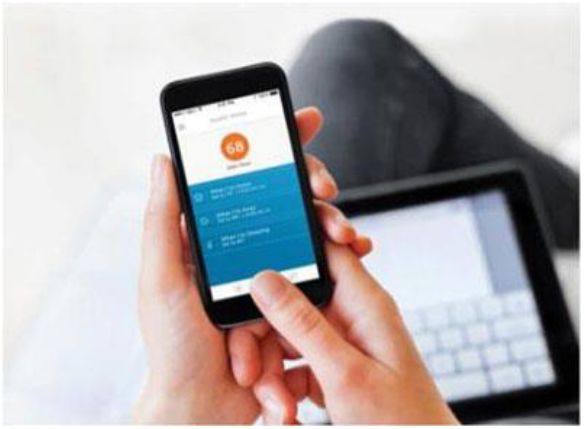


Dave Robinson
October 31, 2018

2018 IDEA MICROGRID CONFERENCE

FDA Federal Research Center at White Oak Tour

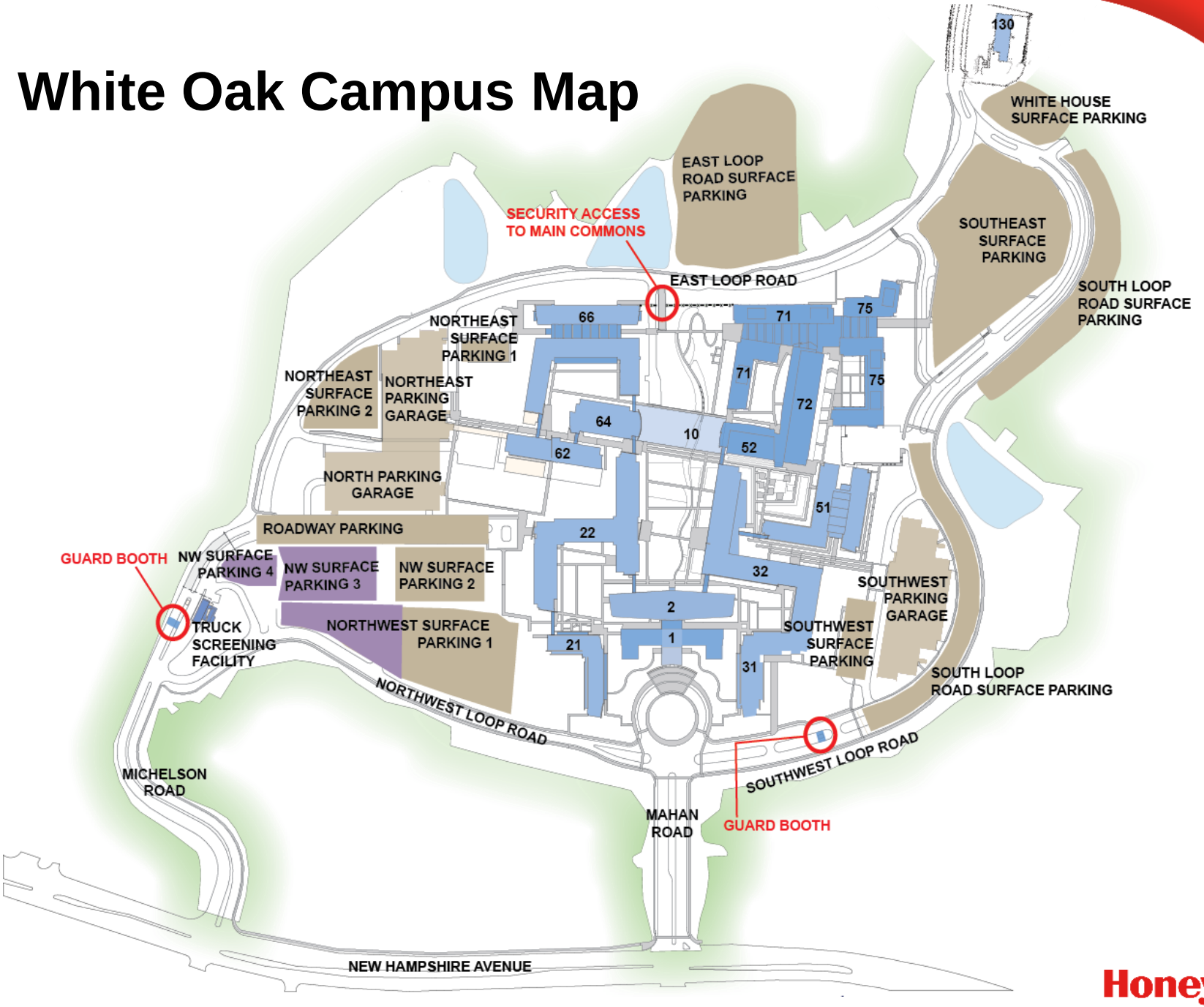
Honeywell

Agenda

- Geographic/ facility overview
- Project Overview
- Technology Overview
  - CUP1
  - CUP2
  - EGEN
- Resiliency Initiatives
- Questions

White Oak Aerial View

White Oak Campus Map



White Oak Challenge

Mission:

- Campus integrates FDA's functions to increase scientific synergy and collaboration.
