Army Installation Resilience

On base and with the community

October 2, 2020

Hon. Alex Beehler
Assistant Secretary of the Army for Installations, Energy and the Environment

Moderator, Jeff Marquesee,
Senior research advisor at the National Renewable Energy Laboratory & Former Director of DoD's SERDP and ESTCP

Edward Saltzberg
Director of Professional Education
Environmental and Energy Management Institute, GWU

THE GEORGE WASHINGTON UNIVERSITY

Agenda

- **Welcome:** Edward Saltzberg, GWU
- **Army Opening:** Hon Alex Beehler, IE&E
- **Overview and Panel Introduction:** Jeff Marqusee, NREL
- **Army Resilience Challenge Question:** Mr. John Surash, IE&E
- **Industry Panel Responses**
  - Fred Bonewell, CPS
  - Scott Manson, SEL
  - Johan Ulloa, Constellation
  - Mehdi Ganji, Willdan and IEEE
- **Panel Discussion**: Jeff Marqusee, Michael McGhee, IE&E
- **Audience Q&A**

Add questions to the WebEx window

Download the slides

Video will be available after the session

GWU Webinar:

Army Installation Resilience *Challenges and Opportunities to Improve Mission Readiness*

Honorable Alex A. Beehler
Assistant Secretary of the Army
(Installations, Energy and Environment)

2 October 2020

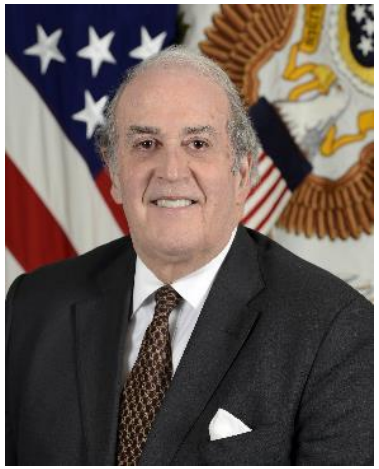
Supporting the Army Strategy

ENERGY & WATER RESILIENCE ENABLE ARMY READINESS

MODERNIZING ENERGY & WATER PROGRAMS ENABLES A LETHAL FORCE

REFORMING ENERGY & WATER BUSINESS PRACTICES ENHANCES MISSION READINESS

Energy Action Month PSAs



Hon. Alex A. Beehler
Assistant Secretary of the Army
Installations, Energy and Environment

SMA Michael A. Grinston
Sergeant Major of the Army

Gen. Edward M. Daly
Commanding General, Army Materiel Command

Lt. Gen. Jason T. Evans
Deputy Chief of Staff, G-9 (Installations)

Sgt. Maj. Jimmy J. Sellers
Deputy Chief of Staff, G-4 (Logistics)

VISION

Army installation energy and water infrastructure supporting critical missions in the Strategic Support Area will be:

RESILIENT

Ensure energy and water for critical missions under all conditions

Ft. Knox, KY
Energy Resilience Readiness Exercise

EFFICIENT

Manage energy and water use to meet requirements effectively and sustainably

Ft. Irwin, CA
Water Treatment Plant

AFFORDABLE

Manage energy and water costs to enable the Army to refocus investment

Ft. Carson, CO
Battery Energy Storage System

Our installations must make energy and water choices that allow installations to maintain critical operations during an unexpected grid outage.

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Twitter: @ArmyOEI

#PowerToWin

Army Installation Resilience

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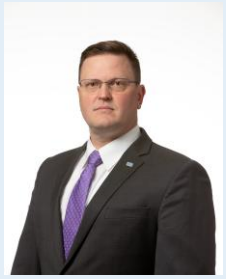
October 2, 2020

Army and Industry Panel

Mr. J. E. "Jack" Surash, Acting Deputy Assistant Secretary (E&S)

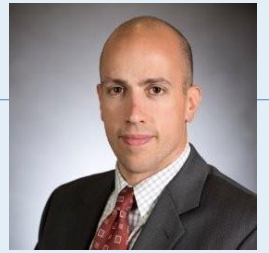
Mehdi Ganji, Lead for Smart Cities at Willdan & IEEE R&D Committee

Fred Bonewell, Chief Security, Safety & Gas Solutions Officer, CPS Energy



Scott Manson, Technology Director, Schweitzer Engineering Laboratories

Mr. Michael F. McGhee, Executive Director of the U.S. Army Office of Energy Initiatives



Johan Ulloa, Manager, Distributed Energy and Energy Efficiency Sales, Constellation Energy, Constellation

GWU Webinar:

Army Installation Resilience *Challenges and Opportunities to Improve Mission Readiness*

Mr. J.E. "Jack" Surash, P.E.
Acting Deputy Assistant Secretary of the Army
Energy and Sustainability

2 October 2020

Challenge

There is a concern about the ability of the commercial grid to sustain power 24/7 to Army installations, which has consequences for national security.

Vital utility services may need alternative power for short durations or for several weeks, given the possibility of longer and further reaching grid outages. Traditionally, the Army has depended on building level backup generators.

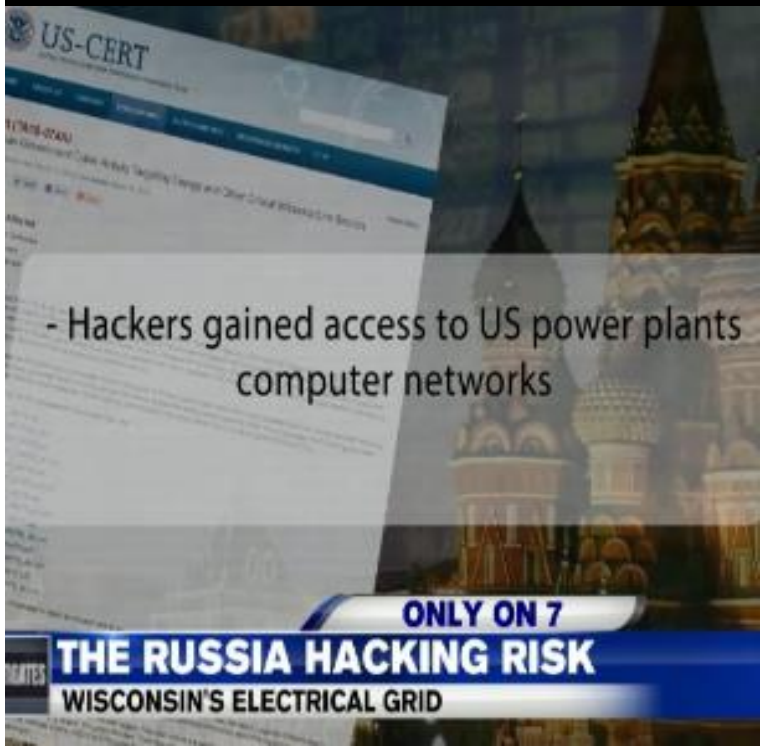
Are there better on-base, behind the fence line solutions and/or better ways for Army installations and utilities to plan together for more cooperative "macrogrid" resilience outcomes?

