MCAS Miramar Overview

- Miramar has been a Navy or Marine Corps Air Station since 1940
- Aircraft
  - On average 200 aircraft are assigned to Miramar—Roughly 100 Fixed Wing and 100 Rotor Wing and Tilt Rotor
  - 65 to 95 thousand flight operations per year
- People
  - About 9,300 Marines and Sailors are assigned to Miramar
  - 1,800 or 20% Marines and Sailors are deployed at any given time
  - Approximately 1,700 civilians work on Miramar
  - Approximately 17,000 dependents of Miramar service members attend schools in San Diego
- On Base Housing
  - 524 homes
  - 3,832 bachelor quarters
- Approximately 23,000 acres
MCAS Miramar Overview

- Mainside
  - Majority of base facilities
  - Airfield

- East Miramar
  - Approach Corridor
  - Training
  - Rifle and Pistol Range
  - Helo and Convoy Ops
  - Sheriff's Department
  - Storage
  - Camp Elliot
  - Ordnance

- Landfill
  - City of San Diego landfill
  - Compatible land use
  - Unimpeded airspace

- Total acreage: 23,065 Acres
- 14,502 Acres
- 8,563 Acres
Landfill Power

- Grid Electric
- Natural Gas
- Renewable

Total Energy Consumed (MBTU)

- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2020

May 2, 2019
Slide 3
Installation Level Microgrid
- Energy Security Microgrid for Critical Facilities
- FY2014 ECIP Project
- Awarded in May for $20M
- Projected Completion 2019
- Integration of Landfill Gas and PV renewables to a central natural gas and diesel power plant
- Energy Storage (CEC EPIC Grant)
- Large Scale HVAC Demand Response (CEC EPIC Grant)

Building Level Microgrid
- Zinc Bromide Flow Battery Installation for Islanding and Backup Power
- FY2012 ESTCP Project
- Cost ~$3M
- Demonstrated June 2016
- 100% Renewable Island with only PV and battery storage
- Future Vehicle to Grid and Stationary Battery Demo (CEC Project)
Project Description

- Install diesel (4 MW) and natural gas (3 MW) generation with the ability to power 100% of the flight line and support facilities (100+ facilities = 4 – 7 MW).
- Incorporate existing onsite landfill power generation (3.2 MW) and existing PV generation (1.3 MW) into microgrid islanding as much as feasible.
- Enable generation to participate in demand response during grid connection.
- Build “Energy & Water Operations Center”
- Cyber Security accreditation through Risk Management Framework
- Grid Scale Energy Storage (CEC EPIC Grant)
- Base-wide HVAC Demand Response (CEC EPIC Grant)

Project Details

- FY2014 ECIP Project
  - Programmed Cost: $18M
  - Awarded in May 2016 for $20M
  - Projected Completion: 2019
- 2018 California Energy Commission Grant
  - Awarded $5M to UCSD in 2018
  - Project Completion: 2022

Project Goals

1) Energy Resilience (Back-up Power)
2) Maximize Renewable Integration
3) Cost Savings/Grid Support
Energy & Water Operations Center

- **Project Development/Energy Auditing**
- **Technology/Equipment Testing**
- **“Calsense” Smart Irrigation System**
- **Installation Utilities & Energy Management**
- **Advanced Metering Infrastructure**
- **Area Wide Energy Management System (HVAC Controls)**
- **Installation Microgrid Controller & SCADA Station**
- **Tenant Training/Behavioral Awareness/Outreach**
Energy & Water Operations Center
Microgrid Power Plant

**Generation**
- Two 1400 KW BACT Natural Gas Reciprocating Engines
  - Prime permitted for 8760 hours per year
- Two Tier 4 Certified 1825KW Diesel Reciprocating Engines
  - Prime permitted for 2000 hours per year
- Total Generation = 6.45 MW
- Building contains Microgrid Server
- 5 position switch will be available path for new BESS and conduit already designed
Landfill Gas Power Reliability

Landfill Power  Installation Load from SDG&E
**Microgrid Modes of Operation**

**Normal Mode**
- Grid connected, landfill power production, SDG&E providing power
- Power plant online and available (no automatic dispatch), running monitoring, forecasting and optimization tools – creating “lost opportunity report”

**Economic Mode**
- Grid connected, landfill power production, SDG&E providing power
- Power plant available for automatic dispatch of generation assets, based on economic algorithms in various opportunity categories
  - Peak Optimization – system will keep track of each billing cycle with SDG&E and dispatch allocated generation in order to avoid the peak each month. Once peak has been avoided with new peak is created and generation will not dispatch unless necessary to avoid new peak (will not run if it does not have to)
  - Landfill Gas Back Up – allocated generation supports landfill power plant
  - Energy Optimization – allocated generation will run if the price of production is cheaper than price from WAPA/SDG&E
  - Demand Response – On notification from SDGE, battery storage will be used to participate in SDG&E DR programs; currently a CPUC rule prohibits use generators in these programs despite having prime permits
Microgrid Modes of Operation, Cont’d

Test Mode

Æ Half of the base remains grid connected, other half is powered in island mode with the power plant, landfill and other onsite generation
Æ Purpose is to “practice” and exercise the system for islanding to ensure that when called upon in an emergency that the system will function as designed
Æ Tests expected 1-2 times per year in conjunction with other operational readiness drills/activities for mission assurance
  • Reference DODI 4170.11, Energy Resilience (2) (b) 4. “DoD Components shall conduct full scale and routine testing…”

Island Mode

Æ “Blackout” SDG&E grid outage,
Æ Microgrid will use Power Plant to black start the critical loops at Miramar to create the microgrid island
Æ Microgrid will utilize as much renewable as possible while maintaining power quality
**California Energy Commission EPIC Grant**

**Addition of 3 MW Battery Energy Storage System**
- Displacing diesel generators as the primary source of backup power for the LFG
- Reducing demand charges when SDG&E is utilized as backup power for the LFG
- Allowing for increased renewable penetration in microgrid
- Improving power reliability and quality to allow 3.2 MW of LFG to be integrated into the DoD-funded microgrid when operating in islanded mode

**Enhanced Demand Response from Basewide HVAC Controls**
- Up to 1.6 MW of controllable building load
- Priority customization of over 80 connected bldgs.
- 3 available load shed levels
  - Thermostat adjustment
  - Compressor shut down
  - Complete Shutdown
CEC EPIC Grant will enable MCAS Miramar microgrid to utilize energy storage to back up landfill power, when traditionally we would have had to use Diesel fuel.
Microgrids

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Building Level Microgrid Overview

- Existing 200 kW Carport PV system – firmware upgrades for control
- New 250 kW / 1 MWh ZnBr Flow Battery
- New microgrid system to control DERs and island Public Works building
- No fossil fuel generation – 100% renewable
- ESTEP Project – Integrate HVAC controls into microgrid, public display, and cyber security evaluation
Completed Project
Island Results with Demand Limiting

- Max Building Load 104KW
- Average Building Load 77KW
- Max PV Penetration 81.5%
- Average PV Penetration 72%
- DLR Level 2
- Activated DLR Level 2
- DLR Disabled
- Auto Curtailment Active
- Initial Load Pick up
- Battery Power - Average 17KW
- Cooling Load After Load Shed
- End of Islanding Event

Key Graphs:
- Building 6311 Load
- PV Generation
- Rooftop Inverter KW
- ESS Power
- Grid Power
- PV Penetration
- Cooling Loads

Time
Awards

2016 ESTCP Project of the Year for Energy and Water

2017 Project Award
Building Microgrid Demonstration Phase 2