Experiences with Energy Planning for DOD Installations

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US Army Corps of Engineers
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Agenda

- Addressing the problem
- Schofield Barracks Case Study
  - ▶ Sustainability Component Plan
  - ▶ NZP Tool
- Future Directions – Tools and Processes

Case Study

- Schofield Barracks, Hawaii

Master Planning Mission Federal Drivers

2005 2006 2007 2008 2009

Energy Policy Act of 2005 (EPAct05)
- *New facilities, 30% more efficient than ASHRAE 90.1*
- *Use of advanced meters*

Federal Leadership in High Performance and Sustainable Buildings MOU (HPSB)
- *Establish Guiding Principles for new construction*
- *DoD was first voluntary signatory*

Executive Order 13423: Strengthening Federal Environmental, Energy and Transportation Management
- *Reduce energy consumption 30% by 2015*
- *Reduce water use 16% by 2015*
- *All new construction incorporate HPSB principles*

Energy Independence and Security Act (EISA)
- *New facilities reduce fossil fuel generated energy, 55% by 2010 – 100% by 2030*
- *30% hot water supplied by solar water heaters*
- *Restore predevelopment hydrology*

Executive Order 13514: Federal Leadership in Environmental, Energy and Economic Performance
- GHG reporting requirements for Federal facilities
- Agencies develop Strategic Sustainability Performance Plan


Schofield Barracks, HI


Schofield Barracks, HI

Just in! DoD Memo…

OSD Installation Energy Plans Memo, 31 March 2016

- OSD memo requiring all services to report in one year each agencies' plan to implementing an energy plan tied to the master plan by 21 March 2019.

Schofield Barracks, HI

Schofield Barracks, HI

U.S. Office of Secretary of Defense Installation Energy Plan Guidance, March 31, 2016

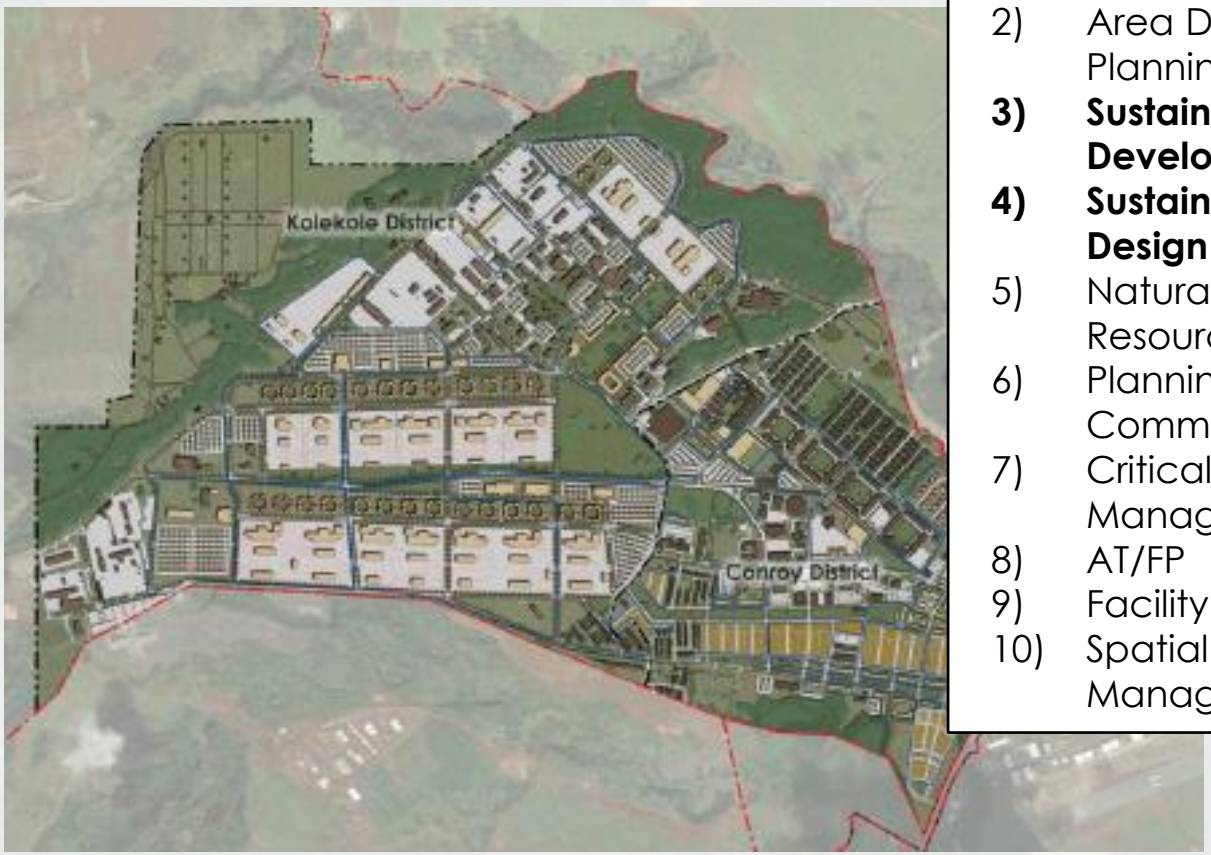
✓ **NZP™ Tool directly supports.**

✓ **SCP process directly supports.**

- ✓ Phase 1: Identify the team, tasks, deliverables, and goals.
- ✓ Phase 2: Establish baseline and future base case
- ✓ Phase 3: Establish alternative scenarios and analyze gaps
- ✓ Phase 4: Develop and sequence projects and activities
- ✓ Phase 5: Assemble review and finalize document
- ✓ Phase 6: Execution and maintenance of the Installation Energy Plan (allows iteration on the plan due to unforeseen circumstances)

