

# Global Energy Management System Implementation: Case Study: New Gold Inc., New Afton Mine

Canada

## New Gold Inc.

*New Afton is the first mine in North America to implement ISO 50001.*



Sunrise at New Afton Mine

### Business Benefits Achieved

New Afton Mine started production in June 2012 and received ISO 50001 certification on March 31, 2014. Since then substantial energy savings have been realized. These are summarized below:

	Energy Savings Objective	Energy Savings Actual	8-Year IRR	% of Previous Year Energy Use
2014	7.1GWh	14.2GWh	121%	5.9%
2015	5.1GWh	10.1GWh	184%	4.0%

A video on the ISO 50001 implementation at New Afton, was arranged by Natural Resources Canada:

[Video - ISO 50001 Implementation at New Afton](#)

Total mine energy consumption increased in 2014, as a result of an increase in tonnes milled and upgrades to the surface ventilation fans, but the energy intensity, or total energy per tonne of ore milled, reduced by 11.4% and GHG emissions reduced by 2.7%, as a result of energy performance improvement initiatives.

2015 saw an increase in total energy consumption due to the addition of a 3,000+ kW expansion project. The energy intensity and GHG emissions, however, remained at 2014 levels, primarily due to the energy savings realized during the year.

These details are tabled, below:

	2013	2014	2015
MWhe	243,697	253,981	276,468
Intensity (kWhe/T)	60.5	53.6	53.6
GHG Emissions (TCO <sub>2</sub> e)	16,074	15,639	15,670

In addition to the energy savings and GHG reductions realized in 2014 and 2015, there is not one energy performance improvement initiative which has not realized an operational, safety, environmental or maintenance benefit. A flotation blower control project, for example, controlled the flotation cell blower pressure for a smoother operation and start up, reduced maintenance on filter changes and blower servicing, improved safety by eliminating manual valve operation and reduced environmental noise pollution, all while saving 1.4GWh per year in energy.

The biggest benefit, however, has been an increased energy awareness, at all levels, which is particularly important as it is people, not systems, who manage energy. It's been amazing the wide range of energy reduction opportunities that have been identified by the mine employees. These range from small opportunities, like an ice machine in the sun during hot summer days, to a mill personnel driven operational improvement in 2014, resulting in an energy performance improvement of 11.4GWh per year.

With a number of prestigious energy management related awards received over the past few years, New Afton continues to set an example of what is possible as a result of passion, drive and commitment.

***"We see an excellent correlation between our ISO 50001 certification and results in terms of cost savings, efficiency improvement and environmental responsibility."***

—Oscar Flores, General Manager, New Afton Mine



*and environmental sustainability of each of the communities in which we work and live.”*

[New Gold - Corporate Sustainability Website](#)

New Afton is the 1st mine in North America to implement ISO 50001, which validated this commitment to social responsibility and sustainable mining.

Recently, New Gold was accepted to participate in a North American Energy Management Pilot Program. This significant commitment of resources, at a corporate level, communicated an important message of support to the rest of the organization.

**Financial driver**

From financial perspective, energy is the 2<sup>nd</sup> biggest expense, after labour, with energy accounting for 13% of total annual operational expense in 2015. With the decrease in the gold and copper prices over the past few years, an improvement in energy performance is one of the areas in which an increase in profitability can be realized. A 1% improvement in energy performance is worth hundreds of thousands of dollars a year.

**Energy management program**

As a member of the Mining Association of Canada (MAC), New Gold is committed to comply with and publically report against the six Towards Sustainable Mining (TSM) protocols, one of which is “Energy and GHG Emissions Management.

New Afton Mine participates in BC Hydro’s Strategic Energy Management Program (SEMP) where targets are set for energy performance improvement.

ISO 50001:2011 aligns very well with both the MAC TSM Energy and GHG protocol and with the BC Hydro SEMP. This allows the mine to focus on ISO 50001 and comply with both the other programs at the same time.

