

Leveraging Utility Resources to Boost Efficiency for the Next Generation of Space Travel: An Energy Efficiency Case Study for ATK Launch Systems

*Sandy Glatt, U.S. Department of Energy
Sarah Ruen, BCS, Incorporated*

ABSTRACT

In promoting energy efficiency for any sector, it is important to break down barriers by demonstrating actual projects. Many projects never make it off the drawing board because decision-makers and implementers simply don't have enough practical information to take the plunge. This case study seeks to break through energy efficiency implementation barriers by demonstrating how utility incentives can be leveraged to reduce simple payback times.

ATK Launch Systems—developers of the current and future solid rockets for NASA's space program—was able to leverage utility incentives to fund efficiency measures in their manufacturing facilities. Using a U.S. DOE Plant-Wide Assessment, ATK recently identified energy cost savings of more than 20%—or \$2.4 million per year—which required an initial investment of \$4.9 million, before utility incentives. Using utility incentives, which totaled \$1.6 million, ATK was able to drop the average simple payback time below two years, from 24 months to 16 months.

ATK and their utility, Rocky Mountain Power (RMP), have been working together for some time on energy efficiency projects. RMP has two specific efficiency incentives which consistently allow ATK to bridge the gap between unacceptable and satisfactory payback periods: Energy FinAnswer and Self-Direction Credit programs. ATK benefits with energy savings as described above and RMP benefits through avoiding costs to upgrade, fuel, and maintain a power grid that serves an ever increasing electricity demand.

The case study was conducted using information shared by ATK and Rocky Mountain Power, and by conducting some simple financial analyses.

Introduction

This case study relays how one U.S. company was able to break through typical energy efficiency implementation barriers by making efficiency a viable business option. This was accomplished in part by cost sharing and leveraging local utility incentives to reduce simple payback times. In light of the volatile energy market, rising energy costs, and an increasingly competitive global marketplace, many businesses in the commercial and industrial sectors are turning to energy efficiency as a means to cut costs and stay ahead of impending carbon legislation requirements. Alliant Techsystems, Incorporated (ATK) has been actively involved in a variety of efficiency projects throughout its U.S. facilities during the past 10 years, many of which utilized local incentives. Beginning in 2004, ATK Space Systems' Promontory site in Utah utilized more than \$246,000 in incentives from their local utility, Rocky Mountain Power, to drop the average simple payback time for its lighting upgrades to below two years. ATK ultimately anticipates the Utah site's total facility upgrades will qualify for more than \$1.6 million in local utility incentives. Without using the incentives from Rocky Mountain Power,

cost saving measures would likely never have been implemented. ATK and Rocky Mountain Power have now worked together for several years on energy efficiency projects. Another example of ATK's use of cost sharing to leverage resources is a plant-wide assessment conducted at ATK Space Systems' Promontory site with the U.S. Department of Energy (DOE) and P&E Automation in 2007. ATK Space Systems identified energy cost savings of more than 20 percent, or up to \$4.3 million per year. Through Rocky Mountain Power's incentives and DOE's cost-share, ATK has been able to identify and realize energy and cost savings, enabling the utility to avoid costly upgrades, lower its fuel costs, and maintain the power grid, which serves an ever increasing electricity demand.

ATK Company Background

ATK Space Systems' Promontory site near Brigham City, Utah, is the world's foremost producer of solid rocket propulsion systems, fueling the National Aeronautics and Space Administration (NASA) with the power to explore space. ATK was launched independently in 1990 as a spin off of Honeywell, cornering defense, aerospace, and commercial ammunition markets with more than 17,000 employees in 21 states. ATK solidified its dominance in the solid rocket market after acquiring Hercules Aerospace, a rocket fuel producer, in 1995 and Thiokol Propulsion, designer of rocket and missile propulsion systems, in 2001. Thiokol developed the solid rocket boosters responsible for thrusting NASA's space shuttles off the ground and up to a speed of 3,000 miles per hour. These solid rocket boosters are the two iconic white rockets flanking the large rust-colored fuel tank on the space shuttle. After purchasing Thiokol, ATK has continued to produce the solid rocket boosters for NASA as ATK-Thiokol and most recently as ATK Space Systems.

