The **reach and effectiveness** of our ships and aircraft will be greatly expanded through new and updated weapons, **unmanned systems, sensors**, **and increased power**.
- Unmanned systems in the air and water will **employ greater autonomy and be fully integrated** with their manned counterparts.

Steady Course and Speed!

Energy Opportunities

- Unmanned and Distributed Netted Sensors
- Long-Endurance Energy Sources
- Network Automation
- Vehicle/Sensor Smart Autonomy



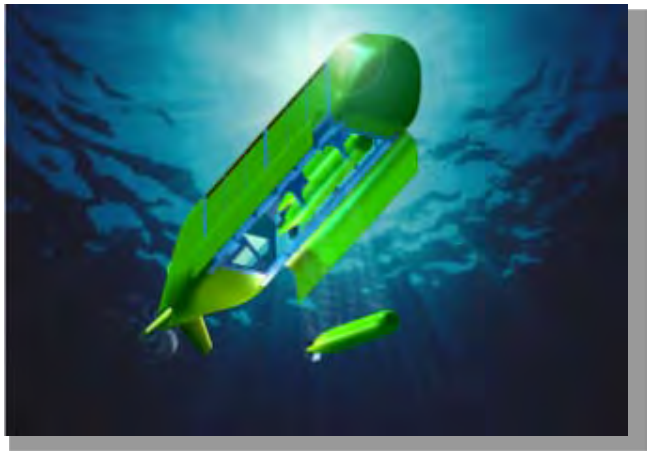
Why Go Unmanned and Distributed?

- Endurance:
  - Persistent ISR unfettered by crew & platform limitations
- Far Forward:
  - Expanded Area of Operations beyond those inaccessible or hazardous to manned platforms
- Complementary:
  - Augments manned platforms to fill capacity gaps & reduce costs.

Greater Flexibility Enhances Capacity & Capability

Long-Endurance Energy Sources

- Advanced Battery Solutions: Chemistry/Monitoring/Certification
- Two Recent BAAs for UUVs: 21” UUV FNC and LDUUV INP
  - 21” UUV Future Naval Capability: High and Low Temp Fuel Cells and Hybrids
  - Large Displacement UUV Innovative Naval Prototype
- Biofuels: Successfully demonstrated on FIRE SCOUT UAV
- “Exotics” - Wave / Ocean Energy Harvesting, Solar, Wind, Solid Oxides



A Role for Autonomy

- Network Automation (TCPED)
  - Energy-efficient processors, also reduced heat loading
  - Reduced Manning (with consequent savings)

- Vehicle “AI”
  - Improved autonomy reduces data volume transmitted
  - Assess on-board energy budget for mission optimization

Total System Energy Budget Counts!

Cross-Domain Challenges

- Energy & Propulsion
- Autonomy
- Operational Integration across all Domains
- Data formats & standards
- Reliability

Common Solutions for Multi-domain Missions

Questions?

Catalyzing Energy Breakthroughs for a Secure American Future

As Director of ARPA-e, you are uniquely positioned to see both the landscape of the energy industry as well as the barriers and challenges in implementing the DOE-DOD MOU. We would be honored if you could address the audience regarding interagency and industry cooperation. As a keynote speaker, your experience and leadership could highlight the new partnerships between our agencies while giving the attendees a glimpse of where "new energy" can take us. Currently,

Key Ingredients for Partnerships

1. Win-Win: Mutual Benefit & Value Proposition
   - DOD: *Save Energy, Save Money, Save Lives (General Martin Dempsey)*
   - DOE: *Accelerate technology development; Early adopter market*
2. Transparency & Awareness
3. People-to-People Interactions
   - Joint ownership
   - Team empowerment
   - Accountability
4. Manage Expectations
   - Short and long term wins

Fostering DoE – DoD Partnerships

Institutional Level

Among Personnel

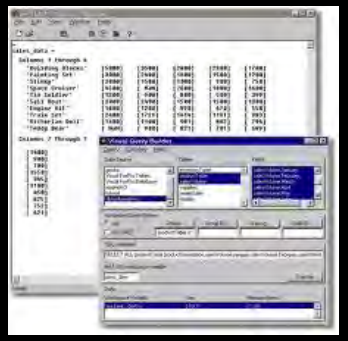
People Exchange

Ens Pedicini, ARPA-E Summer Intern (Naval Academy, Class of 2011)

Integrated Product Teams

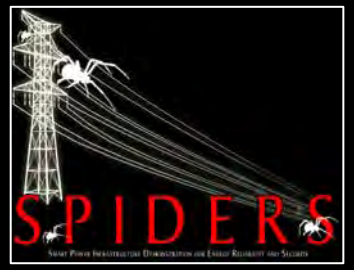
Create, Enable, and Hold Accountable

Project Transparency

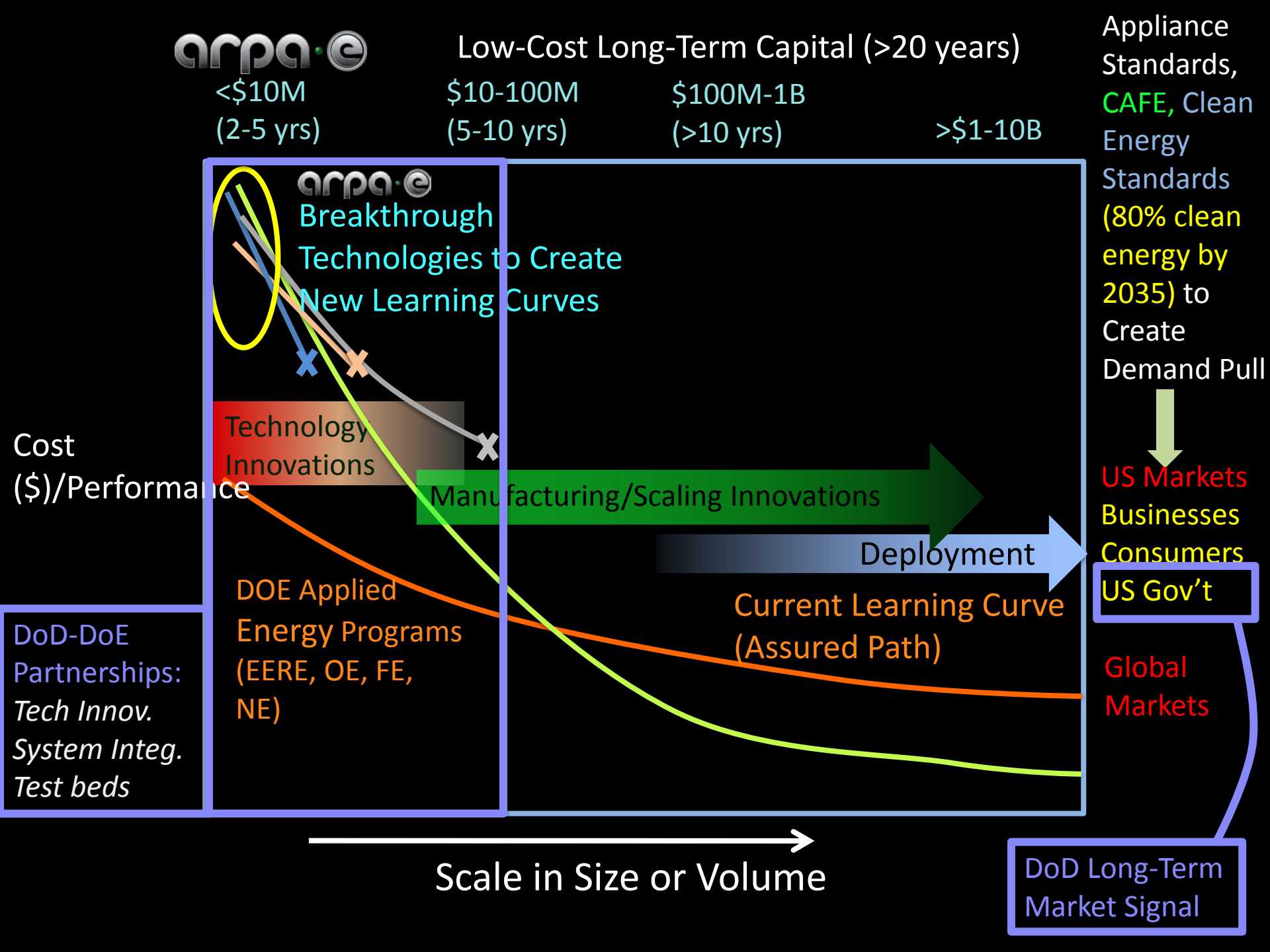


Database

Microgrid



Vehicle R&D


Low-Cost Long-Term Capital (>20 years)
<$10M
(2-5 yrs)
$10-100M
(5-10 yrs)
$100M-1B
(>10 yrs)
>$1-10B
Appliance Standards, CAFE, Clean Energy Standards (80% clean energy by 2035) to Create Demand Pull
Breakthrough Technologies to Create New Learning Curves
Technology Innovations
Manufacturing/Scaling Innovations
Deployment
Cost ($)/Performance
DOE Applied Energy Programs (EERE, OE, FE, NE)
Current Learning Curve (Assured Path)
US Markets
Businesses
Consumers
US Gov't
Global Markets
DoD-DoE Partnerships:
Tech Innov.
System Integ.
Test beds
Scale in Size or Volume
DoD Long-Term Market Signal

Connective Tissue

DoD-ARPA-E Partnership

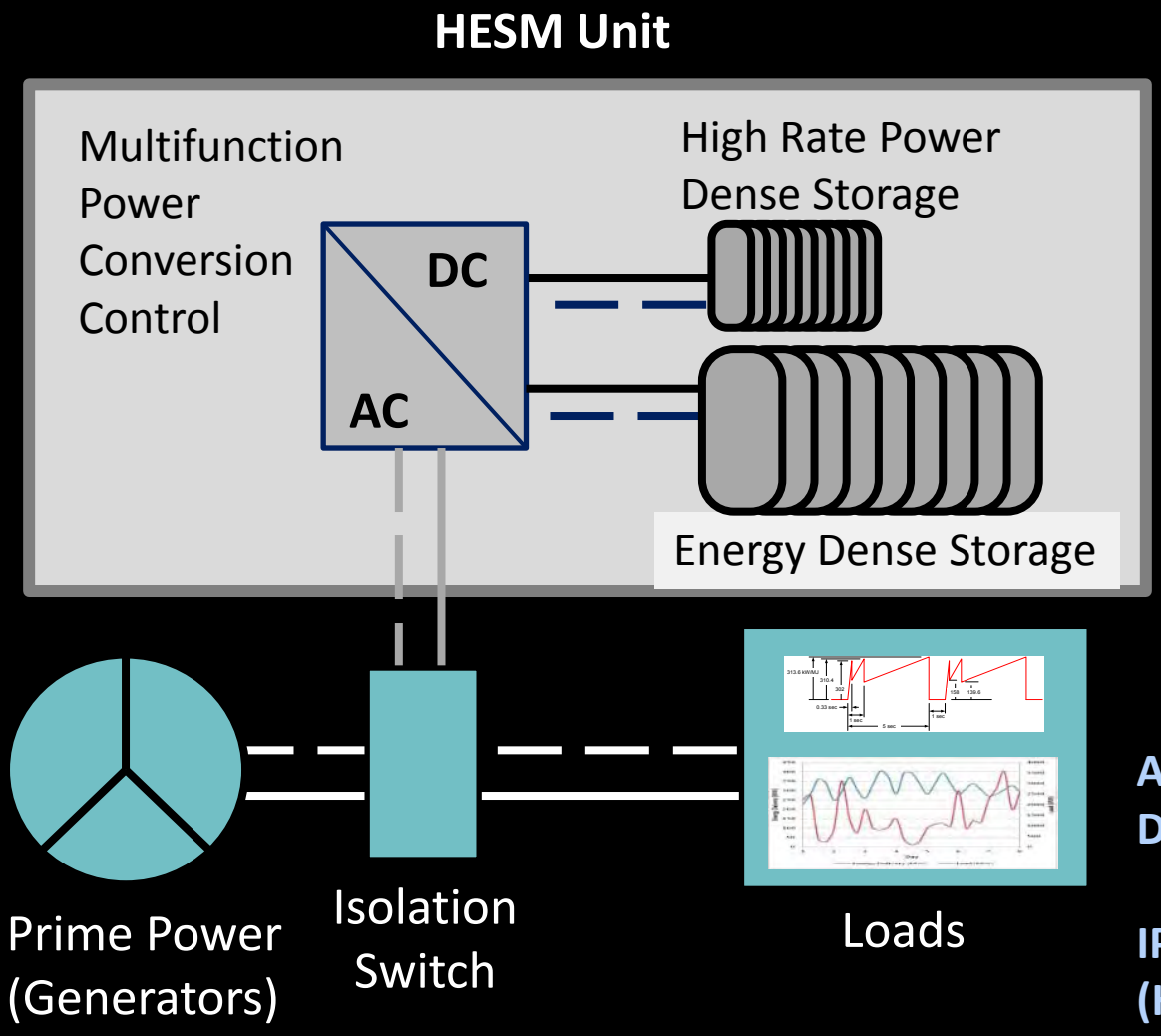
Hybrid Energy Storage Module for Distributed Power Generation

