Practical Considerations in Energy Planning for Air Force and Navy Installations

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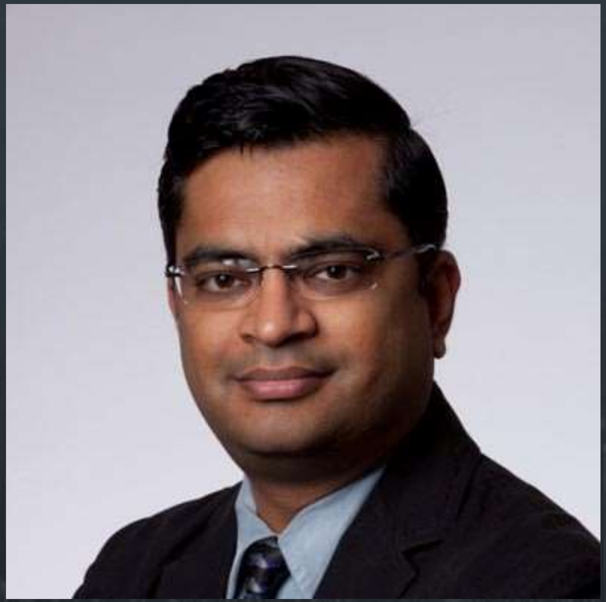

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A Practical Energy Planning Framework

Lessons from Case Studies

The Challenge

The OSD Policy (DoDI 4170.11) requires installations to prepare a resiliency focused Installation Energy Plan (IEP)

Challenges to achieving this at the Enterprise level include:

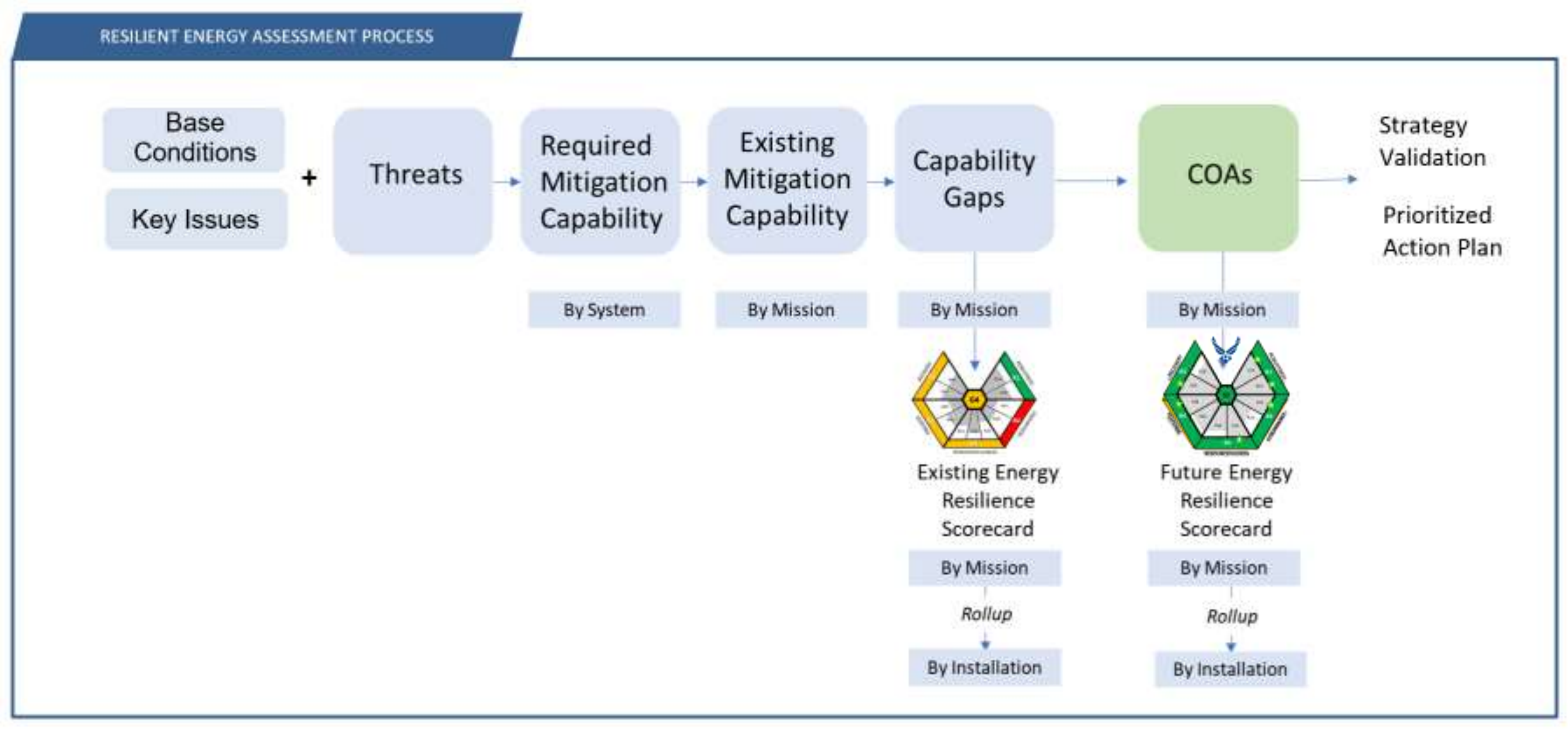
- **IEPs are FOUO** without classified information
- Comprehensive Mission Assurance and Vulnerability Assessments **are typically classified** and not easily translated into IEP usable data
- IEPs are led by Installation Planners, Energy Managers, Facilities and Utility Engineers – who **typically do not have the capability or resources to do complex modeling** and risk assessments
- A large number of IEPs have to be completed in a short time. Conditions in Installation **vary in capability and structure**

