

# Reducing Dependence on Petroleum A Long Standing Naval S&T Goal

## Grand Challenge



***“As we progress into the 21<sup>st</sup> century, the U.S. Navy’s reliance on traditional fossil fuels will become a critical issue. Declining fossil fuel reserves and environmental restrictions on emissions will drive the world economy towards alternative, clean fuel choices and will make all current fuels more costly, less available worldwide, and environmentally unacceptable.”***

***F. E. Saalfeld, ED/TD, ONR, 14 Dec 1998, Memo Establishing Naval S&T Grand Challenges***

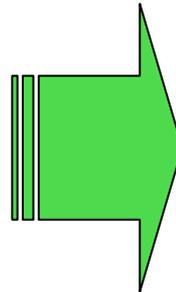
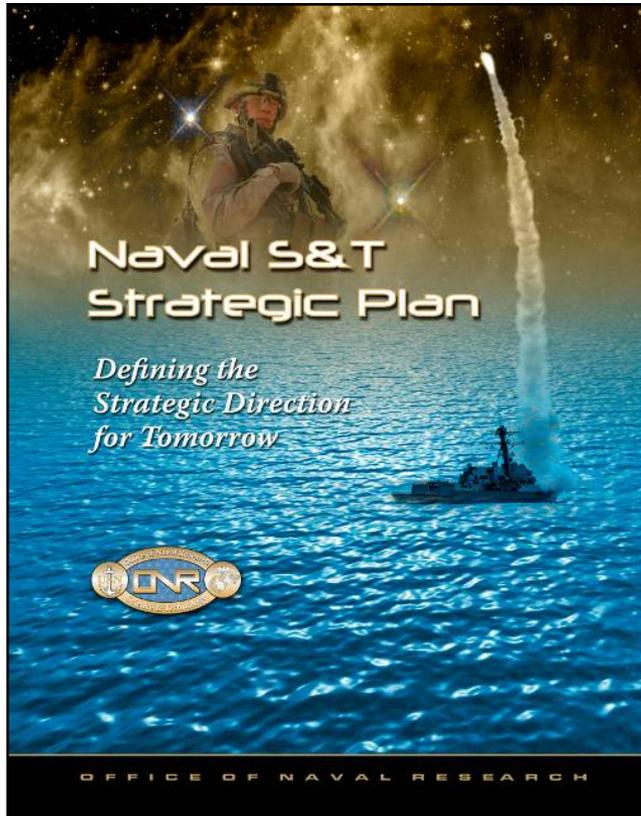
### ***Electric Power Sources for the Navy and Marine Corps***

***“The Challenge is to develop new, safe, efficient, environmentally friendly, and non-petroleum based sources of power that would support portable long-lived power sources for all future Marine-carried equipment and electric power sources required for all-electric ships and other Naval warfighting platforms.”***

1<sup>st</sup> Grand Challenge Workshop: 16-18 November 1999, Alexandria, VA

2<sup>nd</sup> Grand Challenge Workshop: “Future Naval Fuels,” 14 June 2001, Quantico, VA

# Naval Strategic Plan



## S&T Focus Areas

- **Power and Energy**
- **Operational Environments**
- **Maritime Domain Awareness**
- **Asymmetric & Irregular Warfare**
- **Information Superiority and Communication**
- **Power Projection**
- **Assure Access and Hold at Risk**
- **Distributed Operations**
- **Naval Warfighter Performance**
- **Survivability and Self Defense**
- **Platform Mobility**
- **Fleet/Force Sustainment**
- **Total Ownership Cost**

**Vision:** Increase Naval forces' freedom of action through energy security and efficient power systems, to provide desired power at the manned/unmanned platform, system, and personal levels.

## Objectives

### Energy Security:

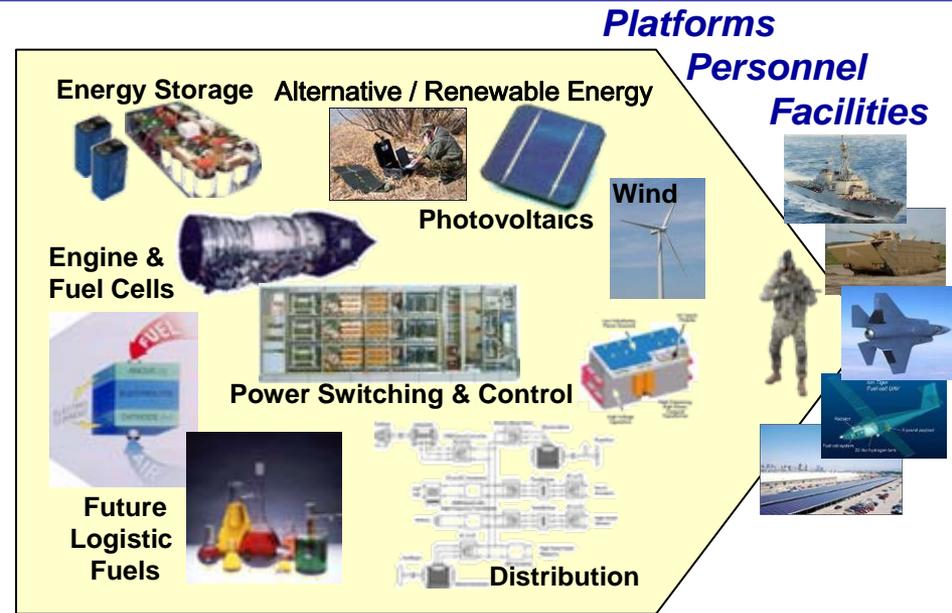
- Alternative and renewable energy sources
- Future logistics fuels
- Resilient power networks and systems

