

# Real-time Energy Services: NOW... AND TOMORROW

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## ABSTRACT

Real time Energy Services and Performance Contracting in particular are concepts whose time is now, and though funding energy upgrades from cost reduction is not new, there have been some changes to the concept recently. Important Performance Contracting developments may make this the best capital improvement idea around.

Performance Contracting, offered by Energy Service Companies (ESCOs), is an excellent answer to shrinking capital improvement spending. In the past two quarters, private companies have reduced or eliminated capital spending plans, and the public sector can be expected to do the same. With all these factors, it seems an excellent time to revisit performance contracting and especially these key topics:

- Energy service measures (what is being funded?),
  - Financing (how are projects funded?) and
  - Real-time energy services (how will success be measured?)
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## A. ENERGY SERVICE MEASURES

Performance Contracting is over two decades old as a vehicle for financing energy projects, and yet there is merit in briefly retracing its development. Guaranteed savings projects evolved from Shared Savings in the early 1980's. At that time U.S. facility owners began to lose interest in implementing energy-related projects to reduce consumption. There

were many reasons for this but two are significant; 1) it became evident that the world supply of Oil and Natural Gas was not rapidly dwindling as had been thought and 2) oil embargoes were less disruptive to the economy because energy management efforts had begun to have a major impact on consumption.

**Owners may have lost interest in energy savings, but they never lost interest in cost savings.** So value-based offerings that achieved cost reductions by improving facilities became popular. There were other benefits besides money, too; improvements in building environments also resulted in better performance by building occupants.

Today "Energy Services" represents hundreds of millions of dollars per year in business. At the heart of the energy services concept is the project value gained by combining multiple technologies to achieve an overall package, which will meet the customer's cash flow requirements. Projects are typically 10 years, though the federal government can enter agreements for a maximum of 25-year deals.

## **Energy Service Measures**

The term "Energy Service Measure" is used here rather than Energy "Conservation" Measures. At the risk of some confusion "Energy Service Measure (ESM)" is also used to describe a variety of projects, because the term "Energy Services" is widely understood to describe projects that are funded using guaranteed savings. Those discussed here are Energy Service Measures (ESMs) and Operational ESMs, which are not energy related such as water efficiency retrofits. Both types of ESMs focus on efficiency, that is, achieving a higher output with the same input by applying new technology or operational approaches.

Performance Contracts initially focused on ESMs, and early projects often included projects that retired debt quickly, such as lighting. Many owners accepted large lighting retrofits to generate savings necessary to replace chillers, boilers or other high profile needs.

A key ESM trend is implementation of more complex systems. These include central plant upgrades such as distribution loop modifications, including plate and frame heat exchanges, variable frequency pumping and controls. With all eyes on California's electricity problems, ESCOs may start installing more Cogeneration (combined heat and power) technology along with Direct Digital Control (DDC) for real-time energy services.



**University of North Texas**

Campus: 27,000 students  
128 buildings comprising 4.4 million square feet

ESMs: Lighting  
VAV conversions  
Direct Digital Control  
Variable Frequency Drives  
Chiller and Boiler Central Plant upgrade  
Power factor correction

Operational  
ESMs: Ethernet Fiber-optic LAN  
WEB-Interface to DDC

Value: \$9,000,000

Guarantee: \$1.2 million per year

Contact: Ray McFarlane, P.E., Director of Facilities

ESCO: TAC Energy Solutions

Early generation performance contracts often ignored controls but this is changing, and the discussion of Real time energy services will touch on ways that this technology enhances projects. At the University of North Texas, TAC Energy Solutions implemented an extensive Direct Digital Control system plus Operational ESMs including an Ethernet fiber-optic Local area Network (LAN) and Network Routers for Internet interface to the campus DDC system.

### **Operational ESMs**

Operational ESMs are popular, however it is important to consult enabling legislation because some states prohibit certain measures. Water projects are common with performance contracts, including toilet replacement and irrigation controls for turf. Operational ESMs like the Ethernet LAN at the University of North Texas are typically considered part of the DDC system, but are an excellent way for customers to upgrade their data communication backbone. More than that, Wes McDaniel, Vice President of TAC Energy Solutions believes that “leveraging the Internet for real-time energy services is key to the future as his company works to build long-term customer relationships and ensure successful projects.”