The Solution

Resilient Energy Assessment Process Overview

A simple, template-driven approach is needed – one that can also:

- Accommodate unique installation conditions
- Include mission specific requirements
- Produce standardized outputs for the whole Enterprise



Step 1: Simplified Threat Assessment

High level simple selections drive degree of concerns based on consequences

CRITICAL MISSION NEEDS

Power	Y
Fuel	Y
Heating	Y
Cooling	Y
Water	Y
Communications	Y
Personnel	Y

KEY RELATIONSHIPS

Power Utility	Strong
Gas Utility	Average
Water Utility	Average
Community	Average

THREATS

	Probability	Severity
Earthquake	Seldom	Critical
EMP	Rarely	Critical
Environmental Corrosion	Rarely	Negligible
Flooding - Major	Occasional	Critical
Flooding - Minor	Likely	Moderate
High Winds	Likely	Critical
Lightning	Frequent	Moderate
Malicious - Cyber	Occasional	Moderate
Malicious - Physical	Seldom	Moderate
Tsunami	Rarely	Negligible
Utility Blackout	Occasional	Critical
Volcanic Eruptions	Rarely	Negligible
Wildfire - Major	Seldom	Moderate
Pandemic	Seldom	Moderate

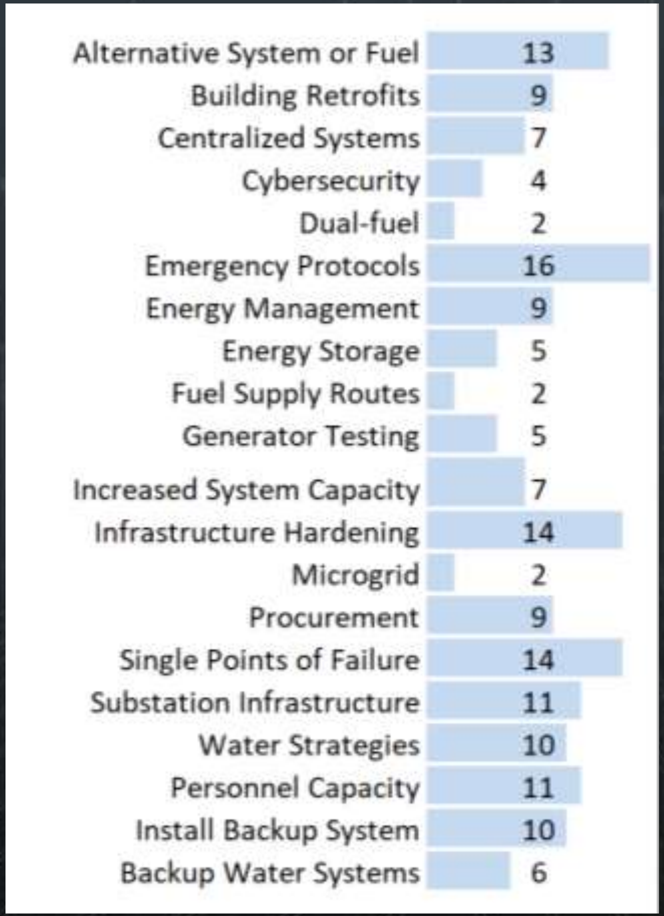
THREAT CONSEQUENCES

	Degree of Concern
Source : Loss of Primary Sources	Low
Supply Logistics : Disruption / Failure	Moderate
Transmission : Failure / Loss	Moderate
Distribution : Failure / Loss	High
Controls : Loss of Access	Low
Communications : Breakdown / Unavailable	Low
Manpower : Unavailable / Inaccessible	Low
Equipment : Damaged / Inoperable	Moderate

Step 2: Mitigation Capabilities Mapping

Consequences → **Mitigation Capabilities & Strategies** | **Resilience Attributes**

Source	Loss of Primary Sources
Supply Logistics	Disruption / Failure
Transmission	Failure / Loss
Distribution	Failure / Loss
Controls	Loss of Access
Communications	Breakdown / Unavailable
Manpower	Unavailable / Inaccessible
Equipment	Damaged / Inoperable



- **Robustness**
- **Redundancy**
- **Resourcefulness**
- **Response**
- **Recovery**
- **Reliability**

Step 3: Mission Requirements

Mission

Resource	Availability Requirements	Min Contingency
Power	Uninterruptible	N+1
Fuel	3 Day Supply	N
Heat	Essential	N
Cooling	Uninterruptible	N+1
Water	Essential	N
Communications	Uninterruptible	N+1
Personnel	No Requirement	N

