

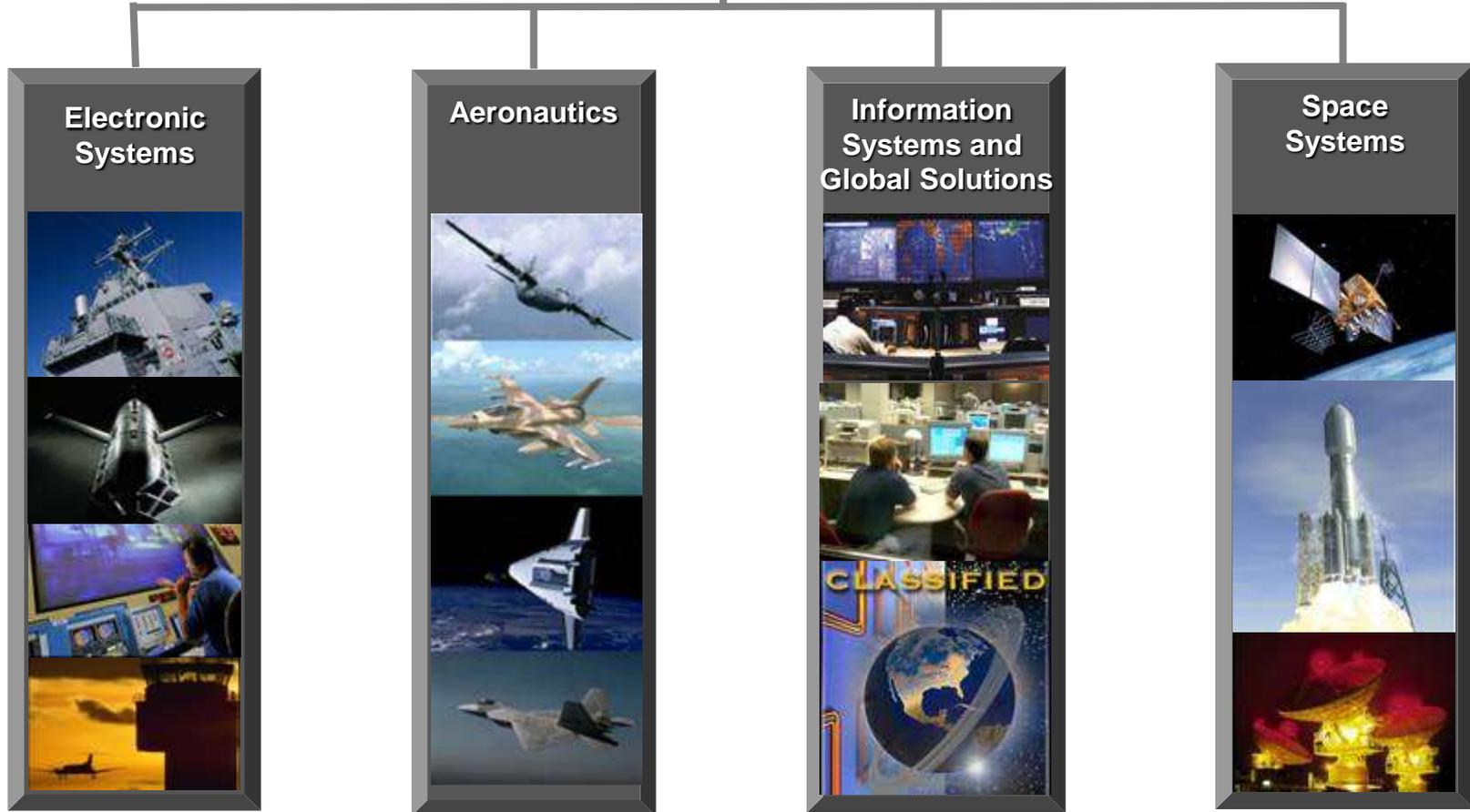
Lockheed Martin Tactical Power Systems Summary