- Protect consumers from unsafe products, address threats before they arise, and help deliver safer foods and safer, more effective medical therapies.

Needs:

- Energy security - supply
- Energy surety - reliability
- Energy efficiency, renewables mandates
- Ability to expand as campus expands

Requires an islanded microgrid to meet GSA/FDA requirements

Challenges:

- Budget constraints (New construction ESPC)
- Ability to balance sometimes conflicting needs
- Aging utility infrastructure

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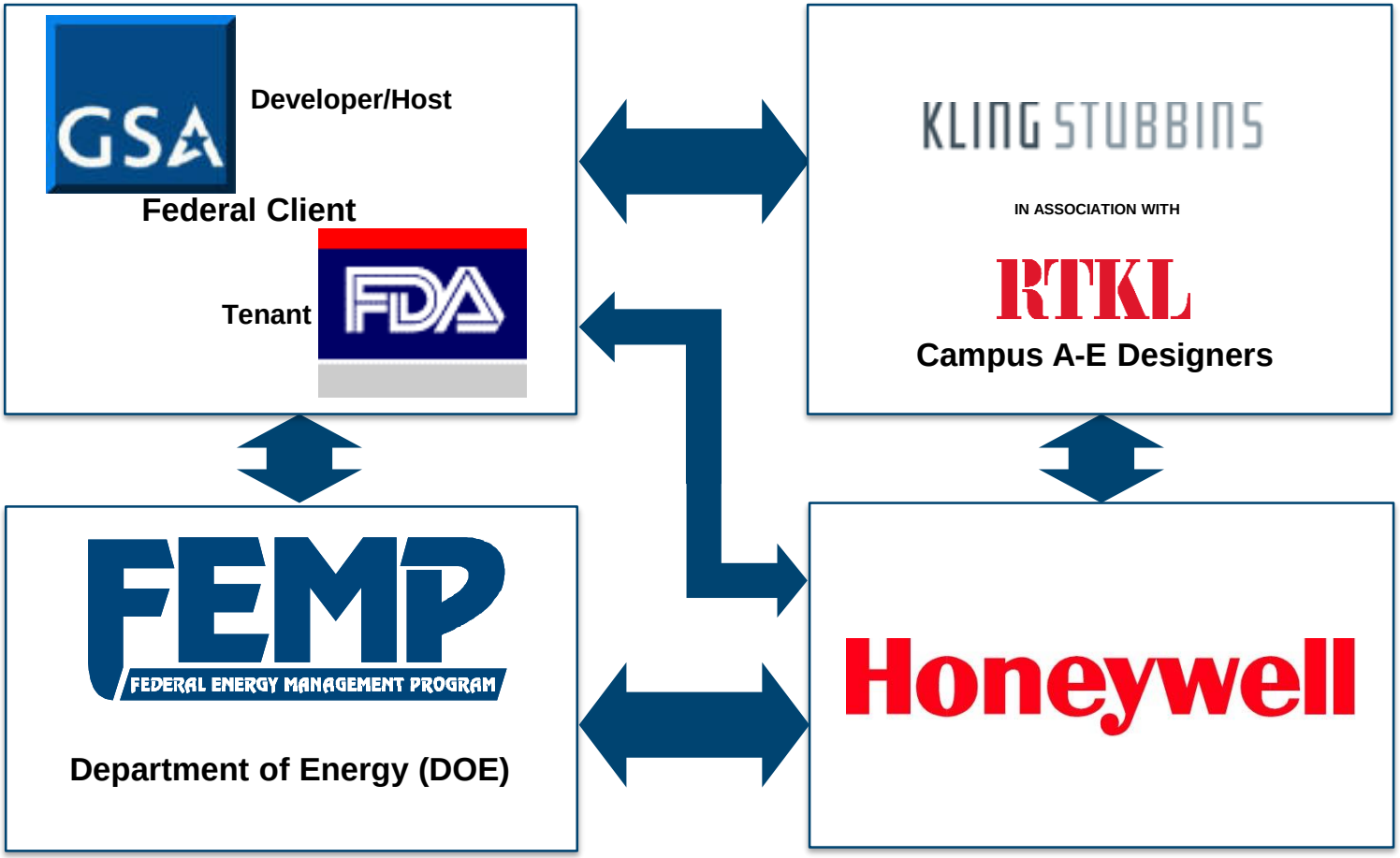
White Oak: Major Stakeholders



