

Report on the Feasibility and Cost of Net-Zero Greenhouse Emissions and Implementing H. Res. 109, the Green New Deal



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**Office of the Under Secretary of Defense
for Acquisition and Sustainment**

As requested by House Report 116-120, page 115, accompanying H.R. 2500,
the National Defense Authorization Act for Fiscal Year 2020.

The estimated cost of this report or study for the Department of Defense is approximately \$7,490 for the 2020 Fiscal Year. This includes \$5,200 in expenses and \$2,290 in DoD labor.

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Background

House Report 116-120, page 115, accompanying H.R. 2500, the National Defense Authorization Act for Fiscal Year 2020 requests the Secretary of Defense to provide to the Committees on Armed Services of the Senate and the House of Representatives a report on the *Feasibility and Cost of Net-Zero Greenhouse Emissions and Implementing H. Res. 109, the Green New Deal*, addressing the following seven questions:

1. An assessment of the technical feasibility of the Department of Defense (DoD) achieving net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.
2. The cost of the DoD achieving net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.
3. An assessment of the effects the effort to achieve net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act would have on the requirements for major service acquisition programs.
4. An assessment of the ability of the DoD to implement the national defense strategy if required to achieve net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.
5. How the implementation of the proposed Green New Deal would affect military readiness.
6. Address the cost of closing all of the more than 800 overseas military installations.
7. How complying with the Green New Deal would affect the current threat environment and the ability of the DoD to protect the homeland.

Department of Defense Response

The Department notes that the “Green New Deal” represented by H. Res. 109 would not be substantive law but rather represents aspirational language. As such, the responses below to the Committee’s questions assume that the questions represent what would be actual statutory requirements, as opposed to a non-binding policy statement.

The Department strongly supports the goal of Executive Order (EO) 13834, *Efficient Federal Operations*, to “enhance the resilience of Federal infrastructure and operations and enable more effective accomplishment of its mission.” This EO affirms “that agencies shall meet such statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment.” By increasing the

efficiency of operations, Federal agencies cut waste, save taxpayer dollars, reduce impacts on the environment, and promote clean air, land, and water.

DoD's mission is to provide the military forces needed to deter war and protect the security of our country. To successfully execute this mission, the Department must have the energy, land, air, and water resources necessary to train and operate, today and in the future. The Department leverages technology to create new and innovative solutions to energy security and energy resilience challenges. It is important for the Department to safeguard personnel and protect the environment, all while increasing mission readiness, supporting alliances, and improving affordability.

The DoD has a worldwide footprint consisting of almost 3 million military and civilian personnel, more than 26 million acres of land, and over 603,385 facilities encompassing more than 1.3 billion square feet and valued at more than \$1,210B. Many of these facilities serve specialized, mission-critical purposes. These assets are distributed across the Components of the entire Department, and can change significantly over time in support of the Department's mission. The Department's scale and operations are unlike those of any other agency or industry, and present unique challenges which it must meet in order to ensure military superiority and national security. The majority of the Department's energy use is operational – required for training, moving, and sustaining military forces and weapons platforms for military operations – while the remainder is used for installation operations.

The Department implements energy resilience and energy security measures in support of advancing mission readiness and assurance. In one important component of its efforts, the Department utilizes performance-based contracting, such as Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs), as a means to improve energy resilience and energy security at the installation level. Since 2011, the Department has awarded over \$3.9B in ESPCs and UESCs, and in Fiscal Year 2019 alone the DoD awarded 27 contracts totaling approximately \$822M. Through a variety of measures, including ESPCs and UESCs, the Department has reduced its Energy Intensity (British thermal unit (Btu) per gross square foot (GSF)) by over 20 percent from Fiscal Years 2003 to 2019 and its Water Intensity (gallons per GSF) by over 28 percent from Fiscal Years 2007 to 2019. Additionally, six percent of the Department's electricity use was from renewable energy sources in Fiscal Year 2019.

