“Sometimes Being Faced With A Challenge Can Lead To Greater Opportunities”

“Making the Case for Energy Savings Performance Contracting at the Opequon Water Reclamation Facility”
Frederick-Winchester Service Authority
Opequon Water Reclamation Facility

12.6 Million Gallons per Day Enhanced Nutrient Removal Facility
Operating Budget – exceeding $5,000,000.00
Servicing City of Winchester and portions of Frederick County, Virginia
Present & Future Challenges

• “Sky Rocketing” Operational Costs
• Present & Future Capital Needs

Funding

“Might There Be A Better Way to Address This Need”? 
**Operational Costs FY 2003 thru FY 2013**

- **Landfill**: 277%
- **Electric**: 105%
- **Chemicals**: 122%

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**Operational Costs FY 2003 thru FY 2013**

- **Sanitary Landfill Usage**
- **Electrical Services**
- **Chemicals**
Capital Improvement Challenges

- **Capital Needs of the Facility ($26.3M)**
  - Sludge Handling & Disposal
    - Plate & Frame Presses, High Pressure Pumping System
    - Future Capacity Needs
  - Aeration System Update
    - New Blower System (28 Years)
    - Controls & Diffuser System
  - HVAC System
  - Emergency Standby Power
**Energy Performance Contracting (EPC)**

**Traditional Definition:**

*Energy Performance Contracting* is a financing and contracting technique that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures.
Energy Performance Contracting (EPC)

**Evolving Definition:**

*Energy Performance Contracting* is an “innovative” financing and contracting technique that uses cost savings from reduced energy consumption and “operational savings” to repay the cost of installing energy conservation measures and “cost savings process improvements and enhancements”.

“Visualizing” The Concept

Performance contract creates savings

Savings applied to payments to fund project

Annual Budget Before Performance Contract

Annual Budget After Performance Contract

- Debt Service
- Maintenance
- Energy
- Chemicals
- Sludge Disposal
- Personnel Costs

Savings

- Debt Service
- Maintenance
- Savings
- Energy
- Chemicals
- Sludge Disposal
- Personnel Costs
Design/Bid/Build

RFP → Prelim Engineering Report → Design (30%→60%→90%→100%) → Bid → Construction → Start Up

Contracts
- Multiple Trades
- Engineer (Final Project Price)

Energy Savings Performance Contracting

RFP → Project Scope Development (30% - 60% Design) → Design (60% → 90%) → Construction → Start Up

Contract - ESCO (Project Development)
Final Price

Contract - ESCO (Energy Performance Contract)

Timeline:
- 0 months
- 12 months
- 24 months
- 36 months
- 48 months
Why We Decided to Pursue Energy Performance Contracting

• **Shared Risk between Owner and ESCO**
  - Extensive Interaction between ESCO, Owner, Engineer and Contractor
  - Guaranteed Saving
  - Long Term Commitment of Parties
  - Innovative Way of Dealing with Capital Needs

• **Uncovered Opportunities**
  - Partnering with Industry for Mutual Benefit
  - Outside Revenue Sources
  - Economic Development Opportunities
Why We Decided to Pursue Energy Performance Contracting

Goals Set by the FWSA Board

• Stabilize Rates for Users
• Provides a Return on Investment
• Addresses Capital Improvement Needs of the Facility
• Provides Economic Development Incentive for Community and Region
Anticipate Initial Doubts

• The Energy Concept – “Is This For Real”
• Going Away from “Traditional” Contracting
• Engineering Firm Playing “Second” Fiddle
• Adequate Information to Make Good Chooses
• Monitoring and Verification Plan
• Regulatory Agencies
• Financing Options
Emergency Standby Power
High Pressure Sludge Feed Pumps
Rebuild & Replace HVAC
Sludge Handling and Dewatering Capacity Expansion
Aeration Control System Replacement
Aeration Basin Diffuser System Upgrade

