Future CCOs

People. Planet. Progress.

Case Study

Integrating Renewable Energy into the Energy Portfolio at Lockheed Martin

Samantha Baker
ACCO Future CCOs Fellow
Lockheed Martin Corporation

About the Author

I am currently serving as a fellow in the Association of Climate Change Officers' (ACCO) Future CCOs Fellowship Program. I came to Lockheed Martin Corporation (Lockheed Martin) in September 2014, to examine the business case for renewable energy procurement at both the corporate and individual site level. My work has focused on the development of a corporate level renewable energy procurement approach that aligns with Lockheed Martin's overarching energy procurement program. This has included analysis of opportunities to reduce short and long-term costs, minimize exposure to fuel or electricity price risks, and align with federal customer renewable energy requirements. This report is intended to share the process I undertook, as well as some of the outcomes of the work I've been involved with for the past year and a half. ***This report is written from my perspective as an ACCO fellow on the Lockheed Martin team.*** *Content is based on my research, experience and observations, as well as published historical accounts.*

About ACCO and the Future CCOs Post-Graduate Climate Fellowship Program

The Future Climate Change Officers Fellowship Program (Future CCOs) is designed to connect masters-level graduates with employer organizations seeking talented climate change practitioners. Centered on this professional talent pool, the program is establishing a professional track for graduates pursuing opportunities in climate change leadership.

The Association of Climate Change Officers is a 501(c)(3) non-profit membership organization for executives and officials worldwide in industry, government, academia and the non-profit community. ACCO's mission is to define, develop and support the functions, resources and communities necessary for effective organizational leadership in addressing climate-related risks and opportunities. For more information about ACCO, please visit http://www.accoonline.org.

Lockheed Martin Background

Lockheed Martin is a global security and aerospace company that employs about 126,000 people worldwide, including the acquisition of Sikorsky in November 2015. Their scientists and engineers' research, design, develop, manufacture, integrate and sustain advanced technology systems, products and services. They also provide a broad range of management, engineering, technical, scientific, logistics and information services. Lockheed Martin primarily serves United States (U.S.) and allied government institutions with charters to protect and provide essential services to billions of citizens worldwide. They also serve commercial customers in sectors such as energy, financial services and hospitality.

Lockheed Martin operates in five business segments based on the nature of the products and services offered. This workforce also supports Lockheed Martin International and Enterprise Operations. Lockheed Martin International enables integrated business strategies for customers outside the U.S. to deliver products and services for national security and citizen services. Enterprise Operations is comprised of headquarters personnel, business function personnel and enterprise-wide shared services centers.

- **Aeronautics** is engaged in the research, design, development, manufacture, integration, sustainment, support and upgrade of advanced military aircraft, including combat and air mobility aircraft, unmanned air vehicles and related technologies.
- **Information Systems & Global Solutions (IS&GS)** provides advanced technology systems and expertise, integrated information technology solutions and management services across a broad spectrum of applications for civil, defense, intelligence and other government customers.
- **Missiles and Fire Control (MFC)** provides air and missile defense systems; tactical missiles and air-to-ground precision strike weapon systems; logistics; fire control systems; mission operations support, readiness, engineering support and integration services; manned and unmanned ground vehicles; and energy management solutions.
- **Mission Systems and Training (MST**) provides design, manufacture, service and support for a variety of military and civil helicopters; ship and submarine mission and combat systems; mission systems and sensors for rotary and fixed-wing aircraft; sea and land-based missile defense systems; radar systems; the Littoral Combat Ship (LCS); simulation and training services; and unmanned systems and technologies.
- **Space Systems Company (SSC)** is engaged in the research and development, design, engineering and production of satellites, strategic and defensive missile systems and space transportation systems.