The DoD is expending substantial time, effort, and funding to meet the direction of Congress to achieve energy security and energy resilience at DoD facilities and in its weapons systems. Given the size of the DoD and the broad mission it is directed to fulfill, it cannot realistically achieve what would be the fundamental goals, no matter how desirable, specified in H. Res. 109, without the development of new technology and massive investments, far exceeding its annual budget, in new or upgraded equipment and facilities. The technical reasons for this are discussed in more detail below. Using World War II as a comparison of mobilization costs, it

would likely require trillions of dollars for DoD, let alone the nation as a whole, to meet the goals of H. Res. 109. Also as discussed in more detail below, the actual cost to DoD, and its ability to meet these goals would depend largely on whether DoD was required to pursue these goals independently or as part of a national (and international) change in the economics of energy. For purposes of this analysis, the Department assumes that achieving "net-zero greenhouse emissions" means actually reducing greenhouse gas emissions, not engaging in substitute measures such as emissions-trading or otherwise transferring the actual responsibility for reductions to other entities.

The Department also notes that it has recently shared a number of ideas with the Armed Services Committees as to how its efforts to increase energy efficiency, energy security, and energy resilience might be enhanced with statutory changes. While none of these ideas would, alone, result in net-zero greenhouse gas emissions, the complexity of such an undertaking requires the use of all available tools.

The seven questions and the Department's responses follow:

Question 1. Provide an assessment of the technical feasibility of the DoD achieving net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.

It is not presently technically feasible for the DoD to achieve net-zero greenhouse gas emissions by 2030, assuming the measure was enacted in 2020. The National Defense Strategy (NDS) requires DoD to operate worldwide and those operations are dependent on the availability and use of energy. While DoD accounts for only a small portion of the United States total consumption of energy, DoD is still the largest single consumer of energy in the nation. Most of DoD's energy use is not related to the operation of facilities. Substituting net-zero greenhouse gas emissions sources for facilities operations alone would not approach anywhere near a net-zero emissions regime for all of DoD. DoD needs to maintain a massive logistics infrastructure to move large numbers of personnel and amounts of materiel on a continuous basis and on short notice. Modern weapons systems are energy intensive, and although DoD is continuously searching for ways to reduce its energy footprint and that of its weapons systems, existing technology does not allow the reduction necessary to achieve net-zero greenhouse gas emissions. Even if such technology were to be developed in the immediate future, the current inventory of facilities and systems could not affordably be upgraded or replaced on such short notice. DoD's most expensive weapons systems generally are kept in inventory for decades.

The DoD purchases fuels based on price and local availability. Even if DoD were to switch entirely to the use of renewable energy sources, there presently is insufficient commercial capacity to provide such fuels on a worldwide basis. This is not due to an inability to use such alternative fuels; DoD has spent considerable time and resources in testing such alternative fuels and found, on the whole, that they can perform on an equal basis with conventional fossil-based

fuels. Nor is it due to restrictive specifications; DoD purchases fuels based on performance, not source. Any fuel that meets the necessary performance specifications and availability will be able to compete for use. The problem is that DoD requires the fuels to be readily available when and where needed, and current production capability for alternative fuels simply does not support wide scale use (although they are used by DoD where available and competitively priced). Were commercial availability of alternative fuels to increase, DoD would likely make greater use of them, being a commercial user like other entities. While DoD is a relatively significant user of fuel compared to other individual entities, it is a relatively insignificant user compared to the entire commercial fuels market, and as such does not have the ability to drive the market. It would be detrimental to the readiness of the Armed Forces to shift much of DoD's funding to purchase more expensive but currently less available fuels and would make U.S. forces operating abroad substantially more vulnerable due to the reduced availability of fuels. Such a shift in fuel sources can only occur when the global commercial fuel system is ready to provide the necessary renewable fuels.

Question 2. Provide the cost of the DoD achieving net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.

DoD is not able to provide a meaningful estimate of the cost of achieving net-zero greenhouse gas emissions by 2030, assuming the measure was enacted in 2020. Some of the anticipated costs would include the following: (a) switching to the procurement of and use of electricity produced by non-emission sources, even though such sources may not be available or provide the necessary energy security and energy resilience Congress has directed DoD to achieve (e.g., 24 hours/day service); (b) conversion or replacement of equipment and weapons systems to using different fuels; and (c) remodeling hundreds of thousands of structures, many of which are listed on the National Register of Historic Places and therefore subject to substantive and procedural restrictions with regard to alteration or renovation, to reduce their energy usage or to change the type of energy used. For example, certain aircraft and ships, many of which are decades old, would require potentially extensive retrofits to reduce fuel use or switch to other fuels or simply be replaced with newer aircraft and ships at substantially higher cost. Additionally, facilities currently fueled by sources that generate greenhouse gas emissions would require conversion. DoD could hypothetically approach (but not fully achieve) a net-zero goal, but the cost would be immense. It would likely require the DoD's annual budget to double or triple in size for many years due to procurement and military construction costs.

