LOCKHEED MARTIN

Buildings and Grid Technologies

NDIA-Next Generation Energy Technologies
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Lockheed Martin Energy Business Portfolio

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RENEWABLE POWER

WAVE
Making Waves in Power

SOLAR
Advancing Next Gen Thermal Solutions

TIDAL POWER
Integrating Marine Power Vertically

BIOFUELS
Growing Alternative Solutions

OCEAN THERMAL
Sustaining Base Load Power

WASTE TO ENERGY
Powering thru Sustainable Sources

WIND OPTIMIZATION
Predicting Wind Movement Accurately

SOFUEL CELLS
Ruggedizing Military Applications

ADVANCED TECHNOLOGIES

LM Building Technologies

MicroGRID
Improving Reliability, Security, Efficiency

GREEN IT
Consolidating & Reducing e-Waste

EFFICIENCY
Reducing Cost, Carbon, Consumption

SmartGRID
Driving Consumer Choice to the Edge

NUCLEAR
Producing Secure 21st Century Controls

STORAGE
Advancing Power & Battery Systems

NANO TECHNOLOGY
Innovating at the "Greening Edge"

Sandia NL
Sandia National Laboratories

Utilizing a National Security Treasure

Leveraging Engineering Capabilities Across the Corporation to Help our Customers Meet their Energy Goals

Lockheed Martin Grid & Building Technologies

- Lockheed Martin is performing microgrid projects for Army and Air Force for applications including tactical (HI Power), expeditionary (ISBPS), fixed installations (Fort Bliss ESTCP)
- Building specific microgrid activity includes development of microgrid interface with existing building management systems in order to provide more discrete control/communication with specific loads within a building, providing more refined demand response and/or peak shaving options.

Microgrid Development Center

Lockheed Martin Grid & Building Technologies

- **Green Data Centers**
  - Data center steam systems
  - Chilled water systems
  - Air & Energy Management Control Systems
  - Data Center Lighting & Lighting Controls
  - Data center metering and other utility systems
  - IT System Consolidation
  - IT System Energy Management
  - IT Server & Storage Virtualization
  - IT Asset Discovery & Utilization Assessment
  - Data Center Design

Lockheed Martin Grid & Building Technologies

- **Standard and New Energy Conservation Measures**
  - Lighting, HVAC, Mechanical Upgrades
  - IT, Power Distribution, Smart Grid
  - Thermal Integrity, Critical Infrastructure Protection
- **Sustainability Management Systems**
  - Automated Building Management
  - Carbon Tracking
  - Supply Chain Management
- **All Major Renewable Energy Options**
  - PV, Solar Thermal, Landfill Gas, Wind, Geothermal
  - Under Government-owned or PPA
  - Optimize Attribute Treatment for your mission
- **Advanced Metering**
  - Baselines and M&V
- **Building metering, end uses, demand drivers**

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- **Cyber Operations Centers**
  - Life Cycle Security Process for Energy Industry
  - Advanced Persistent Threat Analysis
  - Controls to Address Critical Risks
  - Advanced Tools such as Cyber Attack Kill Chains
  - Collaboration on Threat & Information Sharing
  - Build of State of the Art CSOC for Energy

- **SEEsuite Smart Grid Command & Control (C2)**

SEEsuite™ SMART GRID C2	Application Focus	Competitive Advantage	Unique Value Proposition
SEEgrid™	Grid Resource Optimization	Sys-of-Sys Integration	Situational Awareness
SEEload™	Demand Response Management	Multi-Platform Integration	Next-Gen Load Control
SEEview™	Enterprise Energy Mgt.	Hardware Agnostic	Peak Load Mgt Real-Time Control

Lockheed Martin Partnerships

HOW DOES LOCKHEED MARTIN PARTNER?