Consortium on Stationary Energy Systems

Duke Energy®

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Hybrid Energy Storage Module



Goal

- Maximize Fuel Economy
- Enable Increased Performance Capability

Characteristics

- Distributed Generation
- Distributed Varying Load
- Distributed Power & Energy Storage

ARPA-E Lead: Dr. Srini Mirmira
DoD Lead: Mr. Don Hoffman (ONR)

IPT: Army (Kalio), AF (Jordan), Navy (Heinzel)

Operating System for Plug-n-Play Components, Automated Dispatch and Feedback Control for Stable, Resilient Power Management

Ships
Enables Future Electric Weapons & Sensors
Increases Shipboard Fuel Efficiency

HESM

arpa·e

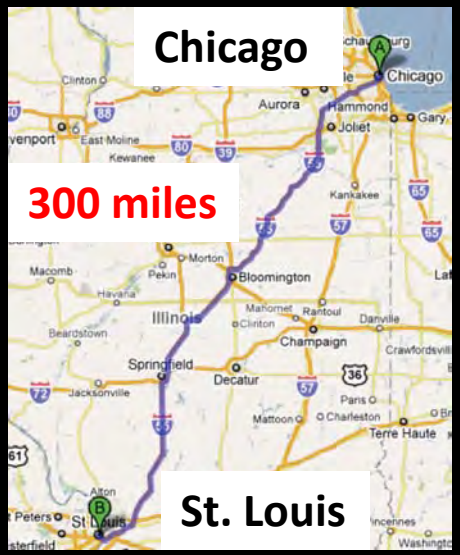
Forward Operating Bases
Enables Reduction in Fuel Use at Forward Operating Bases

Utilities
Increases Efficiency of Islanded Generators

Aircraft
Enables More Capable and Longer Duration Aircraft

Batteries for Electrical Energy Storage for Transportation (BEEST)

Electric cars with longer range and lower life-cycle cost than gasoline cars: Subsidy-free business



BEEST Targets

Double the energy density

+

One third the cost

BEEST Competition

All Electron Battery

Lithium-Oxygen

Lithium-Ion, Flow Battery

Lithium-Sulfur

Metal-Air

Magnesium-Ion

Grid-Level Power Conversion & Storage

Today

10,000 lbs

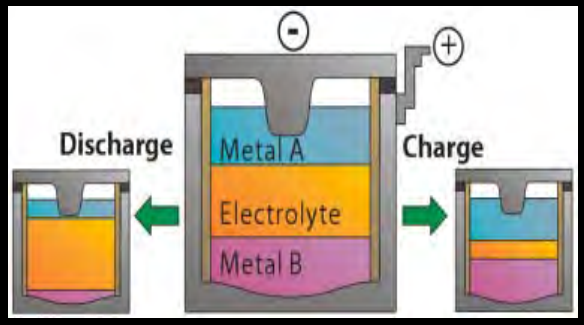
Future

100 lbs

And
Smart!

Cree Inc, North Carolina

$100/kWh



Use anywhere in the world

MIT, Cambridge, MA

REUTERS

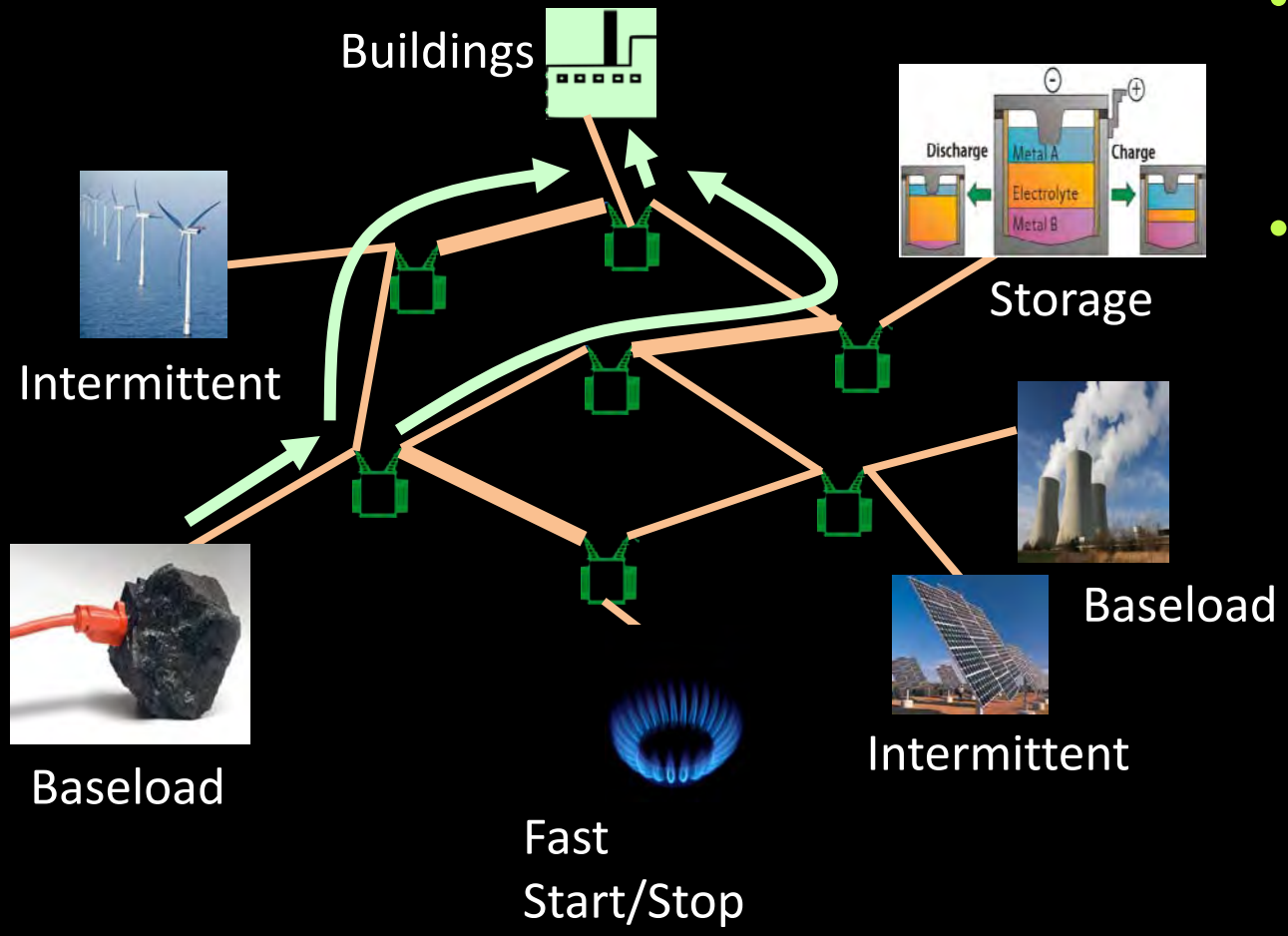
PRESS RELEASE:

Liquid Metal Battery Corporation Secures MIT Patent Rights and First Round of Funding; Gates & TOTAL Invest to Commercialize ARPA-e Funded Technology

Green Electricity Network Integration (GENI)

Telephone → Fiber Optics, Wireless, Internet

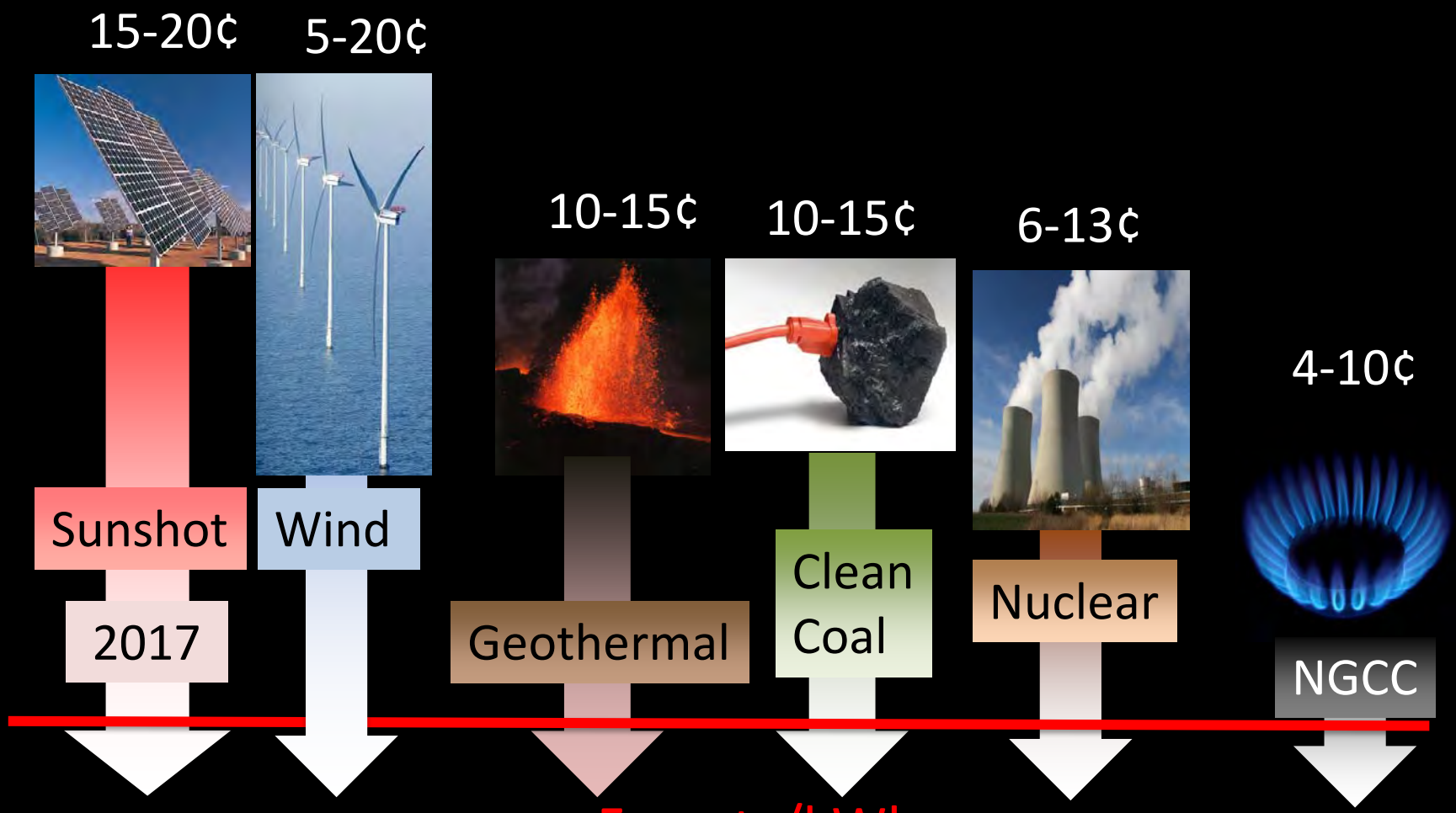
Today's Grid → ?



- Electric Power Routers
- Grid Operating System

Clean and Inexpensive Electricity

Scaling without subsidies



Building Energy Efficiency Through Innovative Thermodevices (BEETIT)

Primary Energy Use for Cooling (kJ/kg)

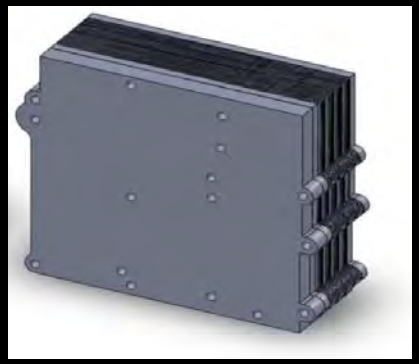
- 120 Today
- BEETIT Target & Competition
- 12 Theoretical Limit

Today

180 lb/ton-cooling

3X

Future



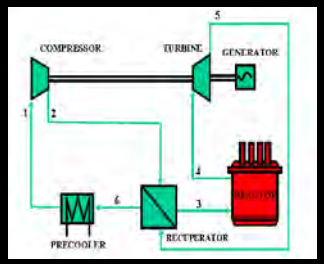
60 lb/ton-cooling

Georgia Tech, Georgia

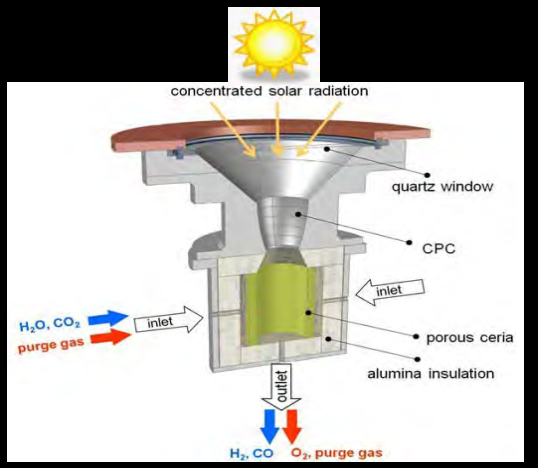
High Energy Advanced Thermal Storage (HEATS)

Grid level storage using heat pumps

Base load Solar and Peaking High-Temp Nuclear



Increase in efficiency > 50% compared to current systems



Thermochemical Fuel Production from Sunlight.