Lockheed Martin Carbon Reduction Program

Lockheed Martin has been actively working to reduce its carbon footprint in an effort to support its overall environmental stewardship effort, dubbed Go Green 2020. Currently, Go Green 2020 includes goals around carbon, energy use, waste and water reduction as well as increased recycling efforts. To meet its carbon reduction goals, Lockheed Martin has pursued efforts in energy efficiency, and renewable energy. While Lockheed Martin has pursued multiple avenues of carbon reduction, the efforts are in various stages of development by the Corporate Energy, Environment, Safety and Health (Corporate EESH) group, and are being integrated into a unified procurement program.

Go Green

In 2008, Lockheed Martin established the Go Green initiative against a 2007 baseline to track environmental performance and measure progress toward three specific target areas: 25% in absolute reductions in carbon emissions (1), water (2) and waste sent to landfills (3) by the end of 2012. Through employee initiatives, innovative projects and strong leadership support, the company was able to meet or exceed each of these goals nearly one year ahead of schedule.

In 2012, the company launched a new set of environmental stewardship goals to reduce carbon emissions by 35%, cut facility energy use by 25%, from a 2010 baseline, along with waste and water reduction goals.[1] To meet these aggressive new carbon and facility energy use targets, Lockheed Martin has focused largely on energy efficiency and building retrofit projects, that have be incredibly successful thus far. These efficiency improvements are supplemented with the purchase of Renewable Energy Credits (RECs) to achieve the aggressive Go Green 2020 goals. To further their efforts towards goal achievement, Lockheed has taken steps to examine the applicability of renewable energy for both carbon reductions and financial benefits across Lockheed Martin's operations.

Energy Efficiency

Energy efficiency, the flagship effort for carbon reduction at Lockheed Martin, has been the most developed and thus far most effective of the strategies. This is in large part due to the large impact electricity reduction has had on Lockheed Martin's carbon footprint and their affordability with carbon reductions of roughly 15,000 MTCO2e of greenhouse gas reductions and $3 million in cost avoidance in 2014 alone.[2] The energy efficiency program involved two main components, a gated capital fund and an energy efficiency process run by the Tiger Team led by the CEESH group.

The gated capital fund has provided additional capital to each of the five business areas (BA), enabling individual sites to budget for specific energy efficiency projects. Each year, business areas are given the opportunity to submit projects across their sites for consideration. Sites develop submissions of project financials, including cost and estimated savings. These submissions are then reviewed by the Gated Capital Team, some of whom are also members of the energy efficiency Tiger Team, to ensure that estimates and assumptions are fair and reasonable. Projects that provide the best payback and energy savings are then submitted to the Lockheed Martin Treasury office for final funding approval.

Renewable Energy

Unlike energy efficiency, the renewable energy procurement tactic is under development. Traditionally, each BA has been encouraged to develop their own cases for renewable energy at the site-specific level. Sites interested in exploring renewable projects, have individually explored opportunities without input from the corporate level. Business areas are encouraged to submit renewable energy projects for gated capital funding which can be a very competitive process. In the absence of an enterprise methodology and process, there has been relatively slow movement with regards to on-site procurement, however, due to a renewed focus on the benefits of using renewable power in combination with improved economics, things have started to change, as this project demonstrates.

Lockheed Martin has made a pledge to quadruple its on-site renewable generation to 10MW by the end of 2020 through the EPA Green Power Partnership On-Site Commitment. This commitment aligned with the goal to reduce carbon emissions by 35% from a 2010 baseline. Lockheed Martin is already well on its way to meeting this goal with a current on-site portfolio totaling approximately 2MW, including wind, solar and biomass technologies. In 2015, Lockheed Martin added an additional 2MW solar parking canopy in Oldsmar, Florida. In 2016, Lockheed Martin is looking forward to the installation of a 1MW ground mount solar system in Palmdale, California as well as the construction of a 250kW waste-to-energy pilot project in Owego, NY and a 2MW solar installation in Orlando, Florida.