## **B. FINANCING**

Packaged financing is another benefit of performance contracts. Financing requires engineering analysis or, what Shirley Hansen, Ph.D., author of *Performance Contracting: Expanding Horizons*, The Fairmont Press, calls an “Investment Grade Audit.” Hansen says resulting projects are “bankable” because they are financially viable. ESCOs guarantee the savings, creating a revenue stream for customers to use in repaying the debt.

Public and private nonprofit customers qualify for tax-exempt lease-purchase financing, and in most states the law requires “termination for non-appropriation” language. This simply means that if a public customer is unable to appropriate funds, they may terminate the lease and the financier can reclaim the ESMs.

This financing approach treats performance contracts the same as equipment purchases, funding products, engineering, design and installation. Under non-appropriation financing, also called off-balance sheet financing, financiers hold title to equipment during the term of the

agreement. Off balance sheet financing is desirable for public and private customers. Public customers can finance capital projects without voter approval.

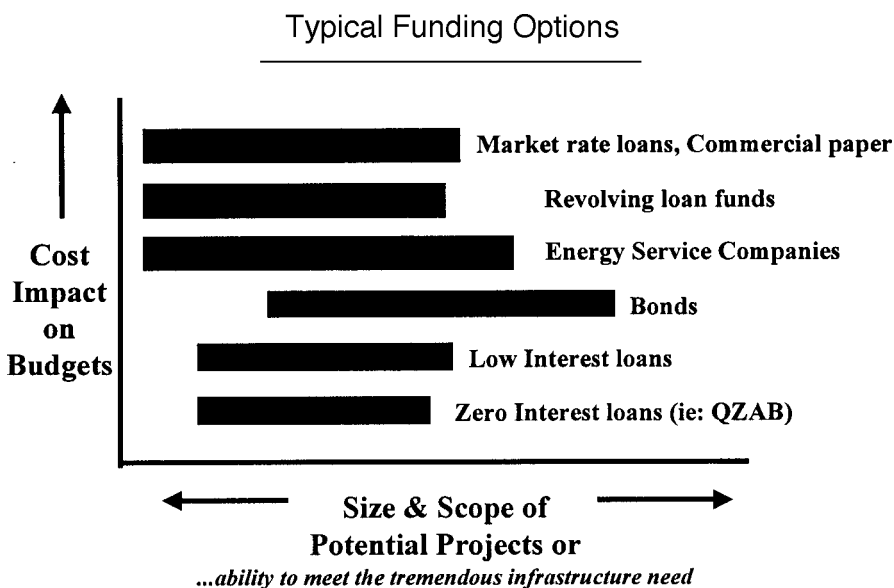
Both public and private customers benefit from this approach because the debt service is treated as an operational expense, not a capital obligation, and debt ratings are not impacted. For highly leveraged companies this means that the obligation does not show up on the balance sheet as debt, freeing up company borrowing capacity. The table below illustrates options that owners have for financing projects including the focus in this article, the Energy Service Company approach.

New trends in Performance Contract financing are evolving and include:

- Large-scale packaged financing,
- Qualified Zone Academy Bonds, and
- Secondary and tertiary financing with "Excess Savings."

### Large Scale Financing

New Hampshire's Performance contract legislation was passed in 1993, but the state recently took action to expand it by issuing an RFP for statewide Master Lease financing. Mike Pais of the Governor's Office of Energy & Community Service says "given all the factors, a Master



Lease was the best finance option.”

Public finance interest rates vary greatly from one debt financing to the next, based on several key criteria. The size of the financing is one factor, along with types of financing and timing which reflects rates in the bond market.

Many government customers float multiple bonds in one year and each time they incur significant cost for bond counsel, balloting, administration, etc. In New Hampshire the state elected to use the Master Lease approach and secure \$18,000,000 with the option to add another \$7,000,000. Among the benefits Pais notes is that the state only needs to borrow what it needs for each performance contract, rather than doing one bond large enough for multiple projects and paying interest on the full amount.

He also points out that Master Leases allow the state to draw down enough dollars for each individual project and that money is kept in an escrow account which earns interest during construction. The state acts as a finance clearing house for agencies that want to implement performance contracts. Each agency signs a schedule to the Master Lease agreement obligating repayment.