In December 2005, ATK Space Systems announced it was chosen as the prime contractor to develop the first stage propulsion system for the next generation NASA Crew Launch Vehicle, Ares I. Ares I will carry the Orion crew exploration vehicle, housing four to six astronauts, into space. In just over two minutes, ATK's solid rocket will propel the Ares I and its cargo through the first 36 miles of their space journey. Two of the anticipated destinations for the crew are the Moon and Mars; the vehicle was named Ares after the Greek god analogous to the Roman god, Mars. Ares I will also be used to deliver crew and supplies to the International Space Station. The International Space Station mission is planned to begin by 2014, with the first lunar mission estimated to take place in 2020.

While assisting with the construction of Ares I, ATK was tasked with making not one, but two different rockets: one efficient enough to offer greater reliability and affordability to boost astronauts into orbit; another to provide an unprecedented level of safety by serving as a launch abort motor that could rescue the entire crew in the event of a launch anomaly during the first minutes of flight. As ATK began to conceptualize efficiency in space travel, the company came to appreciate the efficiency gains available here on Earth.

ATK Corporate Energy Strategy

ATK began serving as a pioneer in energy strategy more than 14 years ago, performing assessments in its plants and steadily implementing efficiency measures prior to the inception of utility and government incentive offerings. In 2003, ATK developed, and has since maintained, a

Corporate Energy Plan that sets annual cost reduction goals across its facilities in the United States and calls for regular review of the facilities' energy data. The Plan also requires the development of on-site Energy Management Plans.

Prior to ATK's Promontory site efficiency upgrades, ATK began to leverage other resources, having received two *no-cost* assessments from DOE's Industrial Technologies Program (ITP) at other sites. An ATK manufacturing facility in Independence, Missouri, received a steam process Save Energy Now (SEN) Assessment on May 18, 2006. Steam systems account for approximately 68 percent of the facility's natural gas consumption. One hundred percent of the identified energy savings were near-term opportunities. ATK also participated in an audit of one of its armament systems manufacturing facilities in Lewiston, Idaho. DOE sent an expert from its Industrial Assessment Center (IAC) based at Oregon State University to perform a *no-cost*, five-step assessment of the Lewiston facility on June 18, 2004. The IACs are energy centers based in the engineering department of major universities and supported by DOE/ITP. The IAC team is composed of one or more professors, as well as engineering students, with typical assessments conducted in just one day, and offered by DOE/ITP at *no cost*. The resulting Assessment Report is designed to help manufacturers identify ways to save energy, reduce waste, and improve productivity while providing engineering students with hands-on training in manufacturing plants.

ATK's Energy Efficiency Projects: Self-Direction Credit

While reviewing prospects for energy efficiency improvements at ATK's Promontory site, ATK was able to leverage the energy efficiency incentives offered by Rocky Mountain Power to significantly reduce project payback times. Rocky Mountain Power offers a variety of incentives and program services for industrial customers including energy engineering analysis, cash incentives and bill credit programs. The two programs ATK was able to use most effectively were Rocky Mountain Power's Self-Direction Credit and Energy FinAnswer®. For ATK, these programs were able to bridge the divide between an unacceptable payback period and a satisfactory one.

Possibly the most innovative of Rocky Mountain Power's programs is the Self-Direction Credit program the utility began offering in September 2003. Under the Self-Direction Credit program, the customer develops a project, funds analysis, and applies to Rocky Mountain Power for eligibility. Once approved, Rocky Mountain Power funds up to 80 percent of the eligible project cost in the form of a credit on the customer's utility bill. The credit is applied against the Customer Efficiency Services charge – a 3 percent surcharge – regularly charged to all Rocky Mountain Power customers to fund demand-side management programs in Utah. The bill credit works as an incentive to increase customer participation in Rocky Mountain Power's energy efficiency programs. The program requirements and benefits are outlined below:

- Customers must have a peak demand of at least 1,000 kW and/or annual energy consumption of 5 million kWh.
- Customers are responsible to fund the engineering analysis and design cost of their projects.
- Projects must have a simple payback period between one and five years.
- Self-Direction credits cover 80 percent of total eligible costs.