### Efficient Power and Energy Systems:

- Materials, devices and architectures to increase efficiency, and power density for platforms, and reduce weight for personal power
- Efficient power conversion, switching, distribution, control and thermal management
- Engines, Generators, motors, and actuators
- Electrochemical, thermal and kinetic energy storage

### High Energy & Pulse Power:

- Energy storage power system architectures
- Energy pulsed power switching & control systems



## Key Research Topics

- Advanced Naval Power Systems
- Air Platform Power & Propulsion
- Power Electronics
- Personal Power
- Bio-derived Materials, Sensors, Systems & Processes
- Manufacturing Science
- Advanced Naval Materials

# Platform Mobility

**Vision:** Develop agile, fuel efficient, and flexible platforms capable of operating in any environment.

## Objectives

**Efficient, high endurance, high speed platforms:**

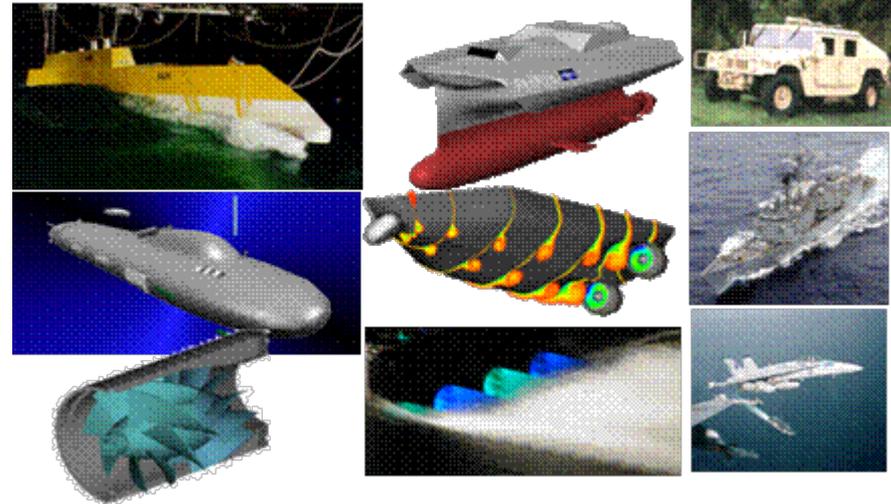
- New and novel advanced platform design supporting new directions in Naval warfare (size, agility, modularity, etc)
- Higher performance platforms at reduced fuel consumption
- Efficient, all terrain, lighter, more agile ground vehicles including suspensions and drive trains
- Manned vessel launch and recovery
- Operator guidance tools and light weight/higher strength advanced composites and structural metals for optimized platform performance

**Vertical lift operations in challenging environments:**

- High performance VTOL/VSTOL
- High sea states launch and recovery technology to enable manned / unmanned air operations

**Autonomous and unmanned vehicle mobility:**

- New unmanned platform design technology
- Advanced robotic systems for air, ground and sea combat
- Unmanned vessel launch and recovery



## Key Research Topics

Advanced Sea Platforms  
Air / Ground Vehicles  
Expeditionary Maneuver  
Advanced Naval Materials  
Naval Engineering/Naval Architecture  
Unmanned Undersea Vehicle Technologies  
Unmanned Air, Ground and Sea Vehicles

# Meeting National and DoN Needs

✓ Elements of Administration's plans. (from White House Website)

*Develop & Support Our Sailors, Marines Navy Civilians & Their Families*

- Create new jobs in the clean energy economy
- New green job training programs for clean technologies
- Restore America's leadership in higher education
- Invest in community colleges to equip greater share of young people & adults with high-demand skills and education for emerging industries
- Invest in innovative K-12 education

*Maintain Our Warfighting Readiness*

- Implement resilient smart grid to support integration of renewable energy
- Implement aggressive appliance energy efficiency standards
- Implement increased vehicle fuel efficiency standards
- Set national building efficiency standards
- Reduce Federal energy consumption
- Reduce Mercury emissions

- Develop technology to transition to a clean energy economy
- Develop advanced vehicles
- Develop next generation of batteries
- Develop ocean-based renewable energy
- Develop domestic renewable energy, sustainable biofuels and infrastructure
- Develop resilient critical infrastructure

*Build the Future Force*



✓ President Obama (19 March 2009): "... We can remain one of the world's leading importers of foreign oil, or we can make the investments that would allow us to become the world's leading exporter of renewable energy. We can let climate change continue to go unchecked, or we can help stop it. We can let the jobs of tomorrow be created aboard, or we can create those jobs right here in America and lay the foundation for lasting prosperity"