The genesis of the current renewable energy exploration, which examined the business case for renewable energy procurement at both the corporate and individual site level, has been spurred by five motivating factors:

(1) the price of renewables were falling rapidly,
(2) it was a critical juncture for federal tax incentives[3] as well as select state incentives,
(3) there was a desire to create a long-term hedge against volatility in the energy market,
(4) an intent to support Lockheed Martin's largest customer, the Federal Government, in achieving their aggressive renewable energy goals, and
(5) a want to support the Lockheed Martin Energy Solutions line of business.

In recent years the price of renewables has fallen drastically – wind and solar industries have seen turbine and panel cost decreases of 20-40% between 2008-14 and 60% between 2011-14, respectively, plus balance of system costs have shrunk, making the overall cost of renewable energy projects cheaper than ever.[4,5] Balance of system costs include all components, other than panels or turbines, needed to successfully install a renewable energy project. These costs typically include wiring, switches, mounting systems, and inverters. The installed costs for solar projects completed in 2013 generally ranged from $\$2.6/W_{dc}$ to $\$3.5/W_{dc}$ and recent pricing was just $\$2\text{-}2.50/W_{dc}$ with prospects of another 5-10% decrease for 2016.[6] These lower costs translated to better Power Purchase Agreement (PPA) prices, and, ideally, lower electricity costs.

Similarly, it was a critical juncture for tax incentives with the step down of the Federal Investment Tax Credit from 30% to 10% on December 31, 2016, and the looming cutoff date of January 1, 2017 for the grandfathered Federal Wind Production Tax Credit. Not to mention the robust state incentives, specifically a North Carolina tax incentive. Since the team began the process to pursue renewable energy, the federal tax incentives have been extended, allowing for further opportunities to pursue viable renewable energy projects. The Production Tax Credit (PTC) has been extended for new wind projects with construction starting by December 2016. Further, those projects starting construction in 2017 will get 80% of the PTC, in 2018 will get 60%, and in 2019 will get 40%. As for the Investment Tax Credit (ITC), it will remain a 30% tax credit through 2019, before winding down to 10% over the following four years.

Ultimately, the principal driver for pursuing a renewable energy procurement tactic has been to create a long-term hedge against volatility in the energy market. Energy markets have been notoriously volatile with increasing pressure on traditional resources, natural pressures like the drought in California (which will undoubtedly affect hydro prices), and future regulation that may impact electricity generators. When it comes to creating a long-term energy hedge, the goal was to integrate the renewable energy procurement approach with the already existing brown power hedging program. Lockheed Martin worked closely with a brown power

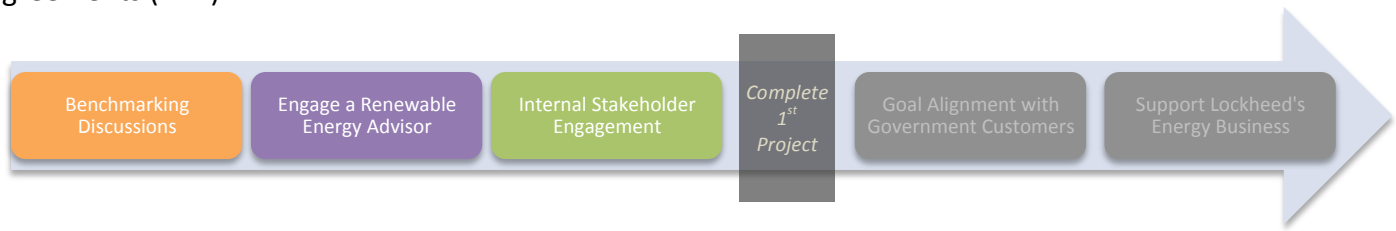
services consultant to develop a short to mid-term hedging approach to protect the energy portfolio from violent market swings. As a government contractor budget certainty is very important, and this hedging program helped Lockheed Martin to better control energy costs.