Master Planning DoD Policy Response

UFC 2-100-01 Installation Planning/ planning strategies



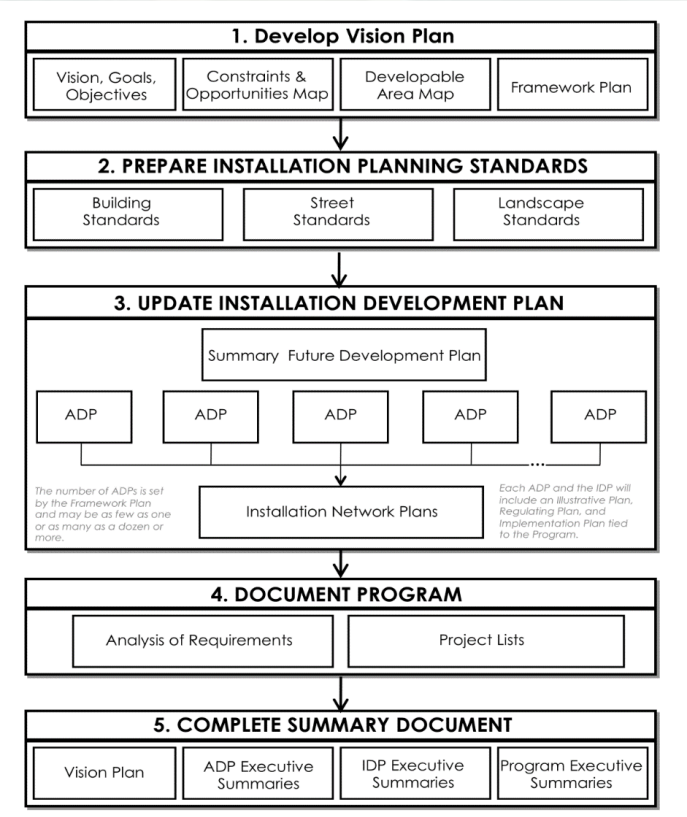
1) Form-Based Coding
2) Area Development Planning
3) Sustainable Development
4) Sustainable Building Design
5) Natural and Cultural Resource Preservation
6) Planning for Healthy Communities
7) Critical Infrastructure Risk Management (CIRM)
8) AT/FP
9) Facility Standardization
10) Spatial Data Management