- Rocky Mountain Power provides bill credits for 100 percent of Customer Efficiency Services charges until credits expire

ATK began receiving Self-Direction credits from Rocky Mountain Power in 2004 to implement efficient lighting projects. ATK used the credits to replace its existing 4-ft and 8-ft T12 lighting fixtures with magnetic ballasts with higher efficiency 4-ft fixtures with T8 lamps and electronic ballasts on the first and second floors of the Promontory's M3 building.¹ To further increase the lamps' efficiency, sweep controls and motion sensors were installed to turn off lights when the space is unoccupied.

ATK has submitted applications for additional lighting project phases as necessary to ensure continuous disbursement of credits since the initial 2004 project. Exhibit X shows the energy and cost savings resulting from the first three completed phases of the lighting project and the anticipated energy and cost savings from the fourth phase currently in progress. Phase IV of the project was pre-qualified by Rocky Mountain Power on November 5, 2008. ATK remains eligible to submit future projects to the Self-Direction Credit program for additional credits.

Table I: ATK Efficient Lighting Project

	Phase I	Phase II	Phase III	Phase IV²
Project Completion Date	August 27, 2004	March 18, 2006	July 25, 2007	Ongoing
Estimated Cost to ATK	\$47,716	\$59,139	\$153,645	\$47,300
Rocky Mountain Power Credit Payment	\$38,173	\$47,311	\$122,916	\$37,840
Estimated Cost Savings	\$14,531/yr	\$16,490/yr	\$26,430/yr	\$3,619/yr
Project Payback Period (without credits)	3.3 years	3.6 years	5.8 years	13.1 years
Project Payback Period (with credits)	0.7 years	0.7 years	1.16 years	2.61 years
Estimated Energy Savings	276,332 kWh/yr	268,985 kWh/yr	449,226 kWh/yr	98,196 kWh/yr
Self-Direction Credit Duration	5 months	5 months	18 months	5 months

Source: Rocky Mountain Power. Note: Dollar amounts have been rounded to the nearest dollar.

ATK's Energy Efficiency Projects: Energy FinAnswer

ATK also took advantage of another energy efficiency incentive program offered by Rocky Mountain Power, Energy FinAnswer. ATK used Energy FinAnswer to receive energy engineering and financial incentives to purchase compressed air efficiency upgrades focused on processes in the north and south Promontory site buildings. The project was initiated in August 2003 and is expected to be completed in 2009. ATK and Rocky Mountain Power began discussing the potential project in 2003 to determine a viable scope, timeframe, budget, and payback threshold. Rocky Mountain Power selected Compression Engineering to perform the energy analysis and engineering of the project, and requested an Initial Site Visit Report be completed to evaluate the proposed measures, estimated energy savings, and potential use of utility incentives. The Initial Site Visit Report was finalized in September 2003 and collaboratively reviewed by ATK and Rocky Mountain Power to select actionable measures for further analysis. The more detailed Energy Analysis Report was delivered to ATK in March

¹ The "T" references the lamp shape, tubular. The number denotes the diameter of the lamp in eighths of an inch. Both T8 and T12 lamps have a 20,000-hour rated lamp life, though T8 lamps with electronic ballasts will use approximately 32 percent less energy than T12 lamps with magnetic ballasts.

² Phase IV of the project not yet completed.

2004 and included detailed commissioning requirements for the compressed air project. Subsequently, ATK signed an incentive agreement with Rocky Mountain Power in September 2004 and proceeded with the purchase and installation of equipment upgrades.

