CELLWATCH

A Mission Critical Protection Investment That Pays You Back

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A Mission Critical Protection Investment That Pays You Back

Reliable power protection systems are a major financial investment, but the potential costs of service interruption and unplanned downtime cannot be ignored. The risk to a company's bottom line and reputation is real and that risk increases as data center operations grow in importance. Data center operators increasingly recognize the need for investments in power protection but often consider them only from an expense perspective.

This study proves that rather than thinking of them as a necessary evil, some power protection investments can pay for themselves and produce ongoing savings for many years. Investing in a daily battery monitoring system (DBMS) can reduce operating expenses, delay capital expenses and reach a breakeven point in as little as eight months depending on current battery management practices.

The business case for reduced preventive maintenance (PM) operations and extending the life of the battery bank is detailed below. The analyses will show that a DBMS deployment is a sound financial investment. The financial benefits compounded by the contribution to business continuity make a DBMS a compelling addition to any data center deployment.

Value of avoiding an outage
It is well known there are many ways that a power loss can cost your business. These include but are not limited to:

Direct customer revenue loss
Missed business opportunity when services were not available
Lost customers and customer dissatisfaction
Customer perception of your service and reliability matters
Recovery cost
Real cost of diagnostic and recovery efforts
Opportunity cost
Lost opportunity while addressing the outage are proportionate to the number of staff working the problem and the length of the outage
Data recovery
While systems are designed to prevent loss of data, losses still occur
Equipment failure
Non-mission critical equipment impacted by mission critical equipment failure

A daily battery monitoring system will not only help prevent costly unplanned outages, but it will also create tangible financial savings for a data center.

The Study
The following analyses use data reported from North American data center operators to determine the cost of manual preventive maintenance services, replacement batteries, and replacement services.

This study applies those cost metrics to a model battery configuration representative of many data center applications. This model matches a particular battery bank at the University of Wyoming where one of the authors manages data center operations. This particular configuration has two UPS units configured with two strings each, and each string has 40 jars.

Historically, the 160 jars were manually tested two times per year and the entire battery bank was replaced every four years. These policies are compared to alternative manual PM and replacement schedules and contrasted with implementing an automated battery monitoring system that measures battery health daily.

Preventive Maintenance Policies

The first component of the financial analysis looks at possible reductions in PM costs. While the policy at several surveyed data centers was only two PMs per year, the most common practice encountered during the study was four PMs per year. This frequency balances the value of increased monitoring with the constraints of manual labor costs. However, even for new batteries, a quarterly PM practice poses a high risk of battery failure. Though many organizations recognize the need to monitor their batteries more frequently, the expense of manual PMs is prohibitive due to costs associated with travel, manual testing labor and manual documentation and reporting. Furthermore, manual PMs introduce a level of personal injury risk and are prone to inaccurate test results due to human error.

Figure 1 below shows the cost comparison between four PM schedules: bi-annual PMs, quarterly PMs, monthly PMs, and use of a DBMS with annual inspections. (Many organizations follow the IEEE 1188 recommendation of an annual manual inspection in conjunction with the deployment of a DBMS.)

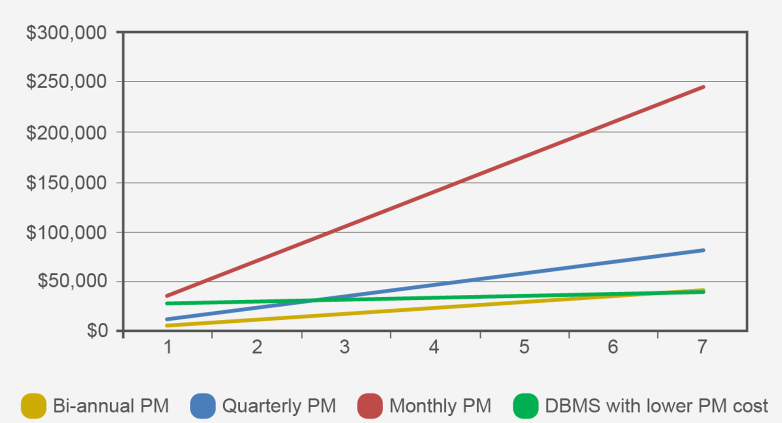

Figure 1: Demonstrated savings between PM costs and DBMS costs

This graph illustrates that purchasing a battery monitoring system is justified by the reduced maintenance cost alone.

