

Naval Facilities Engineering Command

The Guam Joint Military Master Plan Sustainability Program: Achieving Federal Mandates and Targets Using Sustainable Economics

Article provided through Naval Facilities Engineering Command, Pacific (NAVFAC PAC), Asset Management Business Line, Wes Ishizu, Director, Mid-Pacific Planning Division (wesley.ishizu@navy.mil), authors: Avinash Srivastava, AICP, AECOM and Deanna Weber, LEED AP, AECOM

The Guam Joint Military Master Plan (GJMMP) Sustainability Program was recently presented to the Office of Under Secretary of Defense (I & E), Assistant Secretary of the Navy (E, I & E), Headquarters Marine Corps (HQMC) and the U.S. Green Building Council (USGBC) Federal Summit 2010.

Why all the coverage? Guam's military buildup plan, with over fourteen million square feet of new construction, not only meets the federal mandates but also the greenhouse gas (GHG) targets set forth in Executive Order 13514 (Federal Leadership in Environmental, Energy and Economic Performance) in the most cost-effective way using an integrated, whole systems sustainability framework.

The Guam Joint Military Buildup

The U.S. Department of Defense (DoD), under orders from the Obama Administration, has embarked on a service-wide initiative designed to greatly improve the resource efficiency and overall sustainability of U.S. bases and installations around the world. A major starting point for the initiative is the island of Guam where the DoD is engaged in implementing the GJMMP, which will be the new home to four major

headquarters for 8,600 military and 3,500 families. Major functional areas are to be developed on the island of Guam, ranging from a new rotary wing base, training facilities, sea and air embarkation and the Main Cantonment area.

The Main Cantonment of the planned base includes approximately 1,900 separate facilities and approximately 3,500 units of family housing all designed in a walkable, contiguous campus-like setting that includes over half of the overall 3,420 acre site as open space. This development program hosts over 17,000 residents and forms the basis for the proposed GJMMP sustainability program.

Setting the Stage

To set the stage for a comprehensive sustainability program, two Smart Growth Planning Charrettes/Workshops were held in January and June of 2009 with the Joint Guam Program Office (JGPO), Naval Facilities Engineering Command, Pacific (NAVFAC PAC), Naval Facilities Engineering Command, Marianas (NAVFACMAR), U.S. Marine Corps Forces Pacific (MARFORPAC), Government of Guam (GovGuam), and the Environmental Protection Agency (EPA), as well as consultants and key stakeholders to address sustainability for the proposed Guam base. The goal setting process and the formation of guiding >>>

Sustainable Systems Integrated Model

>>> principles reflect the understanding and determination of compliance with various federal mandates, DoD, USMC policy and Department of Navy's targets and commitments to building a highly energy efficient and environmentally sustainable base. The systemic foundation for the sustainable program is the Sustainable Systems Integration Model™ (SSIM™). As a parallel process and to better understand the incremental capital costs and associated operation and maintenance (O&M) savings associated with various programs to achieve different levels of performance, numerous focus group meetings, workshops, calls, and webinars have been conducted to guide the sustainability program team on package selection and program building.

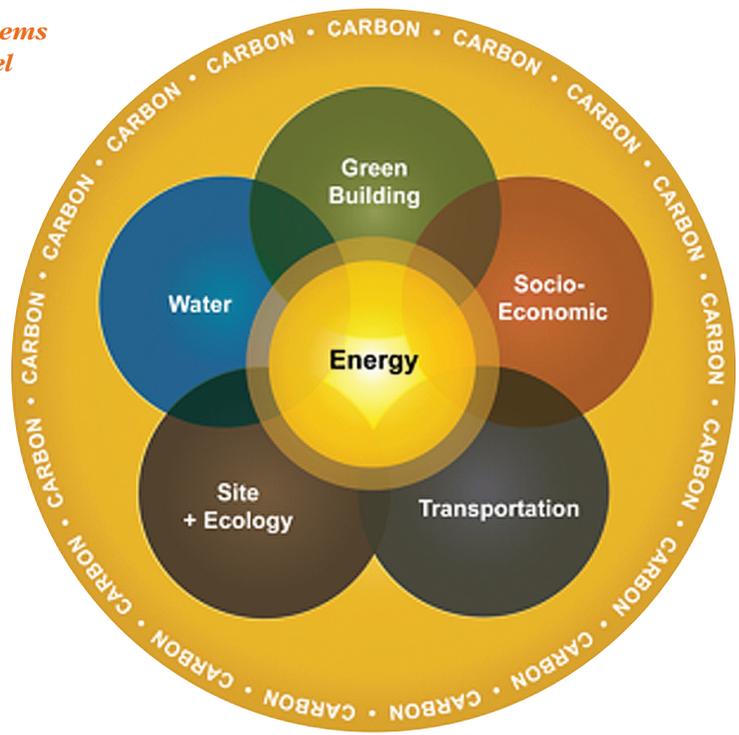
Setting the Goals

The primary goal for the Guam Sustainability program is to meet the federal mandates and targets for the least amount of cost while maximizing resource and environmental performance. "It's all about getting the biggest bang for your buck," says Wes Ishizu, Director, Mid-Pacific Planning Division, Asset Management Business Line Naval Facilities Engineering Command, Pacific. "We are leveraging each of the systems (water, energy, transportation and ecosystem services) to minimize first costs and maximize lifecycle costs," Wes explains. Another one of the key goals of the Guam JMMP Sustainability Program is to position the master plan to not only achieve a LEED (Leadership in Energy and Environmental Design) Silver rating under the federal mandates, but to go beyond LEED and by so doing

be a leader in sustainable base design and development for the 21st century.