Additionally, the team aimed to help Lockheed Martin's biggest government customer, the Department of Defense, reach its very aggressive renewable energy goals. Under the National Defense Authorization Act 2007, the DOD must procure 25% renewable energy by 2025. Similarly, the newest Executive Order 13693 mandated that 25% of total energy used by the Federal government should be clean energy, both renewable and alternative, by 2025 while 30% of total electric energy should be renewable energy by 2025. In line with these requirements, each line of service, the Army, Navy, and Air Force, have all set 1 GW capacity goals, with differing time frames for achievement. Because of Lockheed Martin's government contracts, many of their sites are Government Owned Company Operated sites, which are Federal facilities, subject to Federal requirements. Therefore, our work to bring renewable energy to Lockheed Martin's facilities, could have a direct impact on the goal achievement of the Army, Navy and Air Force.

Lastly, we wanted to capitalize on opportunities to support Lockheed Martin's Energy Services line of business wherever possible. Lockheed Martin's Energy Services business has been taking a comprehensive approach to apply Lockheed Martin's technology and expertise to numerous segments of the energy market – from energy generation and management to storage and security. Lockheed Martin has provided energy management and efficiency expertise to more than 100 major commercial, federal and state customers. Lockheed Martin has assisted their customers with everything from smart grid product and services for utilities to energy management systems for individual buildings, and beyond to effectively manage resources and save money. Some of their most notable renewable energy related products include WindTracer, Tilt Axis Roll Tracker, Energy Storage, Concord Blue Waste to Energy, Ocean Thermal Energy Conversion (OTEC), Wave and Tidal Energy and the Biomass Energy product.

Renewable Energy Program Development: The Process

In an effort to demonstrate the value that renewable energy brings to the overarching energy portfolio at Lockheed Martin, we evaluated the potential for both on and off site renewable energy opportunities, spanning multiple technology types and procurement vehicles, most notably off-site power purchase agreements (PPA).



Because PPAs were a relatively new concept for Lockheed Martin, having never executed one before, we developed a multi-part plan for educating ourselves on renewable energy and developing the larger approach. Step (1) was to conduct benchmarking discussions with other companies who have shown leadership in the area of renewable energy, companies who have similar footprints, and Lockheed Martin's direct competitors. Step (2) was to engage a renewable energy advisor to help us navigate the challenges ahead. Step (3) was to begin engaging key internal stakeholders to introduce them to the concept of a renewable energy PPA. Upon completion of the first project, we would move on to Steps (4) and (5) which were to conduct goal alignment

discussions with government customers to evaluate Lockheed Martin's ability to support their renewable energy requirements and to support Lockheed Martin's energy business through on-site pilot project support, and integration of Lockheed Martin's technologies into future renewable endeavors, respectively.

Step (1): Benchmarking Discussions

When we embarked on this renewable energy exploration, we knew we needed to get a feel for the industry, and the work being done by other corporate leaders. We believed that getting a sense of the successes, struggles and lessons learned of companies would give us an upper hand as we went on to pursue Lockheed Martin's first off-site renewable energy project. Over a roughly six-month period we spoke with seventeen companies, mostly Fortune 100, ranging from highly experienced renewable energy purchasers, to those who, like ourselves, were just beginning to explore their options.

Overall, we found three overarching themes emanating from the groups and individuals we spoke with.

1. The companies that were pursuing renewable energy goals were, by-and-large, pursuing PPAs rather than on-site renewables. The general consensus was that for large corporations, it was impossible to make a dent in the brown power footprint without large scale off-site purchasing.

2. We found that most organizations felt unbundled REC purchases did not add sustainable value to their companies, especially in the absence of carbon commitments. Some companies had stated renewable goals that were spurring their efforts, and they tended to be much more advanced in their strategies than those that did not have any stated commitments.

3. We found that many of the companies were relying on a combination of in-house teams and third party energy consultants or intermediaries. We learned of the valuable role a consultant can play for those just entering the industry that may be unprepared for the highly complex process ahead.

