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Budget and Risk Management using Integrated Energy Management

A Case Study of the Fort Bragg Energy Management Modernization Program

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AGENDA

- Fort Bragg as a Beta Site for Integrated Energy Services
- Challenges prompting Energy Management Modernization – the environment in 1999
- Fort Bragg Strategic Plan Objectives
- The Fort Bragg Approach to the Plan and Plan Implementation
- Energy Management Modernization Model – Integration
- Risk Management – Physical and Financial
- The Results to Date
- Current Projects with the Focus on Energy Security and Systems Integration
- Lessons Learned

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Program Overview

Combination of Supply-Side & Demand Side Initiatives

Program Results to date

Capital Improvements through ESPC financing $66,600,000 (to date)

Annual Utility Cost Savings through Active Demand Management and Commodity Risk Management. ($/Year) $ 6,000,000

Annual Energy Conservation Savings ($/year) $4,500,000

Total Annual Savings ($/year)	**$10,500,000**
Project Term (years)	**18 (average)**
Simple Payback (years)	**6 (average)**
Facility Size (sq. ft.)	**More than 30,000,000**
Number of Buildings	**More than 6,000**
Contract Vehicle	**Army 4 State ESPC IDIQ**

Energy Conservation Applications

- *Boiler Plant Improvements*
- *Chiller Plant Improvements*
- *Building Automation Systems*
- *HVAC*
- *Lighting Improvements*
- *Building Envelope Modifications*
- *CHW, HW, and Steam Distribution Systems*
- *Electric Motors and Drives*
- *Refrigeration*
- *Distributed Generation*
- *Energy/Utility Distribution Systems*
- *Electrical Peak Shaving/Load Shifting*
- *Energy Cost Reduction through Rate Adjust.*
- *Energy Related Process Improvements*
- *Energy Surveys*

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The Challenge

Challenges for Energy Management Modernization – the Environment

Budget management

Maintaining quality of life for soldiers

Privatization and outsourcing

Energy security and reliability

Meeting mission critical objectives

Restructuring and policy changes

Energy conservation mandates

Regulatory compliance

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Strategic Plan

How to address increasing initiatives
with decreasing resources

Energy Management Modernization Strategy

Steps to Success

Agreement of need for overall plan — A **strategic** plan should be implemented to make certain all projects dovetail to meet and exceed energy goals. Assign timelines for completion. Requires innovative management support. Long term timeline commitment

Prioritize projects — **Short term** and **long term** projects will be identified. Clear understanding of how **prioritization** will impact energy goals. Identify **cash generators** as project drivers

Develop utility baseline — **Energy baseline** needs to be accurately calculate to avoid future energy misses. Accurate and up to date **utility information** needed. Bills and contract copies

Identify evaluation procedure — **Identify members** of technical, financial and contractual review teams

Schedule on-going reviews — **Integration Product Teams** need to be established

Clear message

Energy Management Modernization Strategy

Define Current Conditions

Best Practices Assessment
- Energy Procurement Practices
- Energy Security and Reliability
- Active Energy Management
- Work & Business Process
- IT and SCADA Infrastructure

Develop an Improvement Plan

- Identify and Quantify Potential Improvements
- Develop an Integrated Energy Strategy

- Implement Strategy
- Generate Improvements

Refine & Improve

- Measure
- Manage
- Improve

The Fort Bragg Approach to the Developing the Strategic Plan

Strategic Planning	Fort Bragg asked Major Command, ESPC Contractor, Utility Suppliers, Army COE – Energy and Contracting Experts to assist in developing its Energy Management Modernization Plan.
Utilize Integrated Energy Management to reduce both supply cost and consumption	Historically, because of the regulated monopoly environment, the focus has been energy conservation. Deregulation brings the need to manage the supply and use in Real Time.
Use the Private Sector to Improve Business Processes	Consultants were hired to improve IT infrastructure, Customer Service, Work Management to improve workforce efficiency.
Treat Private Contractors as Staff	Private Contractors attend weekly staff meetings and are part of the planning and implementation team.