Given the current state of commercially available resources, it is not presently technically feasible for DoD to achieve net-zero emissions within the next ten years, as there are no existing replacements for many greenhouse gas-producing energy sources. In the case of installation energy, the vast majority of those sources do not belong to DoD. In the case of fuels, DoD does not produce its own fuel. DoD is a commercial purchaser of these types of energy and purchases what is commercially available. The cost of DoD substituting itself as the producer of these

types of energy would require DoD to become an energy producer and, in the case of many facilities, would be impossible just from the perspective of available land. This is the conundrum that DoD faces: it can only approach a greenhouse gas emissions-free scenario if the general economy itself also does so. DoD cannot, for instance, risk an armored brigade in combat running out of fuel because it is only allowed to acquire net-zero fuel and none is readily available. At some point, in order to achieve net-zero emissions, DoD would have to affirmatively remove equivalent amounts of emissions from the atmosphere, such as by paying for carbon capture and sequestration. (Note: Currently, DoD does not receive credit for maintaining millions of acres of land with greenhouse gas-absorbing plants which play a crucial role in removing greenhouse gases from the atmosphere.) This is not to imply that DoD is unwilling to pursue renewable energy. The Department is constantly seeking means to reduce its energy footprint and, in the case of pursuing energy security and energy resilience on installations, obtaining the most secure energy available for its critical functions—energy produced on-post.

Unless the national economy converts to net-zero emissions energy, the DoD, which is dependent on the civilian economy for its energy supply, cannot be expected to approach such a far-reaching goal by itself. Since much of DoD's operations occur overseas, it would also require a similar conversion of other nations' economies. Were the national and global economy to make such a changeover, then the cost to DoD would be significantly reduced, although the cost to retrofit its facilities would still be substantial.

Question 3. Provide an assessment of the effects the effort to achieve net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act would have on the requirements for major service acquisition programs.

The effect on major service acquisition programs of achieving net-zero greenhouse gas emissions by 2030, assuming the measure was enacted in 2020, would actually result in a reduction in near-term expenditures because most, if not all, major service acquisition programs would be halted for reevaluation and redesign. Long-term expenditures would increase to address delays and redesigns, assuming technical redesigns were possible.

No current major acquisition program requires the system being purchased to achieve net-zero emissions. A substantial portion of a system's greenhouse gas emissions occurs during production and maintenance, not just during operation. Consequently, most, if not all, programs would have to be halted to be reconfigured to meet the new requirement. This suspension would result in near-term savings, since the programs would not be expending funds as previously planned. The length of delay in program progress would vary depending on the nature of the acquisition, some acquisitions being more energy intensive and having less flexibility in energy sources than others; but all would be delayed. A program that could not be redesigned from a technical perspective would have to be canceled. Of course, were the underlying energy sources used in weapons systems being developed in major acquisition programs to shift to net-zero

greenhouse gas emissions, then the effect on the acquisition programs would be substantially lessened, since much, but not all, of the emissions would be addressed in the commercial energy sourcing.

Question 4. Provide an assessment of the ability of the DoD to implement the national defense strategy if required to achieve net-zero greenhouse emissions by the date that is ten years after the date of the enactment of this Act.

DoD cannot implement the NDS if required to achieve net-zero greenhouse gas emissions by 2030, assuming the measure was enacted in 2020, unless it is provided massive amounts of additional funding. DoD would require substantial additional funding even if the national and global economy shifted to net-zero sources, but far less than if DoD were expected to act independently. Since it is not realistic to expect the Federal budget to be increased to the extent needed for this effort, DoD would not be able to fulfill the NDS while simultaneously pursuing net-zero greenhouse-gas emissions. As noted above, it is also not currently technically feasible to replace some greenhouse gas-emitting uses with net-zero sources. As an example, DoD would have to fund the development of a massive alternative fuels capacity using technology that has not been proven at sufficient scale. DoD has previously funded some efforts along these lines but without the desired success. If it were even possible to make nuclear power mandatory for all Navy vessels, the cost of replacing most of the Fleet would be enormous, as nuclear power is expensive to install and operate. Again, the overall cost would depend very significantly on whether DoD was acting independently or benefiting from national and global economic changes supporting net-zero energy. If the commercial supply of fuels was converted to renewable sources, for instance, then the Fleet could continue to function under its current technology.