Threats to Energy and Water Resilience

Physical

Natural

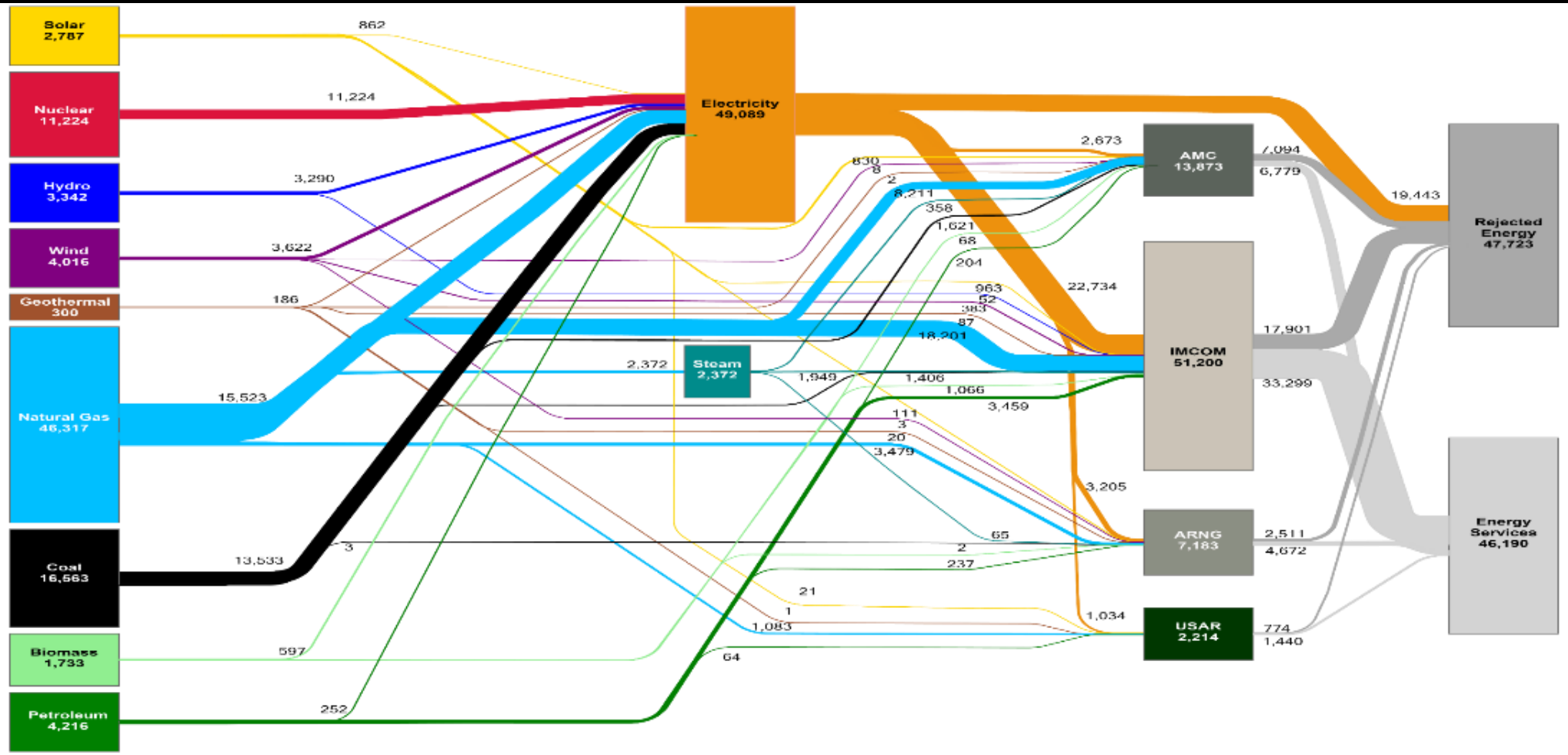
Cyber



"We cannot be an Industrial Age Army in the Information Age. We must transform all linear industrial age processes to be more effective, protect our resources, and make better decisions. We must be the Army of tomorrow, today."

~ General James C. McConville, Army Chief of Staff

Estimated U.S. Army Installation Energy Consumption in Fiscal Year 2019: 93,913 MBtus



In accordance with EPAct 2005, Army installation energy is the energy consumed in, "any building, structure, or facility, or part thereof, which is constructed, renovated, leased, or purchased" in whole or in part for use by the Department of the Army at Army installations in the CONUS, enduring locations OCONUS, and sites managed by the ARNG and USAR. During Fiscal Year (FY) 2019, the Army consumed approximately 3,600 MBtus of its total energy use from renewable sources, 64% of this renewable energy produced on-site.

The data used to create this diagram is from the FY19 Army Annual Energy Management and Resilience Report (AEMRR), DoD Army Supplemental Workbook, and the Federal Energy Management Program (FEMP) Workbook. Additional data used for estimating energy source and rejected energy is based on work completed in March 2020 by the Department of Energy and Lawrence Livermore National Laboratory (LLNL), available: https://flowcharts.llnl.gov. For the purposes of this diagram, the energy services / rejection estimates for the national industrial sector average were applied to Army Materiel Command. For Installation Management Command, the Army National Guard, and the Army Reserve, the national average for the commercial sector was used.

AMC - Army Materiel Command IMCOM – Installation Management Command ARNG – Army National Guard USAR – US Army Reserve

Readiness, Modernization and Reform

Fort Bragg, North Carolina

Utility Privatization

The Army has privatized electric, gas, water, and wastewater at Fort Bragg.

The Army has privatized 47% of its existing utility systems.

Fort Sill, Oklahoma

30 year lease for siting 36 MW Natural Gas Power Plant and up to 14 MW Solar Power
Privately Funded, Owned and Operated

This project would strengthen the local power grid and provide power to sustain Fort Sill's critical missions during a grid outage.

Fort Carson, Colorado

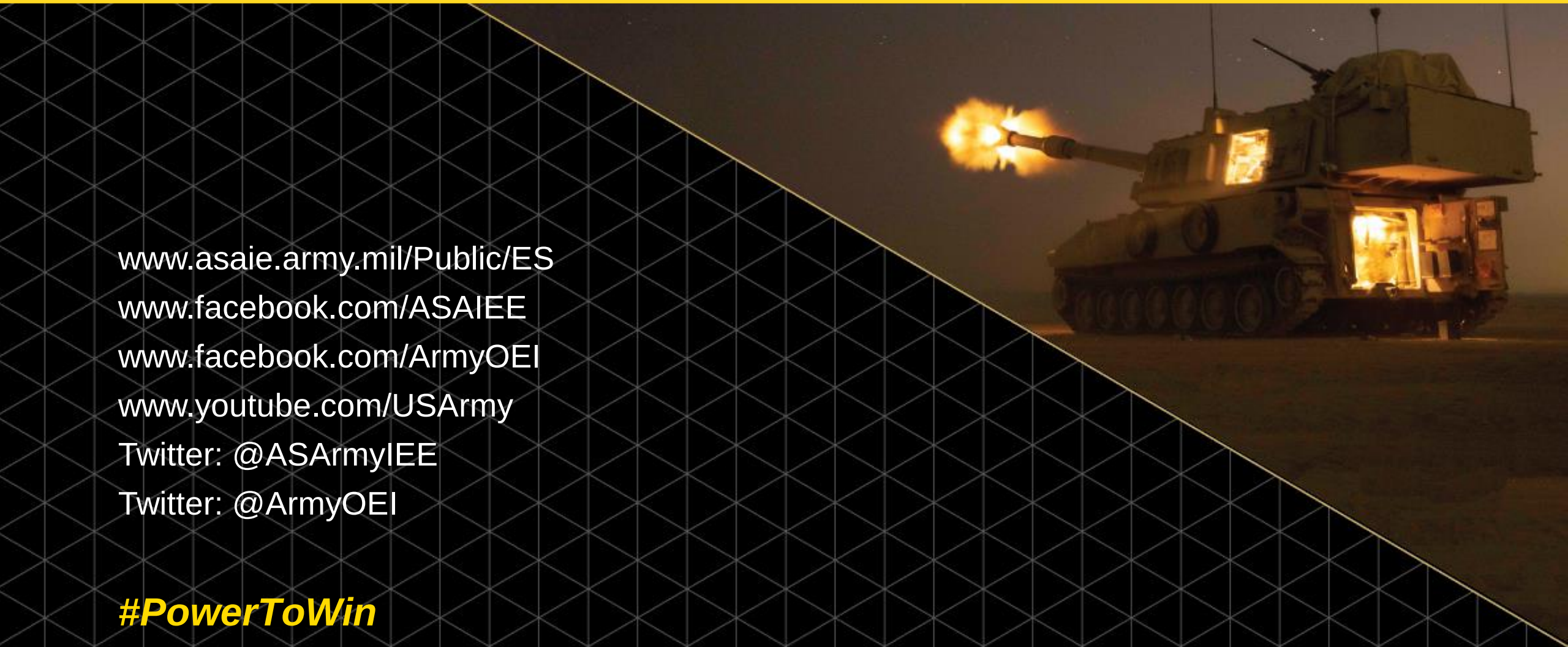
4.2 MW / 8.5 MWh Battery Battery Energy Storage System

Energy Savings Performance Contract (ESPC)

This is the largest peak-shaving battery on an Army installation and will offset peak electric use to reduce installation energy costs.