Is Mission Relocatable?
No

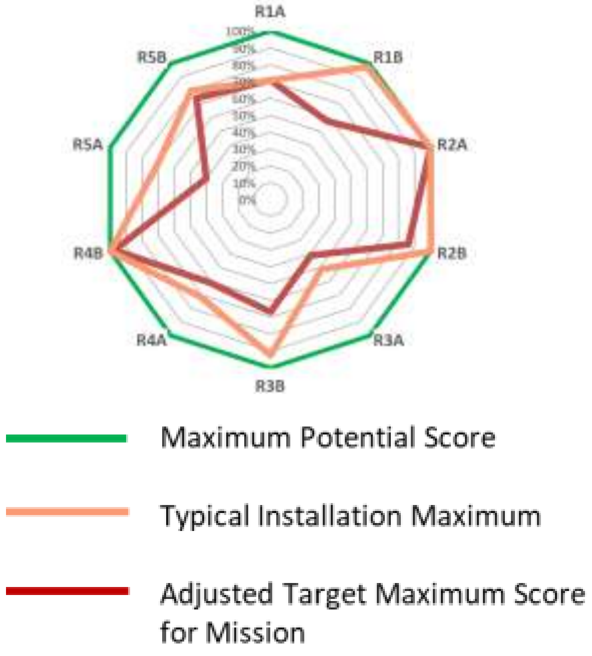
Level of Resilience Capability Required

Step 3: Mitigation Capabilities

Threats | **Level of Concern** | **Requirement**

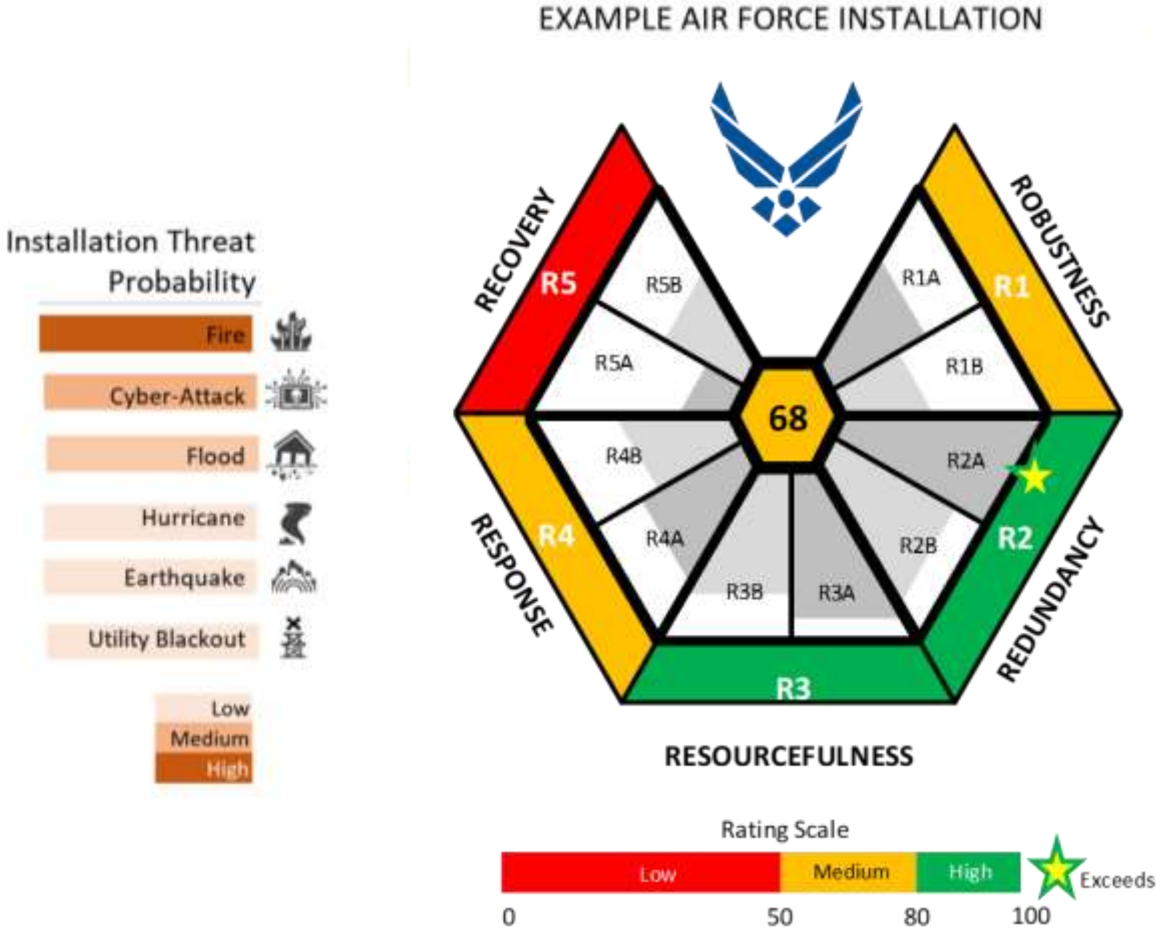
Required Mitigation Capabilities to Achieve Strong Resiliency

Consequences



Step 4: Gap Assessment & Scoring

Inputs culminate in a scorecard – a visual snapshot highlighting performance



RESILIENT ENERGY + WATER PERFORMANCE

R1 ROBUSTNESS
How robust are the energy+water systems on installation?
R1A Cybersecurity of Energy Systems
R1B Physical Hardening / Protection of Critical Assets

R2 REDUNDANCY
Are there redundant systems and alternate sources to avoid single points of failure?
R2A Single Points of Failure in Energy + Water Systems
R2B Energy & Water Source Diversity