**History of energy reduction approach**

A full time Energy Specialist was employed, during construction of the mine, to start planning for energy management and a comprehensive energy management information system was implemented. 2013 was spent preparing for ISO 50001 certification, with the actual certification being received in March

**Case Study Snapshot**

<b>Industry</b>	Mining
<b>Location</b>	Kamloops, BC, Canada
<b>Energy Management System</b>	ISO 50001
<b>Product/Service</b>	Gold/Copper
<b>Energy Performance Improvement (%)</b>	11.4%
<b>Annual energy cost savings (Canadian Dollars)</b>	2014 – \$643,000 2015 – \$444,000
<b>Cost to implement (including utility rebate incentives) (Canadian Dollars)</b>	2014 – \$690,000 2015 – \$259,000
<b>Payback period (years)</b>	2014 – 1.1 2015 – 0.6

**Company (or Facility) Profile**

The New Afton copper-gold mine and concentrator plant is located approximately 350 kilometres northeast of Vancouver in the south-central interior of British Columbia. New Afton began production in June 2012.

**Business Case for Energy Management**

**Energy’s role in corporate strategy**

*“At New Gold, we make it a priority to act as a responsible mining company, from our management practices to our health and safety standards to our stewardship of the environment. We understand that our business activities have an effect on the people who work in our operations, their environment, and on their communities. Our growth and success as a company depends on the long-term economic, social*

2014. Leading up to the implementation, a number of smaller projects were undertaken to start to gain some momentum and credibility for energy management efforts.

### Why ISO 50001?

The primary reason for ISO 50001 was the focus on building energy management into the systems and culture of the company. It was seen as the ideal vehicle to help New Afton achieve its energy management vision.

An internationally recognized, externally verified, energy management system carries credibility and ensures diligence in the management of the energy management system.

*“New Afton is one of the leaders in Energy Management in the mining industry and ISO 50001 helps us to continue identifying new opportunities for business improvement through the participation and contribution of our employees.”*

—Oscar Flores, General Manager, New Afton Mine

## Keys to Success

### Corporate and Management support

As clichéd as this may sound, these were key enablers for the success of the ISO 50001 implementation.

From Day 1, both the Corporate and the New Afton Management Team have been supportive of energy performance improvement. ISO 50001 certification at New Afton was set as objective at the corporate level, which provided further direction for the mine

### Full-time Energy Specialist

New Afton employed a full-time Energy Specialist to manage energy at the mine. This meant that there was someone focused 100% on energy and not side-tracked by production challenges. This was particularly important for the ISO 50001 implementation in a dynamic, multi-faceted operation.

### Taking advantage of programs out there

The BC Hydro Strategic Energy Management Program (SEMP) has been one of the key programs utilized by New Afton and enabled the full-time Energy Manager. The

BC Hydro rebates and incentives facilitated energy studies and projects. The BC Hydro SEMP is the underlying key to success of the energy management program.

Other programs used were:

- Fortis BC, for an energy efficiency feasibility study
- Natural Resources Canada, for webinars, training and cost-shared assistance for the ISO 50001 implementation

### Belief and attitude

The absolute belief in ISO 50001 as a vehicle to help the mine achieve its vision for energy management has been the guiding force behind the success of the program.

### Promotion of successes

Every opportunity was taken to promote energy efficiency, energy savings, the various awards received for energy management achievements and to publically recognize individuals for special efforts made in improving efficiency.

## EnMS Development and Implementation

### 1.1. Business benefits

Energy performance improvement initiatives in 2014 and 2015, the first two full years of being ISO 50001 certified, yielded annualized energy savings of 14.2 GWhe and 10.1 GWhe, respectively.

The cost reductions and improved cash flow as a result of energy performance improvement has been particularly valuable in the period of low metal prices.

### Organizational

The energy policy is reviewed annually, at one of the two Management Review sessions, and amended as required.

Annual Energy Objectives are determined by Top Management and the Energy Team is required to determine the targets to attain those objectives. These objectives form part of the annual business

planning process and are part of the Top Management performance contracts.



Figure 1. ISO 50001 Implementation Energy Team

Training of the Energy Team, Internal Audit Team and of the Management Representative has been supported by Top Management. This has helped ensure the successful integration of energy management practices in the organization.