THE ARMY IS COLLABORATING WITH ENERGY PARTNERS FOR PROJECTS ON ARMY INSTALLATIONS

Find Us Online



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www.youtube.com/USArmy
Twitter: @ASArmyIEE
Twitter: @ArmyOEI

#PowerToWin

ARMY RESILIENCE

PRESENTED BY:

Fred Bonewell
Chief Safety, Security & Gas Solutions Officer

October 2, 2020

GRID RESILIENCY PROJECT

- Public community partnership
- Increase physical security & resiliency
- Preservation of military readiness

This is a collaborative effort between CPS Energy, our local community & our military to improve the resiliency of the infrastructure that is critical to our success.

GRID RESILIENCY PROJECT

- Substation Physical Security Upgrades
  - 11 substations providing power to JBSA facilities
  - Increase security & mitigate risks of vehicle attacks & projectiles
- Air Space Safety Upgrades
  - Remove distribution lines & poles from safety clear zones
  - Increase safety & mitigate risk of aircraft accidents

Photo from www.cpsenergy.com

Photo from www.jbsa.mil/news

$5M GRANT AWARD

- Defense Economic Adjustment Assistance Grant (DEAAG)
  - Granted by Texas Military Preparedness Commission
  - Purpose to enhance grid resiliency
  - Managed by AACOG
  - 2 year project
- Matching Funds
  - Our capital improvement investment is $3.4M in cash & $600K in in-kind contributions

Photo from www.aetc.af.mil/news

BENEFITS

- Increased physical security of our facilities
  - Strengthens grid resiliency
- Supports JBSA mission success
  - Increases national security
  - Reinforces ability to continue contributing to the community
- Economic boost & increased resiliency for CoSA
  - $8.4M injection into local economy through competitive bidding
  - Impacted substations serve our commercial & residential customers

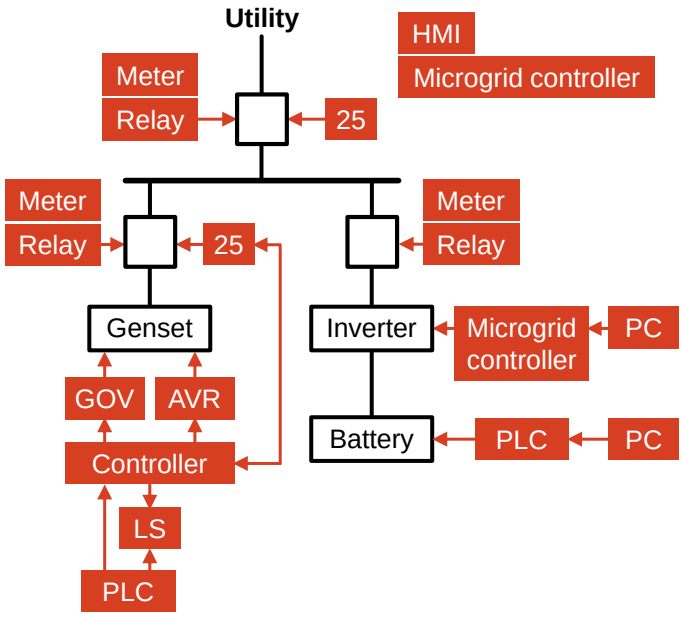
Increasing our mutual operational resiliency enhances our community, the grid & our national security.

Improving Resiliency of Garrison Power

Scott Manson
SEL ES Technology Director

Recent microgrid advancements

- Conventional solution
- Advanced relay solution
- Self-configuring communications
- No tuning controls



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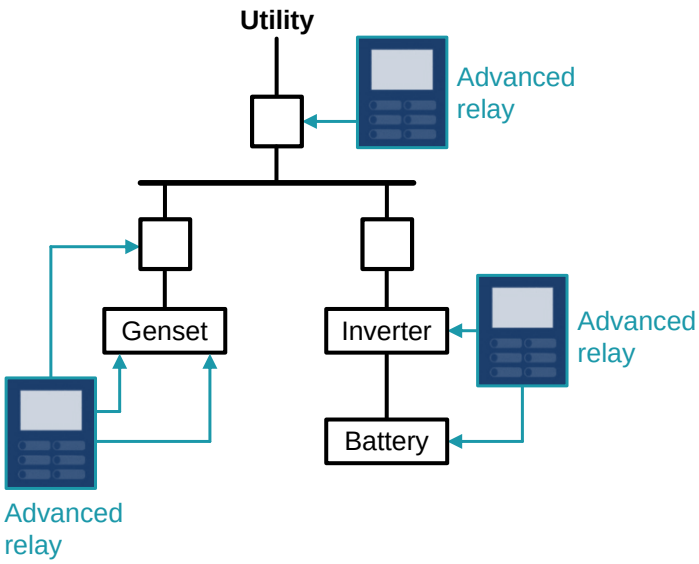

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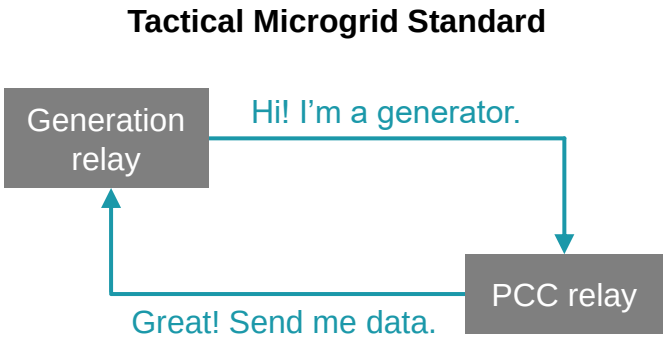

Recent microgrid advancements

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Tactical Microgrid Standard

SEL

DEVCOM C5ISR CENTER

HG ENGINEERS

MIT Lincoln Laboratory

US Army Corps of Engineers®

Recent microgrid advancements

- Conventional solution
- Advanced relay solution
- Self-configuring communications
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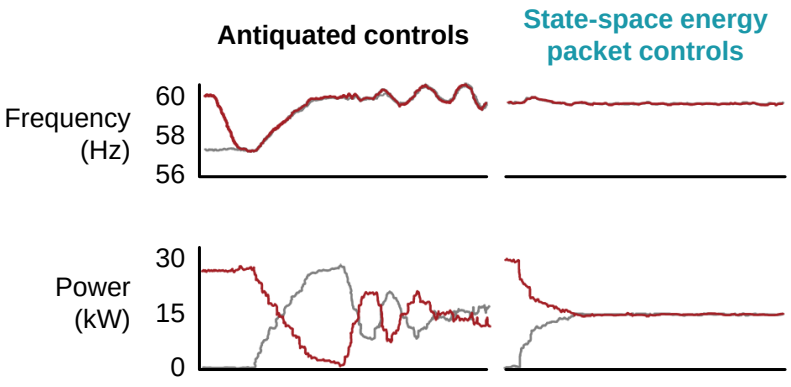
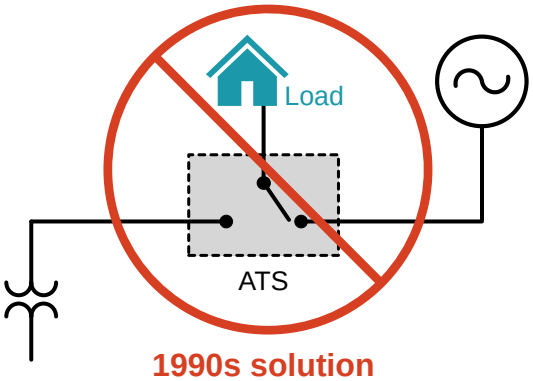
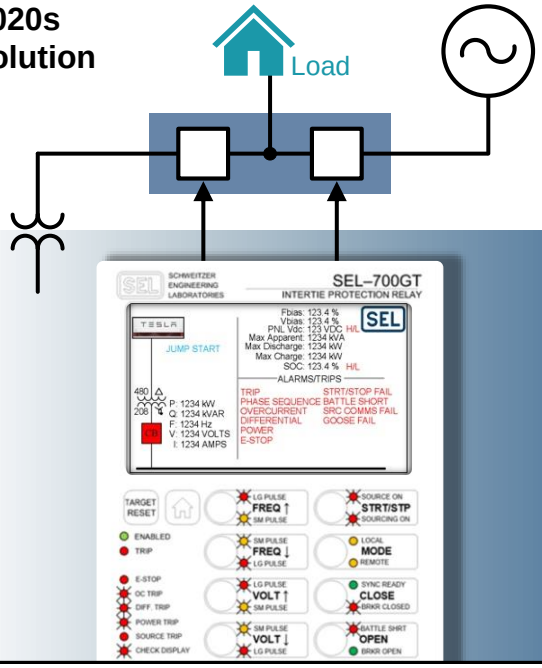