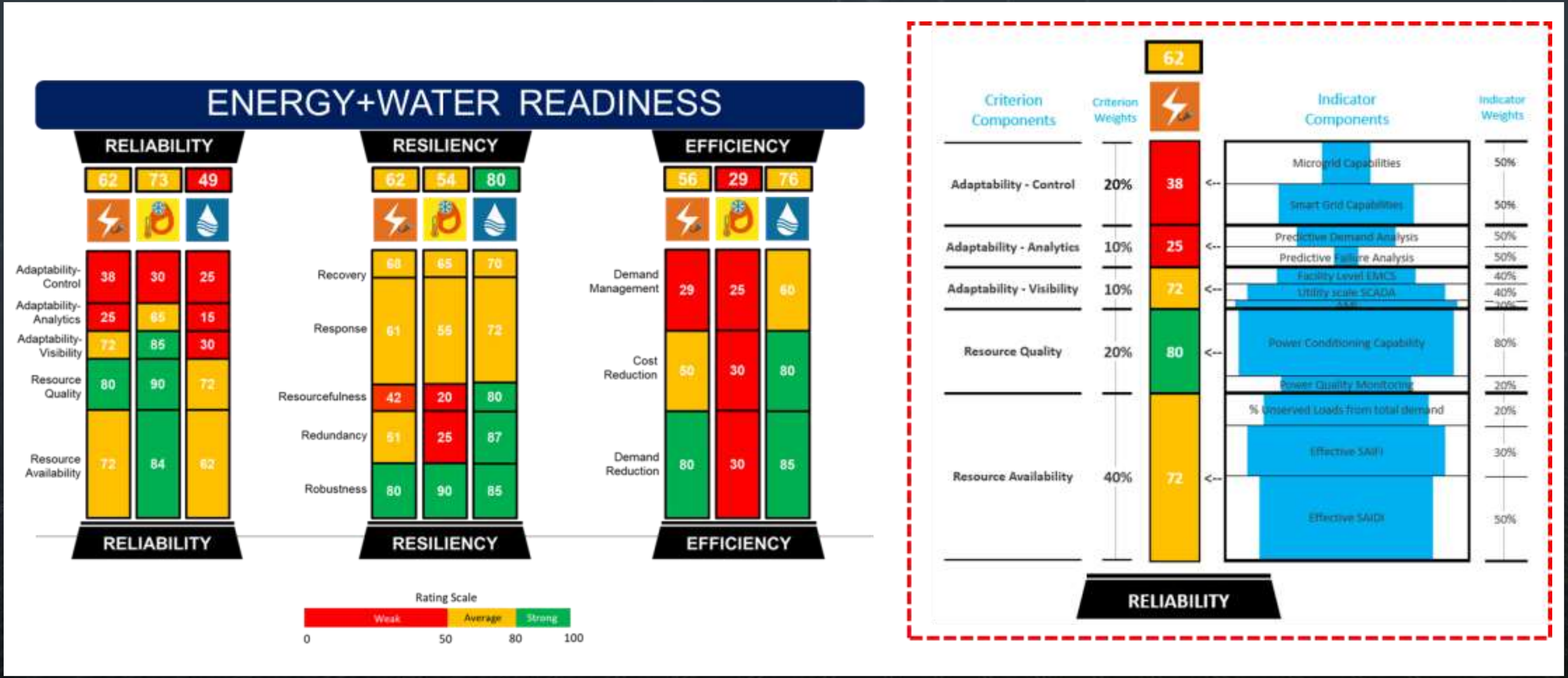
R3 RESOURCEFULNESS
Is energy efficiently managed and delivered?
R3A Energy & Water Intensity (Demand) Reduction
R3B Energy & Water O&M Manpower & Skillsets

R4 RESPONSE
Is the Installation prepared to respond to emergency/disruptive event?
R4A Emergency Management Protocols for Energy+Water Systems
R4B Critical Loads with Island / Backup Mode Operations

R5 RECOVERY
How long can critical mission functions be sustained in emergency mode?
R5A Critical Loads Sustainment Capacity (Fuel/Energy+Water Storage)
R5B Reliability of Emergency Energy & Water Systems & Operations

Step 4: Gap Assessment & Scoring

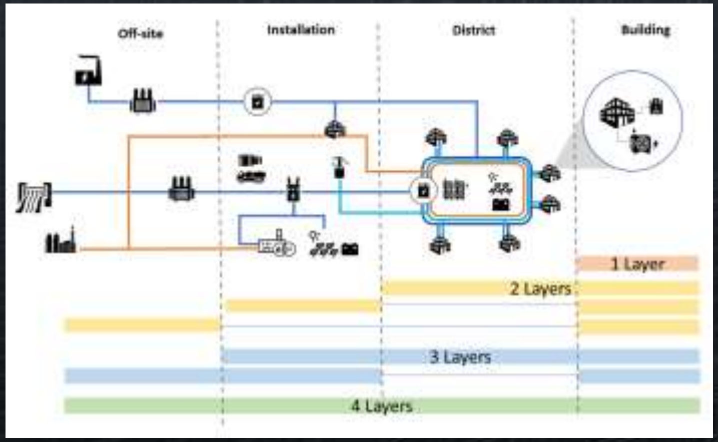
Scorecards are also aligned with strategic direction from service leadership