This concept will clearly gain popularity, especially once word spreads on the successes. Two New Hampshire agencies have already completed performance contracts, and eight more are in process.

## **Qualified Zone Academy Bonds (QZABs)**

The QZAB is a finance vehicle that is available to Public Education (Kindergarten through 12th grade). Congress created QZABs under the Taxpayer Relief Act of 1997 based on the growing realization that public school “Deferred Maintenance” is reaching epic proportions, and there are no funds to address the problem.

Deferred Maintenance refers to infrastructure that is at or beyond its’ useful life, and the U.S. Department of Education QZAB Website reports that fixing schools is a \$225 billion problem. School districts that meet eligibility for QZABs can borrow money from a cooperating bank at 0% interest. The bank or financial institution gets a federal tax credit equal to the cost of money the district would have paid thus freeing up more dollars for projects. Though QZABs are focused general school renovation, it is clearly possible to use these as a funding source for performance contracts as well.

## Secondary and Tertiary Financing with Excess Savings

This creative approach makes use of the excess savings revenue stream. ESCO projects usually generate excess savings that are identified during detailed engineering analysis. ESCOs work with customers to combine the right set of projects that meet cash flow requirements. Typically the resulting project includes: equipment, cost of money, measurement and verification and often a maintenance contract, that can be funded with 80% to 85% of the calculated savings.



### University of Utah

Campus:	26,000 students 280 buildings comprising 10 million square feet
ESMs:	Lighting Campus-wide building upgrades Central Chiller/High-temperature Plant Direct Digital Control
Value:	\$44,000,000
Guarantee:	\$3.2 million per year
Contact,:	Orfeo Kostrencich, Administrative Manager, Plant Operations
ESCO:	CMS Viron

A 15%+ “buffer” is left in place to ensure that customers do not have a shortfall (savings less than the payment). This is a good risk-management tool, but it also leaves projects that could be funded with those savings that are not.

At the University of Utah, CMS Viron has completed several phases of Performance Contracting projects. Measurement and Verification (M&V) results on each phase were carefully reviewed by the ESCO and customer. Based on the success of Phase 1 and 2 Performance Contracts, the ESCO entered subsequent agreements where the excess savings from the initial projects were being used as a revenue stream. Secondary and tertiary funding finances additional projects using excess savings.

In other words Viron is guaranteeing 95%+ of savings from Phase 1 and 2, and the University of Utah is getting more work done! This approach was used to fund a \$44 million facility project for 20 years. Orfeo Kostrencich believes that performance contracts of this type will become popular as more owners learn of successes in Utah and elsewhere.

Performance contract financing will clearly continue to evolve, and with the current economic climate, it may even catch on with private companies. Another interesting development that may influence some projects is the return of demand side management rebates. Several utilities across the country are starting to offer rebates again, and combining them with Performance Contracts can increase project benefits.

## **REAL-TIME ENERGY SERVICES**

Without question, the next horizon for Energy Services is real-time. In this respect, the regular implementation of DDC systems with performance contracts, combined with campus-wide system integration, puts campuses like the University of North Texas at the cutting edge of energy services. To monitor status against baseline with instantaneous measurement and verification is just the first benefit. With the addition of Web-enabled services the entire definition of performance contracting will change.

The evolution of electronic (E)-enabled technology over the next few years will be staggering, and Performance Contracting is the logical way to implement these services. This technology will likely be used to



not only manage the guarantee, but to fundamentally change managing energy.

At a minimum this will include developing energy consumption profiles to enable procurement of deregulated power, and access to Application Service Providers (ASPs) which will make it possible to manage the entire facility in ways we are just beginning to consider. Leveraging technology including DDC, Computerized Maintenance Management and Web-based ASPs, it is possible to track and manage consumption, thus enabling owners to make intelligent buying decisions regarding energy.

More importantly the Internet offers the option to react to building information in real time. Accomplishing this level of sophisticated energy management requires a new skill—"System Integration" to merge all of these various technologies applied in facilities. Using systems from companies such as Tridium and imonitoreerngy.com, System Integrators make it possible for owners to be alerted instantaneously about any event, such as a change in market based electric rates, and can implement a Direct Digital Control sequence immediately.