Use existing standby generators to create microgrids

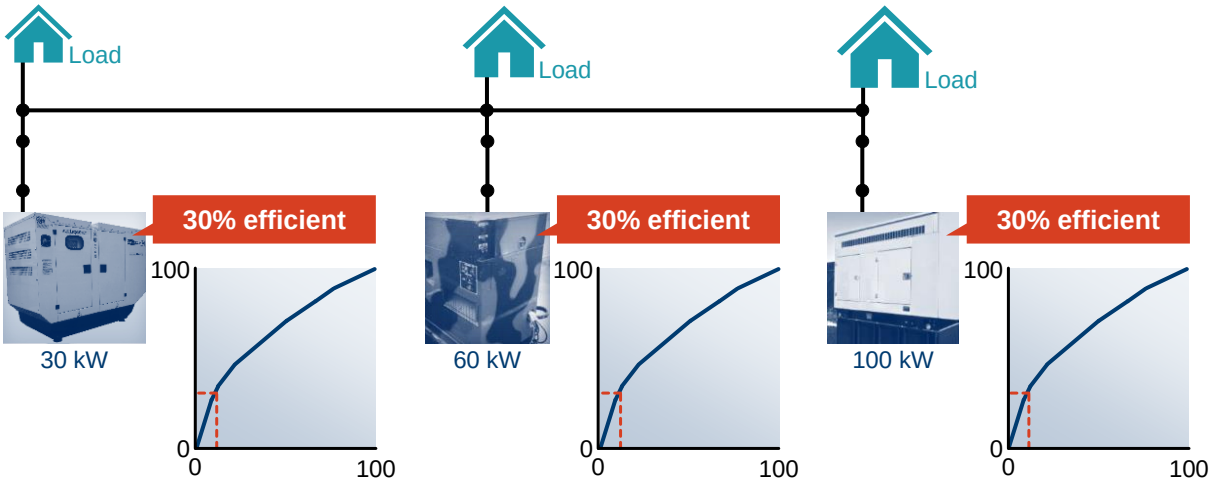


1990s solution

2020s solution



Prolong islanded operation with limited fuel by paralleling building gensets



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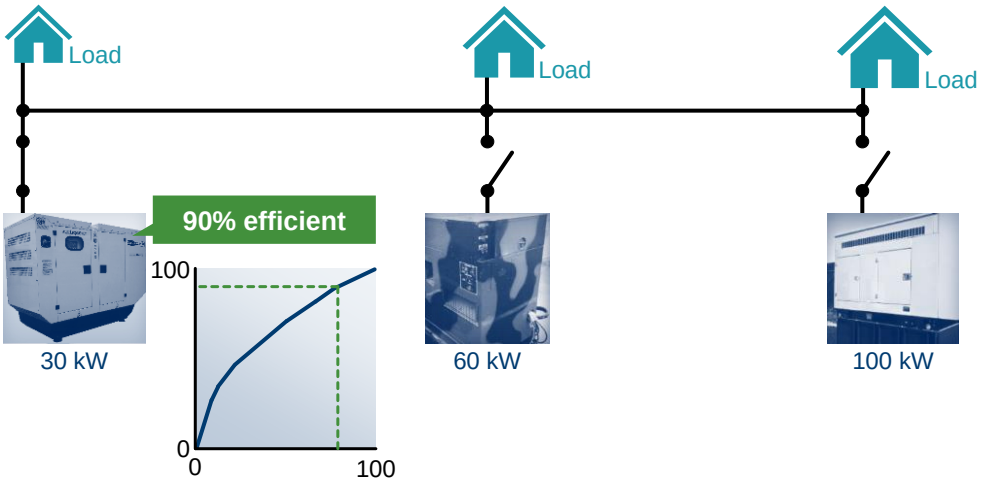
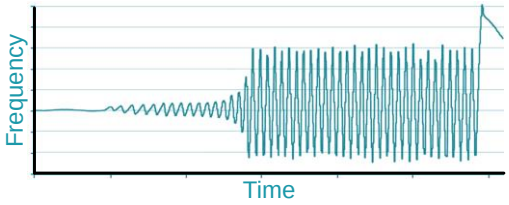
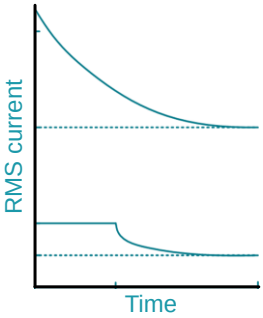


Renewable technologies create “twitchy” power systems

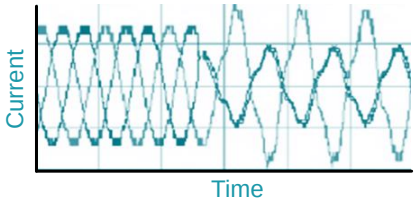
Energy-efficient “improvement” causes outage



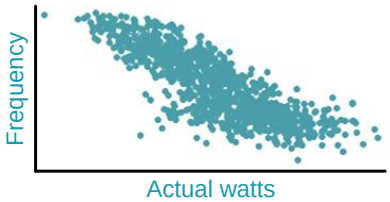
Renewables produce insufficient fault current



Battery produces odd fault current



Battery causes instability



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Army Installation Resilience
Security and Sustainability Forum / GWU
October 2, 2020

Presented by:
Johan Ulloa
Senior Manager, Distributed Energy

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Power Generation

Competitive Energy Sales

Transmission & Distribution

Exelon Generation

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YAMAHA


Proper Planning
Keeps the Mission
Going!!!

Yesterday's grid reflected a model of conventional, centralized generation resources that was then delivered to consumers.

Today, the grid is evolving into a more complex and integrated structure.

- creating **flexibility** to effectively manage local demands
- providing **risk mitigation** and **cost management**
- emerging energy technologies allow customers to achieve **resiliency and sustainability**

Customers are becoming their own energy managers and suppliers.

Yesterday's Grid

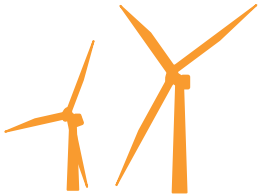
Today's Grid

Diagram adapted from 'The Integrated Grid, Realizing the Full Value of Central and Distributed Resources,' EPRI, 2014.