Real Property Maintenance Operational Funding Decreased by nearly 80% since FY'97

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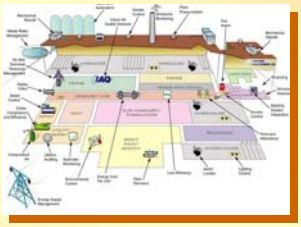
Integrated Energy Strategy

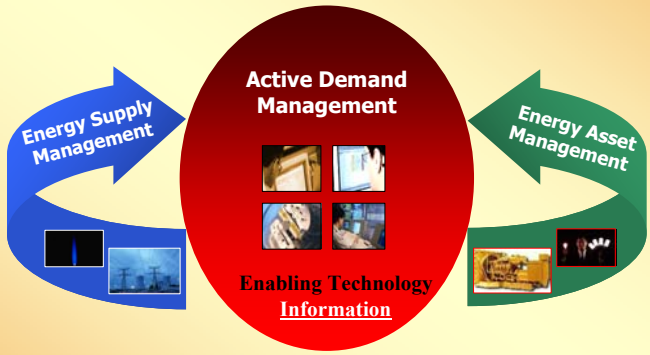
Energy Management Modernization Model (EM3)

The solution is an integrated energy management modernization program – *EM3*

- EM3 is a best practices program designed to pro-actively manage both utility budgets and reduce consumption, provide funding for infrastructure improvement, improve reliability and encourage conservation on a continuous basis.



Cost and Risk Management



Technical Services

Energy Strategy

Major Variables Impacting the Energy Plan Development

Deregulation of energy commodities

- Moves price and volatility directly to the end user, especially large users
- Natural gas prices at a new plateau, price volatility increasing
- Deregulation of power on the horizon

Environmental Requirements

- Restraints are tightening
- Many urban areas are becoming Clean Air non-attainment areas
- Large Defense Installations are major polluters

Privatization

- DOD encouraging participation
- Funding improves with privatization
- Coordination is much more challenging

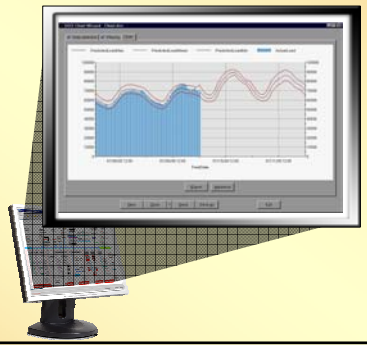
Energy Cost and Risk Management

Optimize energy supply, assets and ongoing active demand
by analyzing historical interval data

Identify fuel and generation options
Options provide reduced supply risks and limit market prices

Optimize load factor, improve efficiency
Peak demand requires excess delivery capacity

Effectively forecast and manage
Real-time information and controls- essential



SCADA Integration provides a single point of access to all information and resources you need to

- Upgrade and coordinate EMS to monitor and control generation and major loads
- Upgrade EMS to better track and manage energy consumption
- Upgrade to provide real-time control of energy use and generation

Active Demand Options

- Power
  - Scheduling loads
  - Demand controls
  - On-site generation
  - Curtailment of non-critical loads
- Fuel
  - Natural gas - primary
  - Fuel switching natural gas, fuel oil, propane
  - Curtailment of non-critical loads
- Central Plant Optimization
  - Combined Cooling, Heat and Power
  - Electric and absorption chillers, gas turbine load and fuel, inlet cooling, boiler or HRSG firing.