Conversion efficiency > 10%

Building thermals

Increase EV range by ~ 40%

Scale

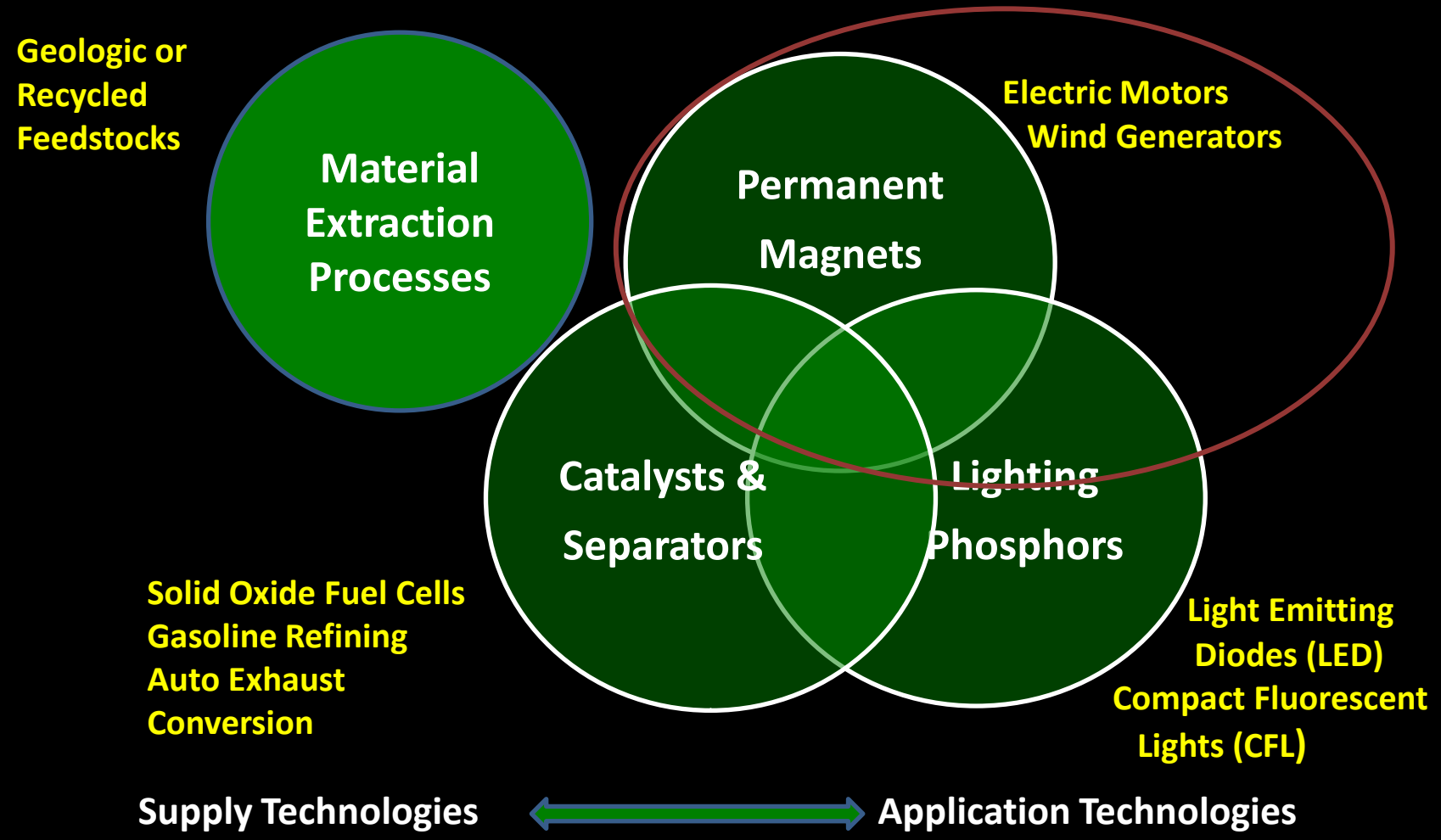
<100 °C

>600 °C

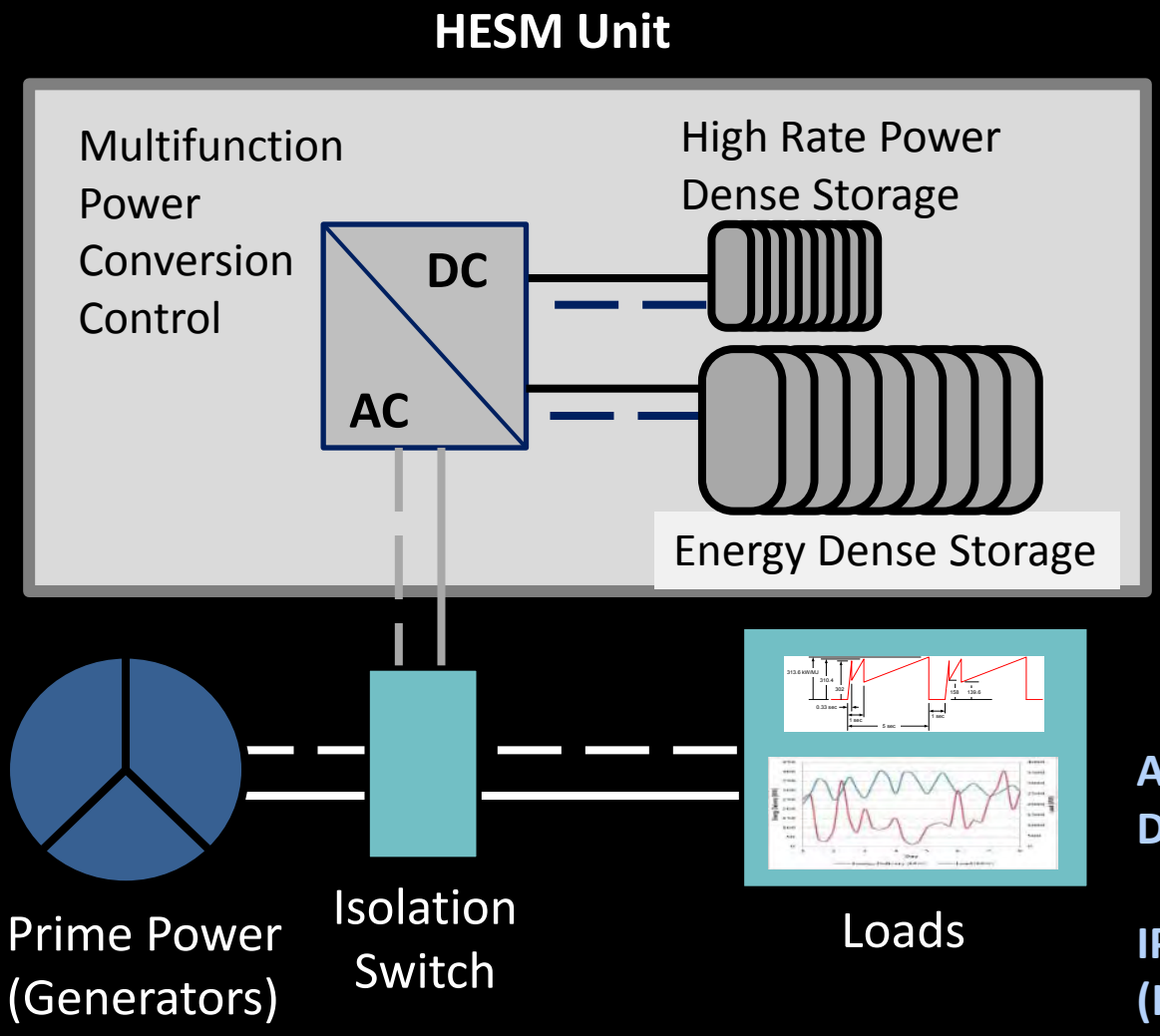
800-1500 °C

Temperature

Rare Earth Alternatives in Critical Technologies (REACT)



Hybrid Energy Storage Module



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Operating System for Plug-n-Play Components, Automated Dispatch and Feedback Control for Stable, Resilient Power Management

Photosynthetic Biofuels

Sugarcane

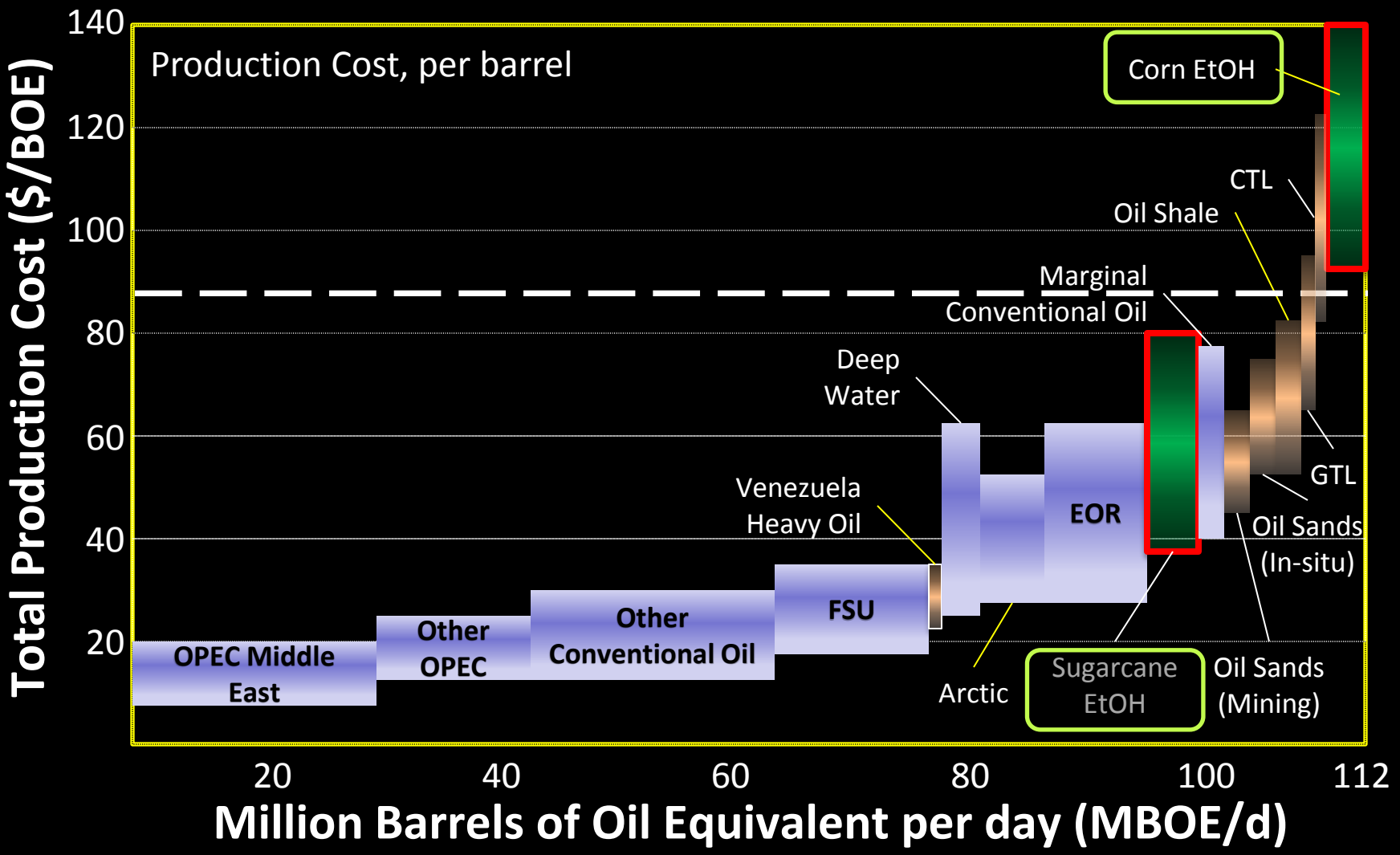
Corn

Algae

Cellulose

Less than
1% efficient

Biofuels in a Petroleum Context



Source: Analysis based on information from IEA, DOE and interviews with super-majors

Plants Engineered to Replace Oil (PETRO)

Today

80 GJ/ha-yr

Future

160 GJ/ha-yr @ $50/BOE

Algae

Tobacco

?