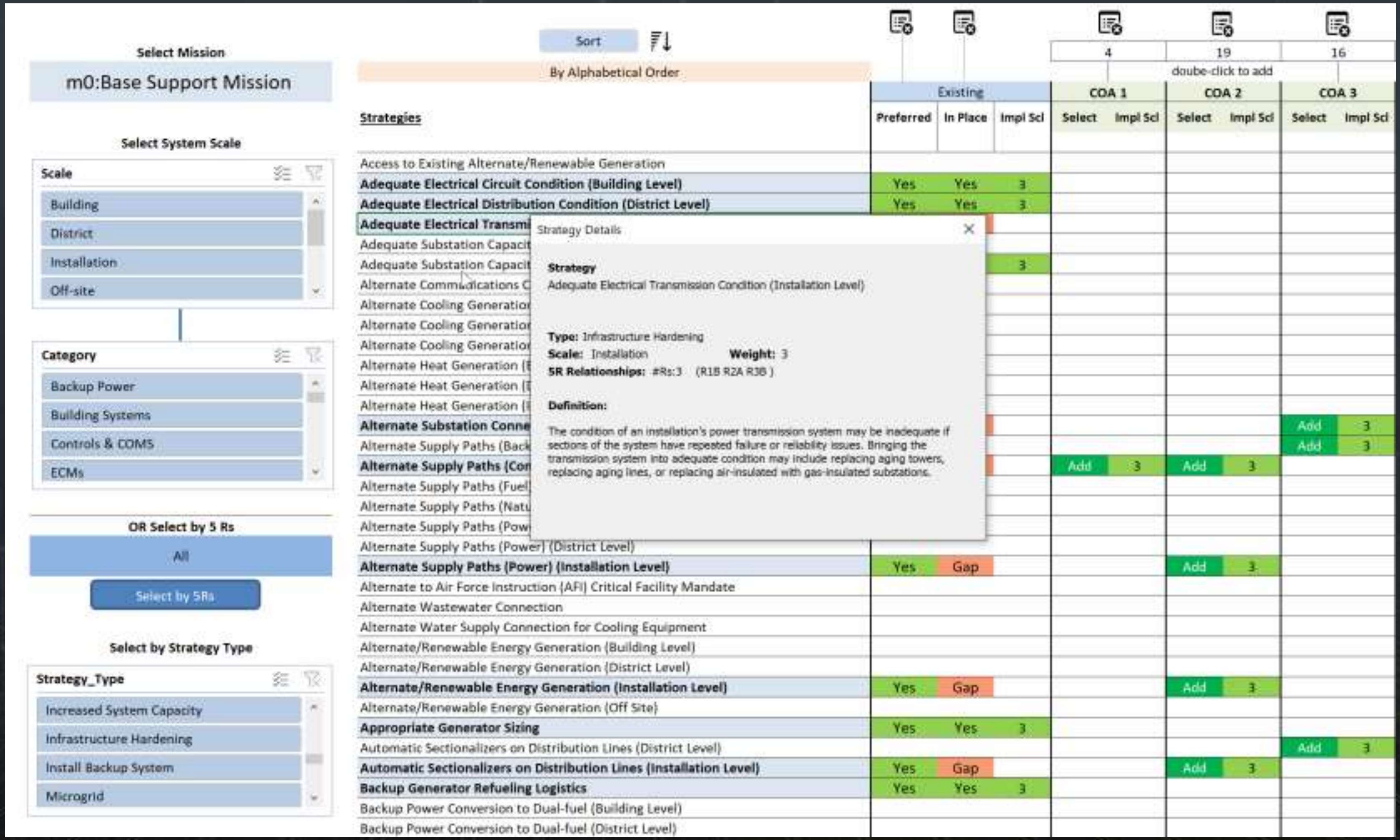


Step 5: Strategy Development (COAs)

Interactive and intuitive strategy mapping process

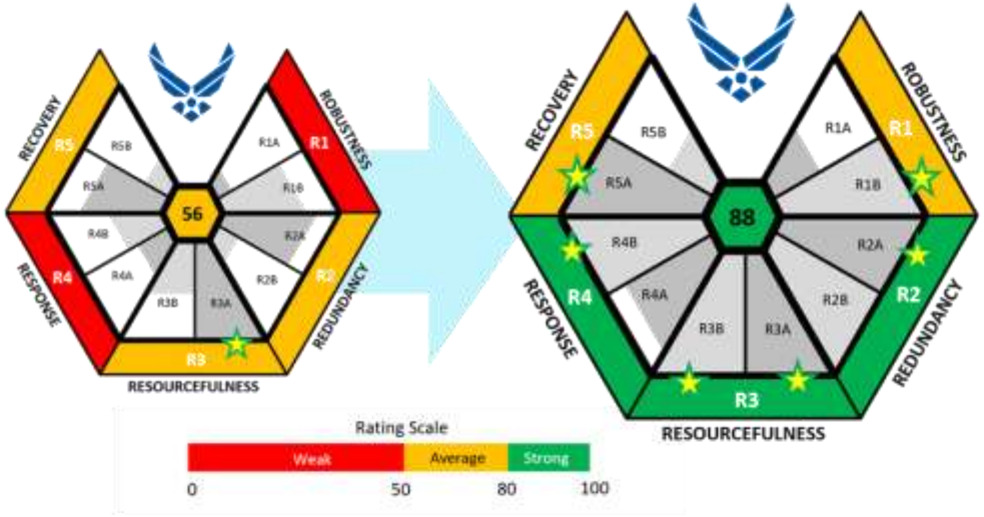
Considering strategies across scale to meet mission requirements