An example of real-time energy services in the market today is being delivered by e-three Custom Energy Solutions, a Nevada ESCO, using Tridium's Vykon® Web-enabled product family. Tridium is being used to integrate a District Cooling plant, which has allowed owners of five connected facilities to acquire cooling energy without building



chilled water plants. The Plant shown here was built adjacent to Fitzgeralds Casino in Las Vegas.

According to e-three's Kevin McKenzie "this allowed his customers to avoid the capital cost of plants and free up dollars to reinvest in their businesses." Alan Hoopes of Yamas Controls, the system integrator on this project, points out that Tridium is integrating both legacy and standard-based systems. The projects ties together proprietary chiller controls with Modbus-based Programmable Logic Controllers (PLCs) and a LON® network, as well as integrating BACnet™ for future expansion. Also the control equipment being integrated is physically distributed in multiple buildings with real-time connections to offices located in two different cities.

For e-three the benefits of real-time energy services are dramatic. They are able to operate the plant with no on-site staff, compared to 7 or 8 that are usually required. This is because they have direct access to the plant via cell phone, e-pagers or a Web-browser from anywhere. The result is a highly reliable system at a low first cost using Web-enabled technology.

Another example is imonitorenergy.com and the services they sell through ESCOs, giving owners access to their Energy Control Center, and then creating custom interface screens so that owners can view status via the Internet. Mark Moore, CEO of imonitorenergy.com says that solutions his company offers make it possible to implement real time control strategies based upon input from a host of sources inside or outside the building envelope.

**Real-time Energy Services and Verification that performance contact savings are optimized based upon data available from anywhere via the Internet is here today.** Based on past experience it is certain that the truly creative Energy managers will rapidly devise new ways to leverage these tools to even greater benefit.

## CONCLUSION

**Performance Contracting or Value Propositions and e-commerce may seem incongruous, but they are converging. The market is being flooded with value-based services, and nearly all e-commerce offers are based upon value.**

Even those B2B offers that simply present the customer with an-

other option for purchasing commodities are offering value in the form of lower cost, convenience, access to a larger inventory or some other differentiating factor. It is the author's perspective that B2B offers will continue to be value based and that value has not even begun to be defined for energy e-commerce.

For example, a recent energy e-commerce conference surfaced topics that included full-scale system integration that would provide owners with real-time data-access enterprisewide at a mouse click, to enable decision-making. The value that can be achieved is dramatic, but the cost is, too. That is why the evolution of performance contracting will continue. Projects of the future can be expected to integrate a wide variety of technologies beyond energy and it is the author's prediction that the majority of these will be Web-enabled to offer real-time business management.

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#### ABOUT THE AUTHOR

**John J. "Jack" McGowan, CEM**, is vice president of Energy Control Inc. (ECI), an energy service company and system integrator specializing in value-based real-time services including performance contracting for public and private organizations. ECI has a Continuous Digital Control (CDC) strategy that merges traditional energy automation with Business to Business (B2B) solutions to integrate multiple systems via the Internet. This allows customers to make decisions with real-time dynamic information from a many sources to optimize facility and business management.

McGowan has published five books and 100+ articles on business and technical topics, including *Distributed DDC*, *A Guide to Building Automation*, and *Networking Building Automation & Control Systems*.

McGowan has published 100+ articles, and speaks regularly at international conferences. He develops and teaches seminars in the U.S. for Association of Energy Engineers and Southeast Asia Centre for Management Technology, and also teaches at universities in Phoenix and N.M.

McGowan sits on the Technical Advisory Board of *Energy User News*, is contributing editor of the *E-Zine* for Automatedbuildings.com and is associate editor of *Strategic Planning for Energy and the Environment*. He was named "International Energy Professional of The Year" in 1997 by the Association of Energy Engineers (AEE), and has been listed

in *Who's Who in Science and Engineering*, Millennium Edition & 1994-1995, 1996-1997 editions, Marquis/Reed Publishing.

McGowan is a Certified Energy Manager (CEM); Certified Lighting Efficiency Professional, Certified Demand Side Manager, and a Certified Cogeneration Professional.

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