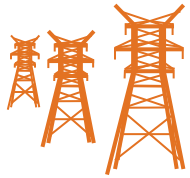
Energy Price Volatility

Energy Security & Resiliency

Sustainability Compliance

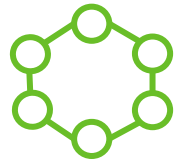


Power Reliability & Grid Pressures



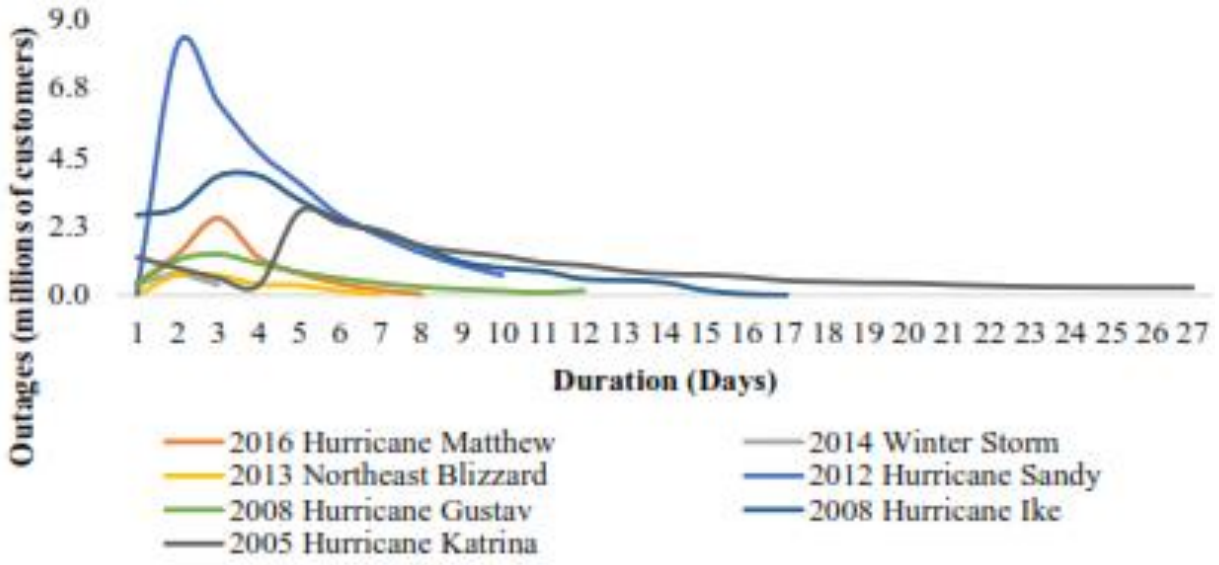
Emergency Preparedness

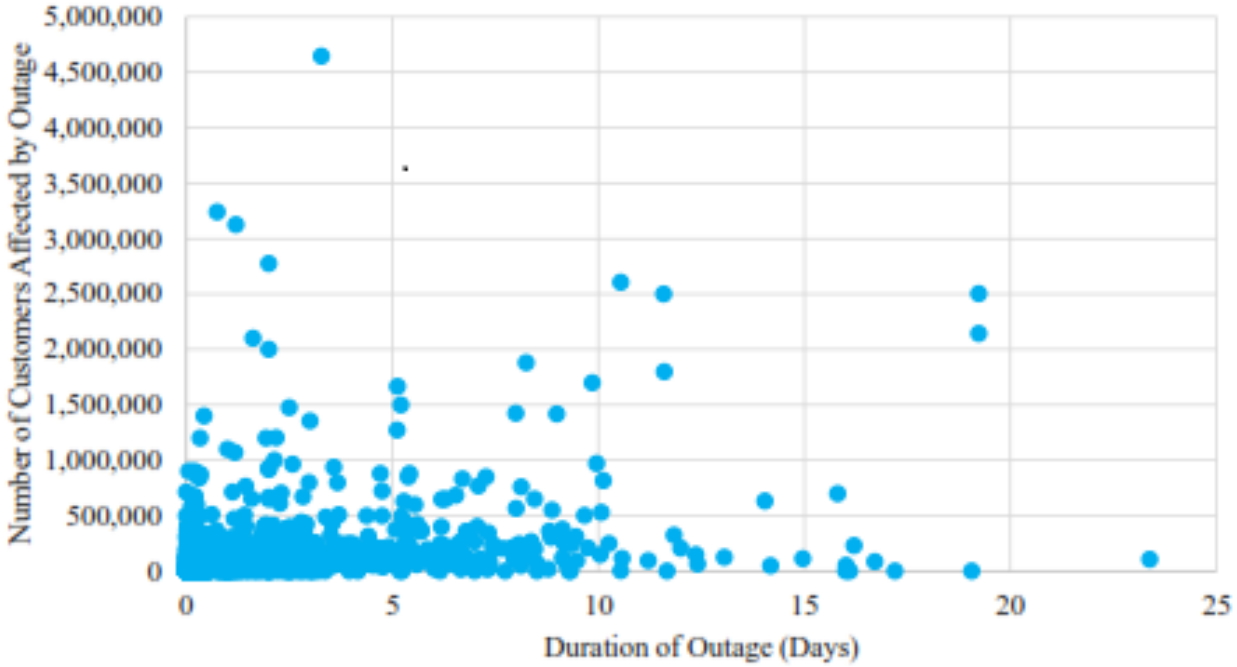
Energy Optimization



Cyber & Physical Security Threats

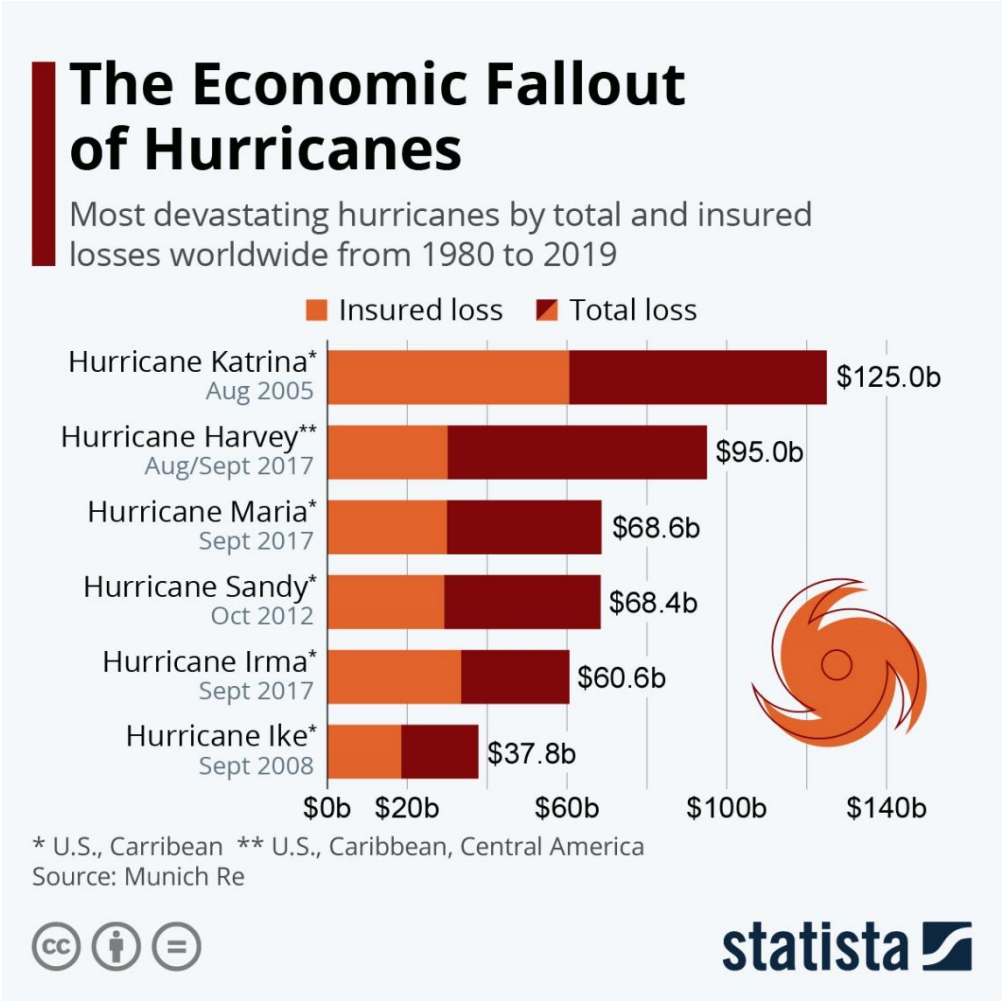
Distributed energy strategies mitigate risk, reduce energy price volatility, and support the achievement of strategic objectives.





