Military Communities and Microgrids

Making Your Power More Valuable

Paul E. Roege, P.E.
COL (ret), US Army
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Ask yourself. . .

Why are we talking about energy in the first place?

Historical View:
Installation vs Operational Energy

- Cost
- Compliance

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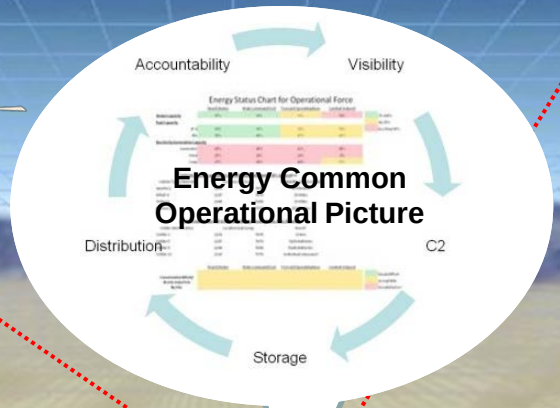
- Requirements
- Performance

Energy-Informed Operations

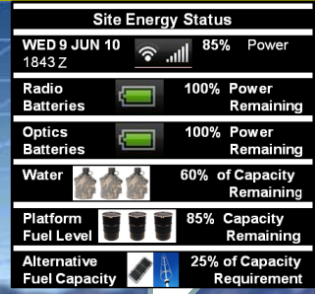
Using energy to achieve the greatest net operational benefit

Operational Energy OV-1



Fuel efficient aircraft fly extended missions

Alternative delivery means



OP

Wind

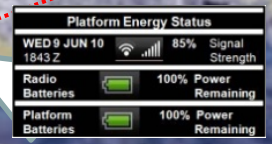
Host Nation Grid

APOD

Planning, monitoring, management

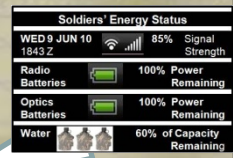
Water & waste management

Longer duration sensing



Recharging while mounted

Individual power awareness



SPOD

Alternative power sources

Fuel efficient vehicles operate over extended distances

Exportable power

Embedded power production, distribution, and intelligent management

Power sources reduced in size and weight

Reduced number of convoys exposed to threat

Coalition Forces

UGS provide on-the-move charging

"Energy aware" Soldiers and Leaders

Energy Visibility

Smart Grid

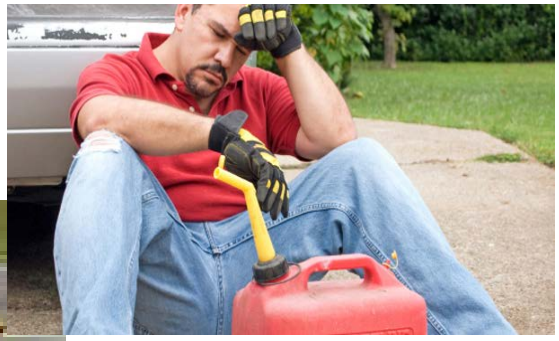
Energy Sharing

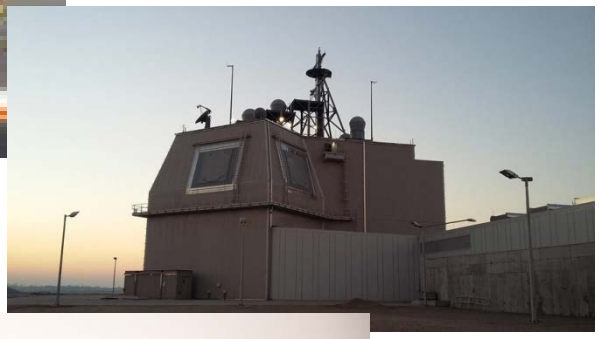
Army seeks improved operational performance as a direct result of reduced power and energy demand through conservation, efficiency, and deliberate management from Soldier to Theater Commander.