With a state-of-the-art battery monitoring system, the number of manual maintenance operations is reduced immediately and the savings begin in the first year of deployment. While the practice of bi-annual monitoring is lower cost, it is also less effective than quarterly PMs. A daily monitoring system is ultimately lower cost and more effective than any of the manual PM practices studied. Considering PM savings alone, if the data center is currently conducting monthly PMs, the breakeven point for the DBMS investment is nine months. For quarterly PMs, the breakeven point is 32 months for a DBMS investment.

Using net present value (NPV), the cumulative value of investments and future benefits can be compared in today's dollars. For this analysis we assumed a 6% annual discount rate. Figure 2 shows the long-term value of reducing PM operations. The greater the number of manual maintenance operations replaced the greater the value of the DBMS. While monthly PMs provide less than 3.3% of the coverage of a DBMS, the cost would be many times that of purchasing and installing the DBMS. The NPV of a DBMS investment is ½ the NPV of quarterly PM operations.

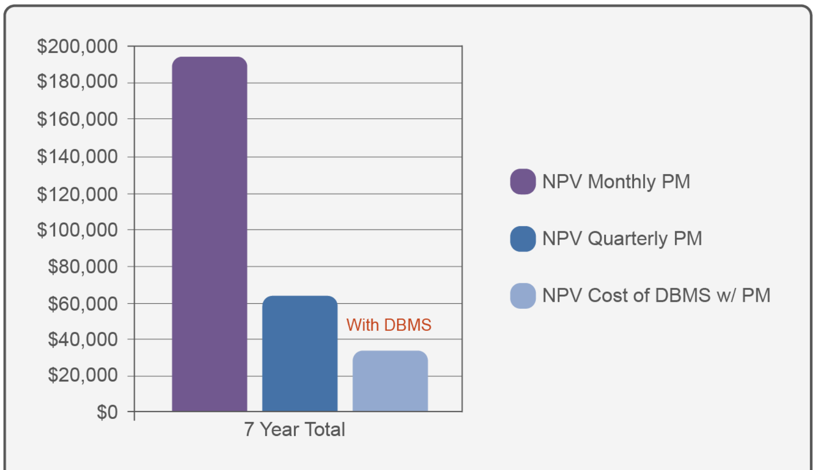

Figure 2: Cumulative NPV for investment in a daily BMS vs monthly and quarterly PMs

Internal Rate of Return (IRR) is often used to measure the viability of a financial investment. Compared to quarterly PMs, the IRR of an investment in the battery monitoring system and annual PMs was calculated to be 57% for seven years.

Battery Replacement Policies

Routinely, many batteries are replaced at a four or five year interval whether the battery is failing or not. With a DBMS, batteries are monitored continuously so the operator knows the health of each jar and can decide when to replace the battery (or portions of it) rather than holding to a fixed schedule. Using basic quarterly PM practices there is temporal visibility to the health of the battery so vendors are often required to make multiple trips to address problems – a trip to test batteries and another to replace. However, a daily monitoring system makes it possible to know in advance the number of batteries needed, allowing time for competitive bidding, and requiring only a single trip on site to complete the work. In effect, this visibility extends the life of the battery and enables a longer replacement interval, resulting in significant savings:

- deferring the capital expense of new batteries
- reducing the cost of manpower and trips for the task of battery replacement
- requiring fewer total jars over time

The effect of extending battery life by adjusting the replacement policy is illustrated in Figure 3.

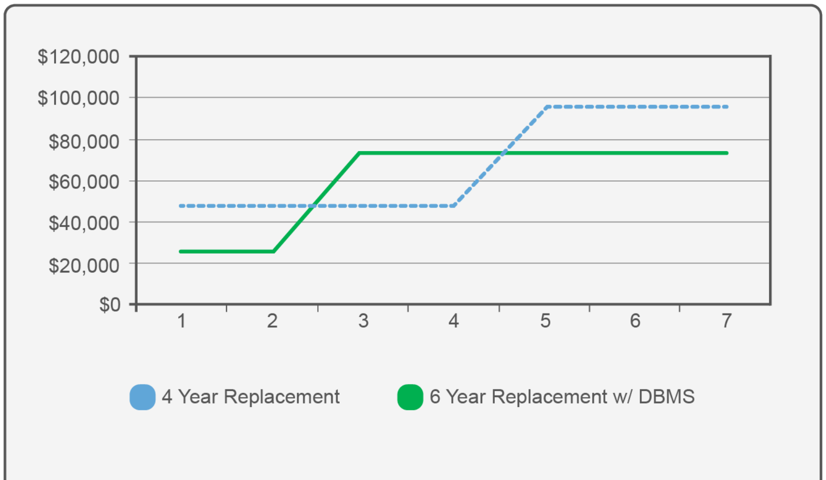

Figure 3: Savings from extending battery life from 4 years to 6 years with DBMS

Figure 4 uses the net present value (NPV) over seven years to compare the costs of battery replacements between a four year life cycle to replacements with a six and seven year life cycle when using a DBMS. The first column shows a four year replacement cycle. The other two columns show the longer replacement cycles including the cost of a daily battery monitoring system.