Electric grid disruption typically short duration and localized

Source: Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure Section 2(e): Assessment of Electricity Disruption Incident Response Capabilities 8/09/2017



- Severity and impact of storms becoming more frequent and costly
- Over half of total loss is not insured
- Graph does not take into account loss of life and long-term impact to communities

Source: https://www.statista.com/chart/10845/economic-fallout-of-hurricanes/

As energy systems age, the need for energy generation and infrastructure investment has grown

Major, Mission-Critical Installations and Infrastructure Date to WWII and Earlier			
Installation	**Mission**	**Age of Main Post**	**Peak Demand in MW**
Fort Hood	III Corps	73 years	110
JB Elmendorf Richardson	Pacific Air Forces NORAD	75 years	~55
Fort Bragg	FORSCOM USARC	93 years	150
Peterson AFB	NORAD	73 years	~75
Navy Region SW	Pacific Fleet	93 years	130
JB Lewis-McChord	I Corps 62nd Airlift	77 years	~76
Offutt AFB	STRATCOM 55 WG	68 years	~36

- Mission critical infrastructure is nearing 100 years old and supports increasingly greater loads
- Energy security and resilience, mission critical effectiveness, and cost effective operations are all at risk with the state of DoD installation infrastructure
- On-site distributed generation and dedicated off-site assets provide a robust mitigation and security strategy for grid outages

Sources:
1) 2011-2014 Annual Energy Management Report
2) Pew Charitable Trusts
3) Booz Allen Hamilton Analysis

How to Mitigate Exposure:

- Understand Critical Loads - Installation Energy Plans, Advanced Meters, Sensors, Data Analytics
- Stress and Test Existing Systems – Generator Load Tests, Controls/Microgrids, Resource Requirements and Contingency Plans
- Identify and Implement Potential Solutions

- Because services cannot attribute financial value to energy security, goals are met through a piecemeal approach
  - Anticipate security being a feature of every acquisition moving forward but rarely being a standalone contract
- Services will seek energy security projects and assets as an addition to energy conservation measures (ECMs) or renewable energy deals
  - Other ECMs/PPAs must cover the cost of these security adds
  - Interest in pilots nested within ESPCs, for example using new/innovative technology at one building to prove technology/security
  - Projects that provide energy security assets, controls or infrastructure will be preferred over those who do not

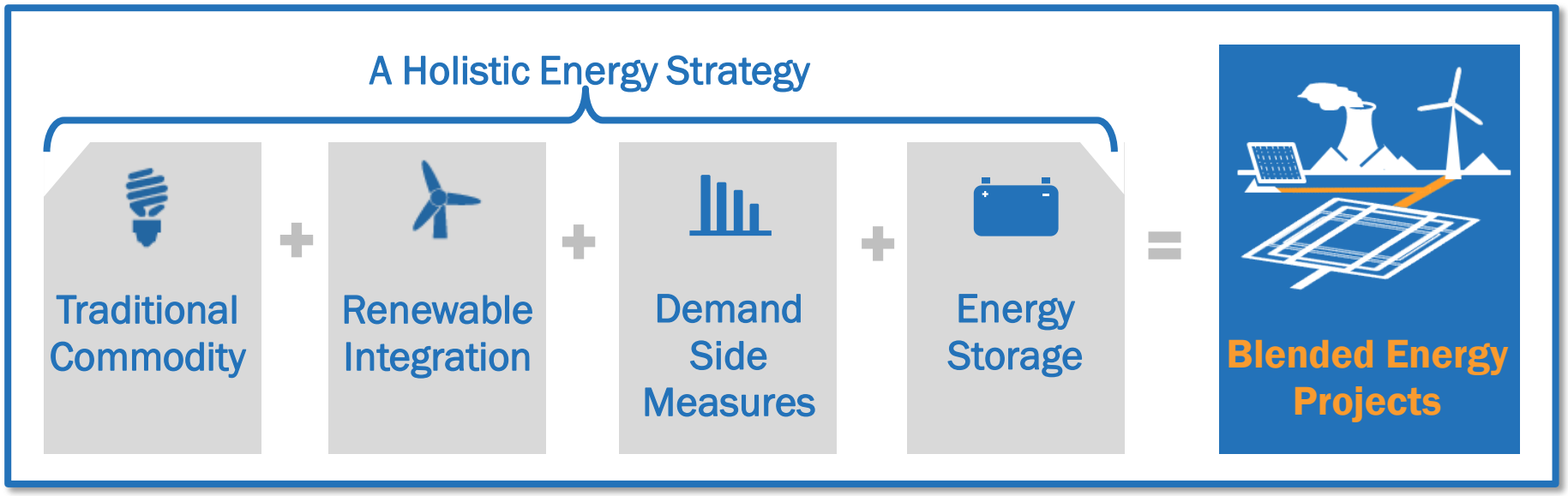
"True valuation of energy security is not likely to happen. Integrated ESPCs that capture large savings and offset security are the only viable path"

DLA Energy

"Security elements need to be rolled in with ECMs that have a shorter payback if the security provisions do not have a sufficient standalone payback"

MCICOM

By employing a holistic approach to energy projects and evaluating economics in aggregate with respect to mission requirements, institutions can experience more meaningful projects.



Local market dynamics and availability of energy resources dictate viability

Available Contracting Options

Authorities	Description
Power Purchase Agreements	Premised on security and renewable energy considerations. Takes advantage of private ownership and corresponding ITC, MACRS, etc. Up to 30 year term
Energy Savings Performance Contract (ESPC)	Ability to blend energy efficiency measures with distributed generation. Up to 25 year term
Enhanced Use Lease	Makes underused land available for lease and development. Offtake is responsibility of the developer and installation may or may not utilize load.
Utility Energy Service Contract (UESC)	Provides for energy services offered by serving utility. Flexible contracting mechanism. Up to 25 year term
Utilities Privatization	Used to recapitalize utility infrastructure where life cycle costs are favorable to the service. Could be leveraged for energy resiliency and capital Upgrades. Up to 50 year term
Environmental Security Technology Certification Program (ESTCP)	DoD's environmental technology demonstration and validation program.
Energy Resilience and Conservation Investment Program (ERCIP)	Funds projects to increase resilience, save energy or water, produce energy or reduce the cost of energy for the Department of Defense
Military Construction (MILCON)	Appropriated funds

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America's energy choice®

Customer	Challenge	Solution
Marine Corps Logistics Base Albany	Need to secure portion of power from **renewable sources**, in order to achieve "net zero" status	**8.5MW woody biomass CHP plant** fuel sourced from nearby industrial steam plant
Naval Station Great Lakes	**Cost of steam** from adjacent VA Hospital on the rise	**2.7MW solar hybrid system** to preheat steam boilers, and preheat water for heat exchangers and water heaters
Defense Intelligence Agency	**Federal energy efficiency mandates** compounded by governmental budgetary restraints	**Renewable Energy Credits** (RECs) to offset cost **of 568 kW PV solar** array installation
National Aquarium in Baltimore	Nature of Aquarium's main focus–**environmental conservation**–coupled with small physical footprint	**4.3MW grid-connected solar** installation in Cambridge, MD, to supply more than 40 percent of annual electricity needs
Newark (NJ) Housing Authority	Aggressive goals set internally to modernize and **improve EE and sustainability** in one of U.S.'s largest housing authorities	**Extensive EE measures** blended with renewable energy: **144mWh capacity solar PV** and **14mWh capacity wind turbine**
Natick Soldier Systems Center	Sustainability goals to **reduce energy consumption by 30 percent** by 2015 (beginning 2003)	**EE measures** coupled with **on-site 150 kW CHP plant** to address year-round steam needs
National Institutes of Health (Bethesda, MD)	Need to address growing **steam and chilled water needs** while not exceeding emissions limits	**On-site 23MW CHP plant** to produce energy that is 60 percent less expensive than that which is purchased from the grid, without surpassing emission limits

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Thank you.

Johan Ulloa

Senior Manager, Distributed Energy

410-470-1897

Johan.Ulloa@Constellation.com

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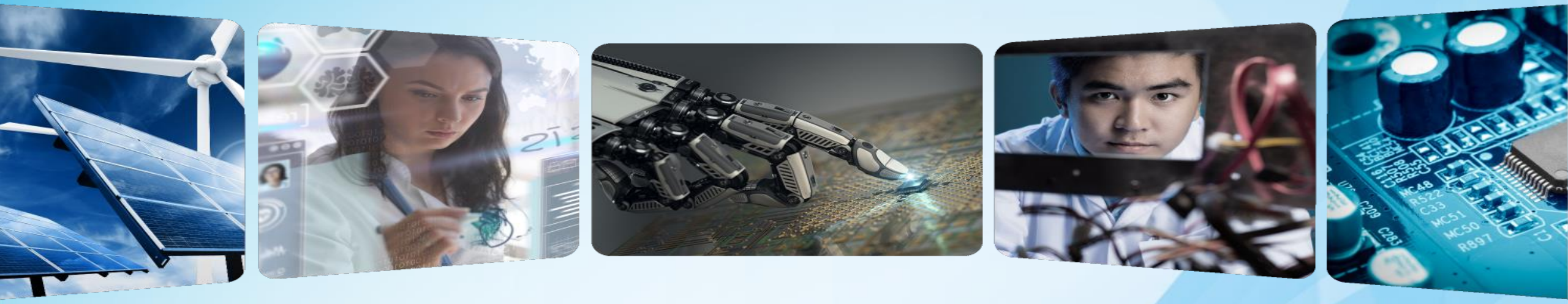


