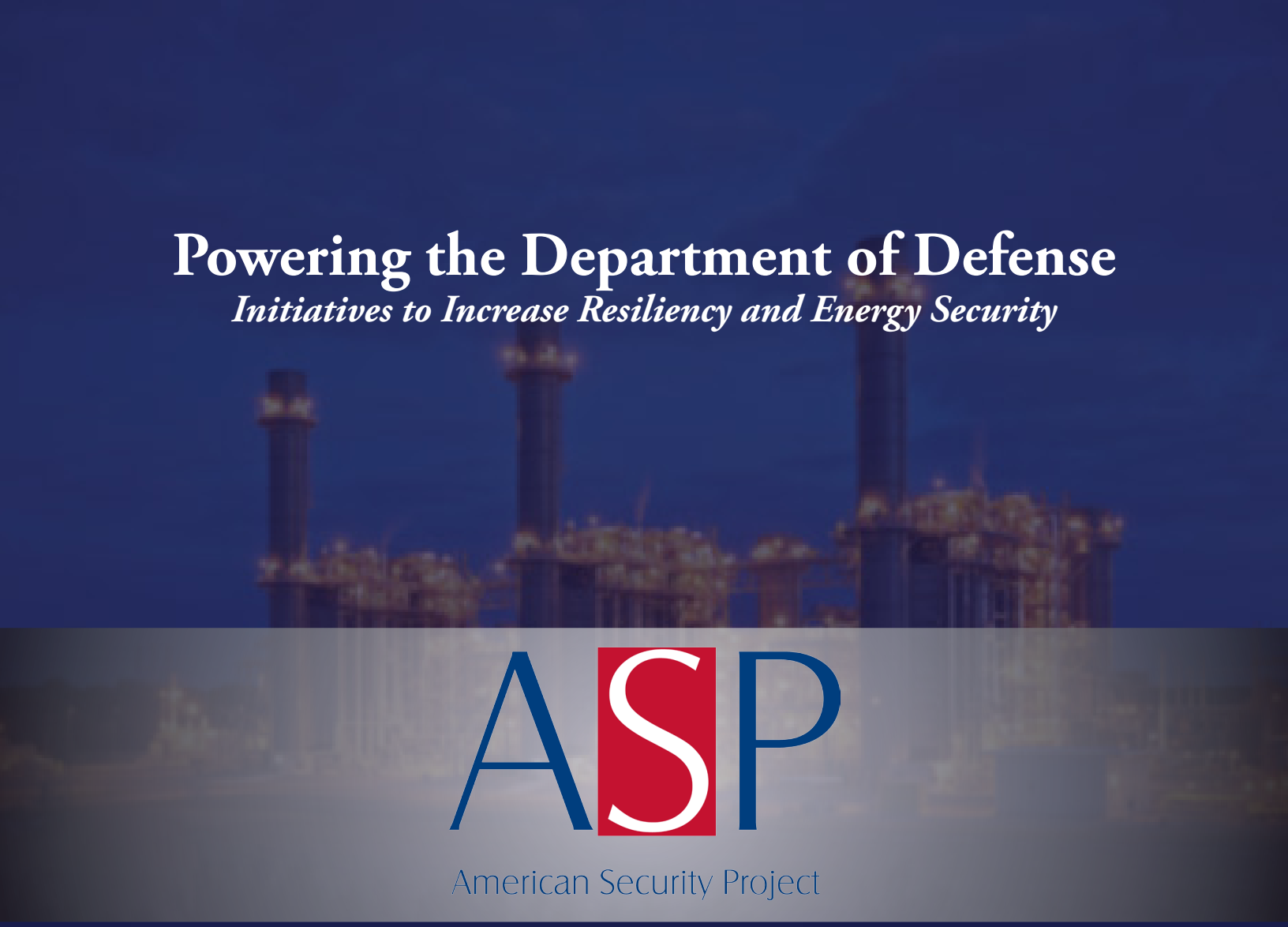
Powering the Department of Defense

Initiatives to Increase Resiliency and Energy Security



ASP

American Security Project

Fact Sheet

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Sierra Hicks

September 2017

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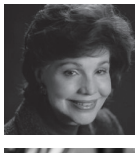

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Edward Reilly is Global Chief Executive Officer of the Strategic Communications practice of FTI Consulting.