May 2011

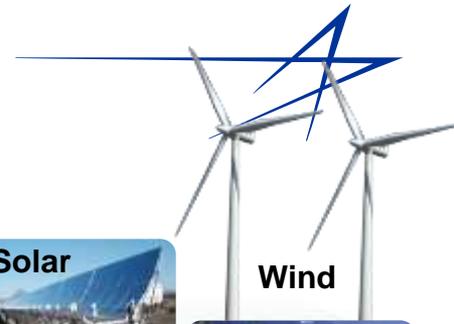


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Lockheed Martin Organization



Lockheed Martin and Energy



Efficiency/Sustainability

Commercial Energy Efficiency

Utility Efficiency Programs

FEMP

City Efficiency Programs

Alternative Generation

Wave

Ocean thermal

Solar

Wind

Storage

Nuclear

Biomass



Operational Optimization

Advanced Tools and Systems

Demand Response

SEEsuite

Microgrids

Substation

Line

Web Energy Apps

Home Energy Network (HEM)

Solar

Distributed Generation

Wind

Batteries

Fuel Cells

Distributed Storage

Thermal Storage

Controller

Bus

MicroGrid

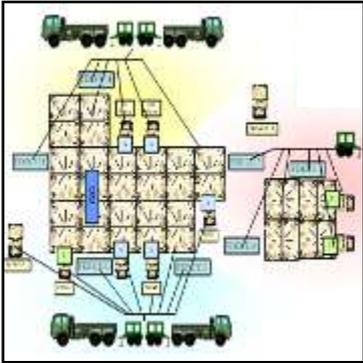
Public Utility Electric

Data

Power

PHEV

DoD Land Forces Power Issues



Inefficient Architecture



Fuel Convoys



Route Clearance



Hazardous Infrastructure



Vehicle Power System Growth

- War Fighter unnecessarily exposed to convoy and infrastructure hazards
- High O&M costs (fuel, batteries, repairs) due to inefficient use of resources
- Power gaps exist away from generators, vehicles, and wall plugs
- War Fighter burdened with weight in carrying batteries



War Fighter Burden

Challenges & Impact of Power are Significant

LM Power Generation & Management



Fuel Cells



- Ocean Thermal Energy Conversion (OTEC)
- Fuel Cells
- Microgrid
- Mobile Waste to Energy Conversion (MWEK)

