

**LOCKHEED MARTIN**



# **GRIDSTAR™**

## **ENERGY STORAGE**

**Introduction**

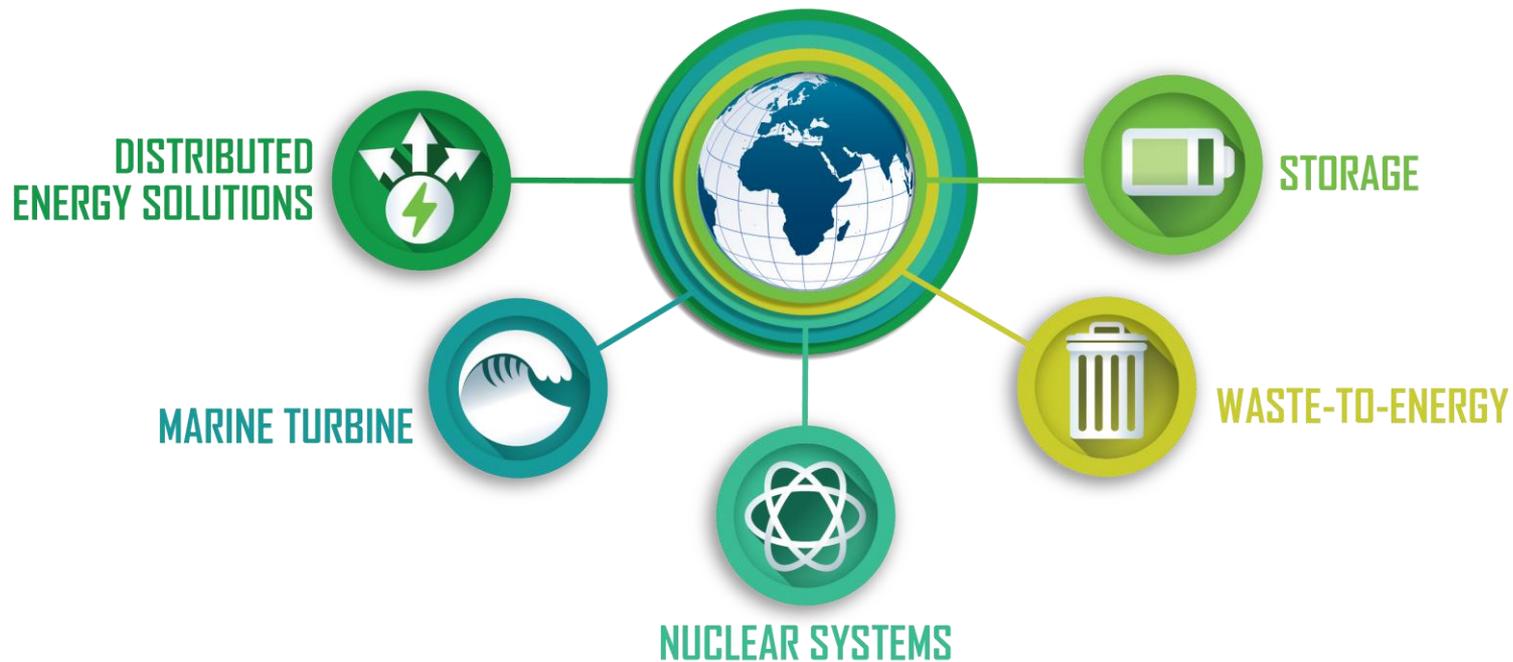
Energy Planning for Resilient Military Installations Workshop