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Lieutenant General Norman R. Seip, USAF (Ret) served in the Air Force for 35 years. His last assignment was Commander of 12th Air Force.

Introduction

The U.S. Department of Defense (DoD) is the largest single consumer of energy in the world.[1] The DoD uses energy in two ways – for its operations and for its installations. Operational energy is "the energy required for training, moving, and sustaining military forces."[2] Installation energy is the energy used to heat and cool buildings, provide electricity, and power non-tactical vehicles. Together, DoD operational and installation energy make up about 80% of the total energy consumption by the federal government.[3]

This fact sheet will look at what the DoD is doing to both lower its energy usage and move away from finite sources of energy to ensure that America's warfighters have assured access to the energy they need to be able to fight and win against an adversary. This brief overview will outline the goals of each military branch and the progress they have made towards those goals.

Facts about DoD's Energy Use

- The US Department of Defense, taken as a single entity, is the largest single energy consumer in America.[4]
- In the fiscal year 2016 (FY2016), DoD's total energy bill was $12.4 billion.[5]
- An estimated 75% of DoD's energy use is for operational use and the remaining 25% is used for installation energy.
- In FY2014, DoD consumed 87.4 million barrels of liquid petroleum-based fuel:
    - The Air Force is the largest consumer of fuel out of all military branches, accounting for 57% of petroleum use in FY2014.
    - By comparison, the Navy makes up 26% of total DoD petroleum fuel consumption, the Army 13%, and the Marines less than 4%.[6]
- From 2007-2014, biofuels made up less than 1% of total DoD fuel purchases.[7]

Why does the Department of Defense Invest in Alternative Energy? Resilience.

The United States military needs a vast amount of energy to ensure that it can operate on a day to day basis. It requires even more during "kinetic" operations against an enemy. Due to this need, the military is vulnerable to sudden changes in the price of energy and disruption of supply. The military's overreliance on petroleum-based fuel causes operational, strategic, and financial risks and endangers critical missions. On installations in the homeland, the military relies on an electricity grid that is stressed and vulnerable to both extreme weather and enemy action. This reliance could negatively affect its projection of power and capability for defending the homeland, as well as its operations abroad.

In order to address these vulnerabilities, the military has laid a framework for increasing its use of renewable energy to ensure reliable access to energy. The DoD sees sustainability as a strategic goal to maintain the ability to "operate in the future without decline."[8] By investing in resilient energy systems now, the DoD can ensure that warfighters have access to energy in all eventualities.

Operational Risks

- The DoD estimates that every $1 increase in the price of a gallon of petroleum-based fuel costs the military billions in additional fuel costs.[9]
- Fuel price volatility makes it difficult to ensure that resources are adequately delivered to the military forces that rely on it.
    - Quickly increasing prices can cause budget shortfalls.
- However, the large volume of fuel needed to power military units deployed means that the DoD will continue to rely on refined energy products that are purchased close to their point of use.
- An Army Environmental Policy Institute study found that, between 2003 and 2007, more than 3,000 U.S. troop and contractor deaths or injuries were attributable to fuel supply convoys in Iraq and Afghanistan.[10]

Strategic Risks

- The risks to the reliable provision of operational energy are also threats to the ability to project and sustain power worldwide.
- Reliance on the uninterrupted supply of oil has compelled the U.S. military to defend shipping lanes around the world to ensure the free flow of oil, not only for the United States, but all countries.
    - One study estimates that the United States has spent $8 trillion protecting oil cargoes in the Persian Gulf since 1976, with at least one aircraft carrier being stationed in the region during any given time.[11]
- Oil dependence on a select few oil suppliers undermines American foreign policy, because those suppliers hold a great deal of leverage over the stability of the American economy through the price of oil.

