

# ***Air Force Civil Engineer Center***

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*Integrity - Service - Excellence*



## **Energy Security: *Challenges with a Microgrid Approach***

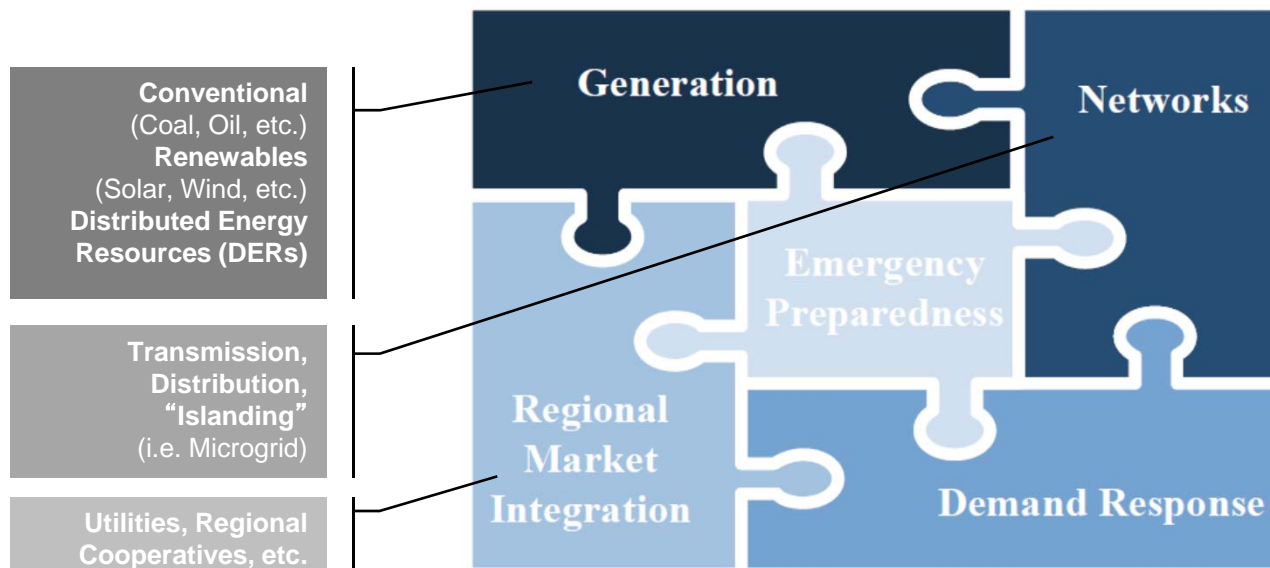
**Mr Tarone Watley, P.E.  
AF Energy Security SME  
3 June 15**

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# Big Picture...

- **Industry** -- The uninterrupted availability of energy sources at an affordable price (IEA).



*Courtesy of International Energy Agency (IEA) – Energy Security Action Plan (IEA, 2012)*

- **Air Force** -- Assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational needs (AFPD 90-17).



## Big Picture...(cont.)

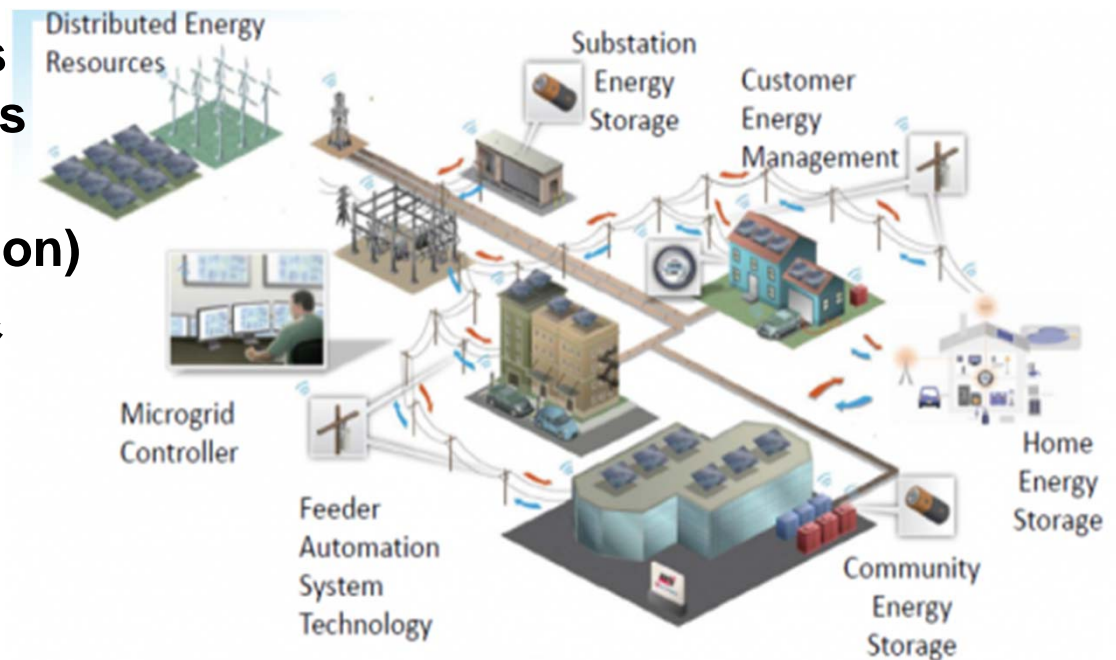
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- **2014 DoD Power Resiliency Review “Key Findings”**
  - **Utility outages mostly weather-related or equipment failures**
  - **Poor alignment of energy resources with military missions**
  - **Air Force second largest of DoD’s critical facility power budget, behind Army**
  