Electrofuels

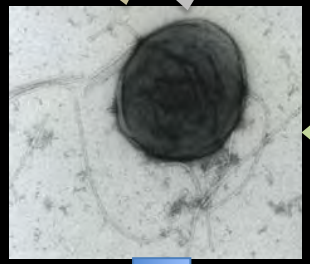
Sour Crude

H_2S

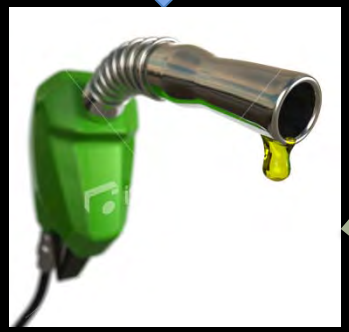
H_2

Electricity

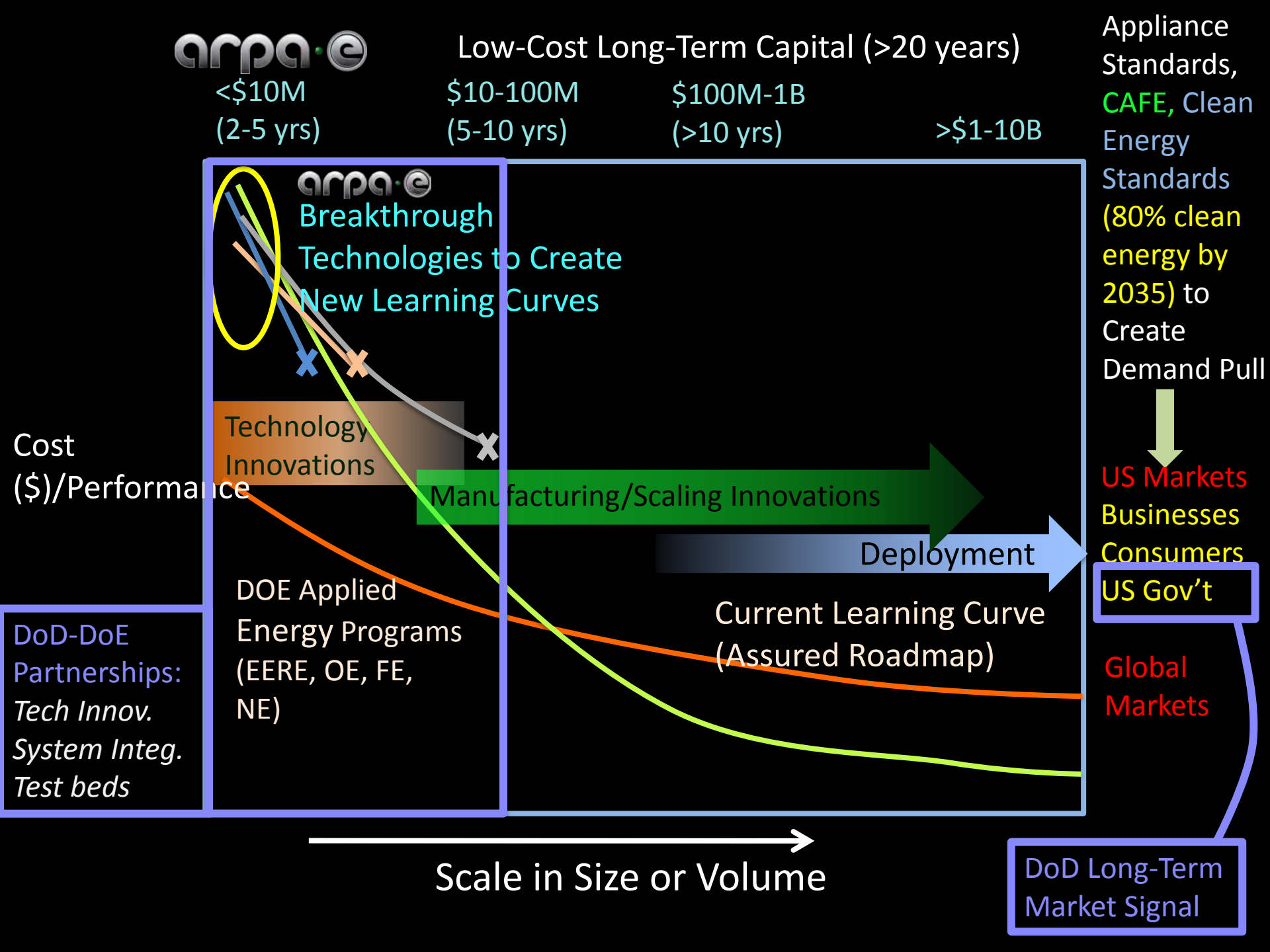
Non-photosynthetic Microbes



OPX Biotechnology & North Carolina State University



>10X more efficient


arpa·e
Low-Cost Long-Term Capital (>20 years)
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Appliance Standards, CAFE, Clean Energy Standards (80% clean energy by 2035) to Create Demand Pull
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Breakthrough Technologies to Create New Learning Curves
Technology Innovations
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Deployment
Cost ($)/Performance
US Markets
Businesses
Consumers
US Gov't
Global Markets
DOE Applied Energy Programs (EERE, OE, FE, NE)
Current Learning Curve (Assured Roadmap)
DoD-DoE Partnerships:
Tech Innov.
System Integ.
Test beds
Scale in Size or Volume
DoD Long-Term Market Signal

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energy innovation summit

Ursula Burns
Chairman & CEO
Xerox Corp.

Susan Hockfield
President & Professor
Of Neuroscience, MIT

Bill Gates
Founder and Chairman
Microsoft

Lee Scott
Former CEO
Walmart

Fred Smith
Chairman, President, and CEO
FedEx Corp.

www.energyinnovationsummit.com

Naval Energy Forum

Dr. Timothy J. McCoy, PE
Director, Electric Ships Office (PMS 320)

October 14, 2011

Outline

- Mission Systems Requirements
- Today's Platforms
- Looking into the future

"OUR SHIPS – THE SYSTEMS THAT WE USE AND THE POWER REQUIREMENTS THAT THEY HAVE ARE GETTING BIGGER ALL THE TIME. EVERY SYSTEM WE'RE PUTTING ON A SHIP NOW OR IN AN AIRCRAFT IS IN SOME WAYS SORT OF A POWER HOG... WE HAVE TO FIND A DIFFERENT WAY TO POWER THE THINGS WE NEED TO POWER."

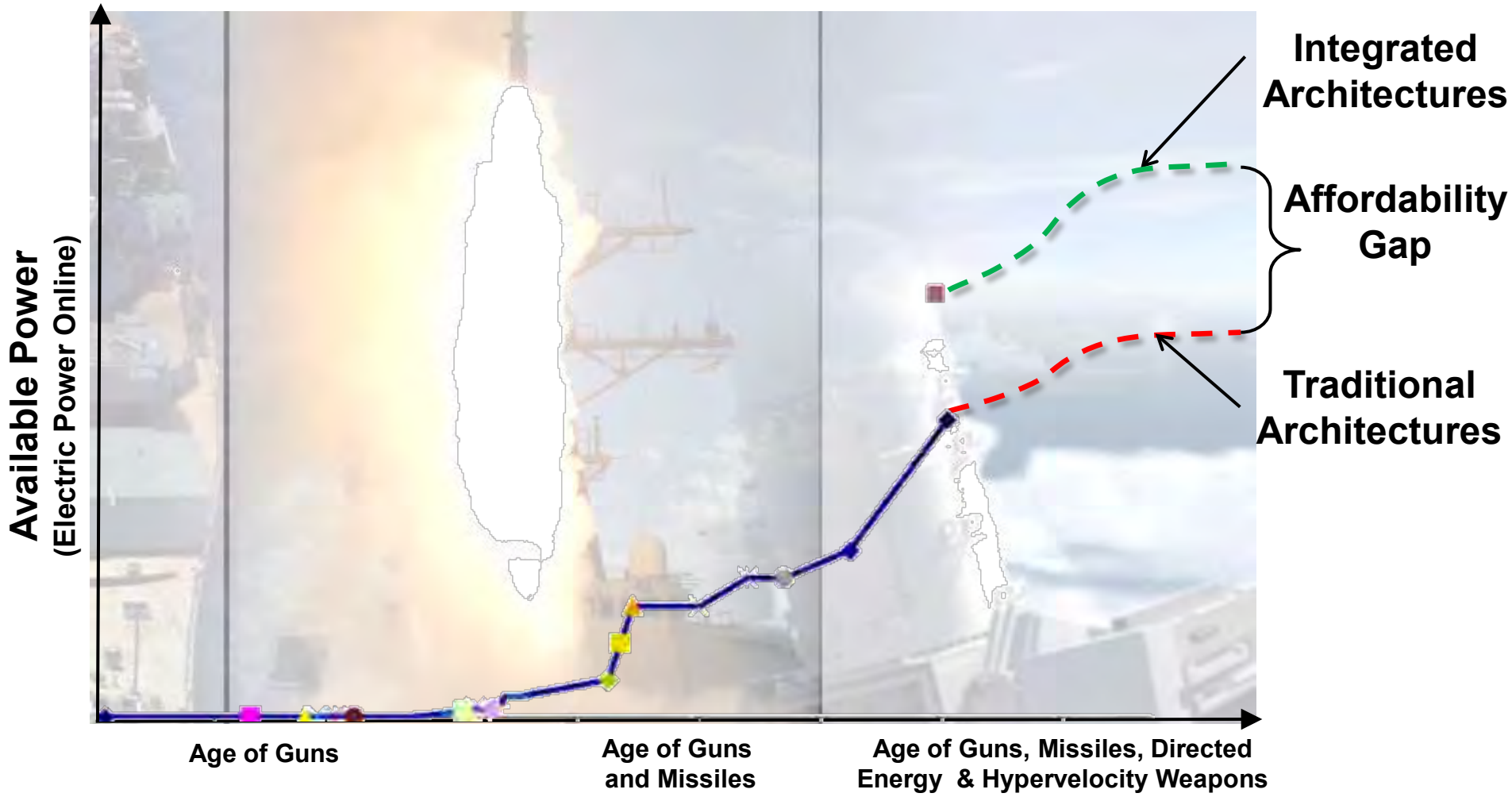
- HONORABLE RAY MABUS
SECRETARY OF U.S. NAVY

"OVER THE NEXT 10 TO 15 YEARS, THE NAVY WILL EVOLVE AND REMAIN THE PREEMINENT MARITIME FORCE. THE REACH AND EFFECTIVENESS OF SHIPS AND AIRCRAFT WILL BE GREATLY EXPANDED THROUGH NEW AND UPDATED WEAPONS, UNMANNED SYSTEMS, SENSORS, AND INCREASED POWER."