**December 2017**



WE'RE ENGINEERING A BETTER TOMORROW™

## LOCKHEED MARTIN ENERGY



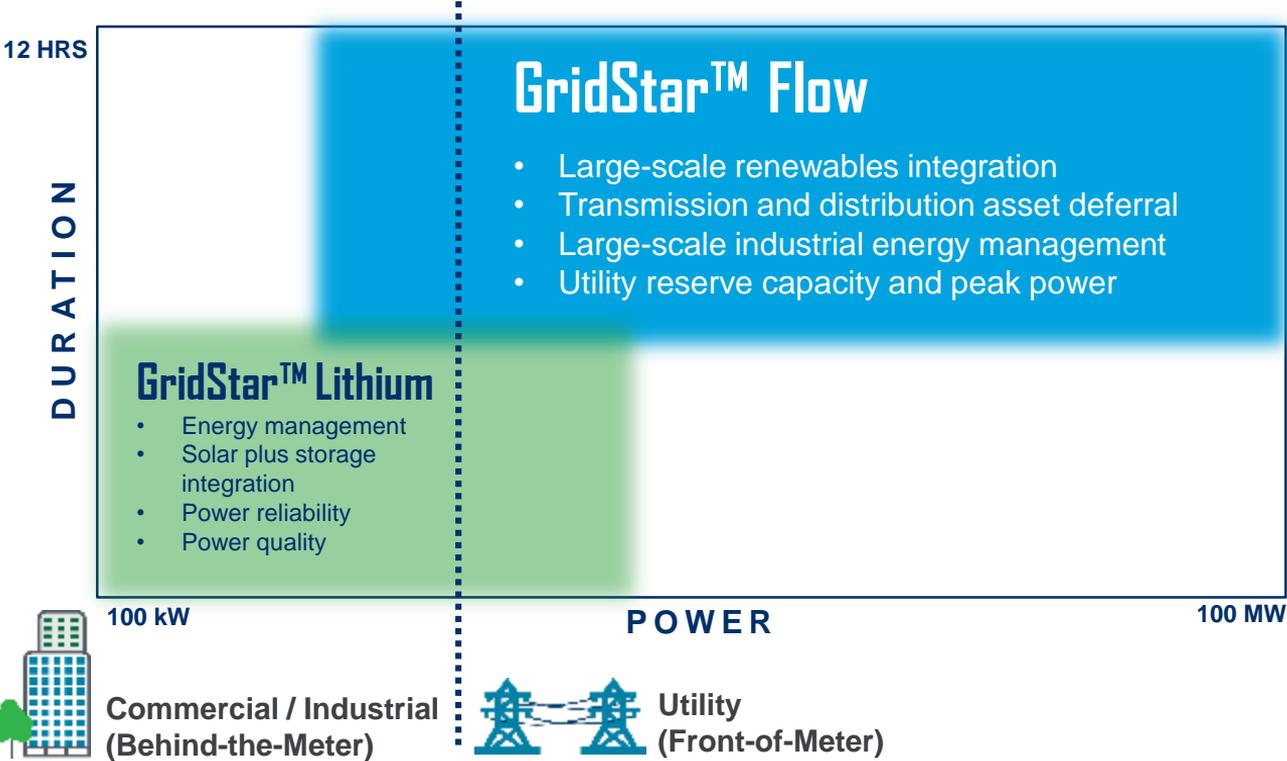


# LOCKHEED MARTIN GRIDSTAR™ ENERGY STORAGE

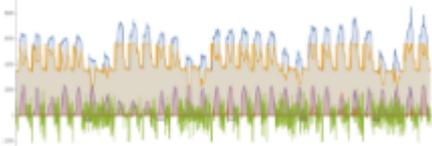
Turnkey energy storage systems  
for commercial, industrial, and  
utility applications.

Enabling a more efficient, secure  
and sustainable electricity grid.

# LOCKHEED MARTIN GRIDSTAR™ ENERGY STORAGE



# TURNKEY ENERGY STORAGE SOLUTIONS



EVALUATION, ANALYTICS & DESIGN



CONFIGURATION & LAYOUT



GRIDSTAR™ ENERGY STORAGE



GRIDSTAR™ SITE CONTROLLER



MAINTENANCE



WARRANTY



## IT'S ALL IN THE BOX.

- Batteries. Power conversion. AC/DC protection. Thermal Management. Controls.
- Up to 500 kW<sub>AC</sub> and up to 950 kWh<sub>AC</sub>.
- 30 power and energy combinations.
- Outdoor rated design. UL certified.
- Lockheed Martin warranty and long term maintenance options.



## GRIDSTAR™ FLOW SYSTEMS

Pioneering long-duration flow battery for utility-scale projects.

Flexible. Durable. Affordable.

Proprietary battery with metal ligand coordination compound chemistry.

# ADVANTAGES OF GRIDSTAR™ FLOW



## Long Duration

- 6 to >12 hours duration

## Durable

- Able to do multiple daily deep-discharge cycles
- Long useful life

## Flexible

- Freedom to operate in future differently than originally planned
- Energy and power can be sized independently
- Can add additional energy in future, as required.