Roles and responsibilities have been drawn up for each Energy Team member, so their role in facilitating ongoing conformance to ISO 50001 requirements is documented, clearly understood and measurable.

## 1.2. Energy Review

### Review analysis and planning

The energy planning process at New Afton is a documented, high level summary of the continual improvement energy management process at New Afton.

New Afton has 4 Significant Energy Uses (SEU's), which account for more than 76% of the total energy use at New Afton Mine. These are shown in Figure 2, below.

For each SEU, the variables impacting energy performance are determined in consultation with qualified personnel and the Energy Team

representative. Energy, production and weather data, applicable to the various SEU's, are captured in the OSIsoft PI data historian. This data is analyzed and the appropriate energy models are determined. These models provide the baseline energy consumption. Using the energy management information system (EMIS), the actual energy consumption is compared to the baseline energy consumption and the cumulative sum of savings (CUSUM) is the energy performance indicator (EnPI) for that particular SEU.

The annual energy review at New Afton is comprised of two parts.

Firstly, a documented summary of current and past energy use, confirmation of SEU's and factors affecting the SEU's, along with the baseline energy performance models for the site and SEU energies. Opportunities for energy performance improvement the following year are also assessed as is the energy forecast for the current and following years.

Secondly, there is a facilitated annual energy review session with the Energy Team. The Energy Team gets to review past energy performance, the factors affecting energy performance, the energy performance indicators (EnPI's) and selects the energy performance improvement initiatives for the following year, using a weighting matrix outlined in the Energy Planning Process. This one day workshop allows the Energy Team to be part of the energy planning and assessment process.

A comprehensive energy action plan is compiled for each of the energy targets. Performance against these plans is checked and progress updated on a regular basis. Performance against objectives is reported to Top Management on a monthly basis.

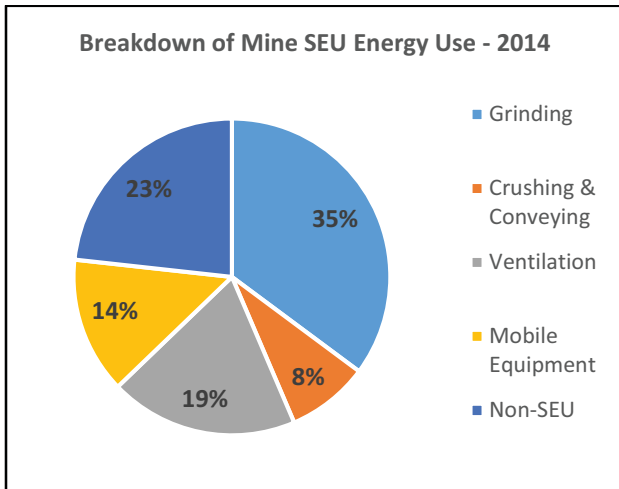


Figure 2: Breakdown of Mine Energy Use by SEU

**Financing**

The company capital budgeting process runs from July through to December. The expectation is that energy performance improvement projects for inclusion in the following year’s capital budget, be scoped out, compete with feasibility studies and possible incentive agreements, in time for inclusion in the capital budgeting process.

While the company does have energy performance objectives, energy performance improvement projects compete for capital on a one-on-one basis with other projects.

**1.3. Development and use of professional expertise, training and communications**

The use of experienced outside consultants, for implementation assistance, training and awareness played an integral part in the initial implementation. New Afton continues to utilize the services of outside professionals for employee training, energy studies and energy review facilitation.

**Professional expertise**

New Afton has made extensive use of external professional expertise in the following areas:

- Installation of the sub-metering and the energy management information system.

- For the implementation of ISO 50001 and internal audit assistance, New Afton recruited the services of an external consultant, with experience in the mining industry, who had assisted other organizations to successfully implement ISO 50001.
- For the development of an ISO 50001 focused Communications, Training and Awareness Plan, which addressed internal and external communications, internal awareness requirements and outlined training requirements for the personnel associated with the various SEU’s.
- Recently a Lean Manufacturing specialist provided training for Energy Team members on Process Mapping and Value Stream Mapping.
- Members of the internal audit team have received RABQSA internal audit training to ensure a high level of internal audit scrutiny
- A variety of consulting engineering firms are utilized to prepare energy efficiency feasibility studies for New Afton Mine.