Master Planning Methodology and Product

UFC 2-100-01 Installation Planning/ planning strategies

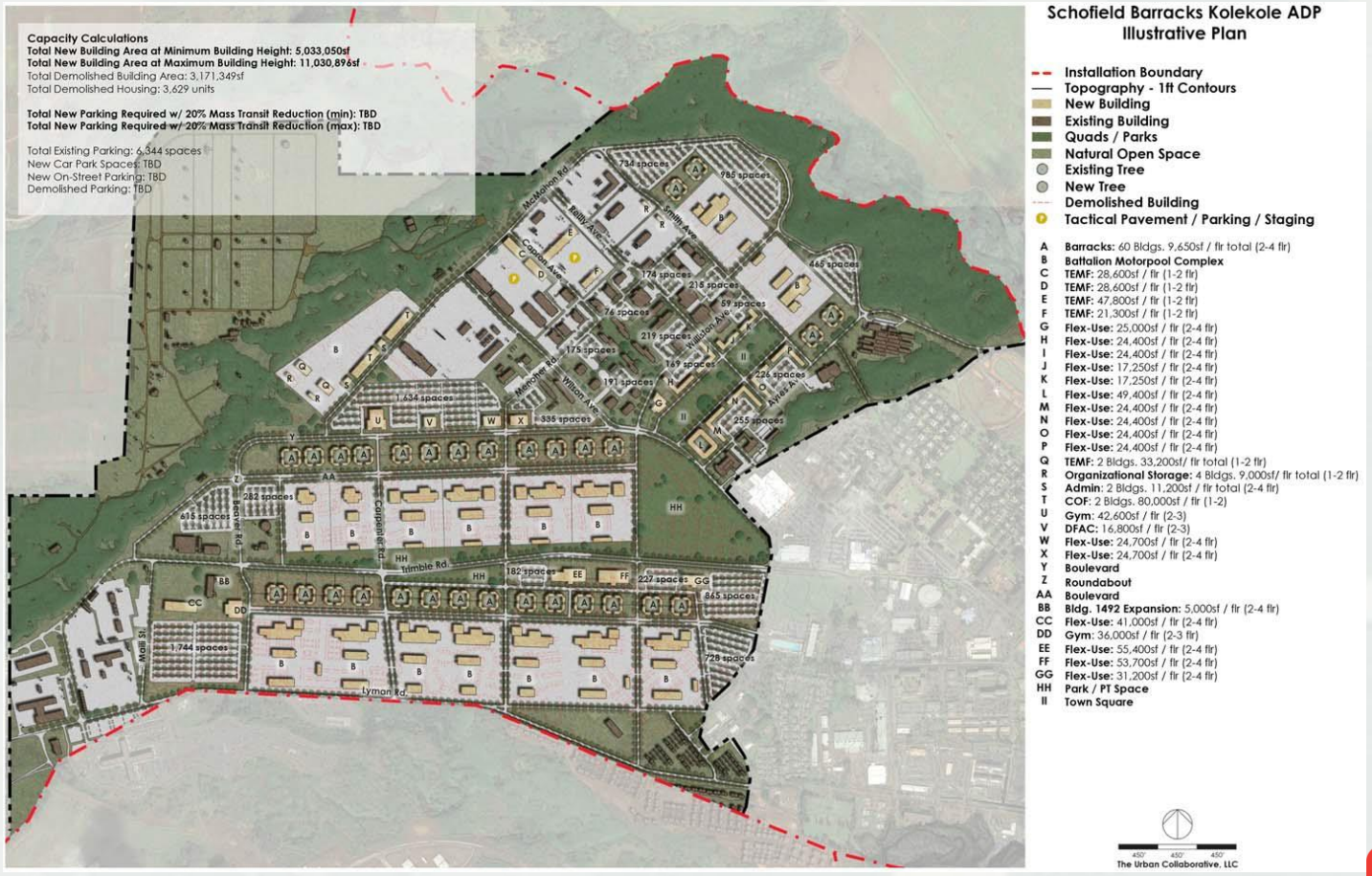
MASTER PLANNING PROCESS

- Establish the Vision
- Collect & Analyze data
- Develop Goals & Objectives
- Develop & Evaluate Alternatives
- Select & Evaluate Alternatives
- Implement Plan
- Monitor/ Amend Plan



Area Development Plan

Kolekole, Schofield Barracks



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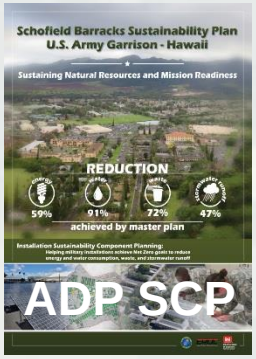
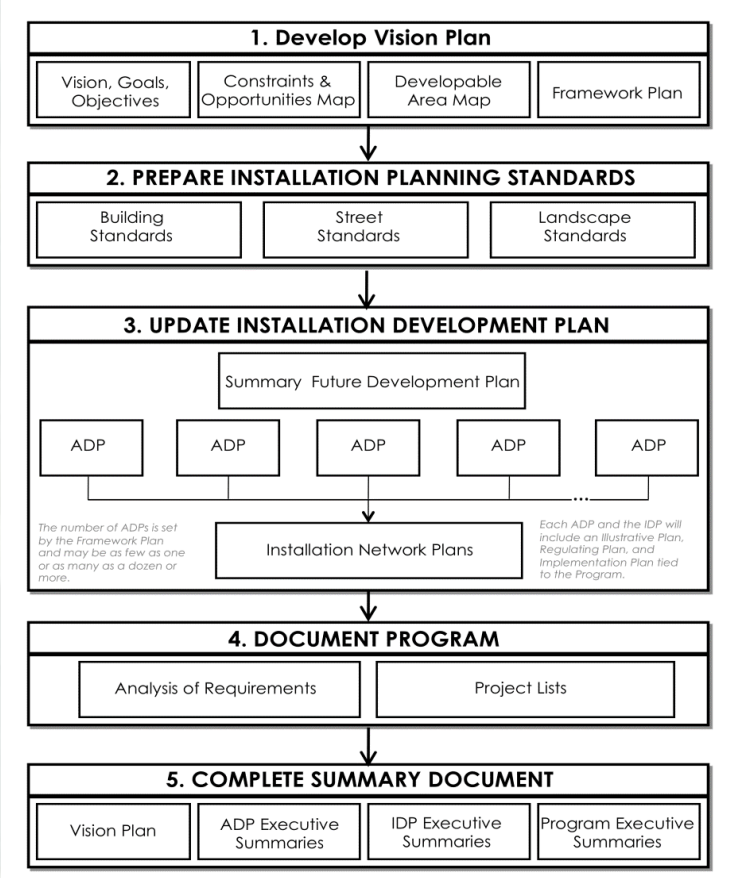
Integration into the Plan

Meet federal planning mandates for maintaining energy, water, waste, and storm water usage optimization through data collection and analysis.



SCP'S are integrated into ADPs and IDPs

Identified projects integrated into investment program



Definitions

- Framing Goal – A target goal for analysis. Not a commitment or decision.
- Baseline – A snapshot of the current energy use situation. The baseline is one reference point used to evaluate alternative futures.
- Future Base Case – The baseline extended to include already-funded renovation as well as planned construction and demolition activities. The base case is a future reference point for "business as usual."
- Alternative(s) – A set of energy measures to be compared against the base case
  - Better, Best, Others
- Site Energy – Energy measured at the point of use.
- Source Energy – Energy measured at the point it is generated (takes into account conversion and transmission losses).
- District/Cluster - a group of buildings to be served by a microgrid/ heating/ cooling loop (or some combination of these)

SCP Process

An Overview

Step 1 Assemble SCP Planning and Stakeholder Team and Develop Framework Goals

Step 2 Installation Data Collection and Establish baseline and future base case

Step 3 Establish and Evaluation Future Case Scenarios and analyze gaps

Step 4 SCP Workshop

Step 5 Develop SCP Document

Base, Better, and Best Case Scenarios


Solar Thermal Hot Water: Fort Shafter, HI


External Shading: Kamuela, HI

Goals - Metrics that guide the analysis of alternatives. Net Zero Energy, Site Energy, Source Energy, Renewables, etc.

Baseline – A "typical" year.

Base Case – A projection of future usage given "business as usual"

Alternatives

- **Better Case** - reduce energy demand on buildings using cost effective EEMS that meet mission requirements (goals)
- **Best Case** - reduce total energy usage further using supply and distribution strategies (cogeneration, solar, wind, storage, etc.)
- Many more alternatives may (and should) be explored.

SCP Process IEP Phases

Step 1 **Assemble SCP Planning and Stakeholder Team and Develop Framework Goals**

Step 2 Installation Data Collection and Establish baseline and future base case

Step 3 Establish and Evaluation Future Case Scenarios and analyze gaps

Step 4 SCP Workshop

Step 5 Develop SCP Document

Phase 1: Identify the team, tasks, deliverables, and goals.