Step 6: Resiliency Action Plan

Resulting mission-tied implementation roadmap



OPTIMIZE COST OF OWNERSHIP

USING THE RIGHT STRATEGIC PROJECTS

SCALE	STRATEGY	SRs					RESOURCE				CRITICAL MISSION				CRITICAL NON-MISSION
		R1	R2	R3	R4	R5	POWER	WATER	HEATING	COOLING	AFTAC	920 RW	45 LRS	45 OG	
Building	Plug Load Management †			•			•								•
Building	System Re-Commissioning			•			•		•	•	•	•	•	•	•
Energy Storage															
District	Centralized Fuel Storage Capacity		•	•			•		•				•		
Building	Energy Storage		•	•			•				•				
Installation	Energy Storage		•	•			•				•	•	•	•	•
Energy Supply															
Installation	Alternative/Renewable Energy Generation		•		•		•				•	•	•	•	•
Maintenance															
Installation	Critical Spares and Obsolescence Prevention					•	•	•	•	•	•	•	•	•	•
Installation	Personnel Training for Expertise Redundancy	•	•		•	•	•				•	•	•	•	•
Installation	Standardization of Replacement Parts	•				•	•	•	•	•	•	•	•	•	•
Other															
Installation	Power, Water, and Fuel Lines Vulnerability Assessment	•	•	•			•	•			•	•	•	•	•
Power Distribution															
Building	Adequate Electrical Circuit Condition	•		•			•							•	
District	Adequate Electrical Distribution Condition	•		•			•				•				
Installation	Adequate Electrical Transmission Condition	•	•	•			•				•	•	•	•	•
Installation	Alternative Substation Connection		•	•			•				•	•	•	•	•
Building	Alternative Supply Paths (Power)		•				•				•				
Installation	Alternative Supply Paths (Power)		•				•				•	•	•	•	•
Installation	Automatic Sectionalizers on Distribution Lines					•	•				•	•	•	•	•
District	District Microgrid †		•	•	•		•				•			•	
District	District Substation Interconnect (Back-feeding)		•		•		•								•
Installation	Installation Substation Interconnect (Back-feeding)		•		•		•				•	•	•	•	•

Advantages of the Practical Approach

- Rapid assessment of baseline and capability gaps
- Standardized scoring for enterprise level prioritization
- Easily communicate strategic overview of installation and missions with synergies and benefits
- Develop and leverage best practices across the enterprise and multiple missions
- Allow for focused deep dive on high priority issues
- Ability to engage with non-technical mission owners
- Ability to incorporate local knowledge

Case Studies

– **Goal:** what was the installations intentions when looking at a resilience project

– **Practical Consideration:** What did that base have to contend with in striving for that goal

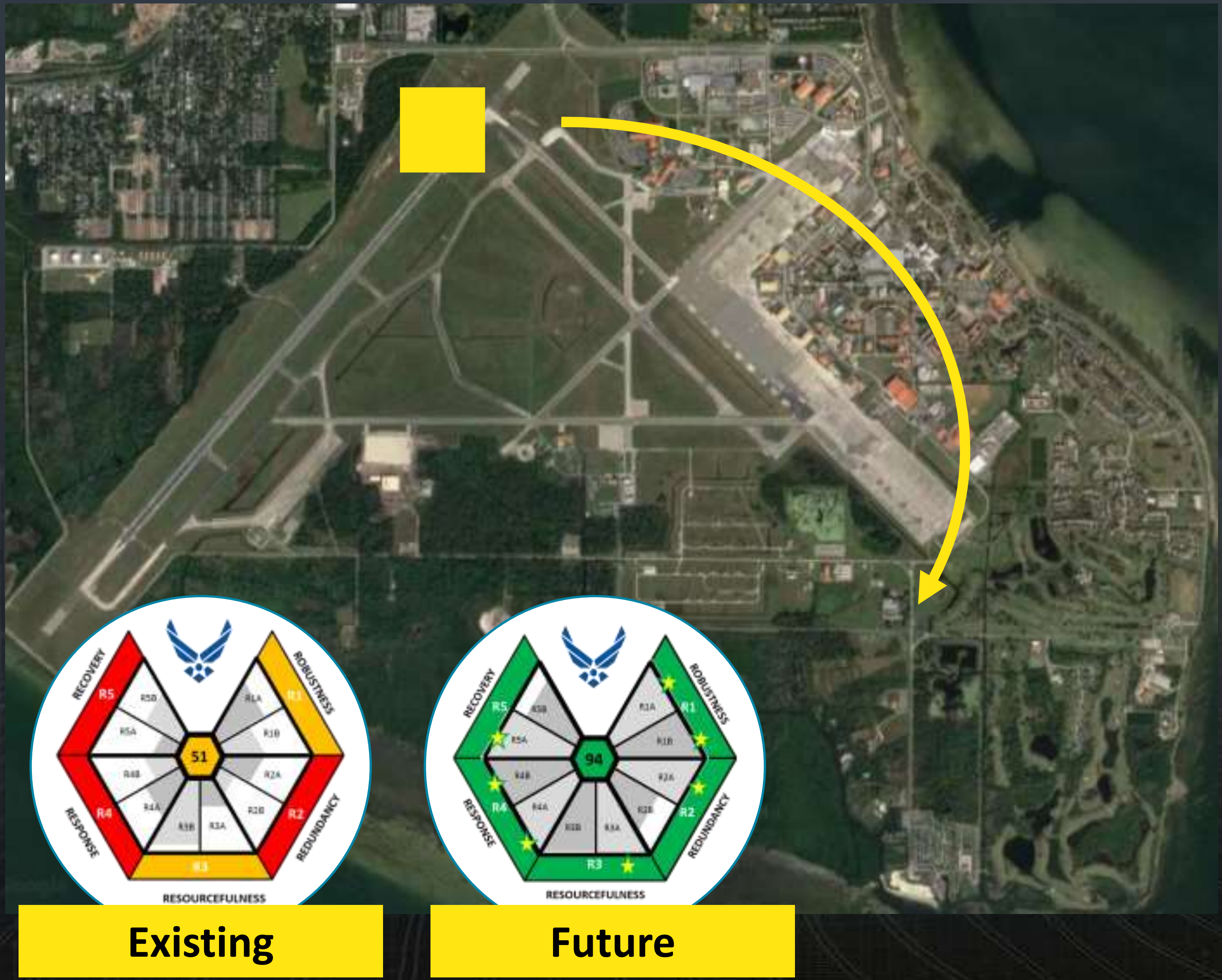
– **Solution:** What were the strategies deployed to meet the goal and how was it achieved