Army Installation Resilience

Mehdi Ganji

October 2nd , 2020

IEEE Smart Cities

WILLDAN

IEEE

Promote Microgrid Business Case

Investment

(Hard Cost, Soft Cost)

Unlock Services/Benefits

(Address beyond the primary issues)

Business Case

Comprehensive

(Beyond Fence Interdependencies)

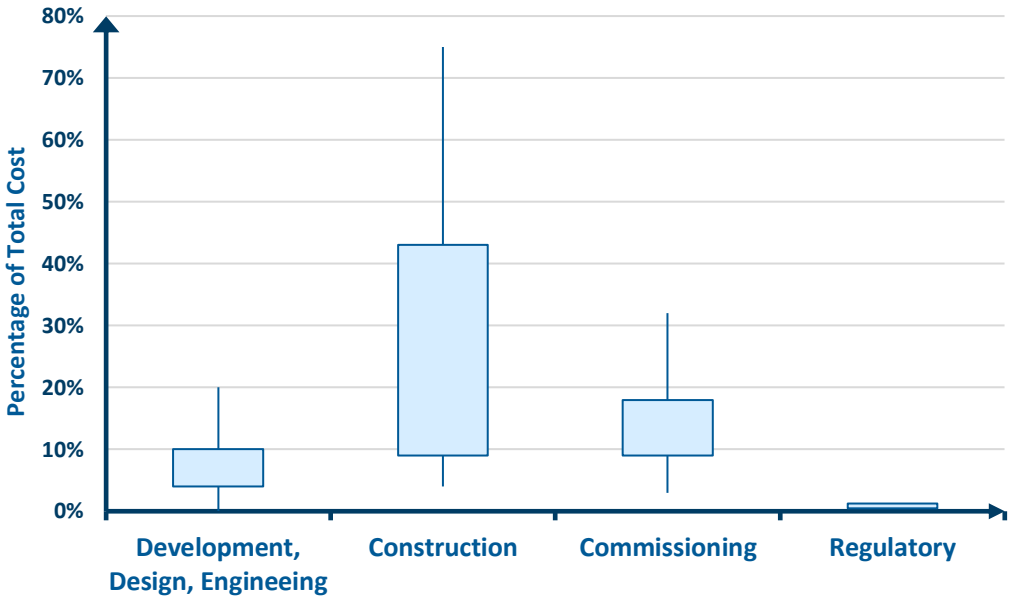
Streamlining

(Development, Design, and Permitting)

IEEE Smart Cities

Investment

Soft Cost

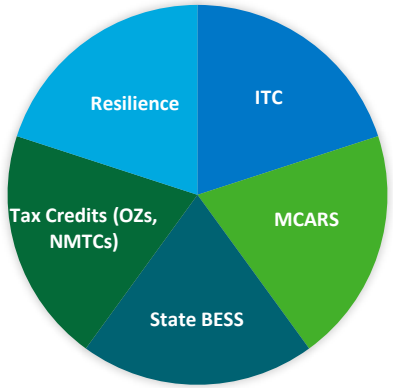


Source: NREL

DERs Technology Cost

Source: Bloomberg New Energy Finance

Incentives



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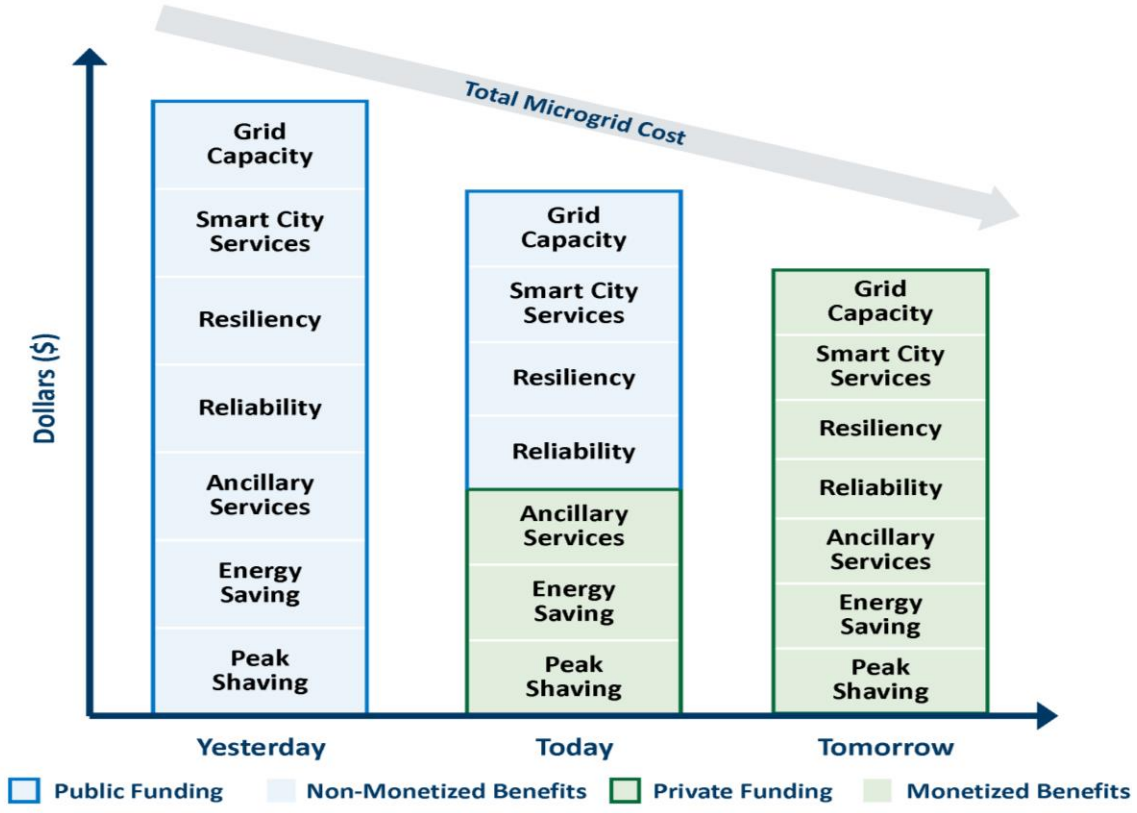
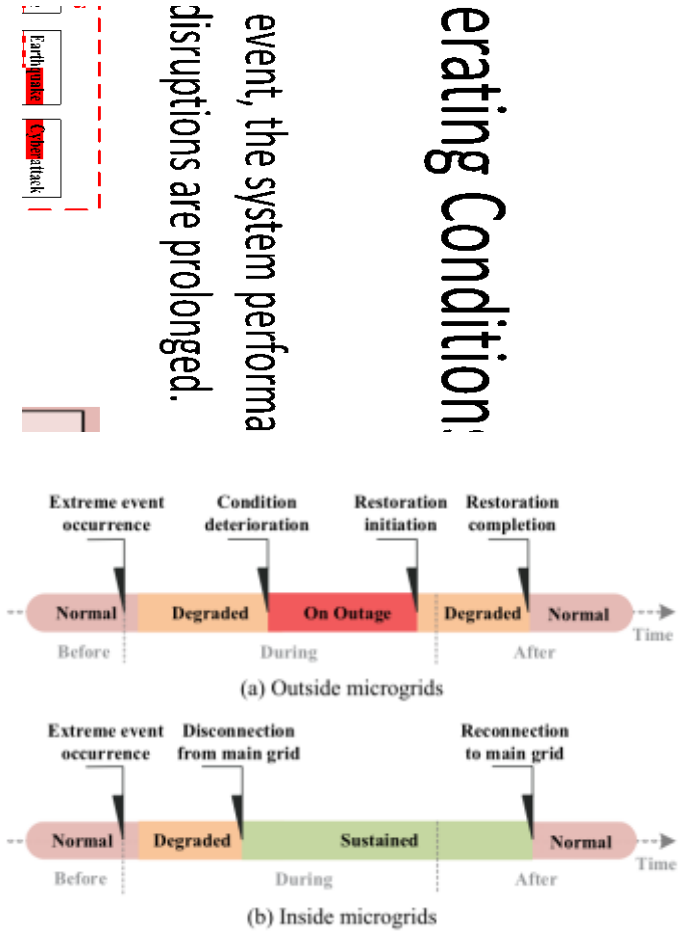
Fully Unlock The Benefits



Benefits



What Resilience Means?