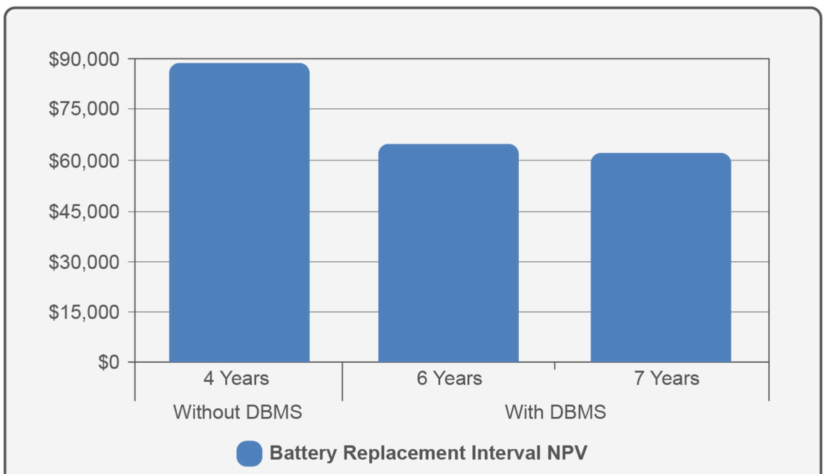

Figure 4: NPV comparison of battery costs with and without a DBMS

Not only is there a direct reduction in NPV for battery replacements over the seven years, the DBMS will continue to contribute to lower battery costs well beyond the timeframe modeled.

One of the drivers of extended battery replacement cycle is the ability to identify and address individual jar failures as the battery ages. With a DBMS these failures can be detected quickly and can be addressed on a jar by jar basis. This practice can be continued until approximately 10% to 15% of the jars have been replaced. Another driver of extended battery replacement cycle is the practice for operators with a daily battery monitoring system to consolidate jars from similar age strings into a new string as the battery ages. This is accomplished by selecting the best performing jars and grouping them to create new strings, extending the life of the battery even further.

Combined PM Cost Reduction and Battery Life Extension

While both preventive maintenance cost reduction and battery life extension can be realized independent of one another, the greatest cost savings can be realized by combining the two approaches. Figure 5 below illustrates the compounded effect of reducing manual PM costs and extending battery life to six years. The red line shows the cost of a battery monitored manually each quarter and replaced every four years. The blue line shows the cost of the same battery with a DBMS and an anticipated six year replacement interval. Of course, extending the battery life longer will create even greater cost savings.

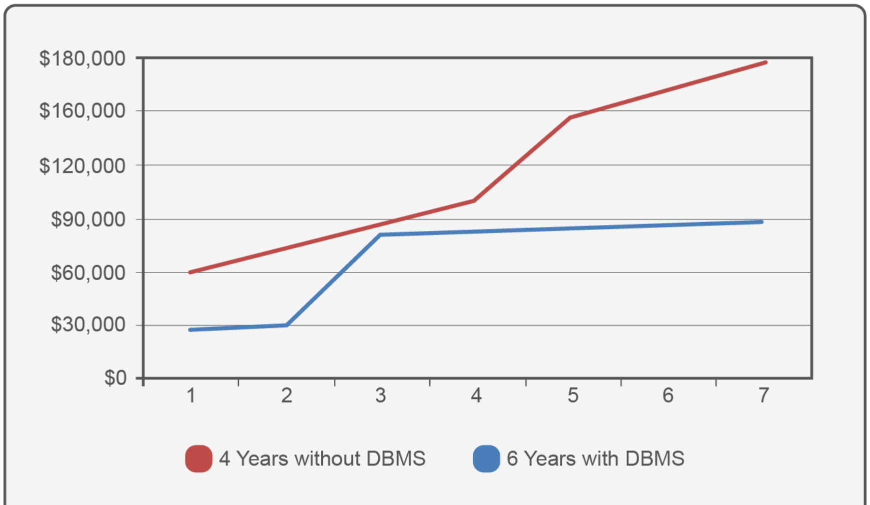

Figure 5: Combined reduction in manual PMs plus battery life extension

The assumption is the data center has had their existing battery for four years and is facing a decision to replace the entire battery bank or to purchase a DBMS and use it to extend the life of their battery.