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Phase 6: Execution and maintenance of the Installation Energy Plan

Stakeholders needed from the Garrison:

- DPW (master planning, energy, utilities)
- DPTMS (range control)
- Tenants
- etc

Parameter	2040 Base Case	2040 Target	Comments
Energy Efficiency %	Reference	40%	"Forty by Forty"
Source Energy Use	360,740 MWh	216,444 MWh	Based on Base Case
Site Energy Use	300,400 MWh	Derived	Depends on Scenario
GHG Reduction %	Reference	100%	Net Zero
Scope 1 & 2 Emissions	63,800 mt	Net Zero	
Energy Economics			Gov't Analysis Life Cycle Cost Effective
Internal Rate of Return	NA	5%	Calculated over plan period
Energy Security	Acceptable	No Change	"Security and Efficiency"
Quality, reliability, resilience	NA	No change	Thermal and electric Equal or better than baseline

SCP Process

Step 1 Assemble SCP Planning and Stakeholder Team and Develop Framework Goals

Step 2 Installation Data Collection and Establish baseline and future base case

Baseline: Existing buildings are simulated. No heating.

Base case: Buildings with planned construction, renovation, and demolition. No existing central plant or cooling systems

Step 3 Establish and Evaluation Future Case Scenarios and analyze gaps

Step 4 SCP Workshop

Step 5 Develop SCP Document

IEP Phases

Phase 1: Identify the team, tasks, deliverables, and goals.

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Calculating the Solution: Energy - Short-Term

I. Baseline Building Energy Use Intensity (EUI)

1. Determine Baseline Energy Use Intensity	A) Total Baseline Energy Use (kBtu/yr)		Total Existing (Current) Building Area (sf)		B) Baseline Building EUI (kBtu/sf/yr)
	792,265,916	÷	6,168,912	=	128

Total EUIs are derived from the CERL Net Zero Planner Tool. Values are based on modeling of existing facilities and checked against metered data.

II. Base Case Energy Use Intensity

1. Determine Base Case Energy Use Intensity	C) Total Base Case Energy Use (kBtu/yr)		D) Total Projected Building Area (sf)		E) Base Case Building EUI (kBtu/sf/yr)
	98,929,042	÷	3,693,790	=	26.8

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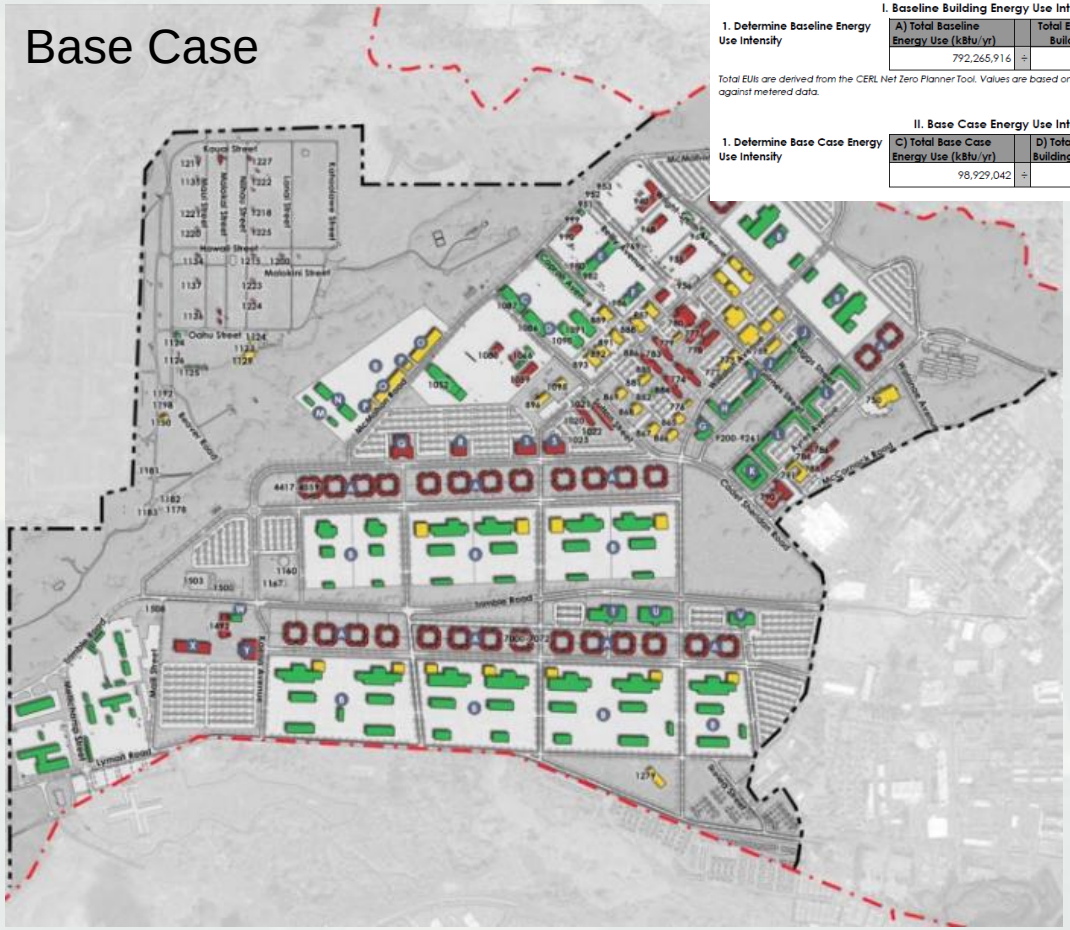
SCP Process

Step 2 Installation Data Collection and Establish baseline and future base case



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Better Case: Minor EEM improvements to buildings

Best Case: Aggressive EEM improvements to buildings.