## Cost Competitive

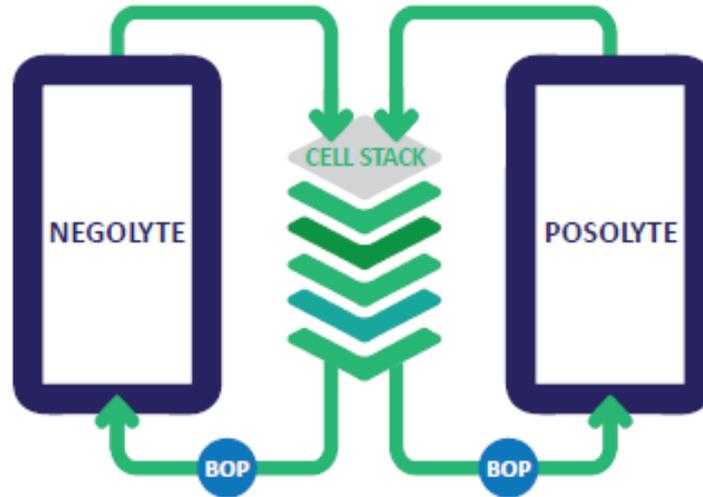
- Low total cost of ownership

## Safe

- Designed for system-level safety and siteability
- Non-flammable battery chemistry

## Lockheed Martin Warranty

# ANATOMY OF A FLOW BATTERY



## CELL STACK:

- Membranes
- Electrodes
- Bipolar plates

## ACTIVE MATERIALS:

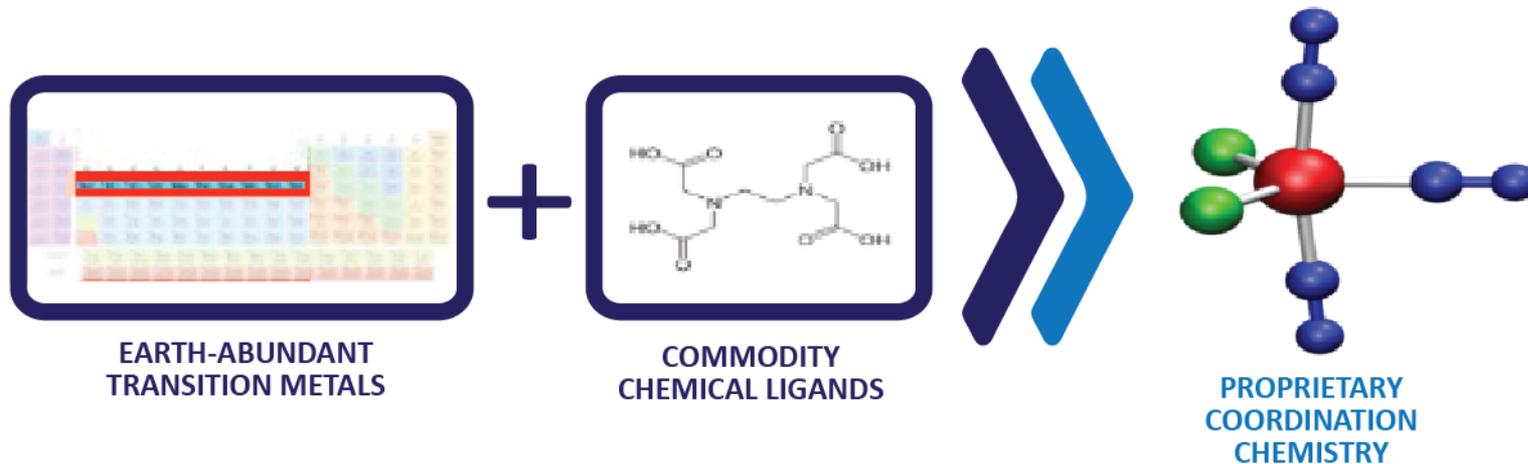
- Redox-active compounds (Posolyte, Negolyte)

## BALANCE OF PLANT (BOP):

- Pumps, tanks, piping
- Control & power conversion hardware

Flow batteries decouple power and energy, lowering marginal cost of multi-hour storage.

# NEW FLOW BATTERY PLATFORM TECHNOLOGY



We have developed our proprietary GridStar™ Flow technology to optimize battery performance and affordability.