Base Resilience

- DoD energy resilience is defined as the "ability to prepare for and recover from energy disruptions that impact mission assurance on military installations."[12]
- DoD installations rely on commercial power supplies, sourced from local utilities, which can be threatened by natural hazards, terrorism, or other events that disrupt power.
- These disruptions could affect critical DoD missions, including those that are directly related to supporting warfighting missions overseas and defending the homeland.

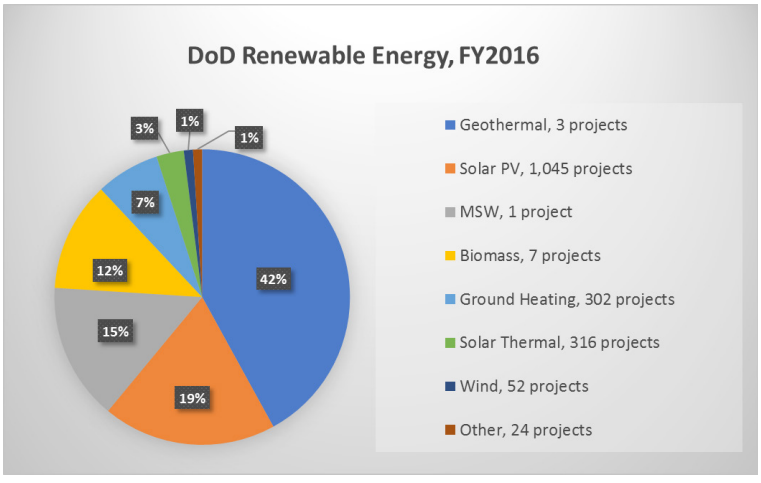
- The DoD has put into place a three-pronged strategy that includes increasing energy resilience, active engagement with key energy players, and pursuing advanced technologies to ensure resilient, reliable, and continuous energy provision.

How Is the Military Alleviating These Threats?

- DoD has had plans to scale up renewable energy and energy storage on bases for the past decade.
- The Energy Performance Master Plan, laid out in FY2011 by the Office of the Assistant Secretary of Defense for Energy Installations and Environment (OASD(EI&E)), provides a framework for consistent decision-making across all departments and establishes metrics that can be used to evaluate progress on energy goals. It has three key elements:[13]
    1. Expand supply (renewable energy)
    2. Reduce demand (increase energy efficiency and reduce overall consumption)
    3. Adapt future forces and technology

What Has DoD Done So Far?

The Energy Independence and Security Act of 2007 requires the federal government – including DoD facilities – to reduce energy use in its buildings by 30% by FY2015.[14] The John Warner National Defense Authorization Act for Fiscal Year 2007 mandates DoD obtain 25% of its electricity from renewable sources by 2025.[15] In 2012, the Defense Department made a commitment to install 3 gigawatts of renewable generating capacity, one from each of the Army, Navy, and Air Force Installations by 2025.[16]



Data from DoD 2017 Energy Management and Resilience Report.