- **Islanding/microgrids just one of many techniques to address Energy Security issues**
  - **Air Force has three kinds of microgrids**
    - **Conventional, Smart, and Next Generation**



# Islanding Challenges...

- **Industry Perspective**
  - **National Grid Interconnection**
  - **Frequency & Voltage**
  - **Dispatchability**
  - **Energy Storage Options**
  - **Interconnection Req't's for different Generators**
  - **Protective Relays (Discrete v. Multifunction)**
  - **Technical Standards & Best Practices**



Conceptual Microgrid Courtesy of California Public Utilities Commission



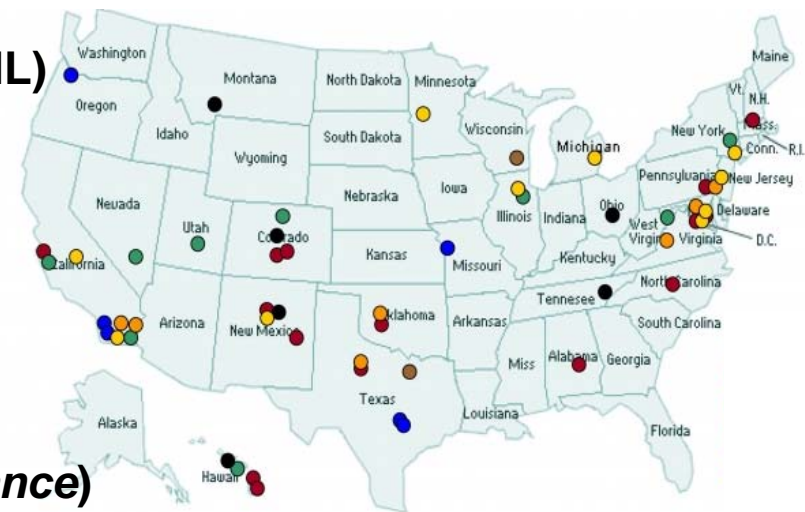
# Islanding Challenges...(cont.)

## ■ Air Force Perspective

- **Risk adverse** – Use of conventional type (i.e. diesel generators), unconnected to utility grid
- Desire to move toward Smart microgrid initiatives that are generally DoE-led (SNL)

## ■ Major Areas of Concern

- Cyber resilient “smart” systems
- Affordability, technology adoption/ readiness
- Equipment complexity, training, and maintenance (e.g. *in-house maintenance*)
- Estimating Outage Durations
- Aging / degraded existing infrastructure w/ limited investment funding (e.g. *fix what we have, acquire new, etc.*)
- Challenge of reactive power



- R&D Test Beds (DOE)
- R&D Test Beds (Non-DOE)
- DOE/DOD (Assessments and SPIDERS)
- DOD ESTCP
- Peak Load Reduction
- ARRA SGDP
- Industry /Utility/University/Other Fed Led

Energy Surety Microgrids (ESM) Deployments Courtesy of Sandia National Labs (SNL)



# Additional Considerations

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- **Create “baseline” energy security condition with increasing levels for higher mission criticality**
  - **Substantiate energy security investments with a Business Case Analysis (BCA) prior investment**
- **Expand beyond just infrastructure energy usage area to aviation operations (Airfields) and tactical/non-tactical vehicles (Vehicle Fleet)**
- **Evaluation techniques to determine appropriate energy security levels**



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# Questions...

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