Operational Energy supports decentralized operations with freedom of movement, operations over extended distances, longer periods of sustained operations without resupply

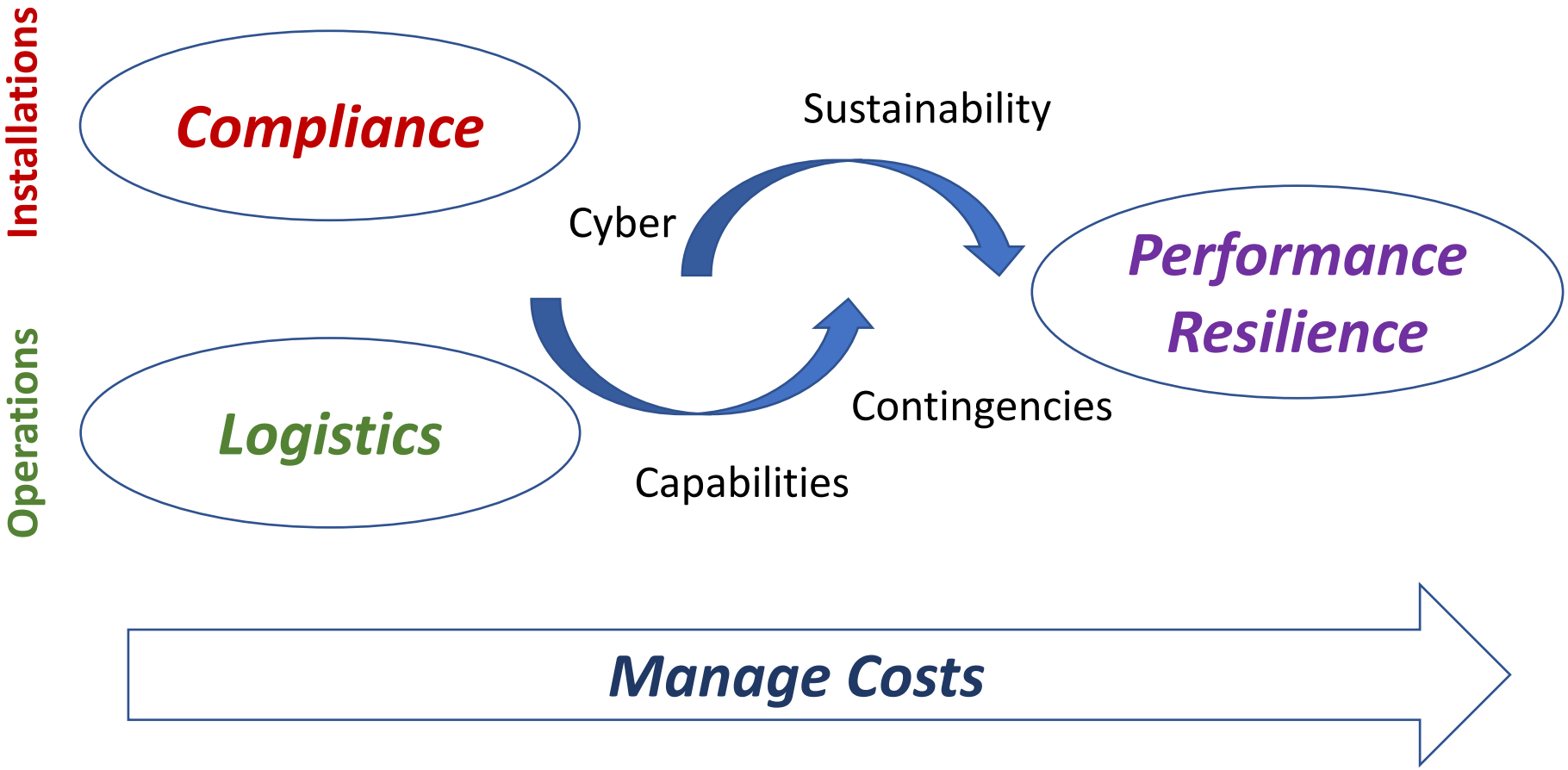
We must understand relevant energy attributes