Best Case w/ 50% renewables: Meet half of best case electrical loads with non-fossil fuel source

Best Case net zero: Buildings with a modern hot water system and lowest equivalent annual cost equipment to meet net zero fossil fuel goals. Only analyzed using the NZP tool.

Step 4 SCP Workshop

Step 5 Develop SCP Document

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Calculating the Solution: Energy - Short-Term

III. Better Case Energy Use - Projected Energy Use Intensity & Reduction Rate

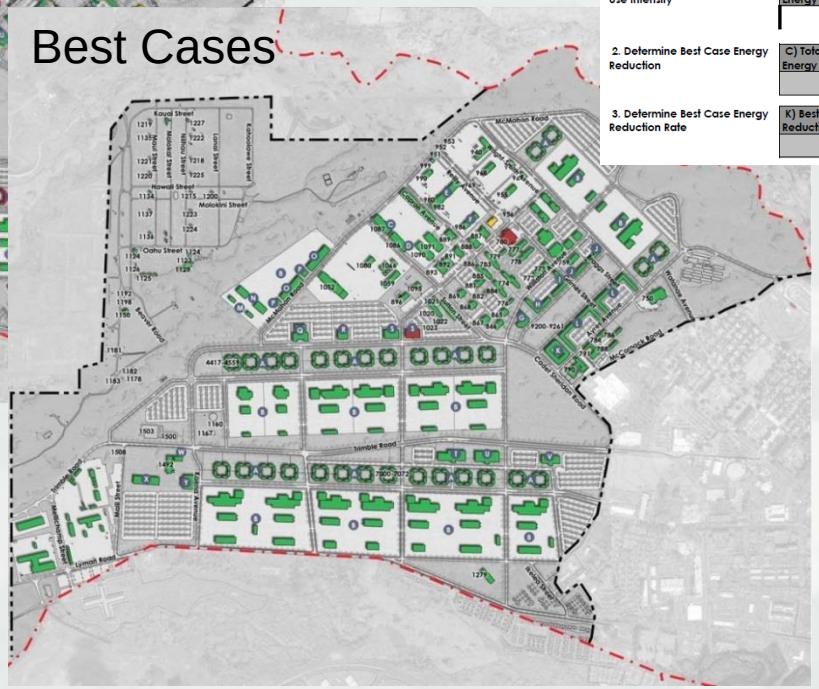
1. Determine Better Case Energy Use Intensity	F) Total Better Case Energy Use (kBtu/yr)		D) Total Projected Building Area (sf)		G) Better Case Building EUI (kBtu/sf/yr)
	87,729,152	÷	3,693,790	=	23.8
2. Determine Better Case Energy Reduction	C) Total Base Case Energy Use (kBtu/yr)		F) Total Better Case Energy Use (kBtu/yr)		H) Better Case Energy Reduction (kBtu/yr)
	98,929,042	-	87,729,152	=	11,199,890
3. Determine Better Case Energy Reduction Rate	H) Better Case Energy Reduction (kBtu/yr)		C) Total Base Case Energy Use (kBtu/yr)		Better Case Energy Reduction Rate (%)
	11,199,890	÷	98,929,042	=	11.3%

IV. Best Case Energy Use - Projected Energy Use Intensity & Reduction Rate

1. Determine Best Case Energy Use Intensity	I) Total Best Case Energy Use (kBtu/yr)		D) Total Projected Building Area (sf)		J) Best Case Building EUI (kBtu/sf/yr)
	80,037,385	÷	3,693,790	=	22
2. Determine Best Case Energy Reduction	C) Total Base Case Energy Use (kBtu/yr)		I) Total Best Case Energy Use (kBtu/yr)		K) Best Case Energy Reduction (kBtu/yr)
	98,929,042	-	80,037,385	=	18,891,658
3. Determine Best Case Energy Reduction Rate	K) Best Case Energy Reduction (kBtu/yr)		C) Total Base Case Energy Use (kBtu/yr)		Best Case Energy Reduction Rate (%)
	18,891,658	÷	98,929,042	=	19.1%

SCP Process

Step 3 Establish and Evaluation Future Case Scenarios and analyze gaps



Calculating the Solution: Energy - Short-Term

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Solar Thermal Hot Water: Fort Shafter, HI