Step (2): Engage a Renewable Energy Advisor

Once we had gathered background information through the benchmarking sessions, we felt it was time to engage an advisor to help guide us through the renewable energy PPA process. We ran a Request for Proposal (RFP) to find a consultant to help with the development of the corporate-wide renewable energy procurement tactic, both on and off-site, and, more importantly, to help with due diligence and opportunity assessment, navigating internal challenges, and ultimately the procurement and negotiation process.

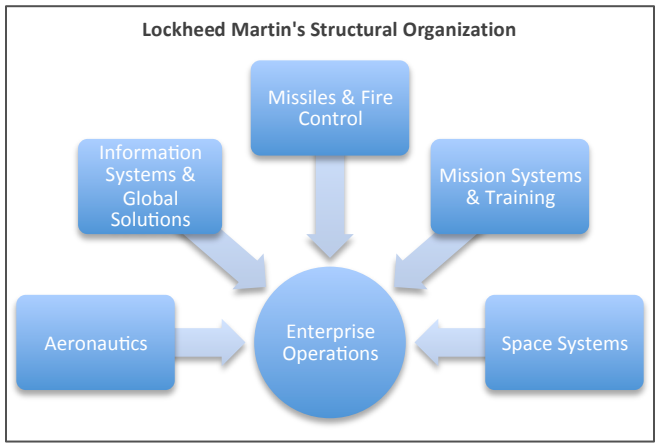
At the end of the RFP process Lockheed Martin contracted a renewable advisor to guide us over the next few months. The renewable advisor would provide the expertise needed to bring our team up to speed on the intricacies of an off-site PPA, and to introduce PPAs to Lockheed Martin's complex internal stakeholder network. We began to formulate the approach we would like to pursue. After some initial discussion, we determined the best way to demonstrate the value of renewables would be to pursue an off-site PPA pilot project. This pilot project would serve as a jumping off point for the larger renewable energy procurement approach. However, before we could begin assessing potential renewable energy opportunities, there was a lot of education and engagement that needed to happen within the corporation.

Step (3): Internal Stakeholder Engagement

The internal stakeholder briefing process was, in many respects, the most labor-intensive and challenging aspect of the renewable energy process. Much of this can be attributed to the sheer size of Lockheed Martin Corporation, while the rest was due to the complex nature of the company's structure, and status as a government contractor. After engaging the renewable advisor in May, we have briefed twenty different internal groups, all five of Lockheed Martin's business areas, and countless individuals.

Lockheed Martin is comprised of six distinct business areas:

- Enterprise Operations,
- Aeronautics,
- Information Systems & Global Solutions,
- Missiles & Fire Control,
- Mission Systems & Training, and
- Space Systems.



Each of these business areas (BAs) acts as a stand-alone business that rolls up to the larger Lockheed Martin Corporation. Therefore, each BA has its own division of all of the corporate stakeholders that would ultimately need to be briefed. Most importantly, each of these BAs has a Government Finance arm that is responsible for ensuring that all activities pursued by Lockheed Martin, or any particular BA, are in line with government Federal Acquisition Requirements (FAR). What makes it more complicated is that each BA has its own disclosure requirements, and contract structures with the federal government. This added layer of complexity is a key driver in shaping any future renewable energy projects.

Corporate EESH, the group responsible for this renewable endeavor, as well as the oversight of the Go Green 2020 program, is part of Enterprise Operations. The Corporate EESH group is responsible for driving innovations that protect employees, increase efficiencies, reduce costs and minimize environmental impacts. Corporate EESH also facilitates the Lockheed Martin Environment, Safety and Health (ESH) Leadership Council, which governs Lockheed Martin's environmental, safety and health management strategy. The group includes senior leaders from all BAs responsible for ESH and from the Corporate EESH organization, Corporate Legal and representatives from functions critical to ESH programs including Health and Wellness, Corporate Engineering, Global Supply Chain Operations, Human Resources, the Corporate Sustainability Office, Corporate Internal Audit and Government Relations.