Case Study: MacDill AFB (USAF)

Goal: Improved power availability beyond critical 'campuses'

Practical considerations: lack of expertise in power generation; varied infrastructure reliability

Solution: Partnership with local utility to install a gas 'peaker-plant' on installation.



Note: Scorecards used for illustrative purposes only and do not reflect actual performance

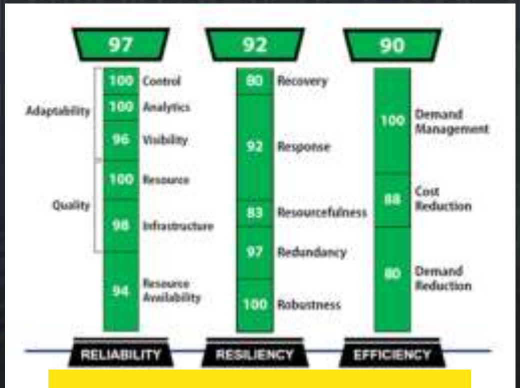
Case Study: PMRF (US Navy)

Goal: Improved power availability and quality, reduction in operational costs

Practical considerations: small base but important missions, high reliance on contractors, existing stranded PV

Solution: Enhanced use lease with utility + grid consolidation

Existing



Future

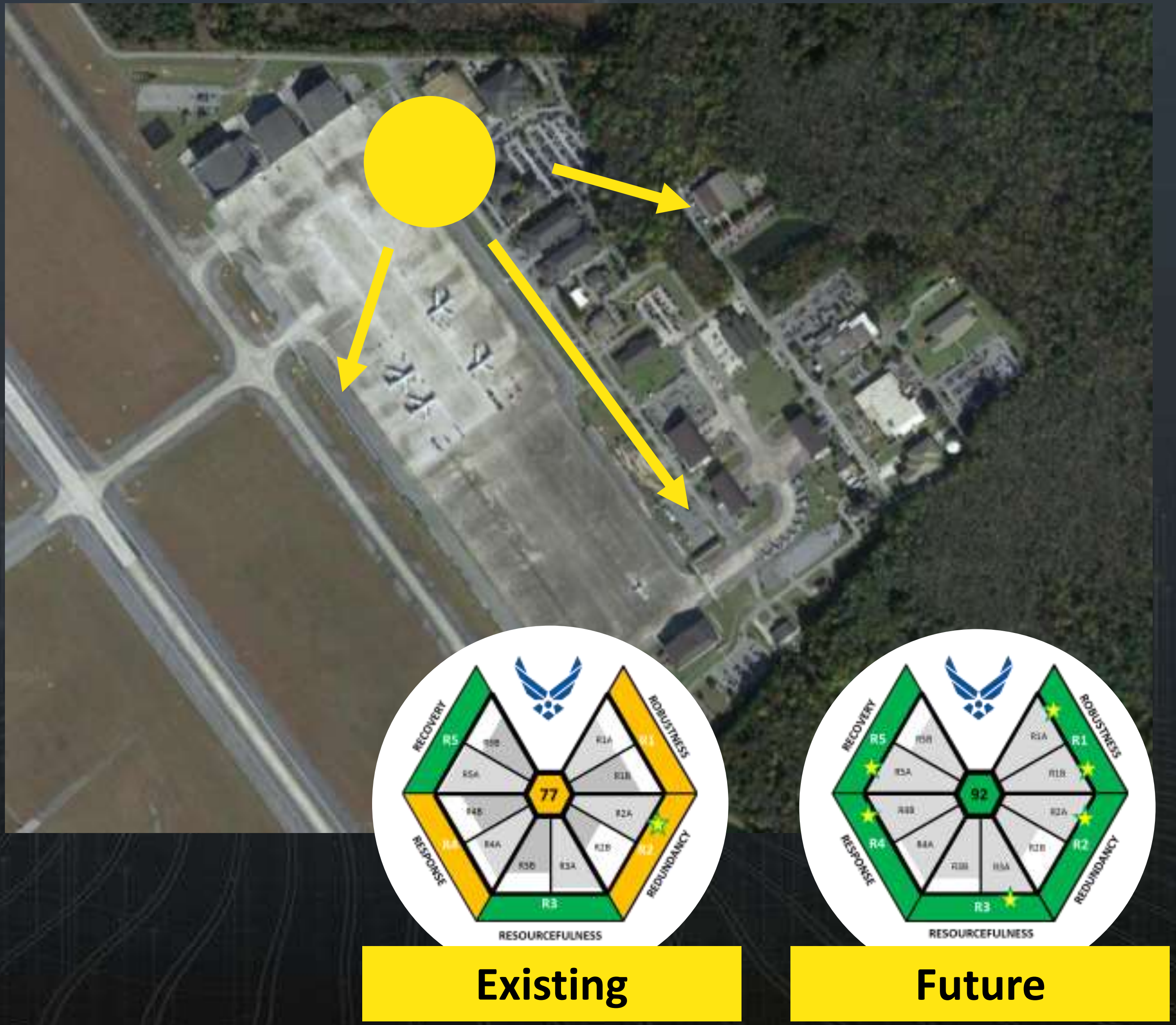
Note: Scorecards used for illustrative purposes only and do not reflect actual performance