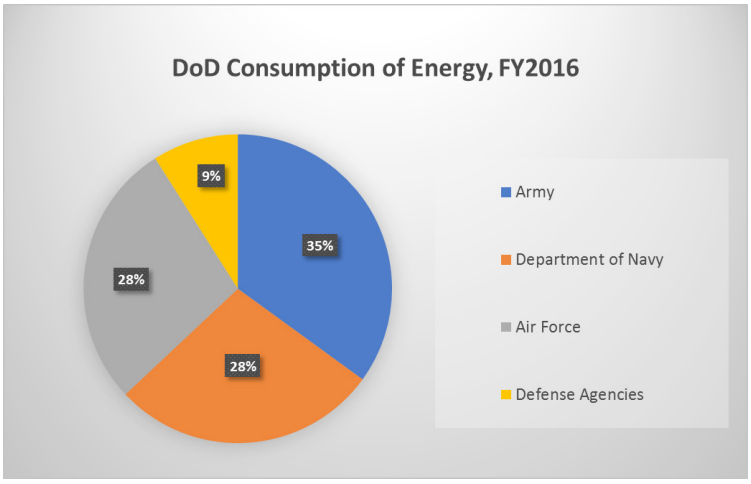
- DoD achieved a 19.9% reduction in energy intensity at its facilities from a 2003 baseline by FY2015, short of the 30% reduction goal.[17]
    - In FY2016, DoD reduced its energy intensity 5.1% from the previous fiscal year, but remains short of its statutory goal.[18]
- As of FY2016, DoD produced or procured 12.6% of its total facility electricity consumption from renewable energy, more than halfway to its 2025 goal.[19]
- In FY2015, DoD had 1,390 operational renewable energy projects, an increase from 1,130 in FY2014.[20]
- DoD is on track to meet the goal of installing 3 gigawatts of renewable energy before the 2025 deadline.

- Geothermal electric power is the largest renewable energy source in DoD, accounting for 42% of the total energy produced. Biomass makes up about 12% of the energy mix, while the 810 solar photovoltaic (PV) systems throughout DoD make up 19% of energy production.[21]

Each of the branches has their own goals and metrics for increasing resilience in their installation energy use.

Army

- The Army is the largest installation energy user in the DoD, making up 35% of total facility energy consumption in FY2016.[22]
- In FY2016, the Army produced or procured 9.5% of its electricity from renewable energy sources and is on target to meet the commitment to produce 1 gigawatt of renewable energy by 2025.[23]
- Based on the FY2003 baseline, the Army reduced energy intensity 18.0% by FY2015, with an additional 5.8% reduction from FY2015 to FY2016.[24]



Data from DoD 2017 Energy Management and Resilience Report.

- Of the 143 installations surveyed, 30.1% (43 installations) were on track to meet the energy efficiency goal of a 30% reduction energy intensity use compared to FY2003 levels.[25]
- The Army's flagship clean energy program is the "Army Net Zero Initiative."[26]
    - Launched in 2010, the Army Net Zero Initiative has the stated goal of – where fiscally responsible – providing greater water and energy security and increasing operational flexibility.
    - The Army defines a "Net Zero Energy Installation" as an installation that produces as much energy on site as it consumes; uses water so as not to deplete the watershed; and reduces waste to the point of contributing zero waste to landfill.
- Since 2011, there have been 17 pilot projects and the Army hopes to establish 25 Net Zero Installations by 2030.[27]
- Through the end of FY15, the Net Zero Energy pilot installations:
    - Reduced energy use intensity by 13% compared to FY2011.
    - Generated almost 28,700 megawatt-hours (MWh) of renewable energy, of which 77% was consumed onsite.[28]

Fort Hunter Liggett

The solar array at Ft. Hunter Liggett. U.S. Army Photo.

Fort Hunter Liggett, California is the only Net Zero installation that is projected to meet its energy targets by FY2020, generating as much renewable energy as it consumes.[29] The base reduced its energy use intensity by 19% in FY2015 alone, with an overall energy use reduction of 3% between FY2011 and FY2015. [30]

The base may be able to reach Net Zero targets as early at FY2018, due to the installation of three 1 megawatt solar photovoltaic systems in FY2013, FY2014, and FY2015. Another 5-megawatt system is planned for construction in FY2017 and FY2018. In addition, the installation will complete a small waste-to-energy (WTE) plant this year that will contribute to achieving both energy and waste goals.

