Energy Security ESPC at JBSA

- *Energy Efficiency*
- *Onsite Generation*
- *Storage*
- *Microgrid Controls*

JBSA ESPC Background

- Awarded in September 2018, $133.5M
- Project Development – ECMs:
  - 150,000 new LED luminaries with exterior lighting control and centralized monitoring
  - ~15 MW of Solar PV
  - Over 2,000,000 gallons of thermal energy storage for load shifting
  - DDC controls upgrades and advanced sequencing in over 285 buildings
  - 4 MW / 8 MWh Battery Energy Storage with 4 MW of gas fired generation for critical load support
  - 585 kW of Combined Heat and Power (CHP) at Critical Loads

Microgrid Benefits

- Leverage the ESPC contract vehicle to provide comprehensive mission support with enhanced resiliency and energy security measures
  - Provide reliable, resilient power to critical facilities and backup power to nearly half of the base loads
  - Distributed Generation assets operating in conjunction with a microgrid for indefinite mission support in the event of a LoU
  - Island from commercial power grid during periods of interruption
  - Increase use of renewable energy (EPACT 05; EISA ‘07) with battery and generation backup capabilities

Distributed Generation Architecture

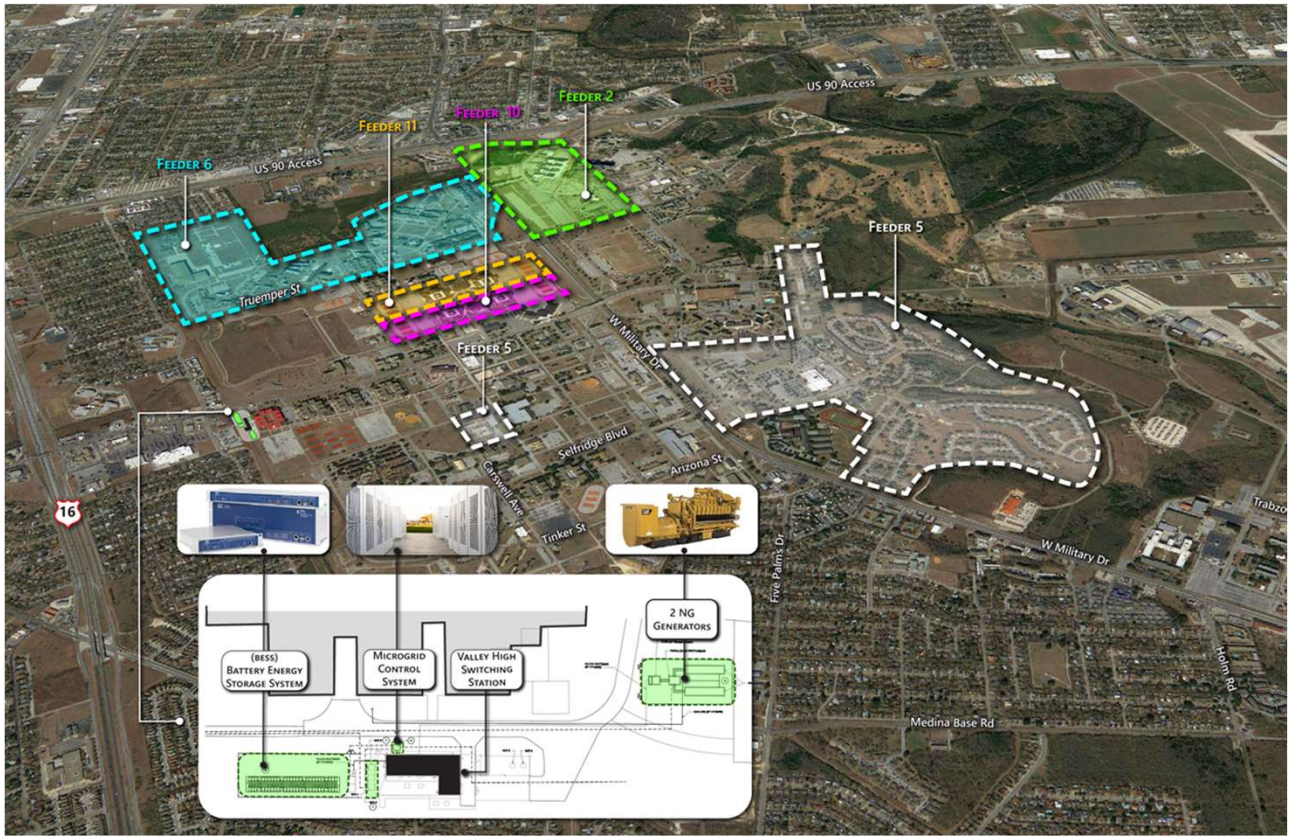
- A dedicated network facilities seamless transition to critical facility loads during a LoU via a dedicated controls network

  - Solar PV
  - Battery Energy Storage (BESS)
  - 4MW-8MWH Lithium Ion
  - (2) 2MW Gas reciprocating engine generators
  - Resulting in resilient and seamless transition during a critical event – that can maintain operation of critical load indefinitely

Power Flow Study

- Load Flow Study:
  - Current configuration - validated cable sizing, breaker sizing, switchgear ratings
  - Proposed configuration – validated DG insertion points capable of accommodating new equipment (Normal, Islanding)
- Short Circuit Analysis:
  - Current & proposed configurations – evaluated short circuit ratings of equipment
- Coordination Study:
  - Current configuration – validation of protection scheme
  - Current Issues – 15 mis-coordinated fuses, for immediate corrective action
- Transient Analysis:
  - Evaluated DG interaction/behavior with MV system
  - Islanding & fast load shed sequencing
  - Key outcome – development of criteria for inverters of BESS & PV
  - BESS and NG Generation are essential for stability

Microgrid Coverage



Operational Intent of the MCS

- Normal Mode
  - MCS to monitor loads
  - DG to reduce peak loads
  - Future: Demand Response from Utility (Natural Gas Generators)
- Islanding Mode
  - MCS to determine Loss of Utility and takes system control and fast load shed
  - BESS to provide ride through power – No blackstart
  - BESS to provide stability and frequency control
  - PV to provide power during peak periods
  - Natural Gas Generators to provide baseload capacity and additional stability
  - MCS to monitor loads and additional load shed to match load to generation

Summary

- Energy resiliency microgrids can be delivered through 3rd party financed projects
- State of the art technologies (MCS, PV, BESS, Microturbines) are driving down costs and increasing performance
- On-base, distributed generation can be incrementally matched to critical facility loads and island from the grid during outages
- DG peak shaving capability can save significant utility dollars
- Up-front planning will optimize execution costs and performance
- DoD, USAF energy resiliency project scoring may provide more resources
- **Microgrids = Resiliency = Mission Assurance!**