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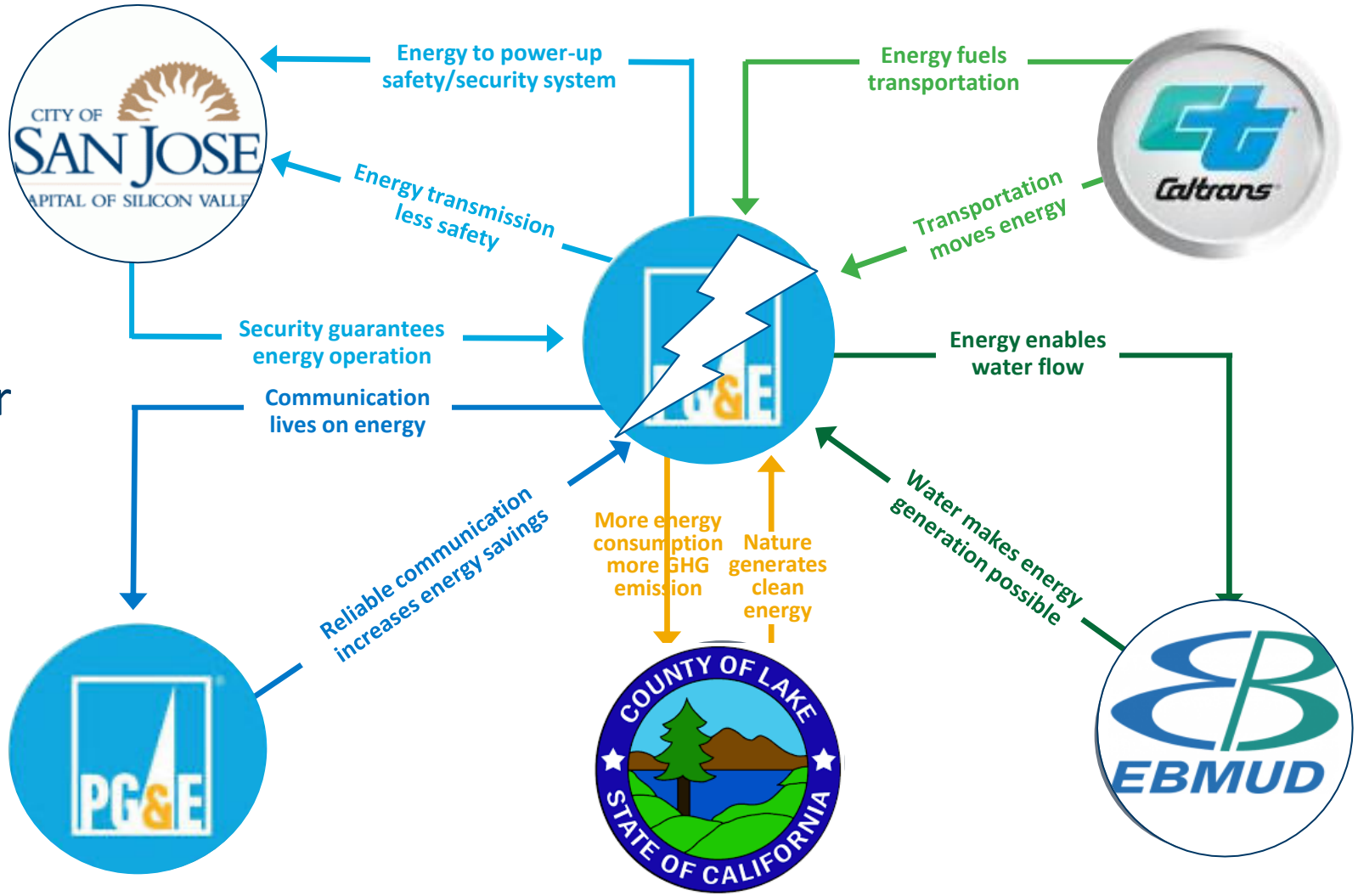
Comprehensiveness: Behind The Fence (BTF) & Infront Of The Fence (IFOF) Infrastructure systems Interdependencies

- Installations are part of a City, and off take the services being served to the **whole city**.
- Installations 'critical **mission** is highly dependent on all BTF and IFOF interdependent Cyber Physical Infrastructure Systems resilience
- Northern CA **Wildfire** primarily impacts **Power grid**, but also disturbs also interrupts **other** infrastructures (October 2019)



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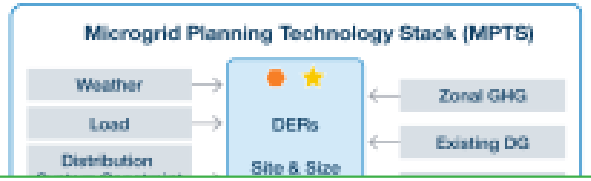
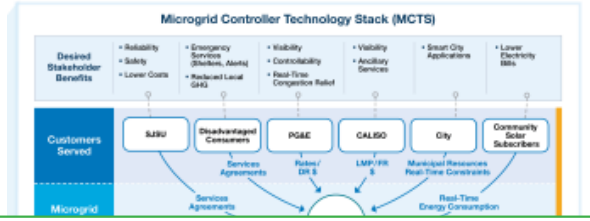
Streamlining

Development & Design



Operation



Commercialization of microgrid is highly dependent on an optimal approach to (i)Placement, (ii) Sizing, (iii) Permitting, and (iv) Securing Contract, and Financing, and BTF and IFOF O&M details, resulting in a solution with a fully unlocked benefits

Solution

- BTF-Tailored solution reduces system economics and resilience benefits
- Lack of Granular Data use results in DERs Over/Under-sizing
- Lack of Network constraints consideration requires additional utility assessment
- Lack of land constraints and characteristics consideration trigs additional AHJs' assessment
- Lack of infrastructures interdependencies consideration reduces system economics
- Lack of consideration the AHJs' permitting requirement results in longer permitting process
- Lack of consideration the community's credibility to receive incentives reduces economics

- Lack of BTF DERs Visibility and Control Access to Utility results in longer interconnection process and some Standby Charge Commitment ($0.015-0.025)/Kwh

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Thank you

Questions?

For more information:
Mehdi Ganji, PhD
Email:
Mehdi. Ganji@Willdan.com
Mehdi.Ganji@ieee.org

Army Installation Resilience

On base and with the community

Q&A

Security And Sustainability Forum
Convening Global Experts to Guide Decision Making

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

GW EEM Environmental & Energy Management

Mr. J. E. "Jack" Surash, Acting Deputy Assistant Secretary (E&S)

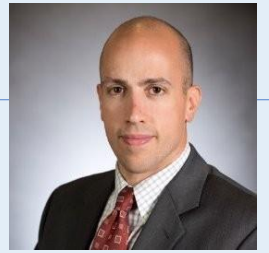
Moderator, Jeff Marqusee, Senior research advisor at the National Renewable Energy Laboratory (NREL)

Mehdi Ganji, Lead for Smart Cities at Willdan & IEEE R&D Committee

Fred Bonewell, Chief Security, Safety & Gas Solutions Officer, CPS Energy

Scott Manson, Technology Director, Schweitzer Engineering Laboratories

Mr. Michael F. McGhee, Executive Director of the U.S. Army Office of Energy Initiatives



Johan Ulloa, Manager, Distributed Energy and Energy Efficiency Sales, Constellation Energy, Constellation

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Edward Saltzberg
Director of Professional Education
EEMI, GWU

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Assistant Secretary of the Army for Installations, Energy and the Environment

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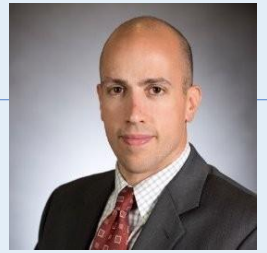

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