Air Force

- The Air Force is the 2nd largest facility energy user in the DoD, comprising 28% of total facility energy consumption in FY2016.[31]
- From 2003-2015, the Air Force reduced energy intensity by 24.3%, with an additional reduction of 4.1% from FY2015 to FY2016.[32]
- Under statutory requirements, the Air Force has the goal of achieving 25% of its energy from renewable sources by 2025.[33]
    - So far, it has been able to produce 7.9% of its energy needs from renewables.[34]
- At the end of FY2015, the Air Force had 311 renewable energy projects across 104 different sites either in operation or under construction.[35]
    - The Air Force is on track to meets its 1 gigawatt of renewable energy production by 2020.

Nellis Air Force Base

The solar installation at Nellis AFB. USAF Photo.

In 2007, a 13.2 megawatt solar array was built on Nellis Air Force Base in North Las Vegas, Nevada. An additional solar array was built in 2015, providing another 15 megawatts of electricity to the base.
During sunny days, these two solar projects provide the base with enough electricity to power the base alone.

The array is made up of 43,200 highly efficient photovoltaic panels, which are cleaned by specially designed panel-cleaning robots. These robots use 75% less water than manual cleaning methods, another part of DoD's sustainability efforts, and can clean the entire array in less than two full days.

Navy and Marine Corps

- The Department of the Navy (including both the Navy and Marine Corps) accounted for 28% of the DoD's facility energy use in FY2016.[36]
- From 2003-2015, the Department reduced energy intensity by 22%, with an additional reduction of 6.7% from FY2015 to FY2016.[37]
- The Navy has already achieved the goal of producing or procuring 25% of its energy consumption from renewable sources for the fourth year in a row, with FY2016 seeing 28.2% of energy consumption from renewable energy.[38]
- The Navy is aiming to hit several aggressive installation energy targets in the coming years:
    - Reduce installation energy intensity by 50% by 2020.[39]
    - Achieve "Net Zero" for 50% of its installations.[40]
- The Navy has already met the goal of installing 1 gigawatt of renewable energy by 2020, in addition to building a large geothermal plant at China Lake and a waste-to-energy plant at Norfolk.
- Through the Renewable Energy Program Office (REPO), the Department of Navy has approximately 300 megawatts (MW) of renewable energy generation under contract or signed lease, and has submitted requests for proposals (RFPs) for an additional 650-750 MW of energy through utility contracts, PPAs, and outgrants.[41]
- The Marine Corps energy ethos is a "bases to battlefield" approach that equates the efficient use of vital resources to enhanced mission readiness on installations and operational effectiveness in combat.[42]

Great Green Fleet

The Great Green Fleet was a year long initiative in 2016 that demonstrated the Department of Navy's efforts to transform its energy use. The name was chosen to honor Theodore Roosevelt's Green White Fleet, symbolling the ushering in of the next era of energy innovation.

The John C. Stennis Strike Group (CSG) was deployed on alternative fuels, including nuclear power for the carrier and a blend of advanced biofuel made from beef fat and petroleum for the escort ships. The DoN was able to buy these biofuels at prices that were "on par" with conventional fuels, which was required by law, and are certified as "drop-in" replacements, meaning that they required no engine modifications to be used.[43]

***USS John C. Stennis* (left) and *USS Ronald Reagan* (right). U.S. Navy Photo.**

Biofuels: DoD's Alternative Fuels Initiatives

- A biofuel is a fuel that has been produced from living matter, instead of a fuel that is produced through geological processes.
    - Advanced biofuels can be produced from a variety of non-food sources, including algae, biomass, switchgrass, camelina, municipal waste or vegetable oil.[44]
- All fuel, whether alternative or traditional, must meet mission requirements and not hinder operations.
- Therefore, alternative fuels must have a "drop-in" capability, which means they are able to be integrated into existing infrastructure without operational drawbacks.
- Through partnerships between the government and private industry, there has been progress on creating domestic manufacturing capability with the end goal of a "consistent supply at a competitive rate."[45]
    - The two groups have been working towards commercializing biofuel technology so that it is a viable and economically attainable option for both public and private groups.
- While biofuels are essential for the military's goal of sourcing renewable energy, private industry has also begun to use biofuels.
    - United Airlines has purchased biofuel to use in its planes that take regular flights between Los Angeles and San Francisco.