- Quantity
- Availability
- Portability
- Reliability
- Delivery Rate
- Flexibility
- Environmental Impacts





Evolving Energy Focus

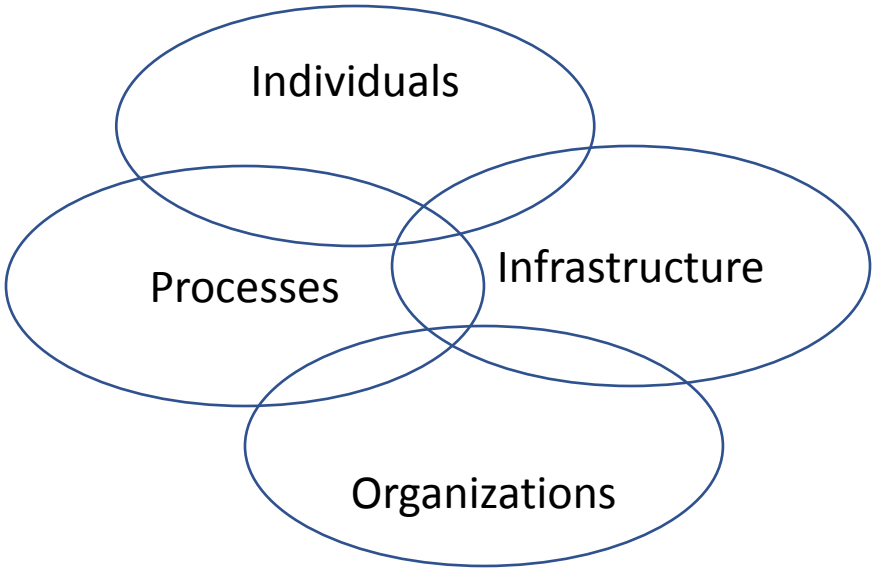


What is Resilience?

Resilience Fundamentals

National Academies' operational definition:

the ability to prepare and plan for, absorb, recover from and more successfully adapt to adverse events.



Temporal phases

- prepare
- absorb
- recover
- adapt

Multi-domain

- physical
- information
- human

Resilience ultimately rooted in individual and group behaviors

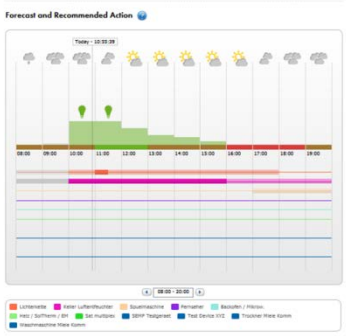
Resilience vs. Protection

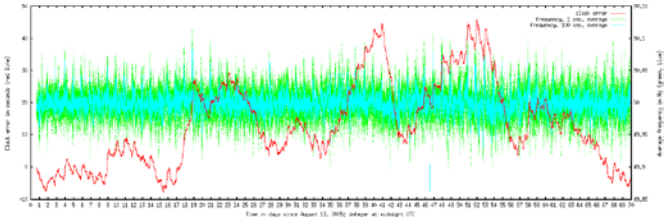
- Capacity, not a design feature
- Focus on outcomes
- Considers unanticipated change
- Emphasizes flexibility and adaptation

Protection	Resilience
• Optimize performance at design condition • Deterministic analysis, actuarial valuation • Protect system to ensure functionality	• Emphasize holistic response to change • Qualitative/quantitative stakeholder assessment • Foster creativity and flexibility to ensure outcome