- ADMIRAL JONATHAN GREENERT
CHIEF OF NAVAL OPERATIONS

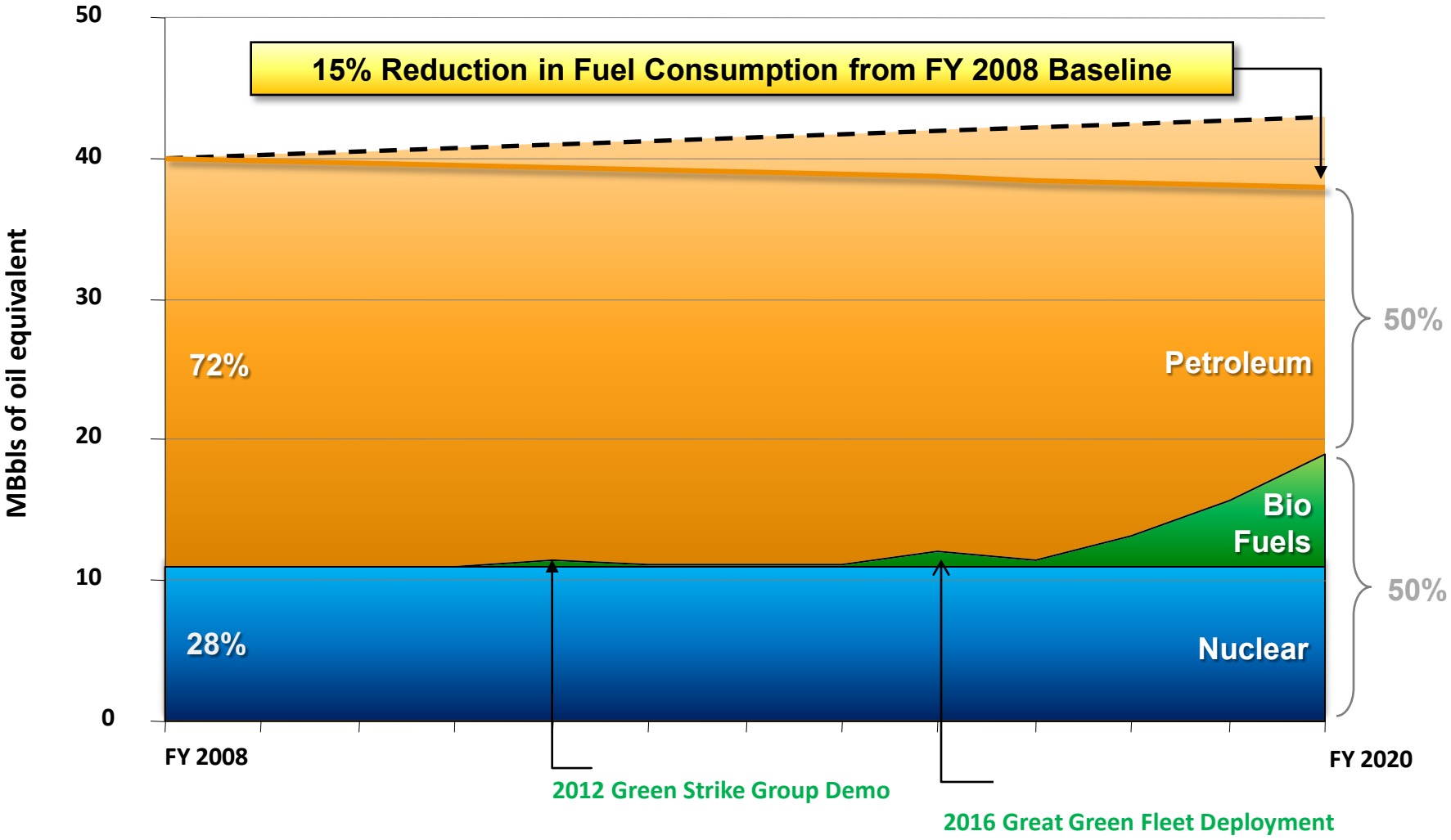
Fundamental Shift Required for Future Acquisition Programs

Warfighting Needs Drive Power Systems



Increased demands for power will continue for the foreseeable future

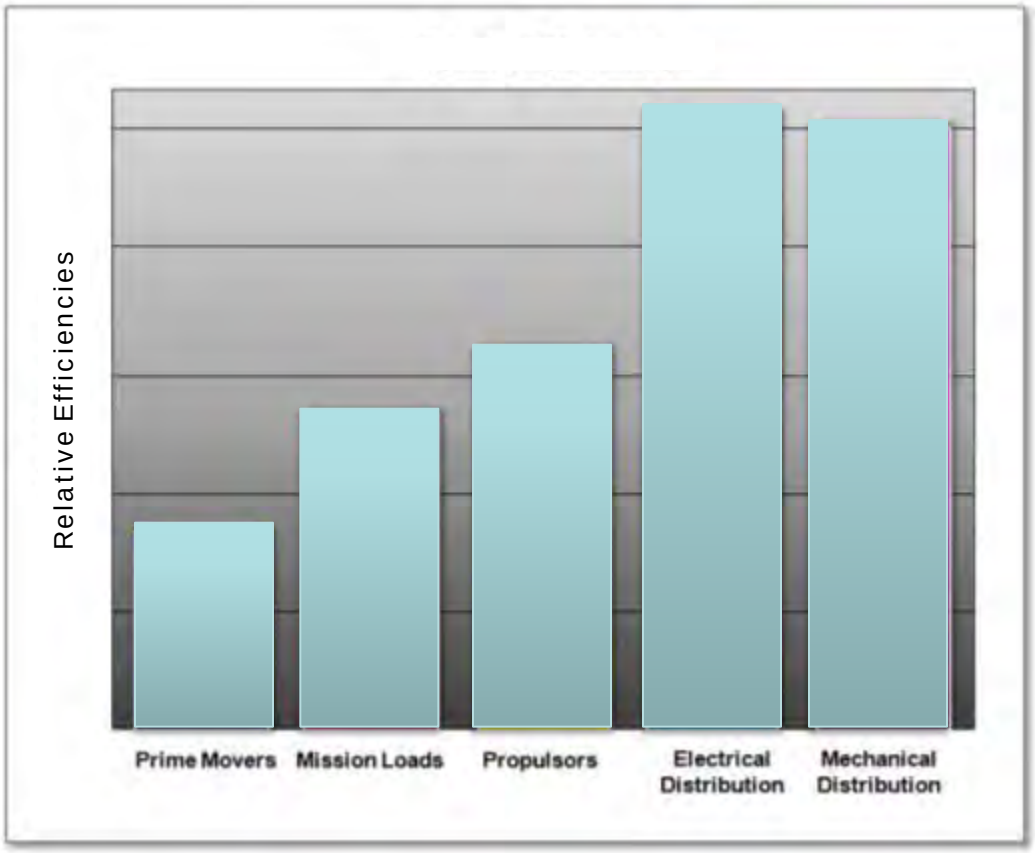
SECNAV Energy Goals



Reduce Consumption Through Conservation and Efficiency

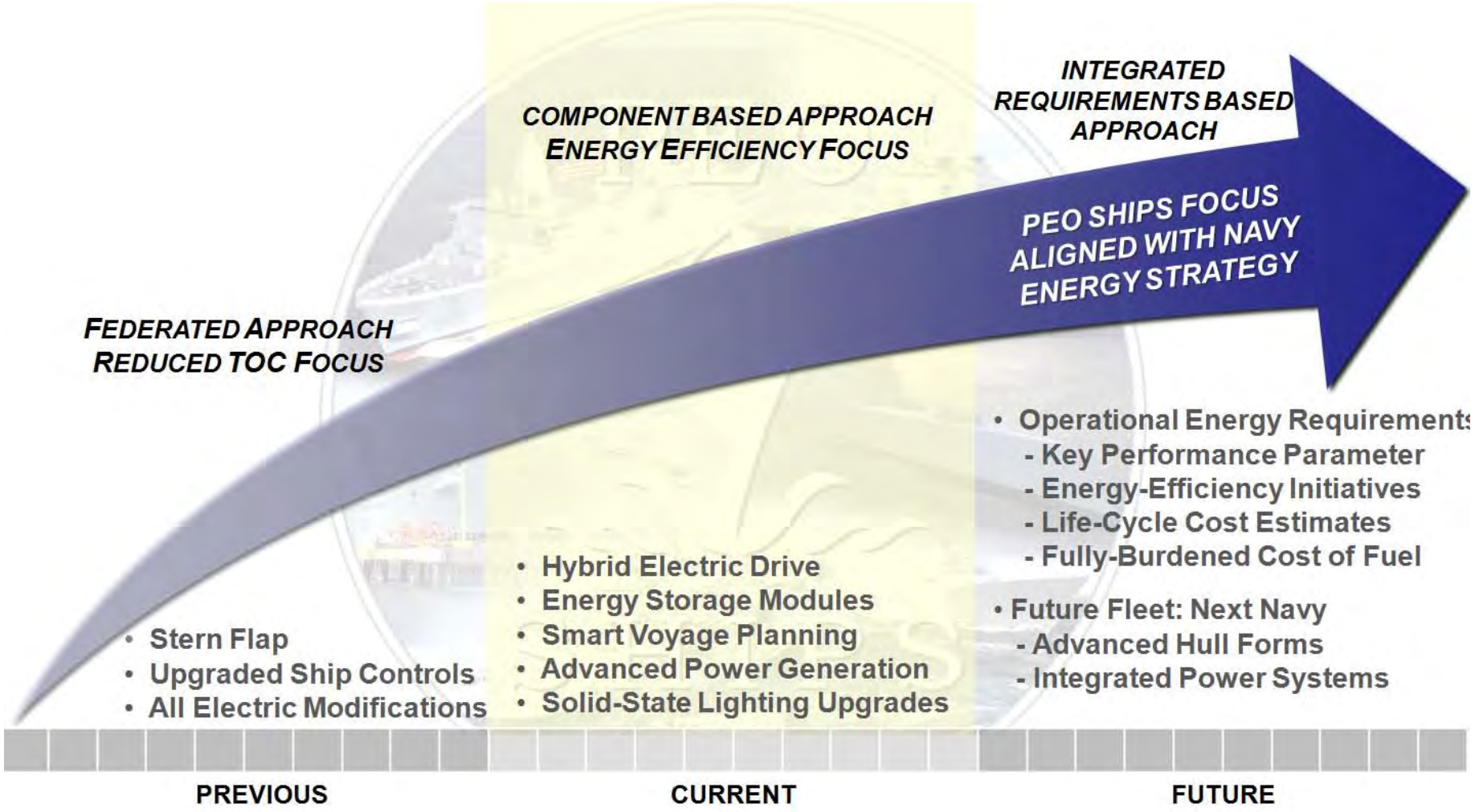
Opportunities for Energy Savings

- **Prime Movers**
  - Technical advances
  - Combined cycles
- **Ship Propulsion**
  - Propulsor efficiency
  - Hullform resistance
  - Energy Recovery
- **Electrical Loads**
  - Fans / Pumps
  - Mission Systems
  - Lighting
  - VFD's
- **Operating Concepts**
  - Alternate Architecture optimizes efficiency



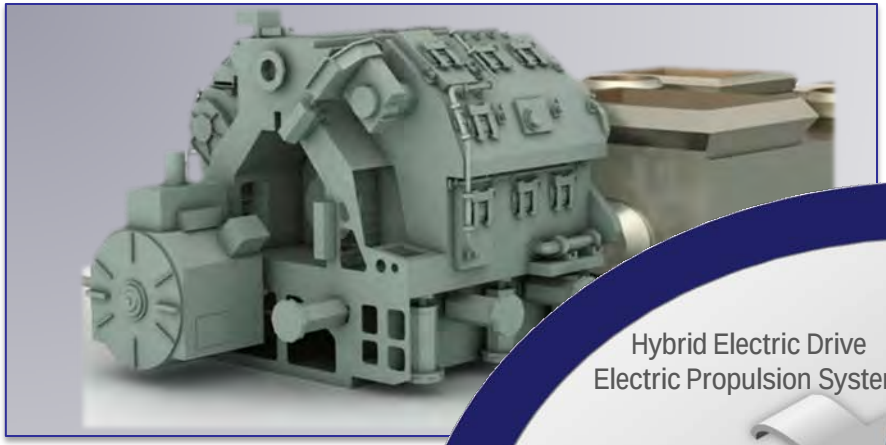
Alternate Architectures Maximizes Energy Savings