In the case of DoD acting independently, essentially, the NDS would have to be changed to the primary goal of achieving net-zero greenhouse gas emissions.

Question 5. Describe how the implementation of the proposed Green New Deal would affect military readiness.

Because of the dislocation and costs involved in DoD achieving the Green New Deal's goals, particularly on a timeline that does not take into account the existing infrastructure and equipment inventory, it is unlikely DoD could maintain military readiness as currently understood. While difficult to quantify, large scale disruptions in energy use would directly degrade military readiness, which in many situations relies directly on energy availability.

If the entire national economy were committed to achieving net-zero emissions, it would be more feasible for DoD to at least approach that goal as well, since the civilian infrastructure would support DoD's effort.

It should be noted that the Department is striving to holistically increase energy resilience in its operations at home and abroad, which contributes to a reduced dependence on fossil fuels.

The Department is pursuing and implementing energy resilience and cybersecurity through mission driven projects to reduce its dependence on potentially unreliable fuel sources. This is most notably the case with energy resilience (and energy security). Energy resilience is best provided for by energy generation located on the installation without the need for fuel sources delivered from off-post. Because of the ubiquitous flying missions of DoD, wind generation is frequently not possible on-post, but solar generation is often a viable means of promoting energy security and energy resilience. Solar power is particularly helpful when combined with storage capacity, making it useful for 24-hour operations. Pursuing on-post energy generation combined with storage and microgrids is a major component of the DoD energy resilience program. While the technology has not been fully developed, this is an area DoD is eagerly pursuing. This also demonstrates the difficulty faced by the Department: while it knows in general where it wants to go, some parts of the needed technology are still not fully developed. DoD is perfectly capable of installing solar energy on its installations, but that solar generation is almost always simply connected to the commercial grid. If the grid is disrupted, the solar generation provides no energy security and energy resilience to the installation. Only when combined with storage and microgrids does on-installation solar generation provide the necessary and useful energy security and energy resilience. Otherwise, DoD can simply purchase solar power from the many off-installation sources with the same outcome. While solar generation is mature technology, storage and microgrids are not. DoD needs mature technology for all three legs of the stool. While the Department is aggressively pursuing these technologies through its Environmental Security Technology Certification Program, Strategic Environmental Research and Development Program, and Energy Resilience and Conservation Investment Program, they are not yet mature.

Question 6. Address the cost of closing all of the more than 800 overseas military installations.

While it is not clear that closing overseas military installations would be required if H. Res. 109's aspirations were made law, the cost of closing all military installations outside the United States would cost billions of dollars to implement. It is difficult to accurately estimate the costs involved because overseas basing is heavily dependent on agreements with host nations. In some instances, terminating basing would involve significant payments in the way of closure costs; in other cases, terminating basing would actually add to overall basing costs because the United States would have to shoulder the entire cost of domestic replacement basing currently partly funded by host nations. Such a change in basing strategy would constitute a fundamental change in the national defense strategy. The closure of all such installations would make it impossible for the United States to defend itself as it has since the end of World War II, namely forward defense and burden sharing with allies. Additionally, some installations outside of the United States are essential for ballistic missile warning and for research and development, e.g., missile defense, and their closure would have potentially catastrophic effects on the programs involved (two of the three primary ballistic missile warning stations are on foreign soil). The closure of all such installations would also make it effectively impossible to fulfill

various defense commitments to allied nations without also expending very large sums on procuring and maintaining the logistics necessary to engage in collective defense. Even with such logistics measures, their use would expose U.S. forces to added vulnerability during movement to the battle area at the outbreak of hostilities.

Question 7. Explain how complying with the Green New Deal would affect the current threat environment and the ability of the DoD to protect the homeland.

As noted in the responses above, it is highly unlikely that DoD would be able to fulfill its mission of protecting the United States if it were to comply with the goals of H. Res. 109. Even assuming sufficient funding were made available, the costs and disruption to military readiness would simply be too great over too short a period of time.