Workshop Stakeholder Engagement

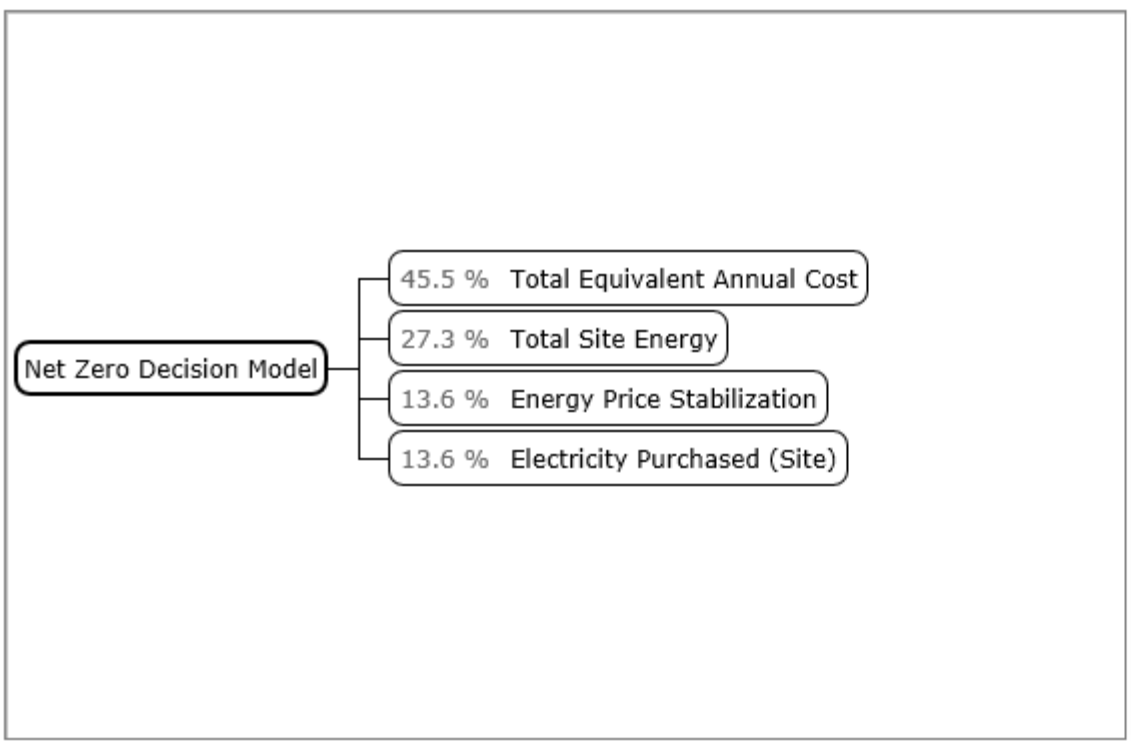

External Shading: Kamuela, HI

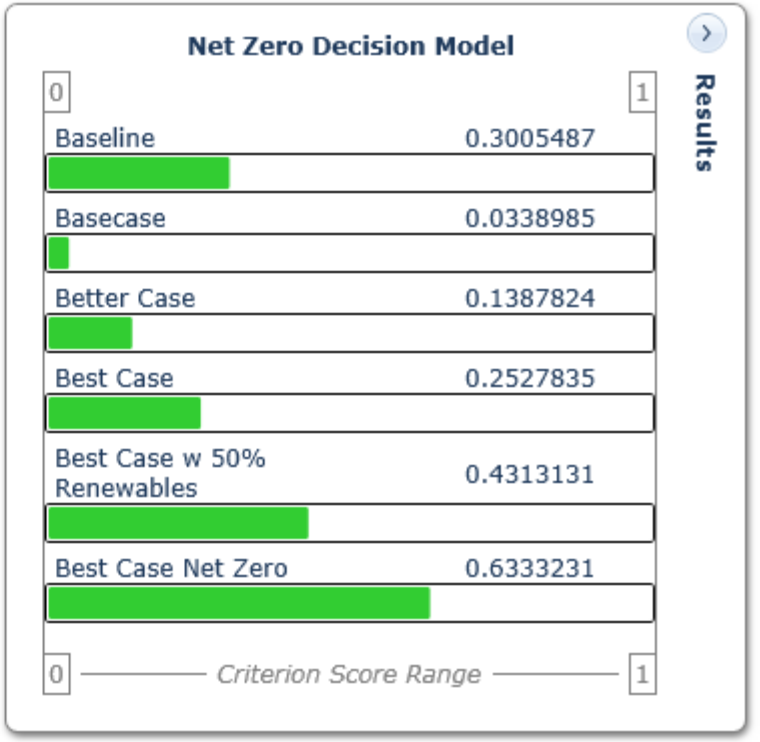
SCP Process

Step 4 SCP Workshop

Multi Criteria Decision Analysis Model (MCDA)