Case Study: Warner Robins (ANG)

Goal: Visibility and controllability of loads, redundant power supply

Practical considerations: Tenant on a large base (little ‘up-stream’ influence), small staff, significant planned growth

Solution: District microgrid with PAMPER, smart energy monitoring



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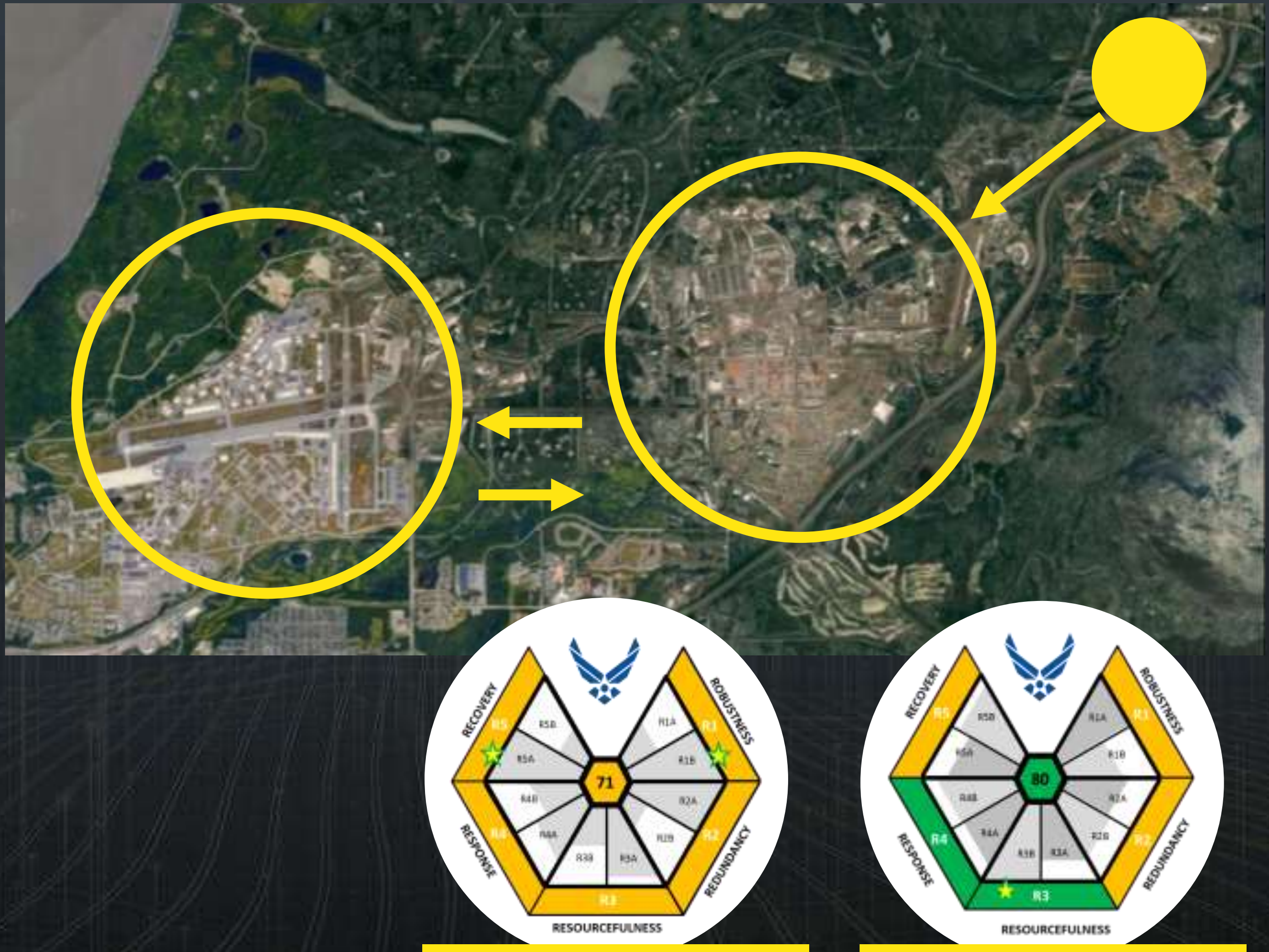
Case Study: JBER (US Army and USAF)

Goal: Zero downtime of heat (requiring electricity)

Practical considerations: Two very different 'sides' – one privatized, heat redundancy critical, OCONUS/remote

Solution: Landfill gas capacity and interconnect 2 grids



Existing **Future**

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Summary

- Empowering installations to implement resilience projects requires a plan that understands their unique challenges and capacity
- An energy planning process that facilitates strategic thinking (beyond mission/responsibility boundaries) from enables collaboration and the development to smarter solutions
- Some installations are already able to operate and implement projects in this way leveraging strong local expertise and relationships
- These forward-thinking installations have shown the importance of multi-stakeholder partnerships in successfully enhancing energy resilience
- Proven an effective way of developing mission-driven strategies without large resources
- Lays the foundation for enhanced analysis and design

Thank You