We began our efforts to engage with the financial groups consisting of Corporate Treasury, Corporate Accounting, Corporate Tax, Government Finance, Financial Planning and Analysis, Risk Management, Capital Market, and Capital Planning. We began by introducing each of these groups to the PPA concept, and determining if their groups would need to be further involved as the exploration process continued. We prepared an introductory presentation that outlined our motivations, our plan, and asked for insight into the needs of each specific organization. Ultimately, we ended up focusing on Corporate Treasury, Corporate Accounting, and Government Finance as they had the most direct ties to the pending project and would need to be intimately involved in the procurement and contract negotiation process. We determined that the Treasurer would ultimately be responsible for signing any agreement we formulated, and Corporate Accounting would have to sign off on any and all PPA terms, while Government Finance would need to ensure that the implementation of the PPA would align with FAR, and that all expenses would be deemed allowable.

We continued our briefings with Washington Operations, the Corporate Sustainability Office, Global Supply Chain Office (GSCO) and Corporate Legal. Of these groups, GSCO and Legal would need to be involved in the renewable energy procurement and negotiations process. The Corporate Sustainability Office would play a larger role in communicating the benefits of the renewable energy pilot upon PPA signing.

Next, we engaged the Independent Cost Evaluation team (ICE), to help us in determining the value of the proposed renewable energy project to the corporation. We worked for four months with the team to provide them with any data they might need to assess the likelihood of an off-site renewable energy project bringing value to the corporation. Their assessment consisted of an overall analysis of the electricity market, a technical analysis of the benefits of renewable energy, and a financial analysis of renewable energy in comparison to brown power. There was extensive work done on the general trends in the electricity market and the risks faced by the corporation if we pursued a renewable energy project, versus remaining with a brown power exclusive portfolio. We ultimately obtained their approval, and recommendation to continue with the pilot project, and larger pursuit of a renewable energy procurement approach. With this recommendation in hand, we felt we had compelling data that supported the project, and would help garner support amongst the business areas, who were the next group of stakeholders to engage.

We began the engagement with facilities by briefing the Facilities Leadership Team (FLT) who directed us to work directly with their energy managers in PJM, the deregulated market we decided to target first, due to the presence of all but one BA. The most intensive briefing process was working with the PJM energy managers and BA representatives to bring them up to speed on the project and the many intricacies of its implementation. Part of the intricacy involved integrating the renewable energy purchase with the brown power program being executed by the consultant on Lockheed Martin's behalf. We worked to make sure that the renewable purchase would fit into the current program without causing any issues of over-hedging, or exposure to the market where it was undesired. Most importantly though, we needed to get the businesses comfortable with making a commitment of at least fifteen years. This was no easy task as all of Lockheed Martin's brown power purchases are made on a yearly basis, and there was a general aversion to any sort of commitment over two to three years. After months of in-depth, site-specific analysis, we were able to get the BAs on board with a long-term commitment as a means to further protect themselves from price volatility in the energy market in a way that yearly hedging could not accomplish, though they still expressed a preference for the shortest term possible.

Proposed Renewable Energy Approach

Through the process of pursuing the pilot renewable energy project, we worked closely with both the renewable advisor and the brown power consultant to develop an overarching approach that we ultimately presented to executive leadership for approval. We developed the following objective: Diversify Lockheed Martin's energy portfolio and hedge against future electricity price increases and volatility by taking advantage of historically-low renewable energy prices. The tactic itself was to: Hedge 25% of total Lockheed Martin's electricity load by 2020 across many geographic areas utilizing various capacities, durations of procurement, and technology types. While the overarching approach was 25%, we were open to individual sites or regions hedging more, or less, depending on their individual conditions.