Evolutionary Ship Efficiency Gains



Shifting to Integrated Approach

Component Efficiency Gains



Hybrid Electric Drive
Electric Propulsion System

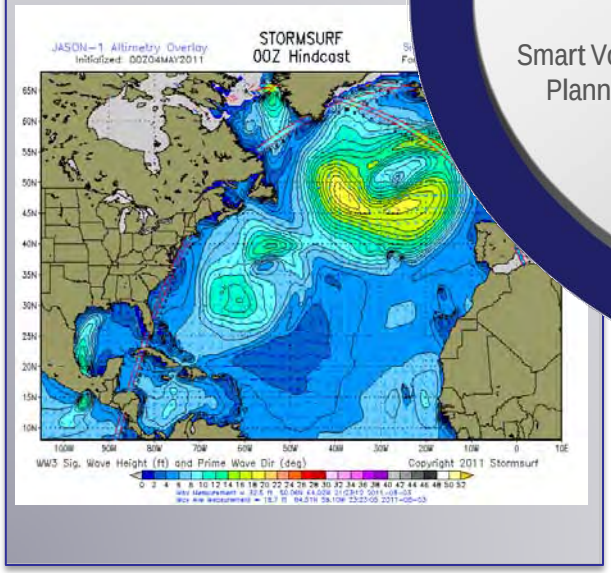
Advanced Power
Generation Module

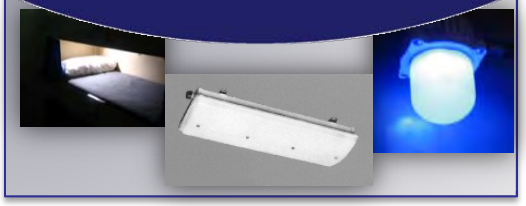
Energy
Efficiency
Focus

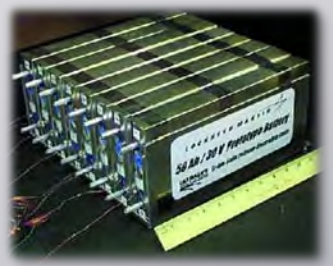
Smart Voyage
Planning

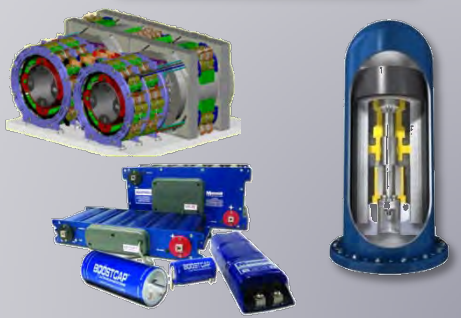
Energy Storage
Module

Solid State
Lighting

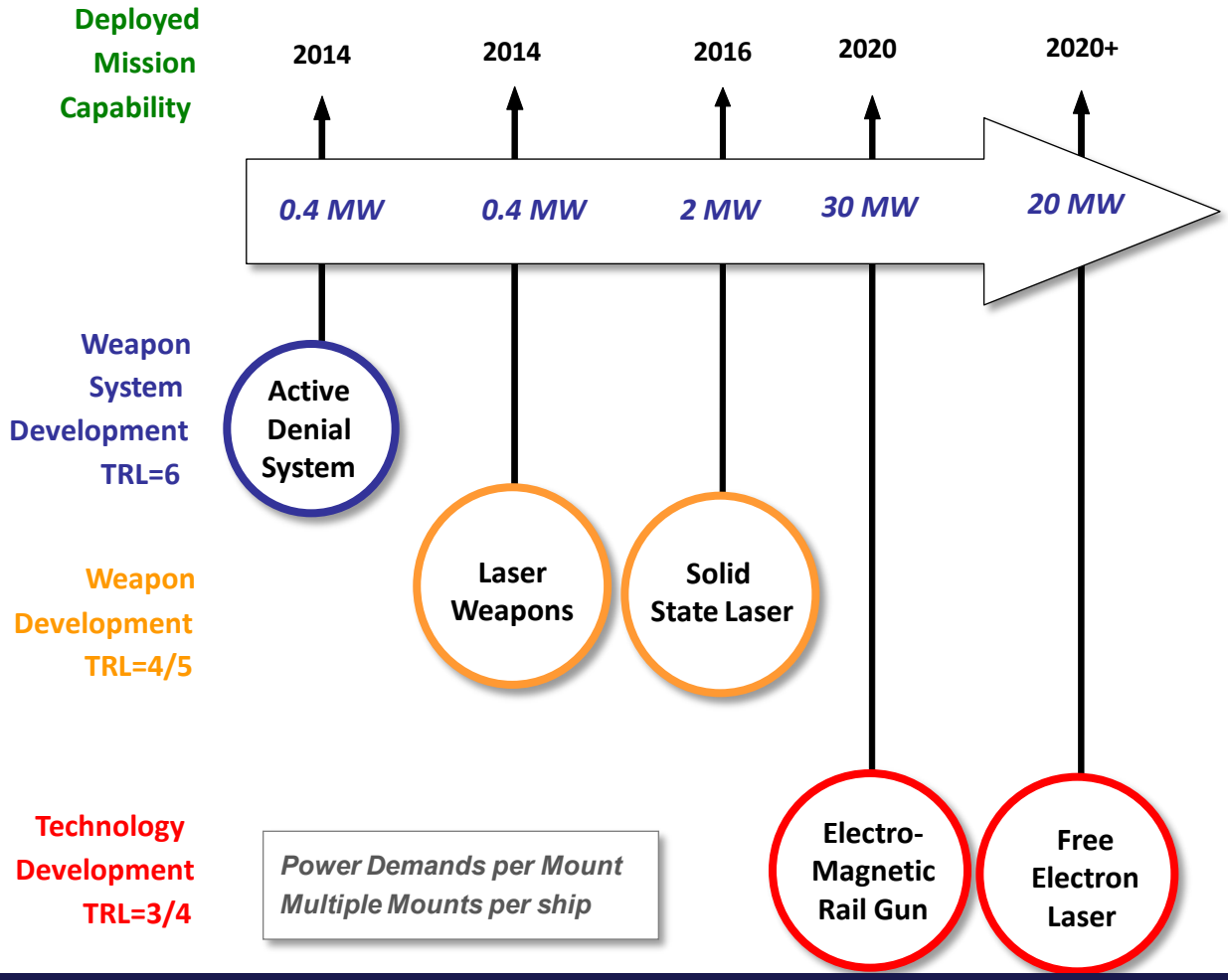


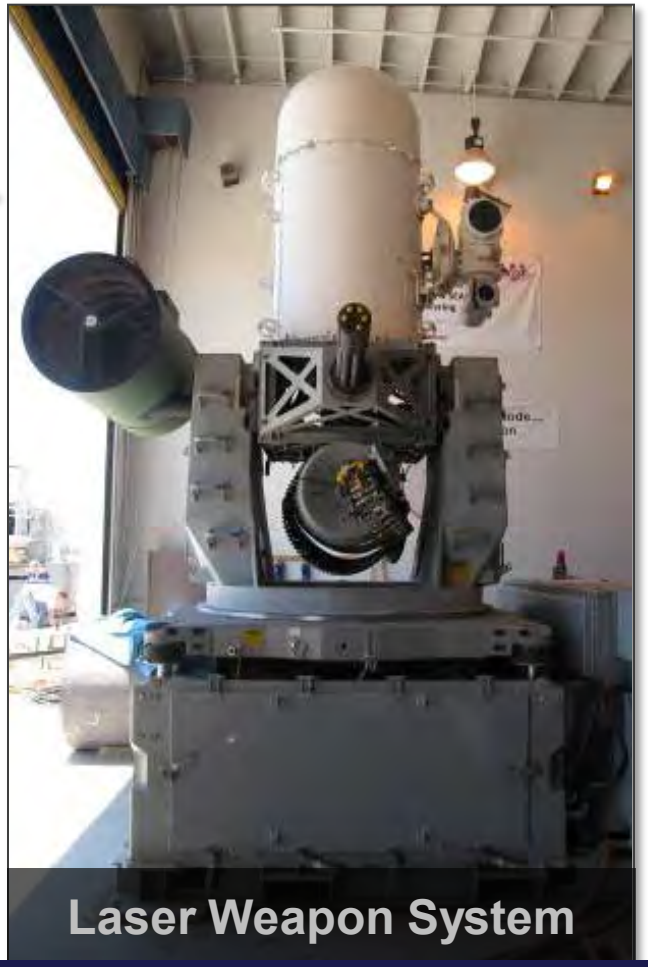






Mission Systems: Increasing Electrical Power Demands




Laser Weapon System

Sensor and Weapon System Power Demands will soon rival Propulsion Power Demands

Other Naval Key Technologies

UK (23 + IPS/hybrid ships)

- Type 23 Frigate, in-service – hybrid electric/mechanical drive
- Type 45 Destroyer, in-service – full Integrated Power System
- Albion Class LPD, in-service – full Integrated Power System
- Wave Class Oiler, in-service – full Integrated Power System
- CV(F) under contract – full Integrated Power System

Netherlands (2 ships)

- LPD "Rotterdam" Class, in-service – full Integrated Power System
- IPS declared for future surface combatants

France

- BPC (LPD) in-service, Podded Integrated Power System
- Future CV in design – full IPS, maybe Pods

France, Italy, Greece, Morrocco

- FREMM Frigate – Hybrid Drive (28 planned, 4 under construction)

Australia (2 ships)

- Canberra Class LPD - Podded IPS
- Collins Class SSG - diesel-electric

Germany

- U-212 Submarines
  - Diesel Electric w/ PM Motors
  - AIP systems using fuel cells

All diesel submarines are electric drive

Other Navies are already experiencing the benefits

Take-away

- **Numerous near-term efforts underway to provide modest fuel savings**
- **Greater gains are possible through fundamental changes in architectures and design philosophy**

Backups

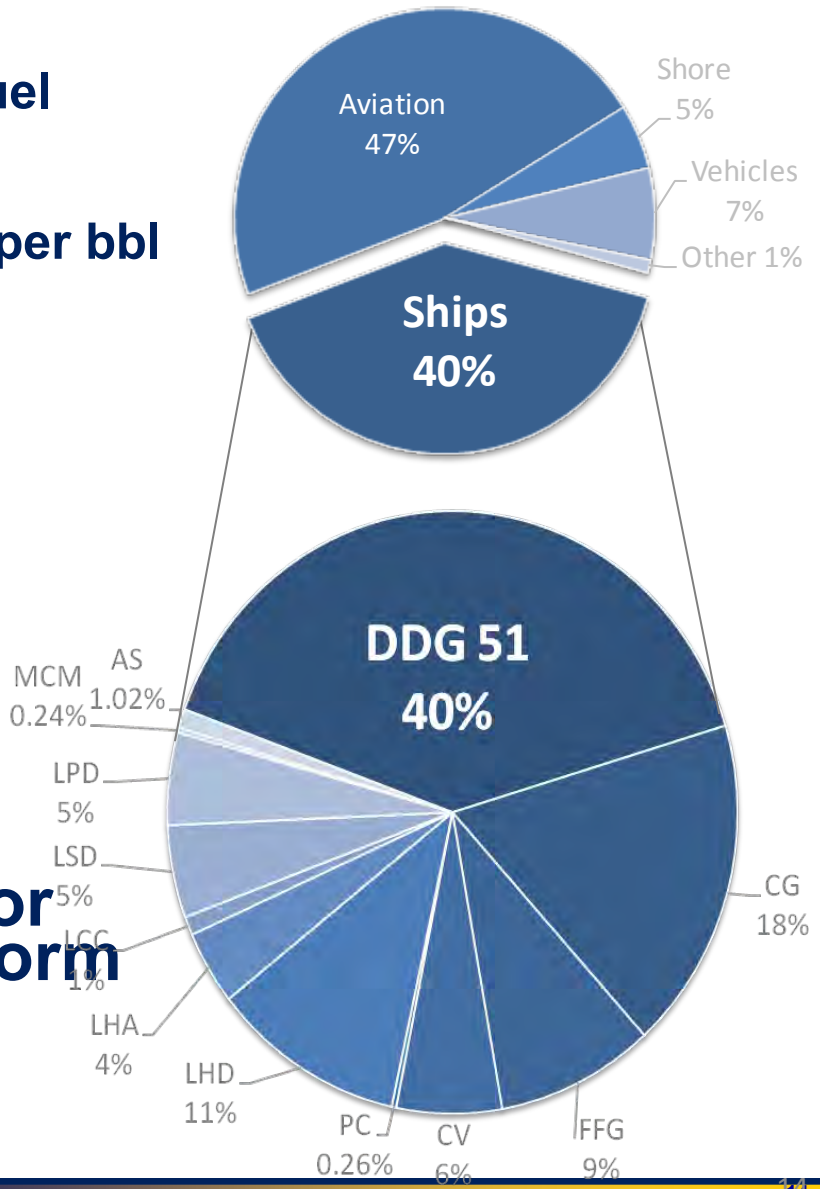
Today's Platform Initiatives

PLATFORM	RESULTS
	**Amphibious Assault (LHD 8 and LHA 6)** ◆ The first U.S. Navy amphibious ship built with Gas Turbine Engines and Hybrid Electric Drive resulting in **significant fuel savings compared with steam driven LHD**
	**Combat Logistics Force (T-AKE)** • T-AKE is powered by a commercial Integrated Power System, realizing **reduced acquisition and life cycle costs**
	**Surface Combatants (DDG 51)** • USS TRUXTUN (DDG 103) Hybrid Electric Drive (HED) and USS PREBLE (DDG 88) Energy Storage Module (ESM) to **demonstrate significant reductions in fuel usage**. HED acquisition program underway to backfit Flight IIA ships

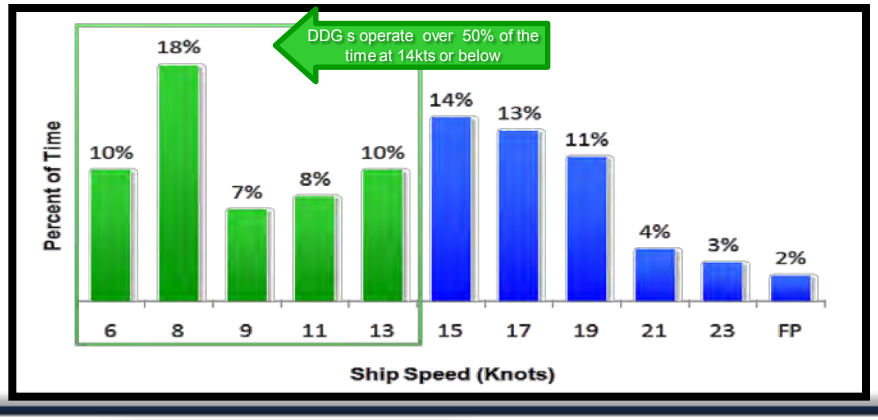
Enhanced Operational Capability at Reduced Costs