Bio-Synthetic Paraffinic Kerosene (BSPK) Project

One major success to come out of the DoD's biofuel program is the Bio-Synthetic Paraffinic Kerosene project. The project retrofitted a California refinery that was no longer operational, putting large-scale production of biofuel for both military and industrial use online.[46]

The type of biofuel that was produced used the hydro-processed esters, an organic compound, and fatty acids (HEFA) process, which mixes non-edible natural oils and agricultural waste with hydrogen and a catalyst material. The result is a fuel that can be blended with petroleum jet fuel in a 50-50 mix that has drop-in capability.

The BSPK biofuels were some of the fuels used by the Navy in the launch of their Great Green Fleet.

Forward Outlook

Over the course of the last decade, the U.S. military has invested a significant amount of time and money into renewable energy, energy efficiency, and sustainability. The Department of Defense recognizes the threat that climate change poses to national security, and further recognizes the threat that dependence on foreign supplies of fossil fuels poses to its ability to operate and sustain critical missions.

There are multiple benefits of DoD's renewable and alternative energy initiatives. Military installations can lower energy costs and enhance energy security by using wind, solar, geothermal, and biomass sources of energy. Missions can be carried out using biofuels made from organic material, allowing the military to rely less on local sources of fuel, which leave it vulnerable to price changes and geopolitical events.

While the DoD has made significant progress, there are still several goals that have yet to be accomplished. Many installations still rely on commercial power and may not have adequate backup plans for grid disruptions. Operations on land, at sea, and in the air still rely almost exclusively on traditional sources of fuel. Much of the progress was made under the Obama Administration, but with the new administration's stance on climate change and renewable energy, there is concern about the future of these goals.

However, there is ample evidence that the Department of Defense will continue to support renewable energy projects, alternative fuels, and efficiency measures to guarantee its energy security. In a February 2017 document, the Secretary of the Army directed the branch to prioritize energy and water security requirements to ensure reliable access.[47] Every Army installation is charged with planning, programming, budgeting, and executing projects that reduce energy and water risks. With a stated goal of "mission assurance through energy assurance," the Air Force's Air Mobility Command (AMC) is working to create innovative and cost-saving ways to increase fuel efficiency.[48] The Navy's Great Green Fleet demonstrates that alternative fuels can be used effectively to power naval operations and missions, paving the way for more and more alternative fuels to be put in use.

Bipartisan minorities in Congress have affirmed the importance of allowing the military to continue to invest in alternative energy. During their confirmation hearings Secretary of Defense Mattis, Secretary of the Air Force Wilson, and Secretary of the Navy Spencer each discussed the importance of investments into assured energy resilience. With a solid framework of goals and initiatives in place, the United States military should continue to invest and implement initiatives that move it towards a more reliable, resilient, efficient, and secure supply of energy.

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The American Security Project (ASP) is a nonpartisan organization created to educate the American public and the world about the changing nature of national security in the 21st Century.

Gone are the days when a nation's security could be measured by bombers and battleships. Security in this new era requires harnessing all of America's strengths: the force of our diplomacy; the might of our military; the vigor and competitiveness of our economy; and the power of our ideals.

We believe that America must lead in the pursuit of our common goals and shared security. We must confront international challenges with our partners and with all the tools at our disposal and address emerging problems before they become security crises. And to do this we must forge a bipartisan consensus here at home.

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We live in a time when the threats to our security are as complex and diverse as terrorism, nuclear proliferation, climate change, energy challenges, and our economic wellbeing. Partisan bickering and age old solutions simply won't solve our problems. America – and the world - needs an honest dialogue about security that is as robust as it is realistic.

ASP exists to promote that dialogue, to forge that consensus, and to spur constructive action so that America meets the challenges to its security while seizing the opportunities that abound.

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