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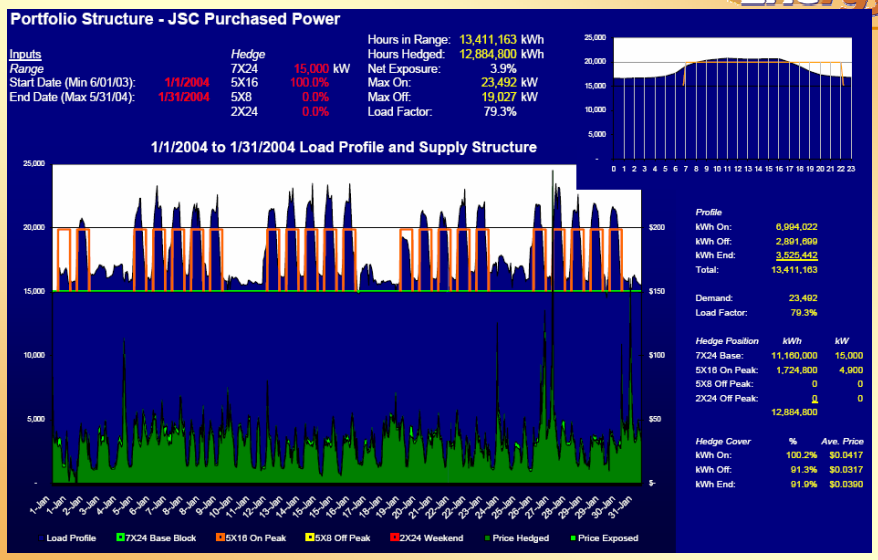
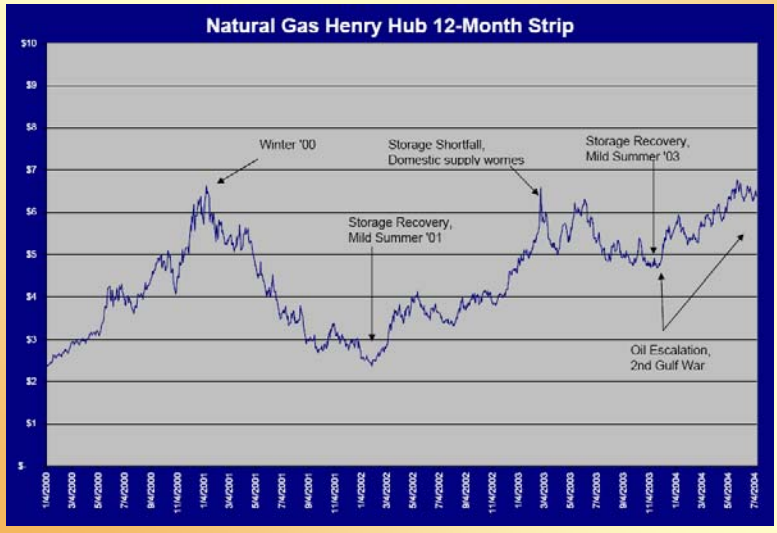
Risk Management

Electricity and Natural Gas Procurement

Structuring Concept

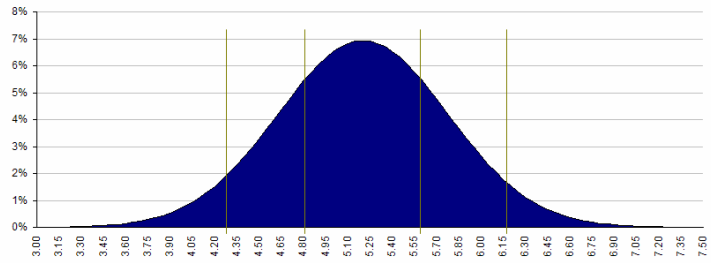


Market Analysis



Risk Analysis – Probability Study

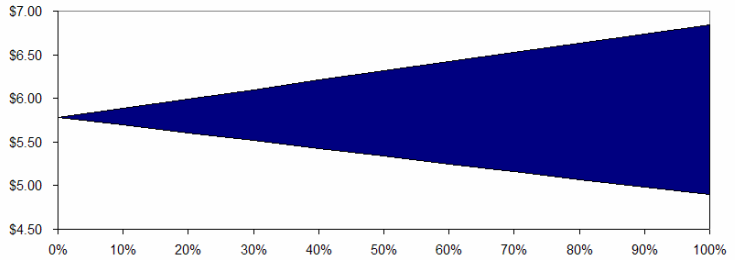
Probability Study 50% Exposure at 95CI, 3-Year Calander Strip