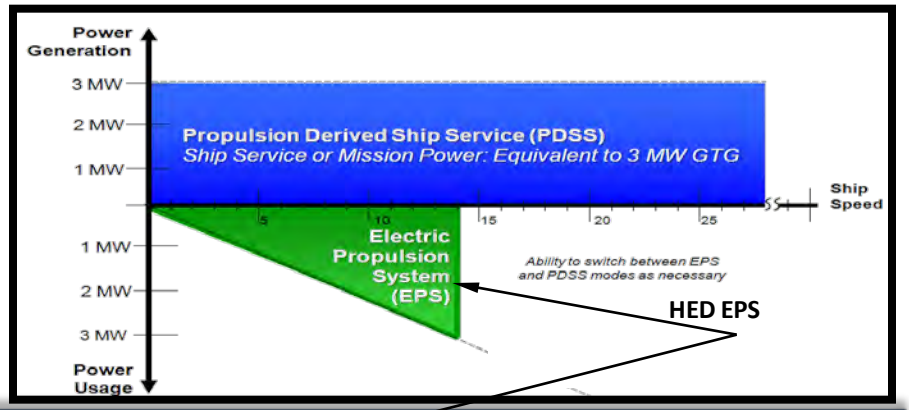
U.S. Navy Fuel Usage and Trends

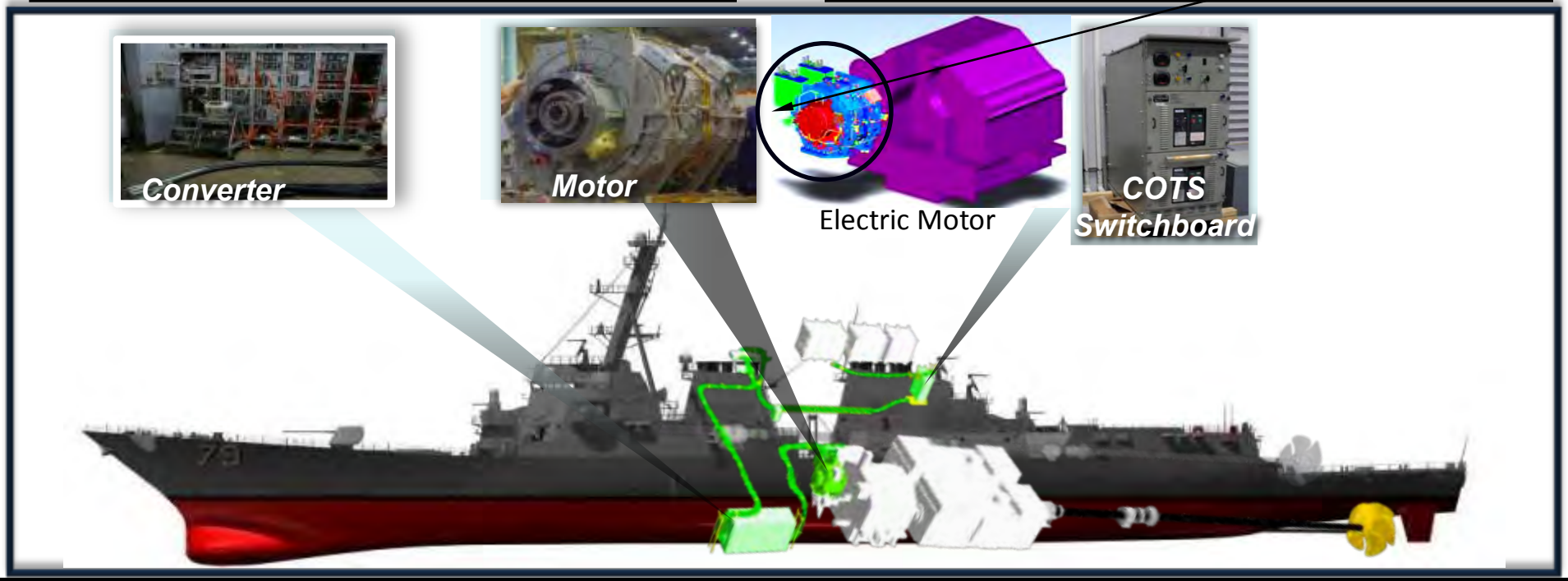
- Surface ships account for 40% of Navy fuel consumption
- Fuel cost uncertainty (~400% per bbl increase since FY03)
- Energy (fuel) Demand Increasing
  - Combat / Weapons Power
  - Force Structure Changing: Higher Fuel Consumption
  - Operational Requirements
- Why focus on DDG 51 Class?
  - Provides best opportunity for long term payoff given platform age, production restart, and quantity



DDG 51 Hybrid Electric Drive

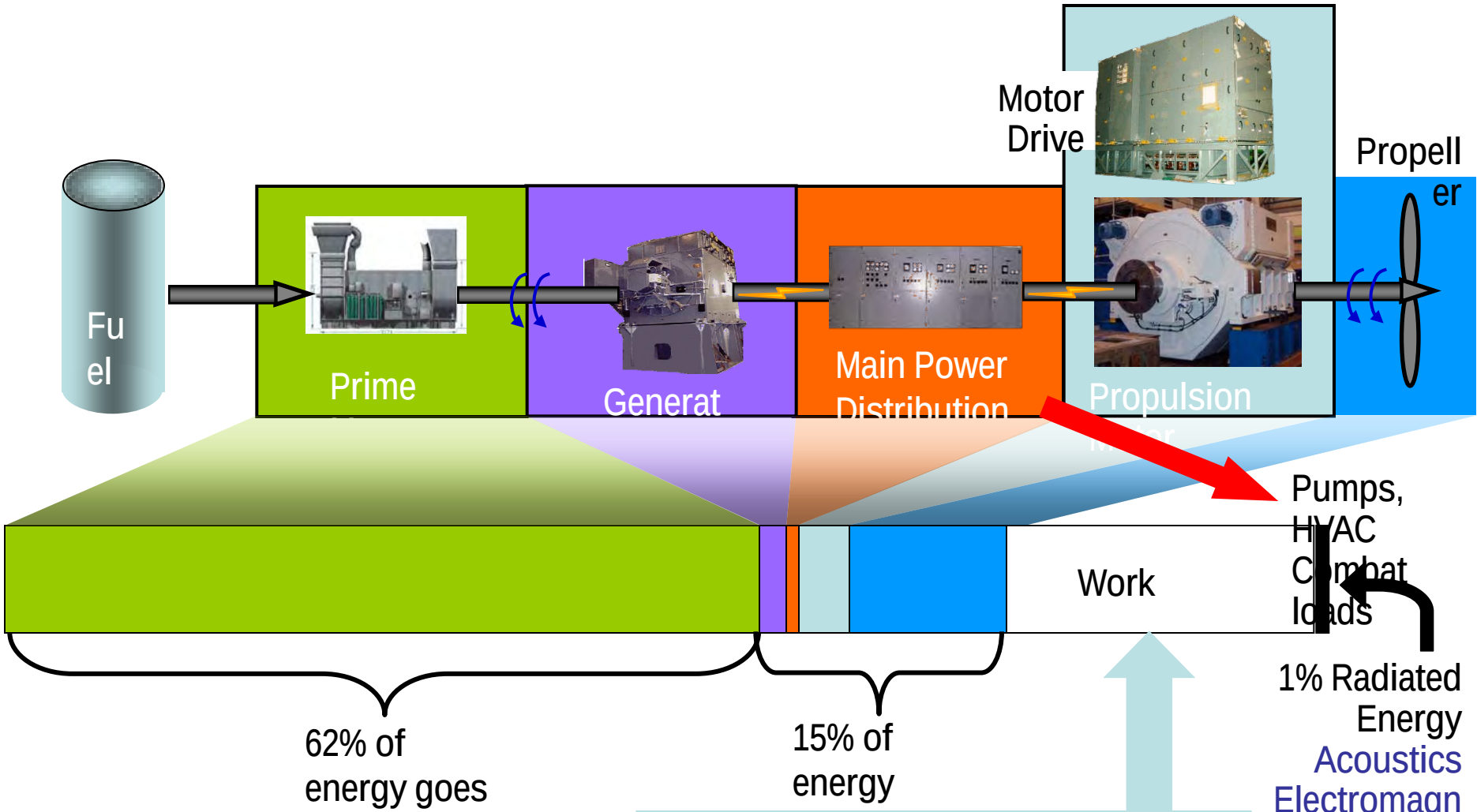






8,000 bbls of fuel saved per ship

Where the losses are: Energy Flow for Electric Ship



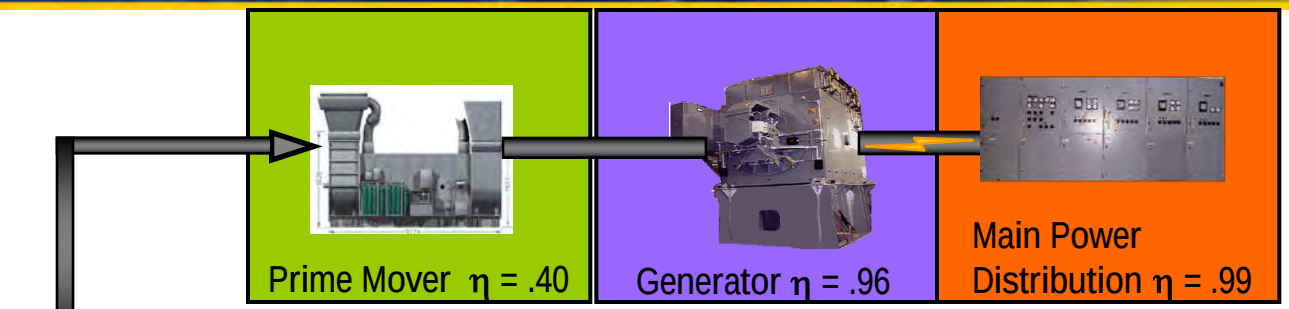
- *~22% of fuel energy provides useful work.*
- *The rest is left behind in the water or air.*

Todays Platform Initiatives

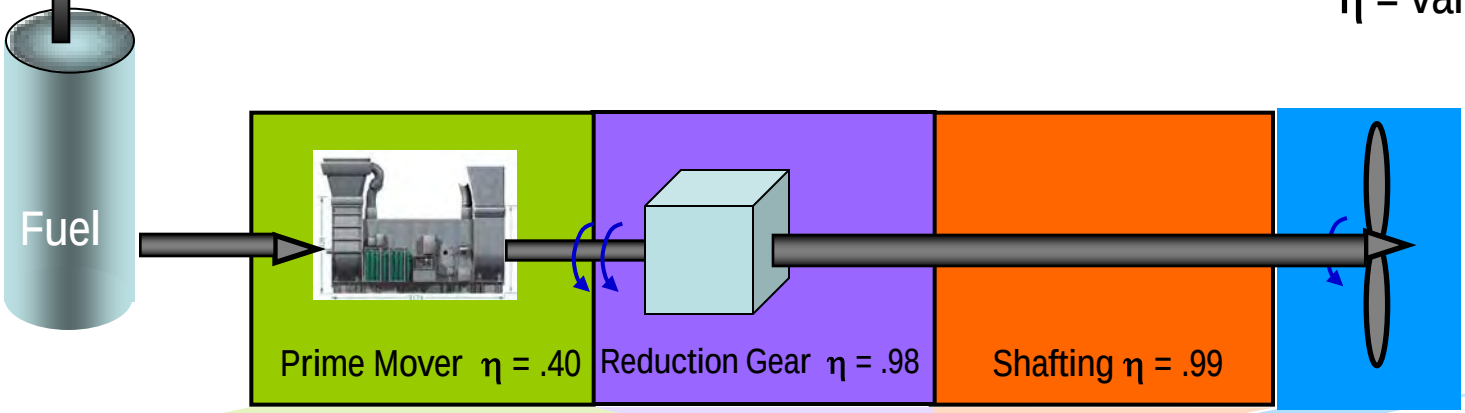
PLATFORM	RESULTS
	**Aircraft Carriers (CVN)** ◆ Compared to steam catapults, EMALS **weighs less, occupies less space, requires less maintenance and manpower, is more reliable, and uses less energy**
	**Surface Combatants (DDG 1000)** ◆ ZUMWALT's Integrated Power System (IPS) combines **78MW of installed power** generation for propulsion and ship service into a single unified electrical system
	**Submarines** ◆ Replacing conventional hydraulic systems with electric actuators realize **significant savings in installation and maintenance costs as well as being cleaner and more safe**

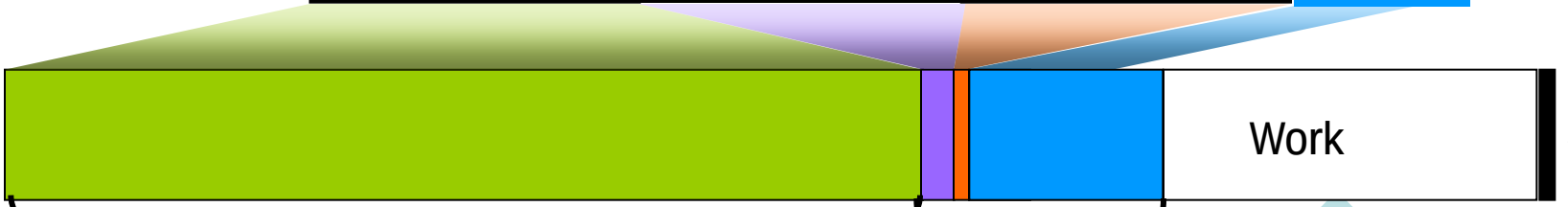
Enhanced Operational Capability at Reduced Costs

Where the Losses are: Energy Flow for Mechanical Drive Ship



LOADS:
Pumps
HVAC
Combat
η = varies





62% of energy goes to the air

15% of energy goes to the sea

• ~ 18-20% of fuel energy provides useful work.