- Lockheed Martin provides the best solution for our customers, whether internally or externally developed
- We pride ourselves in being technology agnostic
- We seek all forms of partnership have been successfully used (sub/prime, prime/sub, teaming, joint venture, mentor/protégé, etc…)
- We seek and develop the best of breed- small, medium and large
- We seek innovative cutting edge technologies to mature and cultivate
- We build alliances among partners to create value to the customer
- Small business are the engines for innovation
- We stage managed opportunities for small business to present, demonstrate and create in our laboratories
- Our small business partners leverage LM's balance sheet, our value chains, scale and customer intimacy

Grid & Building Technology Trends

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WHAT'S HAPPENING ACROSS THE INDUSTRY?

MARKET

- Global markets for smart grid sector remain large with estimates up to $40B
- Utility modernization is ramping up particularly large roll outs of AMI projects
- US has a total of 148M electric meters with 71M expected to be converted to AMI
- Increase interest for distributed systems (Microgrids)
- Increase focus on in-home consumer portals
- Demand for building automation, sensors, peak shaving are growing
- Demand for data is growing

TECHNOLOGY

- The intersection of EE, RE and IT are just beginning to be instantiated
- Integration efforts, and enterprise-wide solutions growing
- Technology that manages customer privacy in two-way communication

POLICY/AQUISITION

- Value propositions and benefits are getting articulated in terms of efficiency, reliability, security, quality, sustainability
- Consolidated acquisition efforts, e.g., US Army Energy Initiatives Office Task Force (EIOTF)
- Large IDIQ's are increasing (FEMP, Army Energy Division Design Build MATOC ($400-800M), Army Huntsville Renewable and Alternative Energy Power Production for Army Installations ($5B)

Barriers & Challenges to Grids & Buildings

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WHAT ARE THE HURDELS TO DEVELOPMENT AND DEPLOY THESE TECHNOLOGIES?

MARKET

- Renewable cost / grid competitiveness – integration of sustainable sources into the grid and buildings
- Sophisticated business models that balance risk and reward
- Transformation at scale

TECHNOLOGY

- Technology roadmaps that drive market transformation
- Next generation innovations in specific technologies such as solid state lighting, HVAC, envelope, working fluids and sensors/controls
- Sophisticated and elegant solutions for consumer data transfer – Still missing the “Killer App”
- Private sector collaboration in developing new technologies – CRADAs

POLICY/ACQUISITION

- Value placed on energy security (surety, survivability, sufficiency, supply, sustainability) and clean energy over and above the direct economic comparison to utility provided electricity
- Existing utility regulatory environment adds complexity to both technical and contractual solutions
- Building code compliance across all 50 states
- Clear acquisition and funding strategies for energy projects

Technology & Product Acceleration

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WHAT IS NEEDED TO ACCELERATE TECHNOLIGIES? HOW CAN GOVERNMENT HELP?

MARKET

- Create executive campaigns to capture the hearts & minds of employees /war fighter… like the Navy
- Create competitive environments among the services/agencies … like the Army's Net Zero plan
- Instill a culture change away from "Always On" to "Always Ready"
- Incent facility performance metrics and action plans to drive cost reductions
- Tie all projects to the *"Triple Bottom Line"* … ("people, planet, & profit" or "ecologic, economic, & social responsibility")

TECHNOLOGY

- Invest in smart grid technologies focused on renewables facilitation
- Ability to scale retrofits of transmission apparatus with smart grid capabilities
- Invest in advanced technologies for consumer integration into energy markets and grid operations

POLICY/ACQUISITION

- Place a value on and provide adequate budget for solutions that provide clean, secure energy
- Incentivize utilities to support their customers in meeting their energy goals – Carrot vs. Stick
- Modernize energy acquisition policy to reflect the new priorities
- Bundle "low-hanging fruit" and it will create more opportunities to finance deeper retrofits
- Commission studies to determine appropriate energy metrics and value
- Incent agencies to take advantage of the attractive financing market that exists today

CONVERSATION