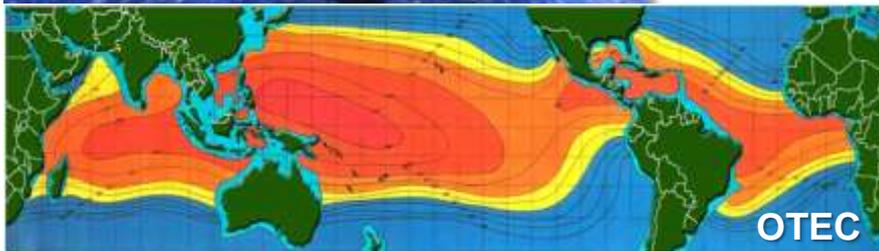
OTEC



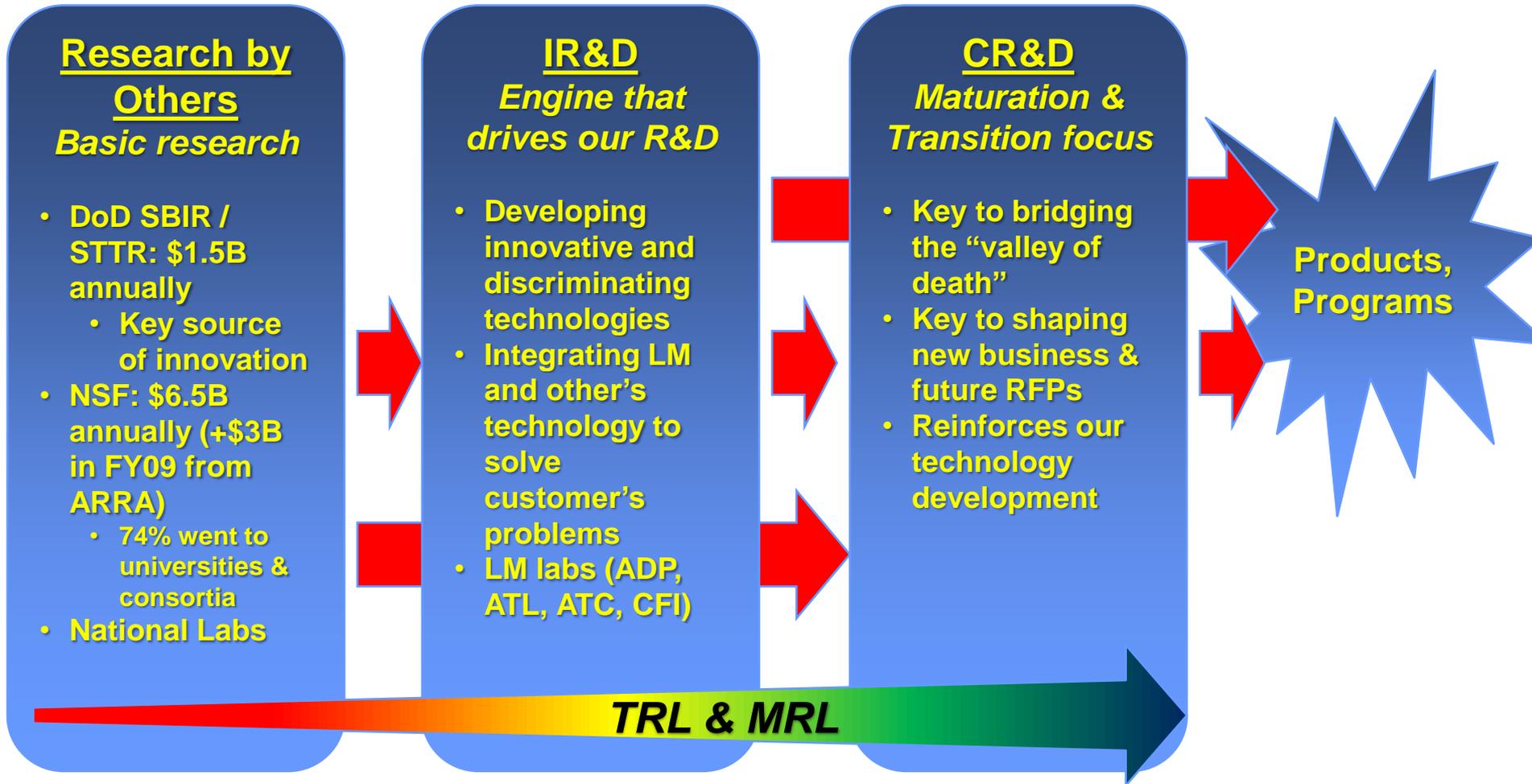
MWEK



Microgrid



LM General R & D Pipeline



Innovation is Key to the Long Term Success of LM

Microgrids R&D Pipeline



Univ, Small Business

- University (Texas A&M, UT Austin, Drexel, etc.)
- Small Business Partnerships (Ideal Power Converters, Skybuilt Power, others)



Sandia National Laboratory



IR&D

- Microgrid Architecture and algorithm IRAD
- Cohesive LM Energy Systems via MFC Microgrid Architecture
- Hardware/software in the loop intelligent Microgrid Development Center



CR&D

- Hi-Power - AC/DC Trade Study 2008
- Army CERDEC HI-Power 2009/2010 – Demo microgrid for Army TOC/FOB
- Air Force Integrated Smart BEAR Power Systems 2010
- ESTCP Ft. Bliss microgrid demo



DoD Tactical /Installation Microgrids, Global Commercial Microgrids

Leveraging University and Small Businesses to Fill Key Gaps

Partnership with Lockheed Martin



- **Mechanisms**

- Direct Research and Development Contracts (IRAD)
- Subcontracts from Customer Research and Development (CRAD)
- Subcontracts from Programs
- Small Business Innovation Research (SBIR)
- Direct Response to Broad Area Announcements (BAA)
- University Research Contract
- Mentor-Protégé

- **Hot Topics**

- Intellectual Property
- Publications



LM Vision and Values



**Powered by Innovation, Guided
by Integrity, We Help Our
Customers Achieve Their Most
Challenging Goals**

- Do What's Right**
- Respect Others**
- Perform With Excellence**