Model Weights

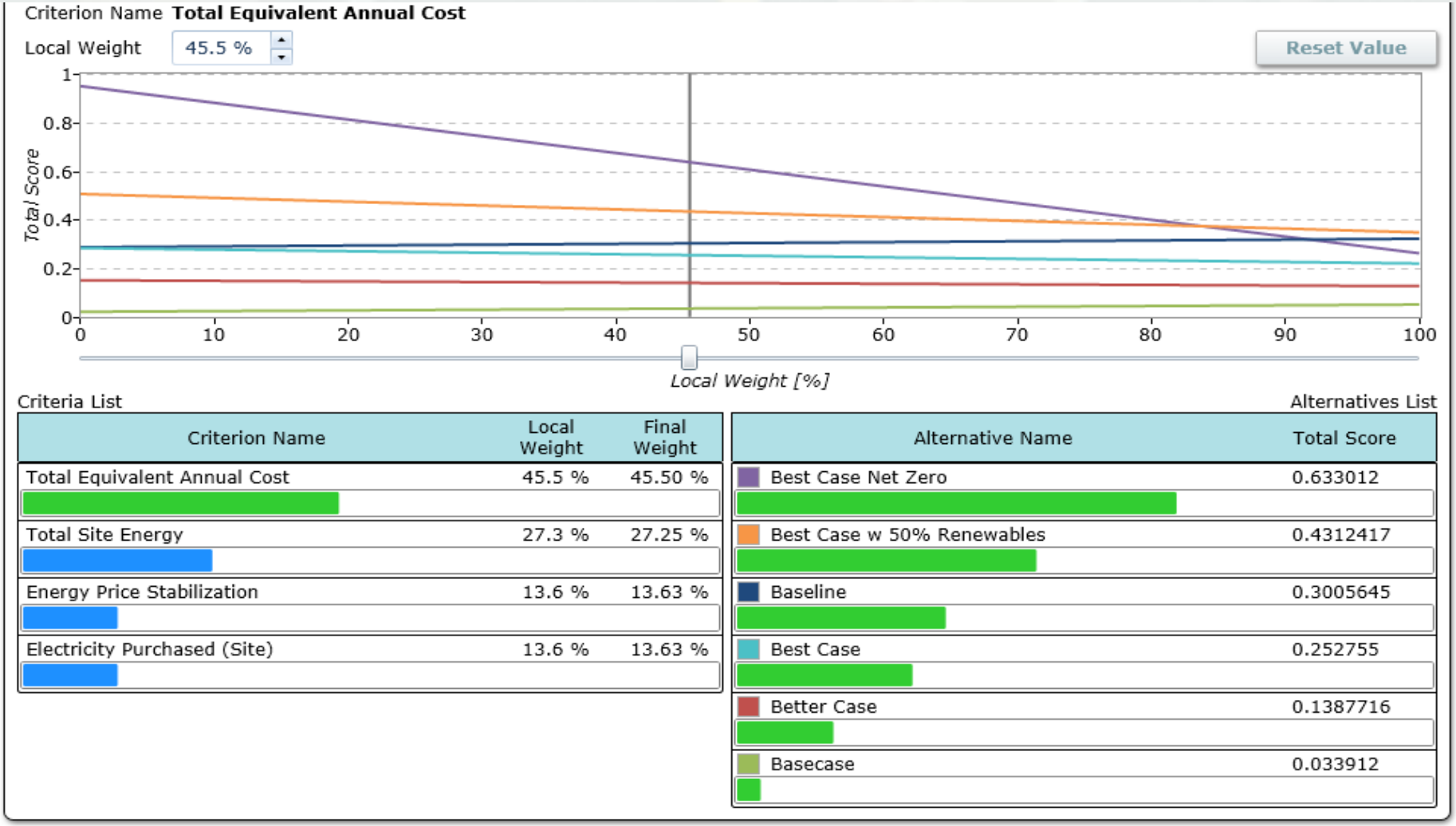




SCP Process

Step 4 SCP Workshop

Multi Criteria Decision Analysis Model (MCDA)



Criterion Name	Local Weight	Final Weight
Total Equivalent Annual Cost	45.5 %	45.50 %
Total Site Energy	27.3 %	27.25 %
Energy Price Stabilization	13.6 %	13.63 %
Electricity Purchased (Site)	13.6 %	13.63 %

Alternative Name	Total Score
Best Case Net Zero	0.633012
Best Case w 50% Renewables	0.4312417
Baseline	0.3005645
Best Case	0.252755
Better Case	0.1387716
Basecase	0.033912

SCP Process

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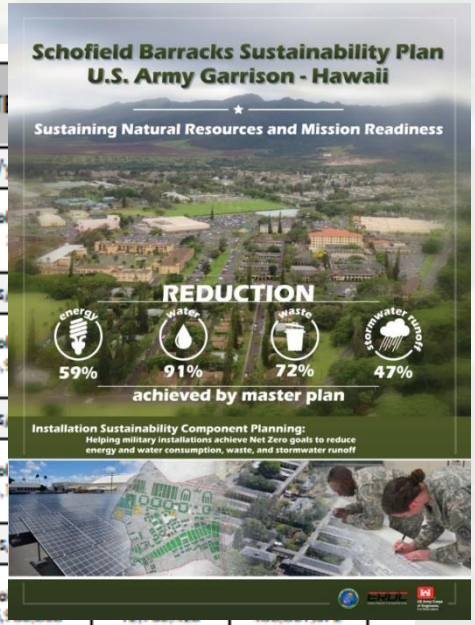
SCP Process

Step 5 Develop SCP Document

Meet federal planning mandates for maintaining energy, water, waste, and storm water usage optimization through data collection and analysis.

	ENERGY		WATER		WASTE	
Baseline Use Rate Use Intensities based on current consumption patterns	SB: 17.4 kWh/sf/year		SB: 91.25 gal/sf/year		SB: 3.92 lbs/sf/	
	Conroy: 22.4	Kolekole: 13.9	Conroy: 91.25	Kolekole: 91.25	Conroy: 3.92	Kol
Base Case Total Demand Total Demand for Installation in the Base Case	SB: 424 Million kWh/year		SB: 2.14 Billion gal/year		SB: 96 Million lbs/	
	Conroy: 221,944,852	Kolekole: 202,172,932	Conroy: 905,881,455	Kolekole: 1,323,782,000	Conroy: 38,915,675	Kol 56,9
Better Case Total Demand Reduced demand based on application of selected strategies	SB: 301 Million kWh/year		SB: 961 Million gal/year		SB: 58 Million lbs/	
	Conroy: 168,266,339	Kolekole: 132,957,445	Conroy: 317,687,200	Kolekole: 642,814,371	Conroy: 23,349,405	Kol 34,1
Best Case Total Demand Rreduced Demand based on application of all strategies	SB: 175 Million kWh/year		SB: 192 Million gal/year		SB: 27 Million lbs/	
	Conroy: 79,428,214	Kolekole: 95,713,680	Conroy: 78,525,695	Kolekole: 113,297,556	Conroy: 10,896,388	Kol 15,5
Total Reduction Reduction in Use From Base Case to Best Case	SB: 59%		SB: 91%		SB: 72%		SB: 47%	
	Conroy: 62.2 %	Kolekole: 52.6%	Conroy: 91.3%	Kolekole: 91.4%	Conroy: 72%	Kolekole: 72%	Conroy: 94.9%	Kolekole: 27.5%

Note: Calculations in this report are based on the capacity potential of Schofield Barracks (SB), United States Army Garrison, Hawaii.