The following two compressed air efficiency measures were selected for implementation by ATK:

- Installation of a variable speed drive compressor in the South Plant, Building M33
- Upgraded compressor controls in the North Plant

ATK's incremental costs for the equipment and installation for these two measures is estimated at \$280,000 and the incentive offered to ATK by Rocky Mountain Power for implementation of the measures is estimated at \$140,000. The project's payback period, after the incentive, is estimated at 3.3 years. The total projected energy savings are estimated to be 2,112,305 kWh/yr.

Promontory Energy Efficiency Assessment

In September 2007, during Phase III of ATK's implementation of efficient lighting upgrades, ATK finished a \$300,000 one-year, plant-wide energy assessment of the Utah facility that was conducted by P&E Automation and cost shared with DOE and P&E AUTOMATION, with each partner covering one-third of costs. The assessment identified 351,907 MMBTU potential in annual energy savings and \$2.4 to 4.3 million/year in cost savings through implementation of 500 efficiency measures, including steam, water, compressed air, HVAC, utility, production, and building systems. The recommended efficiency projects have a combined simple payback of less than three years. While performing this assessment, ATK kept in close communication with Rocky Mountain Power, inviting the utility provider to some of the related meetings and sharing the resulting recommendations. ATK realized the value in having sought the initial partnership with its local utility, and in maintaining communication to ensure its qualification for further utility incentives.

For more information on the Promontory Assessment see: <http://www.osti.gov/bridge/servlets/purl/926204-VqXAM0/926204.pdf>.

Case Study Findings

The ATK case demonstrates the flexibility of energy efficiency project implementation, whether an organization has a corporate energy strategy, a progressive on-site management, or both. Taking advantage of local utility and government incentives can enhance the bottom line, saving both energy and money – with energy savings of over one million kWh each year and likely cost savings of over \$1 million.

ATK's efforts at its Promontory site were successful because the company was able to identify energy-saving measures that fit its unique needs and were able to maximize the payback by utilizing Rocky Mountain Power's efficiency programs and financial assistance. The measures were also successful because ATK's energy manager understood the nature of the industry and the requirement to market the merits of each efficiency measure to management, project by project. He understood that the reality of availability of funds would also determine

interest in, and the pace of, project implementation and that these projects ultimately compete for the use of other investment dollars, so the payback had to be short (1-3 years) in order to increase the likelihood of implementation.

ATK has emerged as a prominent part of the aerospace market, and has begun to show leadership in its innovative approach to implementing energy saving measures. These measures have not only saved energy, they have saved the company millions of dollars, which will surely boost ATK to new heights in the near future.

References

- [ATK] Alliant Techsystems, Press Releases. 2005. "NASA Selects ATK to be Prime Contractor for First Stage of Next Generation Crew Launch Vehicle." http://atk.mediaroom.com/index.php?s=press_releases&item=410. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [ATK] ATK Launch Systems. 2007. "ATK Launch Systems Pioneers Automated Energy Assessment to Identify \$4 Million Annual Savings" <http://www.osti.gov/bridge/servlets/purl/926204-VqXAM0/926204.pdf>. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [ATK] Alliant Techsystems, Capabilities, Space. 2008. "ATK and NASA Conduct Successful Test Fire of Space Shuttle Reusable Solid Rocket Motor." http://www.atk.com/capabilities/c_space_default.asp. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [ATK] Alliant Techsystems. 2009. "Corporate Overview." http://www.atk.com/corporateoverview/corpo_ver_ataglance.asp. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [ATK] Alliant Techsystems, Corporate Overview. 2009. "Our History." http://www.atk.com/CorporateOverview/corpo_ver_history.asp. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [ATK] Alliant Techsystems, Contact Us. 2009. "ATK Armament Systems." http://www.atk.com/locations/locations_armamentgroup.asp. Minneapolis, MN: ATK Corporate, Corporate Headquarters.
- [CLUI] Center for Land Use Interpretation. 2009. "Thiokol Promontory Complex." <http://ludb.clui.org/ex/i/UT3163/>. Culver City, CA: Center for Land Use Interpretation.
- [DOE] Department of Energy, IAC Database. 2004. "Assessment #OR0466." <http://www.iac.rutgers.edu/database/findassessment.php?ID=OR0466>. Washington, D.C.: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program.

