REDUCING FUEL CONSUMPTION: A MARITIME ENERGY PORTFOLIO MANAGEMENT APPROACH

Kathleen Schneck
Herren Associates
Senior Engineering Consultant
Lean Six Sigma Black Belt

Thomas Levac
Herren Associates
Associate Engineering Consultant
Marine Engineer

Glen Sturtevant
Program Executive Office, Ships
Science & Technology Director
Program Manager
### Report Documentation Page

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

| 1. REPORT DATE | MAY 2011 |
| 2. REPORT TYPE |
| 3. DATES COVERED | 00-00-2011 to 00-00-2011 |
| 5a. CONTRACT NUMBER |
| 5b. GRANT NUMBER |
| 5c. PROGRAM ELEMENT NUMBER |
| 5d. PROJECT NUMBER |
| 5e. TASK NUMBER |
| 5f. WORK UNIT NUMBER |
| 6. AUTHOR(S) |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) | Herren Associates, 1220 12th Street, Suite 310, Washington, DC, 20003 |
| 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) |
| 10. SPONSOR/MONITOR'S ACRONYM(S) |
| 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT | Approved for public release; distribution unlimited |
| 13. SUPPLEMENTARY NOTES | Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA. |
| 14. ABSTRACT |
| 15. SUBJECT TERMS |
| 16. SECURITY CLASSIFICATION OF: |
| a. REPORT | unclassified |
| b. ABSTRACT | unclassified |
| c. THIS PAGE | unclassified |
| 17. LIMITATION OF ABSTRACT | Same as Report (SAR) |
| 18. NUMBER OF PAGES | 15 |
| 19a. NAME OF RESPONSIBLE PERSON |

---

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18
Outline

- ENERGY AS A NAVY IMPERATIVE
- ENERGY DECISION FRAMEWORK
- MARITIME ENERGY PORTFOLIO PROCESS
- IMPACT TO NAVSEA ENERGY PROGRAM
Energy Demands and Costs Continue to Rise
Manpower and Maintenance Budgets are Challenged
We Have the Ability to Control Acquisition Costs
US Navy Tactical Energy Goals

**INCREASE ALTERNATIVE ENERGY USE DON-WIDE**

- By 2020, 50% of total DON energy consumption will come from alternative sources.

**SAIL THE “GREAT GREEN FLEET”**

- DON will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016.

**ENERGY EFFICIENT ACQUISITION**

- Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings.

**EFFICIENCY AND CONSERVATION AFLOAT**

- By 2020, the Navy will increase efficiency and reduce overall fuel consumption afloat by 15%.
Energy Decision Framework

1. Improve Energy Efficiency
   - Identify Inefficiencies
   - Perform Analyses
   - Examine Technology Candidates
   - Identify Solutions & Submit Budget

2. Perform Analyses
   - Determine Possible Solutions

3. Examine Technology Candidates
   - Develop Implementation Plan

4. Identify Solutions & Submit Budget
   - Evaluate Energy Scorecards
   - Analyze Fuel Consumption
   - Identify Inefficiencies

5. Measure Success
   - Policy & Guidance

Energy Efficiency Enabling Technologies (EET)
Sets the tone and goals for framing technology development investment decisions based on cost, technical maturity, risk, and overall fuel savings.

Navy leadership is increasingly proactive with SECNAV, CNO, and Fleet Goals for fuel savings as Navy technical agents investigate energy efficient ship designs and equipment procurement.
Perform Analyses

Analyzing Fuel Consumption and Identifying Inefficiencies

- Developing a baseline for energy consumption on Ships is key to making meaningful investment decisions in Energy Efficiency Enabling Technologies (E3Ts).
- In the development of a baseline on Ships, inefficiencies and large power consumers will be identified providing a higher fidelity view of the current profile, allowing more informed investment decisions.
Energy Decision Framework

1. Improve Energy Efficiency
2. Perform Analyses
3. Examine Technology Candidates
4. Identify Solutions & Submit Budget
5. Measure Success

Policy & Guidance

Analyze Fuel Consumption

Identify Inefficiencies

Develop Implementation Plan

Determine Possible Solutions

ENABLED BY MARITIME ENERGY PORTFOLIO PROCESS
Maritime Energy Portfolio Process

- Outreach
- Collaboration
- Impact
- Performance
- Optimization
- Metrics
- Technical
- Financial

Maritime Energy Portfolio Management
Data Flow

DATABASE

PRIORITIZATION
- Algorithms
- Optimization

DISCOVERY
- Ship Schedules
- E3T Attributes
- Fuel Burn

ASSESSMENT
- PM Input
- Benefit
- SME Input
- Cost
- Modeling

SCORECARDS

MONITORING

Optimization

Scorecards
**Case Study: Smart Voyage Planning Decision Aid**

**DISCOVERY**

**COLLABORATION**

*Identify technology stakeholders*
- Oceanographer & Navigator of the Navy
- METOC Community
- Task Force Energy Maritime Working Group

**DESCRIPTION**

*Determine what the technology does and how it operates*
- Optimizes ship routing for both maximum fuel efficiency and safety
- Fleet Weather Centers will push fuel efficient routes to all Navy ships
- Reduces energy consumption by considering:
  - Weather
  - Waves
  - Currents
  - Ship specific hydrodynamic data
Case Study: Smart Voyage Planning Decision Aid

ASSESSMENT

TECHNICAL

Perform technical modeling and simulation and receive input from Subject Matter Experts

- Military User Assessment
  - Ashore Demonstration at Fleet Weather Centers
  - At Sea Demonstration on T-AKE 7
- Successful Implementation in Commercial Shipping

FINANCIAL

Perform Cost Benefit Analysis and receive input from Program Manager

- Anticipated 3% Fuel Savings Across Navy Ships
- Anticipated Payback Period of Less Than 1 Year

IDENTIFIED AS QUICK-WIN OPPORTUNITY
Case Study: Smart Voyage Planning Decision Aid

PRIORITIZATION

METRICS

Track KPPs to use as algorithm inputs

- Benefit: Fuel Savings
  - 3% Across All Navy Ships
  - 280,000 BBLs Annually
  - 17% of CNO Goal

- Payback Period
  - Less Than 1 Year

- Technical Maturity
  - Technology Readiness Level 6

ALGORITHM

Follow algorithm to determine best solutions for achieving Navy Energy Goals

- Implementation Requirements
- Funding Availability
- Product Availability
Case Study: Smart Voyage Planning Decision Aid

MONITORING

IMPACT – NOTIONAL

Calculate projected impact on Navy Energy Goals of reduced fuel consumption

- 280,000 BBLs Saved Annually
- 17% of CNO Goal

PERFORMANCE – NOTIONAL

Evaluate projected impact against actual impact

- 4% Fuel Savings Realized vs. 3% Projected Fuel Savings
- 375,000 vs. 280,000 BBLs Saved Annually
- 22% vs. 17% of CNO Goal
Conclusions/Next Steps

- Portfolio Infrastructure Allows for Quicker, Repeatable Responses
- Perform Disciplined Cost Analysis to Make More Informed Decisions
- Form Collaborative Relationships to Meet Our Goals of Reduced Energy Consumption and Increased Energy Efficiency

Kathleen Schneck, Herren Associates
Senior Engineering Consultant
Kathleen.Schneck@jlha.com

Thomas Levac, Herren Associates
Associate Engineering Consultant
Thomas.Levac@jlha.com

Glen Sturtevant, PEO Ships
Science & Technology Director
Glen.Sturtevant@navy.mil