Setting the Process in Motion

The process dictates keeping initial capital costs in check and maximizing long term savings through O&M. The sustainability framework assessment tool SSIM™, was utilized for systems of energy, water, transportation and ecology using models built on Guam specific data and assumptions relating to climate, costs and even user behavior. For example, the water model calculations are calibrated to water usage conditions in different building types using not only the number of occupants and types of fixtures, but also the typical number and duration of showers in the hot and humid climate of Guam. Similarly, building energy models are calibrated to Guam conditions including the requirement for 175 mile per hour Super Typhoon conditions. First, the models calculate a "baseline" established by the federal mandates. Then, for each system, up to three options of increasing levels of performance are developed along with their associated costs. Using an innovative process, a whole systems "gameboard" is developed that allows interactive selection of various combinations of the performance packages within each system.



Using a logic engine, an optimal sustainability program is 'solved' that meets or exceeds the federal mandate performance levels at specific cost conditions. For example, we can solve for various scenarios such as:

- Meeting LEED Silver including 30 percent energy reduction, 26 percent water use reduction, 7.5 percent renewable energy requirement and 34 percent GHG reduction from mandated baselines while minimizing first capital costs,
- Meeting all federal sustainability mandates while maximizing long term savings using life-cycle analysis, and
- Meeting all federal sustainability mandates while achieving the quickest payback period.

The Results

Results from applying this methodology to over 14 million square feet of construction resulted in six programs focusing on minimizing first costs, maximizing quickest payback period and >>>

>>> maximizing lifecycle costs. The results are still being evaluated by the Department of the Navy, but will allow for executive decision making comparing results to meet all DoD mandates and targets:

Economic Results Comparison:

- Percent additional capital costs over baseline
- Total annual O&M cost savings
- Lifecycle savings in years
- Discounted payback of additional investment

Resources and Environmental Results:

- Percent greenhouse gas emission reduction
- Percent building energy reduction
- Percent renewable energy component
- Percent water use reduction
- Percent vehicle miles traveled (VMT) reduction
- Percent fleet fuel savings

Lessons Learned

As the sustainability program was developed, a number of lessons learned through the process have been realized including the need to build consensus throughout the process. Working on the ground in Guam with energy and water managers to decision makers in Washington, DC, workshops, webinars and focus groups helped to craft the solution for Guam.

In addition, the incorporation of lifecycle costs in the military construction process requires a fundamental shift in thinking and implementation methods. This is a process that will take time to incorporate in everyday decision making. Another important finding was that merely meeting the LEED Silver facilities mandate may not necessarily meet the EO 13514's GHG reduction targets or EO 13423's (Strengthening Federal Environmental, Energy and Transportation Management) renewable energy mandates, and certain facilities may need to exceed the minimum 30 percent energy reduction targets in order to bridge the gap.

Exceeding minimum standards may also be advisable if installations are serious about the long term mandates such as 100 percent fossil fuel free energy use by 2030 (under the Energy Independence and Security Act of 2007). Finally, the need to "count the cost" of a sustainability program is essential to the success of the program. Only through a whole systems approach of tracking costs and benefits can systems be leveraged to achieve optimum results for the investments in sustainability. Ultimately, new research and data is validating the idea that sound investments in sustainability can lower the costs of ownership of installations while supporting their core missions.

Next Steps

Implementing the GJMMP

Sustainability Program will require an ongoing process throughout planning, design, construction, metering and monitoring/reporting. To ensure the proposed 14 million square feet of new construction meets LEED Silver and the various federal mandates, a thoughtful, well crafted implementation program will need to be developed and refined. To this end, sustainable solutions are merged from both vertical and horizontal construction through a combination of green planning, design and building. The components of the program include vertical design and construction elements such as building form, solar orientation, construction technologies, and building energy and water efficiency. Equally important are the horizontal planning and site works elements such as sustainable mobility, ecosystem services, and whole systems water balance planning including Low Impact Development (LID).

The lessons learned from the Guam Sustainability Program methodology can be applied to not just new construction but also sustainable retrofits. NAVFAC will be utilizing the SSIMTM on an existing base retrofit analysis with NAVFAC MIDLANT. With additional guidelines forthcoming from EO 13514, we can anticipate challenges and opportunities ahead that need to be addressed in an integrated fashion while keeping a close eye on the bottom line. Guam's success story is one of many to come in light of the new greenhouse gas targets soon to be mandates. ¶

About the authors: Avanash Srivastava is a Senior Associate Planner and GIS specialist with AECOM in Alexandria, VA. Architect of the SSIMTM Model, Avi leads the technical Guam Sustainability team for AECOM. Deanna Weber is an Associate Principal with AECOM. Deanna leads the Irvine, California office's Sustainability Studio.

Having developed greenhouse gas modeling approaches for California regulations such as AB32, she has applied this methodology to DoD facilities to meet mandates and targets. AECOM's Guam Sustainability Program Team members also include: Greg Hurst, Water Expert; Alastair MacGregor and Andrew Bickerdyke, Energy Experts; and

Xin Li, Ecosystem Services and Public Realm Energy Expert. Fehr and Peers team members include Sohrab Rashid and Nicole Hervol, Transportation Experts.) (Copyright © 2010 AECOM. Patent pending. All rights reserved. Sustainable Systems Integrated Model, SSIMTM and the SSIMTM logo are trademarks of AECOM.