- [DOE] Department of Energy. 2006. "ESA-140 Public Report." <http://apps1.eere.energy.gov/industry/saveenergynow/partners/pdfs/esa-140-1.pdf>. Washington, D.C.: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program.
- [DOE] Department of Energy. 2006. "Plant Assessment Summary: ATK - Lake City Army Ammunition Plant." <http://apps1.eere.energy.gov/industry/saveenergynow/partners/plant.cfm/esa=ESA-140-1>. Washington, D.C.: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program.
- [DOE] Department of Energy, IAC Database. 2007. "IAC Industrial Assessment Protocol." <http://www.iac.rutgers.edu/database/protocol.php>. Washington, D.C.: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program.
- Gallinger, Hallie (PacifiCorp Energy). 2008. Personal communication. November 4.
- [NASA] National Aeronautics and Space Administration, News Release. 2002. "NASA extends Shuttle Reusable Solid Rocket Motor contract with ATK Thiokol to May 2007." <http://www.msfc.nasa.gov/news/news/releases/2002/02-164.html>. Huntsville, AL: NASA, George C. Marshall Space Flight Center.
- [NASA] National Aeronautics and Space Administration, News Release. 2007. "NASA Awards First Stage Contract for Area Rockets." http://www.nasa.gov/home/hqnews/2007/aug/HQ_C07036_Ares_first_stage.html. Washington, D.C.: NASA Headquarters.
- [NASA] National Aeronautics and Space Administration, Current Missions. 2009. "Latest News." http://www.nasa.gov/mission_pages/constellation/ares/index.html. Washington, D.C.: NASA Headquarters.
- [NASA] National Aeronautics and Space Administration, Current Missions. 2009. "Overview: Ares I Crew Launch Vehicle." http://www.nasa.gov/mission_pages/constellation/ares/ares1/index.html. Washington, D.C.: NASA Headquarters.
- [NASA] National Aeronautics and Space Administration. 2009. "NASA Facts, Ares I First Stage." http://www.nasa.gov/pdf/230922main_1stStage_FS.pdf. Huntsville, AL: NASA, George C. Marshall Space Flight Center.
- [NASA] National Aeronautics and Space Administration. "Table 1-39: Chronology of Shuttle Solid Rocket Booster Development." In *NASA Historical Data Book: Volume III, Programs and Projects 1969-1978*. Source: <http://history.nasa.gov/SP-4012/vol3/table1.39.htm>. Washington, D.C.: NASA Headquarters.

- [RMP] Rocky Mountain Power. 2006. “Fact Sheet, Rocky Mountain Power Self-Direction Credit program: An energy efficiency program option for large Rocky Mountain Power customers.” <http://www.rockymountainpower.net/File/File32842.pdf>. Salt Lake City, UT: PacifiCorp, Rocky Mountain Power.
- [RMP] Rocky Mountain Power. 2009. “Overview of Energy Efficiency Programs for Utah Business Customers.” <http://www.rockymountainpower.net/File/File38496.pdf>. Salt Lake City, UT: PacifiCorp, Rocky Mountain Power.
- [RMP] Rocky Mountain Power, Utah Energy Efficiency Programs. 2009. “Self-Direction Credit Program.” <http://www.rockymountainpower.net/Navigation/Navigation32666.html>. Salt Lake City, UT: PacifiCorp, Rocky Mountain Power.
- [RMP] Rocky Mountain Power, Utah Energy Efficiency Programs. 2009. “Utah Energy Efficiency.” <http://www.rockymountainpower.net/Navigation/Navigation921.html>. Salt Lake City, UT: PacifiCorp, Rocky Mountain Power.
- [RMP] Rocky Mountain Power, Utah Energy Efficiency Programs. 2009. “Utah Energy FinAnswer.” <http://www.rockymountainpower.net/Navigation/Navigation926.html>. Salt Lake City, UT: PacifiCorp, Rocky Mountain Power.
- Weir, Roger (ATK). 2009. Personal communication. January 14.