Close-up aerial view

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Central Utility Plant 1

- 27,000 SF
- Electrical Generation – 25.8 MW
  - One - 2.0 MW black-start generator (diesel)
  - One - 5.8 MW reciprocating engine (dual fuel)
  - Four - 4.5 MW turbine-generators (NG only)
- Chilled Water – 10,460 tons
  - Two - 1,100 tons absorbers
  - Two - 1,130 tons, three - 2,000 tons centrifugals
- Hot Water
  - Three – 10 MMBtu/Hr (dual fuel)
- PV: 25 kW fixed, 5 kW tracking


045-4212


045-4212

Master Plan	Square Footage	Campus Population
1997	2,100,000	6,000
2006	3,200,000	7,500

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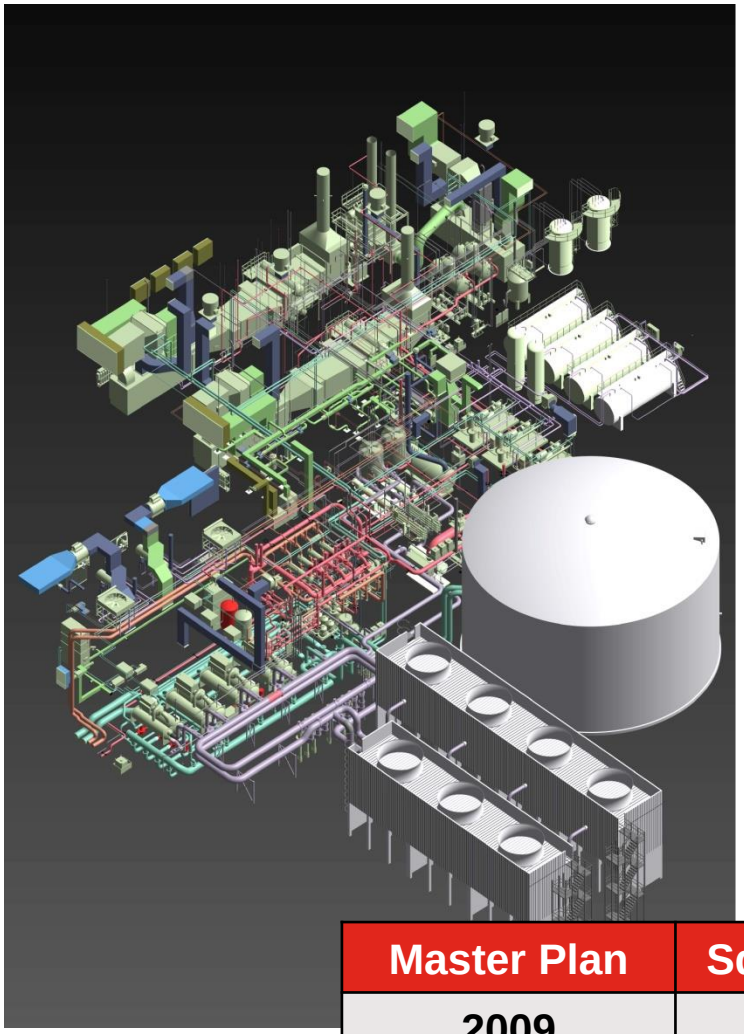
Central Utility Plant 1