**Employee engagement**

New Afton has a number of programs to increase employee awareness of energy management at the mine.

**Mine Orientation**

Every new employee and contactor coming onto site has to participate in an energy orientation and quiz, outlining the energy policy, the importance of energy management at New Afton, the SEU’s and the potential consequences of not managing energy correctly. After the orientation attendees receive a sticker of the mine “Energy Matters” logo.

**Quarterly Crew Meetings**

Every quarter, the management team updates all mine employees on various aspects of the business. Energy is given a platform at these meetings and

employees are updated on the successes of, and any changes to, the energy management system.

#### Home Energy Meter

To help employees save money at home, and to create awareness around energy use, employees were able to participate as “Agents of Change”, enroll in “Mission: Zero Energy Waste” and buy a special internet linked home energy meter at a discounted rate. A Facebook group was set up to create a conversation around energy savings.

Should a 5% energy savings be realized over the campaign period, New Afton will donate money to a charity selected by the Agents of Change.

#### Newsletters

An energy management related article is included in the quarterly environmental “Spadefoot Toad Gazette”, and in the monthly mine newsletter.

#### Posters

Posters are produced for each energy performance improvement initiative. These are posted at strategic, highly visible, locations around the mine to create awareness around the initiative.

#### E-Days

In conjunction with PASS Inc., out of Kelowna BC, New Afton developed the E-Day, where, at the daily safety meeting, employees briefly discuss any energy savings the previous day and energy saving opportunities to look for that day.

### 1.4. Tools and Resources

New Afton utilizes a number of tools and resources to assist with the managing and monitoring of energy data and for the continual improvement of energy performance at the mine, these include:

#### Energy monitoring

With a network of more than 160 energy meters, good energy data management is readily available. The OSIsoft PI data historian, is the underlying tool

for energy management at the mine. All energy models were formulated in-house, and entered into PI for use in the real time energy management information system (RtEMIS).

RtEMIS utilizes the PI data to create visual displays of energy performance and to allow real time monitoring of energy performance and energy costs. This is the primary tool for energy monitoring at the mine.

An Overconsumption Event Monitoring module is configured to alarm if the actual energy consumption of a Significant Energy Use (SEU) exceeds the baseline by a certain amount for a certain period of time. Recurring reasons for overconsumption events can then be identified and corrective actions initiated.

Portable tools, like thermal imaging cameras, ultrasonic sensors for leak detection and plug in power meters are utilized to identify possible areas for energy performance improvement.

#### Other tools and resources

New Gold utilizes the InControl and InTuition modules of INX software for incident reporting and training record management respectively.

A Business Improvement (BI) initiative is in-progress at all New Gold operations. Tools utilized by the BI teams are being adopted by the Energy Team.

New Afton is ISO 14001 certified. Systems in place for this certification were, where possible, leveraged for ISO 50001 implementation.

*“ISO 50001 has enabled us to manage our energy in a way that meets our internal expectations, while also meeting the environmental expectations of external stakeholders.”*

—Dennis Wilson, Director Environmental & Social Responsibility, New Gold Inc.

**1.5. Steps taken to maintain operational control and sustain energy performance improvement**

Operation control training modules for each SEU have been compiled outlining the factors affecting the SEU’s, the control limits for optimal efficiency and actions required in case of an overconsumption event. All personnel associated with the operation and maintenance of that SEU receive the training. The training modules are set up as competencies, for the relevant positions at the mine, so if a new person is moved into that position, their supervisor will receive a notification that that person needs the appropriate SEU training.

Standard Operating Procedures (SOP’s) are developed, if necessary, to ensure compliance with optimal energy efficiency practices. The Energy Team members are key to ensuring compliance with SOP’s and for sustained energy performance improvement. Any new procedures or changes to procedures are communicated, by the Energy Team member, to their respective departments.