For this small system (of 160 jars) over $71,000 is saved over a five year period. The savings would exceed $264,000 over 20 years. For large battery deployments the savings will be millions of dollars. With this information, a data center could invest in a DBMS at the four year mark and extend battery life, rather than blindly doing a complete battery replacement considering many of the batteries could be effective much longer.

The cumulative savings afforded by using a DBMS to reduce PM costs and extend the life of the battery are shown in Figure 6.

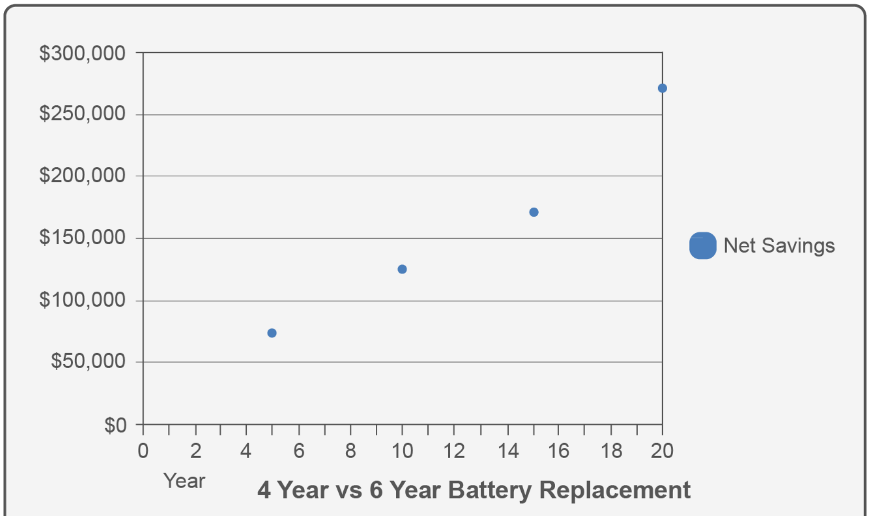

Figure 6: Savings realized when using a DBMS to reduce PM costs and extend battery life

Another way to measure the financial benefits is to calcuate the savings over time as the return on investment (ROI) in a DBMS.

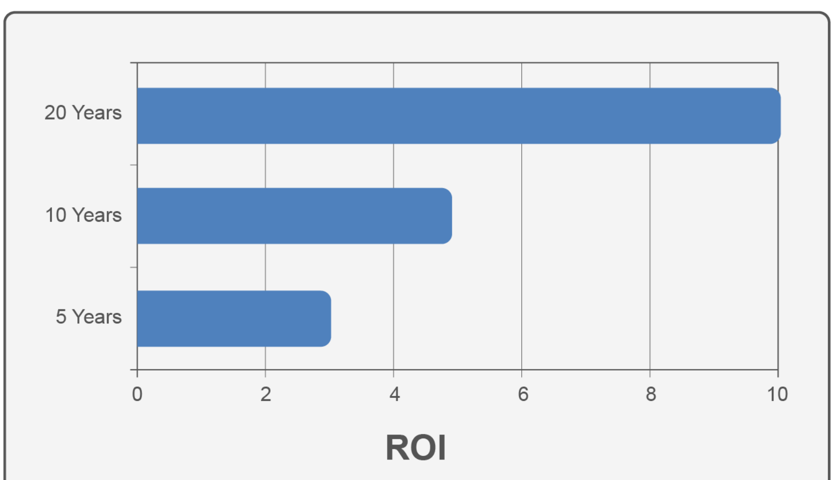

Figure 7: ROI for DBMS when combining PM reduction and extended battery life

The savings shown in this analysis have been realized by data center operators using a daily battery monitoring system. While there isn't enough historical data to validate the full modeled timeframe the savings are projected to be above $260,000 over 20 years.

These savings would be extremely difficult to realize using a battery monitoring system that doesn't take an ohmic reading every day, given that daily battery monitoring is the key to extending battery life and reducing PMs, especially as the battery ages. Having current battery health information every day allows the operator to detect the early signs of battery failure and effectively manage an aging battery. Additionally, with modern battery monitoring systems, operators are notified remotely of any battery performance issues, allowing them to concentrate on other responsibilities. Preventing outages is still a key driver for deployment of a battery monitoring system, but these cost saving benefits make it financially rewarding as well.

The combined effect of reducing preventive maintenance operations and extending battery life can greatly reduce battery management costs. This validates the claim that installing a daily battery monitoring system, in conjunction with your backup power system, pays you back in many ways.

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