Evolving Power Markets

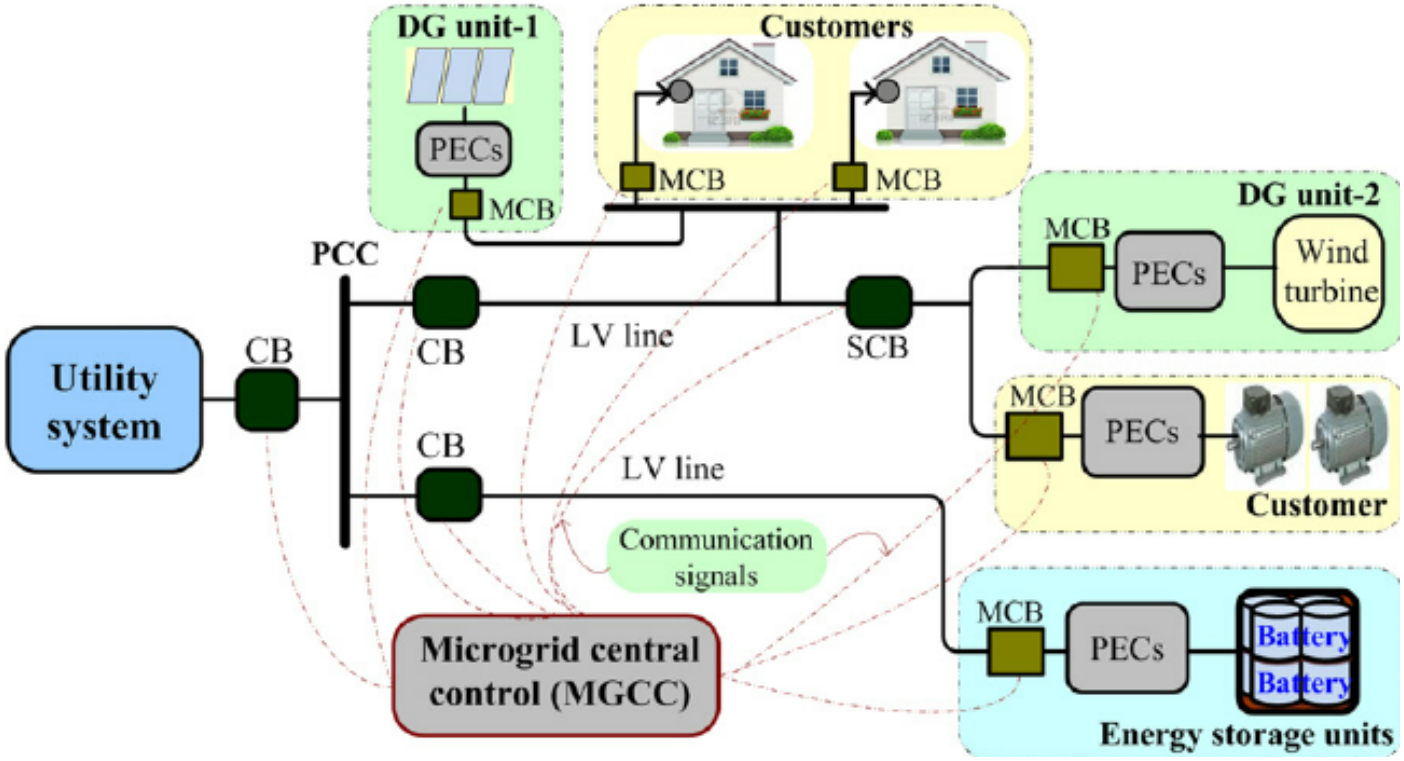
- Distributed Generation
- Power Purchase Agreements
- Demand Response
- Grid Services
- Energy Management Applications





Microgrids

Localized set of electrical sources and loads that can be operated separately and/or connected to a larger network



Microgrid Functionality (e.g.)

- Distributed Generation/Storage
- Cost Optimization
- Reliability Assurance
- Power Quality Management
- Security Management
- Energy Management
- Islanding

Key Points

- Understand organizational goals and operational processes
- Relate energy attributes to performance under diverse conditions
- Assess alternative methods to meet needs, limit failures/vulnerabilities
- Implement operational and technical measures in concert
- Monitor, learn, and adapt

Discussion

Contact:

Paul Roege

Paul.roege@alum.mit.edu

208.521.2417