Future (Contract Jan' 05 to Dec' 07):	Total	Power Price	Floating Gas	Fixed Gas	Percentile
Floating (Indexed), Current	$ 11,370,932	$ 66.06 /kWh	$ 5.73 /MMBTU	$ 5.73 /MMBTU	Market
Floating (Indexed), Expected	$ 10,983,326	$ 63.81 /kWh	$ 5.20 /MMBTU	$ 5.73 /MMBTU	50%
Downturn Study					
Floating (Indexed), Expected	$ 10,310,501	$ 59.90 /kWh	$ 4.28 /MMBTU	$ 5.73 /MMBTU	5%
Floating (Indexed), Expected	$ 10,698,107	$ 62.15 /kWh	$ 4.81 /MMBTU	$ 5.73 /MMBTU	25%
Upturn Study					
Floating (Indexed), Expected	$ 11,268,545	$ 65.47 /kWh	$ 5.59 /MMBTU	$ 5.73 /MMBTU	75%
Floating (Indexed), Expected	$ 11,700,031	$ 67.97 /kWh	$ 6.18 /MMBTU	$ 5.73 /MMBTU	95%

Risk Analysis – VaR Study

VaR Study 50% Exposure, 36-Month Strip, 180-Days, 95CI



Future (Contract Jan' 05 to Dec' 07):	Total	Power Price	Floating Gas	Fixed Gas	Percentile
Floating (Indexed), DownTurn	$ 10,760,055	$ 62.51 /kWh	$ 4.89 /MMBTU	$ 5.73 /MMBTU	100%
Floating (Indexed), DownTurn	$ 10,922,190	$ 63.45 /kWh	$ 5.12 /MMBTU	$ 5.73 /MMBTU	75%
Floating (Indexed), DownTurn	$ 11,084,325	$ 64.40 /kWh	$ 5.34 /MMBTU	$ 5.73 /MMBTU	50%
Floating (Indexed), DownTurn	$ 11,246,460	$ 65.34 /kWh	$ 5.56 /MMBTU	$ 5.73 /MMBTU	25%
Floating (Indexed), Current	$ 11,370,932	$ 66.06 /kWh	$ 5.73 /MMBTU	$ 5.73 /MMBTU	Market
Floating (Indexed), UpTurn	$ 11,603,374	$ 67.41 /kWh	$ 6.05 /MMBTU	$ 5.73 /MMBTU	25%
Floating (Indexed), UpTurn	$ 11,798,153	$ 68.54 /kWh	$ 6.31 /MMBTU	$ 5.73 /MMBTU	50%
Floating (Indexed), UpTurn	$ 11,992,932	$ 69.67 /kWh	$ 6.58 /MMBTU	$ 5.73 /MMBTU	75%
Floating (Indexed), UpTurn	$ 12,187,711	$ 70.81 /kWh	$ 6.85 /MMBTU	$ 5.73 /MMBTU	100%

Fort Bragg Strategy Results

- 1997 Utility Budget - $35 Million
- Current Annual Savings
  - Electrical Savings - $5.0 Million/Year
  - Natural Gas Savings - $1.5 Million/Year
  - Energy Conservation - $4.5 Million/Year
- Infrastructure Upgrades $66.6 Million

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Current Initiatives

Current Projects with the Focus on Energy Security and Systems Integration

Energy Security - Vulnerability, Reliability

•Six Sigma Analysis of transmission system, IT infrastructure and electrical and gas distribution systems. Develop remediation plan.

Develop micro-grid with more generation, 16 MW Peaking Plant

- Include combination of efficient cogeneration and rapid response peaking capacity for load demand and security.

Expand Power Delivery System

- Major building program will overload electrical substations

Integrate SCADA and Security Systems

- Incident management and facility management have common requirements.
- Real time information for monitoring and control is essential

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Lessons Learned

Lessons Learned

EMS
+ DG/CHP assets
+ dual fuel capacity
+ real-time pricing & controls

= $$ savings, improved security and managed fuel risks

Thank you!

Questions?

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Enabling Issues

- For the Federal Government, a knowledgeable, flexible contracting agency teaming with the private sector is needed to support an Integrated Energy Management Approach.
- Web enabled SCADA and information systems are critical to Integrated Energy Management. Government Communication Lans and SCADA Lans do not appear to be compatible.
- Multi-site demonstration - next suggested step toward aggregated Integrated Energy Management for the Federal Government.