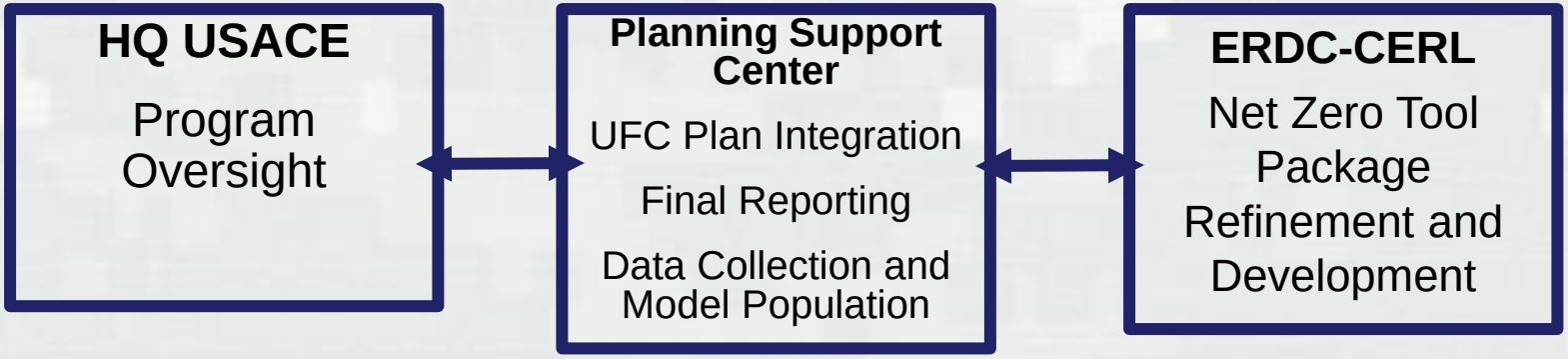


Sustainability Component Plans (SCPs)

2015 – recent
70+ sites

Presidio of Monterey (POM)
Parks Reserve Forces Training Area (PRFTA)
NASA JSC – Main, EF/SC, WSTF
Fort Hood – 13 districts
USAG-HI – 9 districts
NSA
Fort Bliss – 2 districts
WSMR – 7 districts
Army National Guard Greeley
RAF Lakenheath
ESTCP JBPHH
ESTCP Fort Hood
McAlester Army Ammunition Plant
Camp Buehring, Kuwait
MCAS Iwakuni - 6 districts
Fort Polk
AMC Anniston Army Depot
AMC Letterkenny Army Depot

Current SCP/Net Zero Tool Teaming



Questions?

ESTCP

Visualization of Energy Monitoring, Benchmarking, Modeling, and Project Generation through Integration of the Comprehensive Asset Master Planning Solution (CAMPS) with the Net Zero Planner (NZP)

Performer: USACE SWD, CERL

Demonstration Sites: Fort Hood, JBPHH

Technology: Demonstrate integration of a Master Planning system (**CAMPS**) with an Energy Planning System (**NZP**) to provide improved Installation Scale-energy planning.

Technical Objectives:

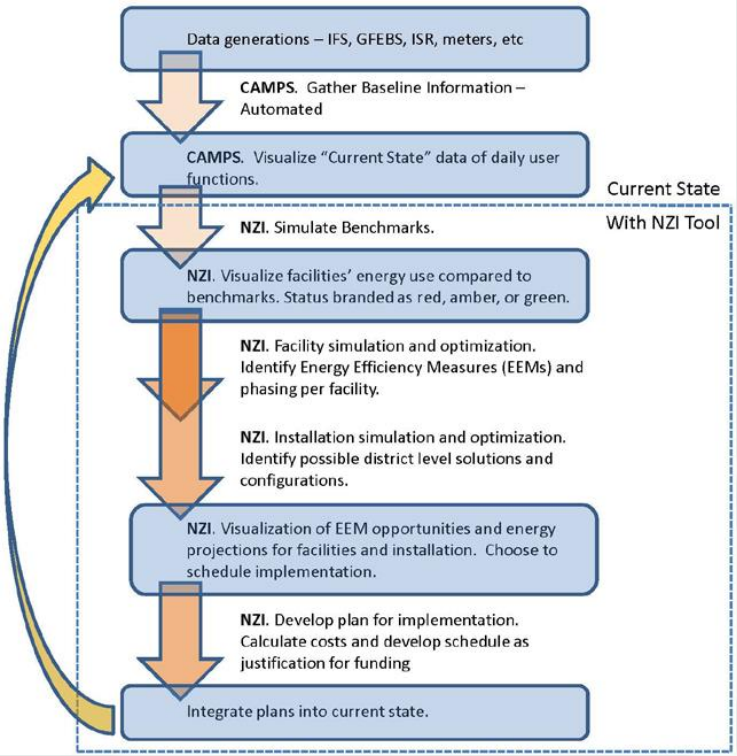
- Integration of Master Planning tool (CAMPS) and Energy Planning tool (NZP)
- Rapid identification and quantification of energy facility and installation energy efficiency measures.
- Improved planner and installation tenant understanding of energy measures
- Reduced planning cycle time.

CAMPS/NZP will help installation planners and residents to identify and communicate energy efficiency opportunities (red facilities exceed EUI targets for plan).

ESTCP

Visualization of Energy Monitoring, Benchmarking, Modeling, and Project Generation through Integration of the Comprehensive Asset Master Planning Solution (CAMPS) with the Net Zero Planner (NZP)

Technical Approach (TA) CAMPS/NZP Architecture



ESTCP funding integration of CAMPS/NZP

Certification for Competency