# GRIDSTAR™ FLOW: 1MW|6MWh



# LOCKHEED MARTIN ENERGY STORAGE DEVELOPMENT NETWORK



Located in Massachusetts, Texas, and California



# PROJECT EXAMPLE: COMMERCIAL/INDUSTRIAL



## LOCATION

Syracuse, New York

Manufacturing facility  
with 5MW of peak load

## APPLICATION

Demand charge reduction  
& ancillary services

## SYSTEM SIZE

1MW, 1.4MWh

## CUSTOMER BENEFITS

- Reduced electricity costs from capacity charges
- Revenue from services to the New York Independent System Operator (NY ISO) to maintain grid reliability



**Project provides both behind-the-meter demand charge reduction and ancillary services.**

# SYRACUSE, NY: VALUE STREAMS STACKING DEMAND MANAGEMENT+ANCILLARY SERVICES

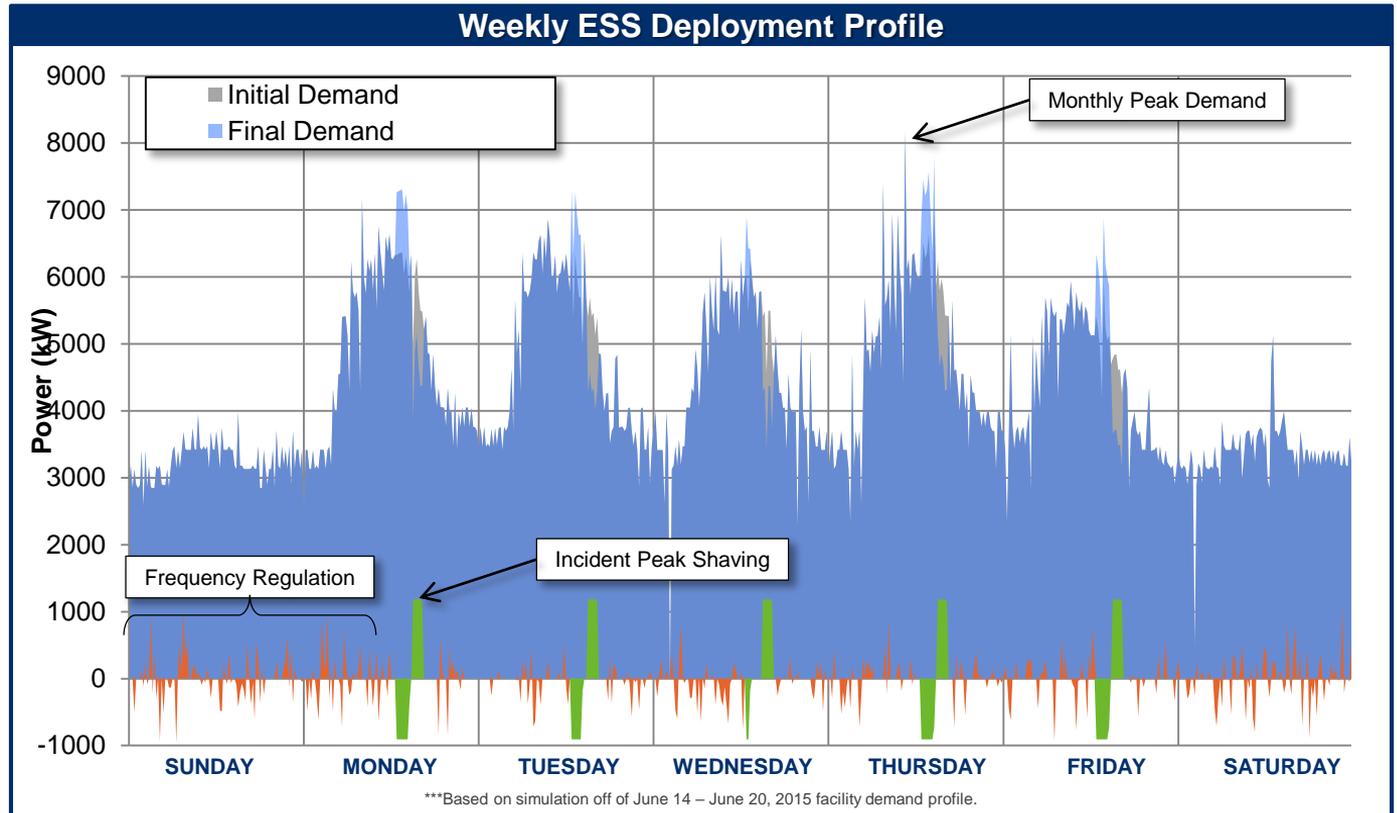


## VALUE STREAMS

- Unforced Capacity Charge Reduction
- NYISO Frequency Regulation

## DEPLOYMENT STRATEGY

- Reduce facility demand during historic incident peak window (~3-5pm, weekdays, June–Sept.)
- Participate in NYISO frequency regulation market when the system is not needed for incident peak shaving





CONTACT US

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WARNING  
HIGH VOLTAGE  
KEEP OUT