Scenario: Business As Usual $26.3M
Scenario: Audit Identified ECM

- Emergency Standby Power
- Potable Water Treatment System
- High Efficiency Lighting Systems
- Rebuild & Replace HVAC
- Full Aeration Blower System Replacement
- Sludge Handling and Dewatering
- Disinfection Automation
- Aeration Basin Diffuser System Upgrade
- Aeration control system replacement
- New sludge storage mixing
- High Pressure Sludge Feed Pumps
- Scenario: High Efficiency Lightin systems
Energy Performance Concept
Formulating a Potential Solution

Driving Force

Reduce Biosolids Production

- Electrical Usage
- Chemicals
- Tipping Fees
Scenario: Green Energy

Est. Investment: $42.8M

- Rebuild & Replace HVAC
- New Belt Filter Presses for Sludge Dewatering
- Complete Aeration Blower System Replacement
- Aeration Control System Replacement
- Cogen Based Standby Power System
- Anaerobic Digester and Control Building
- New sludge storage mixing
- Food Waste & Sludge Cake Receiving Stations
- 840 kw Digester Gas Cogeneration System
Digester & Cogeneration Facility

Primary Digester #1
Primary Digester #2
Secondary Digester
Digester Building
The biogas conditioning system:
- Two incoming moisture/particulate filters
- Two hydrogen sulfide ($H_2S$) removal tank
- Two compressors
- One dual core heat exchanger with forced air fan
- One glycol/water chiller and recirculation pump
- Two siloxane removal tanks
One new biogas generator:
Nominally sized at 848 kw.
The unit will be containerized
Heat recovery systems (jacket water and exhaust) for heating the digesters
Space will be left for one more generator to be installed in the future.

One new 800 kw diesel back-up emergency generator
integral diesel fuel tank
This unit is intended for black start conditions when the plant is in island mode and will assist the restarting of the biogas generator.
Upper Floor
- One dual fuel digester heating boilers
- Two heating water pumps
- Heat recovery heat exchanger
- Heat recovery water pumps

Lower level mechanical room
- Two belt filter press progressive cavity pumps
- Three tube-in-tube heat exchangers
- Three sludge grinders
- Three sludge recirculation pumps
- Three heating water pumps
- Three foam suppression pumps
- Two air compressors for cover inflation
Operational Budget Impact

Operational Savings, $1,290,000

- Personnel, $1,503,000
- Repair, Maintenance and Supplies, $1,315,000
- Utilities, Chemical and Landfill, $1,043,000
- Additional Maintenance and Supplies, $500,000
- 3 Additional Personnel, $156,000
- Chemicals, $570,000 (52% Reduction)

Utilities, $500,000 (68% Reduction)

Landfill Fees, $220,000 (54% Reduction)
Partnersing with Industry for Mutual Benefit

- Waste management directly impacts plant production
- Minimize or eliminates discharge permit violations
- Increase limits to allow for future growth
- Reliable and long term means to manage waste stream
- Be a Strong Community Partner
Project Financial Summary

**Project Expenses**

New Operations Expenses
- (Salary, Maintenance, Transportation) $14,330,000

New Debt Service $57,895,000

Total of New Expenses $72,225,000

**Project Savings & New Revenue**

Avoided Future Operating Expenses
- (Landfill Fees, Utilities, Chemicals) ($56,144,000)

New Revenue from receiving Food Waste ($38,105,000)

Total of New Savings & Revenue ($94,249,000)

Project Benefit ($22,024,000)
Benefits and Challenges

**Benefits**

- Minimize future rate increases
- Reducing biosolids volume reduces operating costs
- Preserve landfill space
- Renewable energy and heat source
- Reduced chemical costs
- Partnering with existing and future industries
- New sources of revenue
- Industry wants to be associated with anything green and sustainable

**Challenges**

- More complex system to operate
- Phosphorus and Ammonia loading
- Dewatering
- Excess heat – what to do with it?
- Air permitting
- Marketing to future industry partners