Bending the DoD Energy Consumption Curve with Big Data Analytics (Conserving Energy with 1's and 0's)

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ABSTRACT

In 2014 Frontier Technology, Inc. (FTI) utilized Small Business Innovative Research (SBIR) funded technologies to develop a *Decision Support and Optimization System Model* for energy consumption for the United States Navy's Fleet Forces Command (USFF). SBIR technologies provided innovative high-end data processing (ELAPS ™), predictive analytics (NormNet ™) and a metrics progress analysis engine (MPAE ™). This effort resulted in the Fleet Energy Conservation Dashboard (FECD) that is part of the Global Energy Information System (GENISYS) Program. FECD encompasses both a shore based data warehouse and analysis system and a ship based information system focused on energy security, consumption and efficiency. FECD was developed to support the Chief of Naval Operations (CNO) goal to reduce ship consumption by 15% and non-tactical petroleum use in the commercial fleet by 50% by 2020 to improve Fleet readiness.

1 INTRODUCTION

The DoD manages over 500 installations worldwide and over 300,000 buildings. In FY14, the DoD fell short of its goals for energy intensity renewable energy, however it did meet goals for potable water intensity and petroleum consumption reduction. As defined in 10 US Code 2924(5). The DoD clearly distinguishes facility and operational energy as "energy required for training, moving, and sustaining military forces and weapons platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms." Fleet Energy Conservation Dashboard (FECD) software is part of the Global Energy Information System (GENISYS) Program that encompasses both a shore based data warehouse and analysis system and a ship based information system focused on energy security, consumption and efficiency. FECD collects, consolidates, stores, processes, and presents energy consumption data to stakeholders. This model utilizes multiple data stores from disparate systems and serves as a template for universal Department of Defense (DoD) systems and assets in achieving the DoD energy program's three pillars 1) Expand Supply, 2) Reduce Demand and 3) Adapt Future Forces Technology. FECD interfaces with data sources that collect energy use information from ship systems, subsystems or components, and shore based pier systems. FECD uses a standard enterprise-level framework to identify, integrate, display, compare, and analyze different aspects of energy data from a variety of Navy data sources and provides specific dashboards to support different user communities. FECD software uses an extensible architectural framework to allow the addition of ships, data sources, and analysis capabilities. FECD provides an energy decision support system(s) capable of transforming data into actionable, intelligent information required for decision making. Utilizing proven SBIR technologies, FECD can be leveraged throughout the DoD, e.g. US Army, United States Air Force (USAF) and the United States Marine Corps (USMC) and in Other Government Agencies (OGAs), e.g. the Department of Homeland Security (DHS) and the Department of Energy (DoE).

2 CURRENT ENERGY CHALLENGES

2.1 Energy Collaboration

DoD personnel need centralized energy analytic monitoring and reporting capabilities to make cost-wise decisions while supporting Energy Conservation Measures (ECMs) and determining Warfighter impacts.

2.2 Manual Analysis

Most energy related reports are manually generated, contain data inaccuracies and have duplicative programs due to disparate information systems.

2.3 Understanding Impacts

Impacts include monitoring energy expenditures associated with operational procedures and tasking, environmental concerns, equipment line-up and efficiencies.

2.4 Operational Outreach

Reduced budgets combined with increased operations creates energy demand and extended operational outreach requiring behavior awareness.

3 ENERGY DECISION SUPPORT AND OPTIMIZATION MODEL

In the initial effort, FTI set a local development environment to view and understand the previous requirements and minimal code developed from previous efforts. This included a thorough comparison of the Functional Requirements Document (FRD) with code functionality. FECD was then migrated to ASP.NET and SharePoint dependencies were removed. The FTI team reverse engineered and developed missing software components. A functional demonstration was provided based solely off a PowerPoint presentation. FECD was constructed from PowerPoint slides, developed, delivered and demonstrated to USFF in less than 9 months.

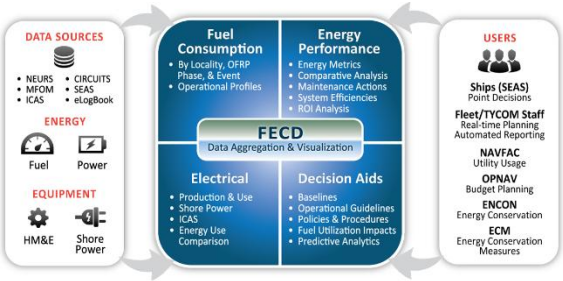

Figure 1: Energy Decision Support and Optimization Model

4 BENEFITS

FECD reduces or eliminates man hours associated with manual data entry/analysis into disparate information systems through automation in a single software tool. The tool displays real-time data through an automated data import and calculations and measures asset success, and assist in identifying opportunities, through aggregated energy metrics available in a single portfolio/report. Through historical/real-time data aggregation and baseline formation, predictive analytics allows for change management, evaluates other near and long-term goals by day, month, quarter and fiscal years. FECD monitors and evaluates existing energy reduction efforts to determine effectiveness vs. goals, raises awareness of energy costs associated with operational procedures and tasking, environmental factors, equipment/system line-up and efficiencies and automates energy reports normally requiring in-depth energy analysis.

Figure 2: Dashboard Fuel Consumption Monitoring Screenshot

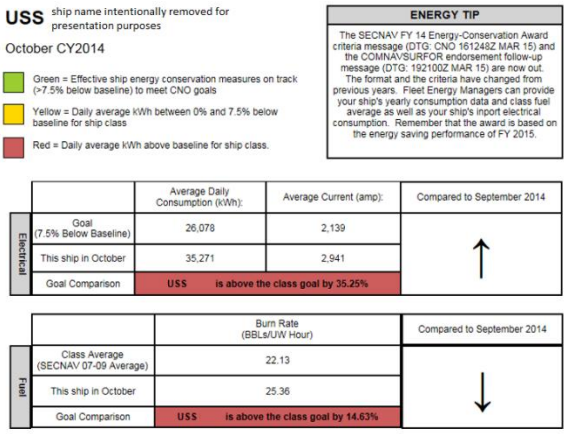

Figure 3: Energy Performance, Trend and Scorecard

5 CONCLUSION

SBIR technologies (ELAPS ™, NormNet ™, and MPAE ™) have been proven as vital components to tracking, assessing and analyzing energy consumption for USFF and the United States Navy. Other Department of Defense and Federal Government Agencies could utilize the framework of FECD to implement a similar solution to lessen energy cost and show a true Return On Investment (ROI) for energy related saving initiatives. Since protecting citizens' lives is the first duty of our nation's government, the DoD budget is usually the last to feel the effects of fiscal constraints. However, recent initiative to cut budgets and look for cost savings and avoidance have created a culture of doing more with less. This is especially true in the DoD, where cuts to the defense budget could impact national security. Through the SBIR program, FECD serves as a true model for reducing energy consumption in the future for all DoD assets and systems.