Central Utility Plant 2



- 50,000 SF (LEED Silver)
- Electrical Generation – 29 MW
  - Two - 2.25 MW black-start generators (diesel)
  - Two - 7.5 MW turbine-generators (dual)
  - One - 4.5 MW turbine-generator (NG only)
  - One - 5.0 MW steam turbine
- Chilled water - 7,500 tons
  - Three - 2,500-ton centrifugals
- 2MM gallon chilled water storage tank
- Steam
  - One 25 KPPH dual-fuel Steam Boiler
  - Two (fired) HRSGs (on 7.5 MW turbines)
  - 112 MMBTUH heating HW converters

Master Plan	Square Footage	Campus Population
2009	3,900,000	9,000

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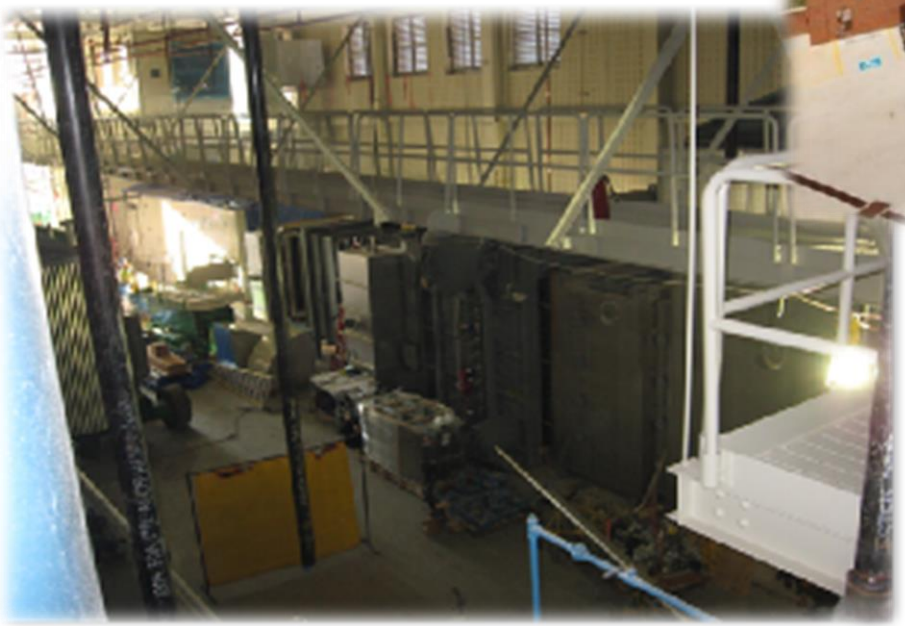
ESPC III – Major Physical Features (CUP 2)



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Emergency generation (EGEN) system

- Redundant system to serve select facilities in the event of primary system failure (power generation, distribution)
  - Would only operate in island mode, not paralleled to utility (NOT seamless) – transfer switches
- Remotely located power plant with five (5) 2.5 MW SDGs, individual weatherproof enclosures, 72 hours of diesel fuel storage
- Dedicated 15 kV feeder to critical building switchgear
  - SDGs start within 10 seconds
  - Switchgear at each building switches to EGEN feeder

Optimization: Key to successful partnership

Initial Strategy

Near continuous operation of engine-generator

Current Operations

Real-time “make or buy” decision based upon cost of natural gas, electric tariff, campus loads vs. CHP system efficiencies, spinning reserve

Additional Value:

- Over-produce on ‘gold’ days for PJM ISO
- Automatic load shed scheme
- Dual-fuel generation assets

Honeywell, GSA and FDA work together to operate the facility in the best interest of the Government.