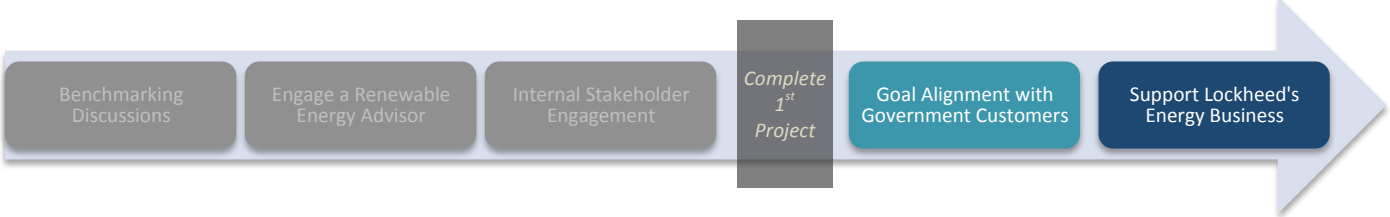
We felt that by targeting deregulated markets first, where there was the option for wholesale delivery, and existing brown power hedging, we could develop a comprehensive and diverse energy portfolio. However, the majority of Lockheed Martin's facility load was located in regulated markets, where there was not a wholesale market to participate in, or, by extension, a hedging option available to us. For these sites, we would be unable to integrate the purchase into Lockheed Martin's current electricity spending, but would instead deliver any savings from the agreement to interested sites. We were also targeting on-site renewable energy as a means to peak shave for Lockheed Martin sites with particularly high electricity costs and demand charges. Ultimately, the on-site footprint would still be a small percentage of the overall renewable portfolio due to the size of Lockheed Martin's total electricity load.

At the end of the day, we hoped that through this approach we would be able to increase the diversification of Lockheed Martin's energy portfolio, create a long-term hedge against market volatility across multiple markets, and reduce Lockheed Martin's overall electricity spend. We were also motivated by the opportunity to eventually eliminate Lockheed Martin's need to purchase unbundled RECs to meet their Go Green carbon commitments[7] as we would have a sustainable source of RECs.

Just over one year after beginning this process we finally received approval to further pursue the above proposed approach from Lockheed Martin Senior Leaders, the EESH Leadership Council, the CIO & VP of Enterprise Business Services, the Treasurer, and the CFO.

Next Steps

Now that we have achieved corporate level buy in to further pursue a renewable energy procurement tactic, though no formally stated commitment or goal, the team plans to continue exploring opportunities for on and off-site renewable energy projects. We will also pursue Steps (4) and (5) of the plan by conducting goal alignment discussions with government customers and evaluating opportunities to collaborate on projects for shared sites. We also hope to begin integrating Lockheed Martin Energy Solutions, like energy storage, waste-to-energy, biomass, and Lockheed Martin's energy services, wherever feasible.



[1] Lockheed Martin, "Energy and Environmental Stewardship," [Online]. Available: http://www.lockheedmartin.com/us/who-we-are/eesh/from-inside.html.
[2] Lockheed Martin, "The Science of Citizenship: 2014 Sustainability Report," 2014.
[3] When this project began we were facing the expiration of the grandfathered PTC and step down of the ITC at the end of 2016, since then tax incentives have been extended.
[4] R. Wiser and M. Bolinger, "2013 Wind Technologies Market Report," US Department of Energy, 2014.
[5] G. Parkinson, "Solar Costs Will Fall Another 40% In 2 Years. Here's Why.," 29 January 2015. [Online]. Available: http://cleantechnica.com/2015/01/29/solar-costs-will-fall-40-next-2-years-heres/.
[6] G. Barbose, S. Weaver and N. Darghouth, "Tracking the Sun VII: The Installed Price of Photovoltaics in the United 1 States from 1998 to 2013," Lawrence Berkeley National Lab, 2014.
[7] Approximately 180MW of solar fully achieves 35% GHG Go Green target