1% Radiated Energy
Acoustics
Electromagnetic
Kinetic

At design operating point

SBA Administrator Karen Mills

SECNAV GREEN INITIATIVES

Federal Business Opportunities

Download Spreadsheet containing all SECNAV Green Initiatives

NAICS Energy Search Codes

NAICS Code - Title	Search Dat
221111 - Hydroelectric Power Generation	11/30/2010
221112 - Fossil Fuel Electric Power Generation	11/30/2010
221113 - Nuclear Electric Power Generation	11/30/2010
221119 - Other Electric Power Generation	11/30/2010
221121 - Electric Bulk Power Transmission and Control	11/30/2010
221122 - Electric Power Distribution	11/30/2010

Green Government Opportunities
FOR SMALL BUSINESSES

SBA

NAVY Green Opportunities

Green Biz Opps serves as a single authoritative source for Naval acquisition opportunities and other initiatives.

Click here to see the opportunities

Green Solicitations
Find Federal Business Opportunities And Set-asides For Small Businesses.

Green Grants
Find Federal Grant Opportunities.

Green Research & Development
Explore Federally Funded Research.

Green Patents
Search Patents Related To Clean Energy And Sustainable Business.

Green Government Opportunities

"Simply put, we as a military rely too much on fossil fuels. That dependence creates strategic, operational and tactical vulnerabilities for our forces and makes them susceptible to price and supply shocks caused by either man-made or natural disasters in the volatile areas of the world where most fossil fuels are produced."
- Honorable Ray Mabus, Secretary of the Navy

SIGNED MoU WITH NAVY

Green Government News

SBA And Navy Launch Green Government Opportunities
The U.S. Small Business Administration (SBA) and the Department of the Navy today announced the...

White House Blog To Feature Green Government Opportunities
The White House blog tomorrow will feature a post...

Green Government Opportunities Detailed
The U.S. Small Business Administration (SBA), along with the Department of the Navy, has...

More Green News »

NAVY ENERGY FORUM

13 OCT 2011

Rear Admiral Ann Phillips (N86)

Surface Warfare N86

"Retooling Our Fleet"

- **Maritime Successes**
- **Leading Up to the 2016 Great Green Fleet**
- **Challenges**
- **Change Inside the Lifelines**
- **Vision for the Future Fleet**

Maritime Successes

Fuel Consumption Trending Downward

Surface Warfare N86

Leading up to the Great Green Fleet

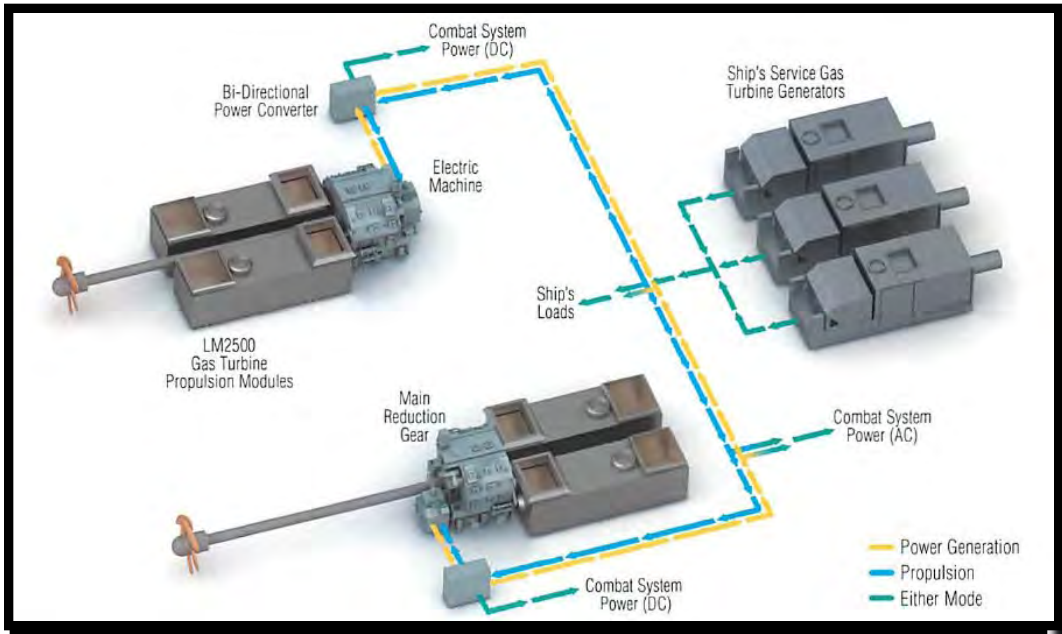
NAVY ENERGY

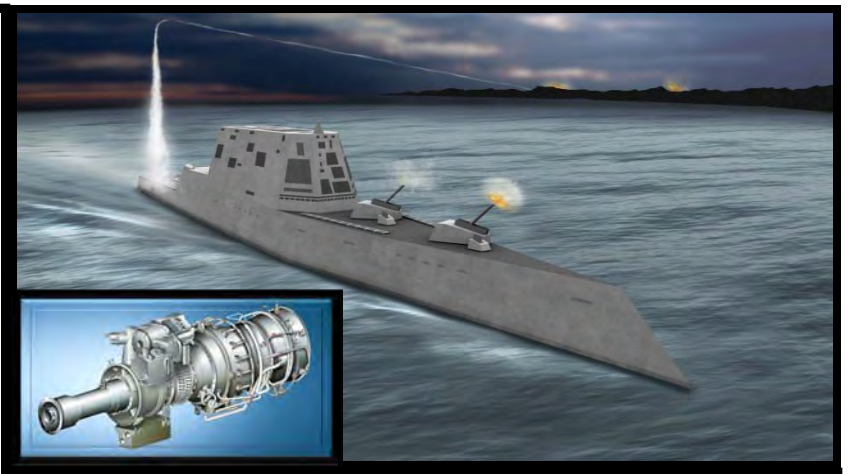
Challenges/Measuring Results

Surface Warfare
N86

Change Inside the Lifelines

Vision for the Future Fleet





Meeting the Power Needs of Tomorrow's Navy


Questions

USMC Expeditionary Energy Concepts to Combat

14 October 2011
Maj Sean Sadlier
Logistics Analyst, Expeditionary Energy Office (E^2O)

Experimental Forward Operating Base (ExFOB)

First ExFOB
India Company 3/5 Battlefield Evaluation
Helmand Province AFG Early 2010

SPACES
(Battery Charger)

GREENS
(300 Watts Continuous Power)

Zero Base
(300 Watts Continuous Power)

To Reduce Fuel & Battery Re-Supply

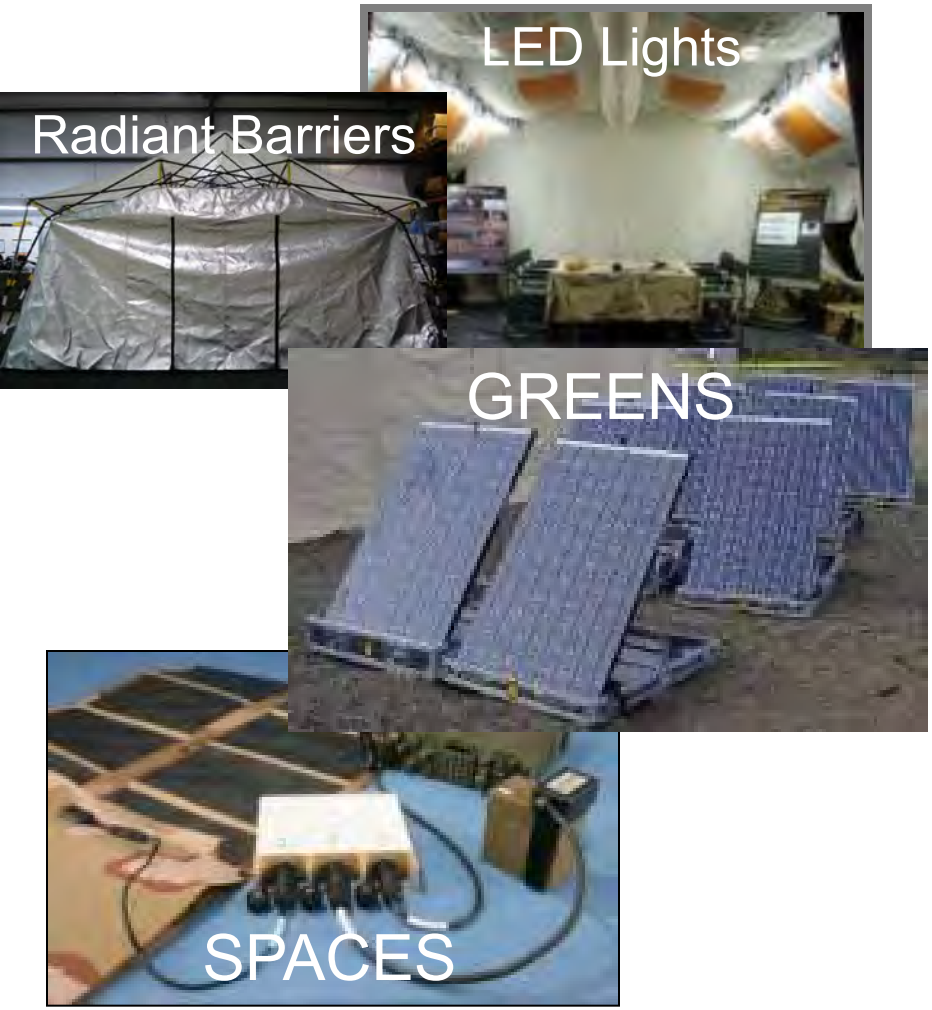
LED Lights

Solar Shade
(100 Watts Continuous Power)

Solar Light Poles

Unclassified

Acceleration of ExFOB Gear to OEF Programs of Record



Cost & Savings:

- **Cost $25M**
  - Below Initial Estimate of $39M
- **Projected Savings**
  - Est. $40.9M / Year
  - Est. 9M lbs / Year
  - 450 MV-22 Sorties
  - 180 Fuel Trucks

Operational Impact:

- Fielding Complete by Feb 12
  - Before Dec 12 Initial Estimates
- Reduced fuel and battery requirements, reduced load
- Improved quality of life with efficient shelters
- Quiet, easy to maintain systems

Leveraging Learning and Leadership of India Co. 3/5

Acceleration Gear
First Site Installed PB Boldak, June 2011

Training and confidence in equipment are key to realizing savings.

Evaluating Next Round of ExFOB Gear

Hybrid Systems & DC Air Conditioners—Systems Approach

From the Deckplate

"THINK AND LIVE ENERGY AWARENESS. TURN OFF LIGHTS WHEN YOU LEAVE THE ROOM OR IF YOU HAVE AMPLE NATURAL LIGHTING. SWITCH TO MORE EFFICIENT LIGHT BULBS AND MAKE SURE YOU TURN OFF AND UNPLUG EQUIPMENT OR APPLIANCES WHEN NOT IN USE."

— Master Chief Rick D. West, MCPON