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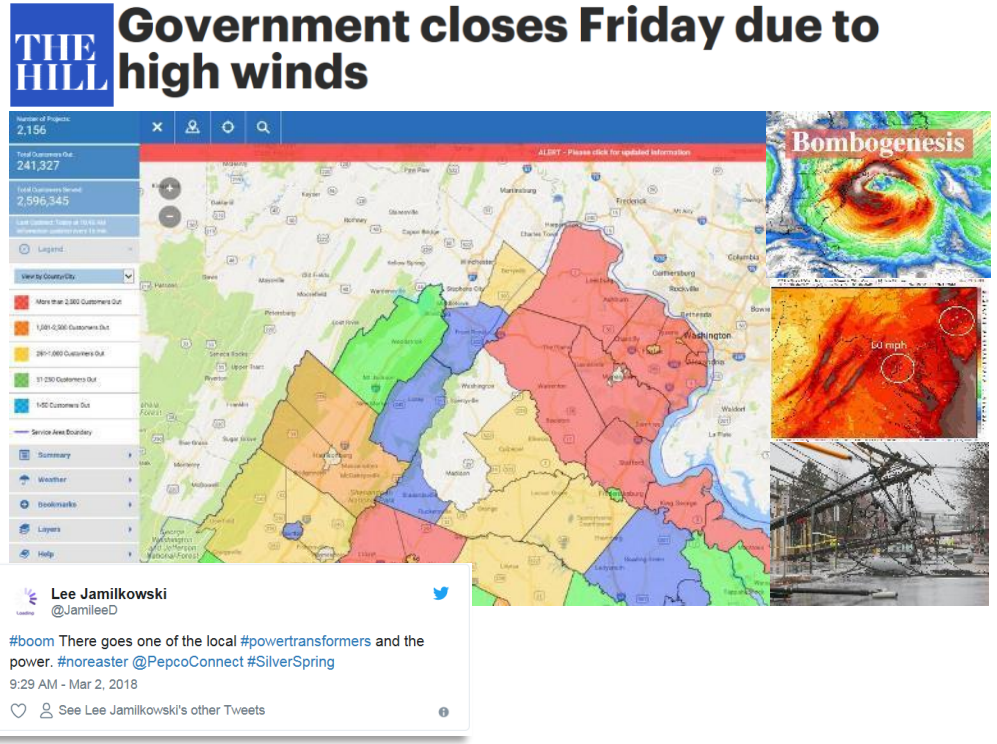
Surviving super storms, hurricanes, derechos, earthquakes (and those pesky squirrels!)

- Fast, seamless separation from utility instability
- Fast load management for generator demand control
- Slow load management when time is not critical
- Black start capability to island mode operation

Transition to island-mode is reactive or proactive

FDA Headquarters, Labs Remain Online With Honeywell Microgrid During Bomb Cyclone

- 0715 White Oak loses first electric feeder
- Honeywell manually placed plant into island mode
- 30 Minutes later second feeder down –Campus without external grid power supply
- 0929 Local residents ‘Tweet’ of exploding transformer and loss of power
- FDA continued without power interruption for over 24 hours (ultimately)



- Using grid sampling and weather analysis tools Honeywell predicted when safe and prepared to come off island mode – Winds below 25 MPH monitored with “Thor Guard”.
- March 3 - 0800 FDA White Oak returned to grid power

March 2, 2018 – yet another storm rolls through DC

Weekly operating report from 10/24/2018

CUP Report	
Cup statistics	
76 - Island Mode YTD 2018	100% Power Generation
492 Days Uninterrupted Power	74.7% Fuel Tank Reserve On Hand (2 Trucks) 89.8% EGEN's fuel On Hand
ISLAND MODE	
2018 - Island Mode Operation Hours (YTD) - 191:48	76 Island Mode Initiation - 33 Automatic transfer, 43 manual
Last island mode was manual on • 10/11/18 – 1457, Central utility plant in island mode; Thor Guard lightning detection system red alert, CUP Operator opened CUP CB 301, 401, 500 and 700. (CB203 -)	

Note proactive nature of switching to island mode

Questions?

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