Energy management and SEU energy performance are discussed in the relevant weekly team meetings and the reasons for any change in energy performance are investigated. Deviations are assessed and corrections made if necessary.

**1.6. Determining energy performance improvement and validating results**

The primary tool for determining energy performance improvement is the RtEMIS. A positive slope for the trend on the CUSUM graph, indicates an improvement in energy performance compared to the previous best performance baseline, and vice versa.

For individual energy projects, IPMVP methods are utilized. Energy consumption and operational parameters are determined after completion of the initiative, normalized if necessary, and compared to the baseline to assess the value of the energy performance improvement.

Systems are in place for checking and recalibration of equipment. This give confidence in the validity of meter and transducer data.

The annual internal audit is the primary vehicle to ensure the validity of the energy management system as a whole. A comment in the recent ISO 50001 Annual Surveillance Audit Report mentioned that, “...the findings of the internal audits demonstrated that internal auditors conducted a thorough and detailed review of the management system”.

**1.7. Cost-Benefit Analysis**

Total ISO 50001 - Cost Benefit Analysis				
	Cost	Incentive	Net	Savings
2012 - Sub-Metering & RtEMIS	\$ 500,000		\$ 500,000	
2013 - ISO 50001 Implementation	\$ 45,210	\$ 22,100	\$ 23,110	
2013 - Certification Audit	\$ 29,100		\$ 29,100	
2014 - Surveillance Audit 1	\$ 10,460		\$ 10,460	
2014 - Surveillance Audit 2	\$ 10,250		\$ 10,250	
2014 Projects	\$ 1,049,244	\$ 359,348	\$ 689,895	
2014 Savings			\$ -	\$ 643,283
2015 Projects	\$ 830,219	\$ 571,093	\$ 259,126	
2015 Savings			\$ -	\$ 444,314
IRR - 2012 to 2023			65%	
2014 Project Cost Benefit Analysis				
	Cost	Incentive	Net	Savings
2014 Projects	\$ 1,049,244	\$ 359,348	\$ 689,895	
2014 Savings				\$ 643,283
2014 Simple Payback (years)			1.1	
2014 8-Year IRR			121%	
2015 Project Cost Benefit Analysis				
	Cost	Incentive	Net	Savings
2015 Projects	\$ 830,219	\$ 571,093	\$ 259,126	
2015 Savings				\$ 444,314
2014 Simple Payback (years)			0.6	
2015 8-Year IRR			184%	

Figure 3: Summary Cost Benefit Analysis

A summary of the total cost benefit analysis along with the 2014 and 2015 cost benefit analyses can be seen in Figure 3, above.

New Afton is saving in excess of a million dollars a year as a result of improvements in energy performance.

## Lessons Learned

While a book could be written on the lessons learned, alone, a few of the biggest lessons are outlined below.

### You cannot do this alone

Support of the management team and the employees must be done face-to-face, talking to people and listening to their concerns. Let them know what this will do for them; sell the benefits of the system. You're going to need help from a lot of folks in your organization, so get them on your side; their support is essential. Communication, training and awareness is the crux of the system and is where you spend a great deal of time.

When it comes to external support, there are always people out there who know more than you do, people who have been there and done it. Utilize that expertise to help you move ahead. It may cost you money, but the time and frustration saved will be well worth it.

### It takes time

This is not a get quick rich scheme, it takes time. Successes achieved at New Afton have been more than 4 years in the making, so be patient, but persistent, and avoid trying to rush it. That said, sometimes you cannot wait and just have to do it.

### Just do it

The primary objective of most production facilities, is to produce a product, so folks are working at doing just that... producing. At times people will be too busy to act on your requests, so, you may have to get on with it and "just do it" anyway. If you do something in the best interest of the company, you will generally be OK. You may be burnt occasionally, but if you wait around for

something to happen, you're going to be waiting a long time.

### Belief

Belief! To me, this is the single biggest obstacle to overcome. Why? Because you are challenging the status quo with respect to energy management. At times, it will seem like an uphill battle, so it's important to try maintain enthusiasm and keep focused on what you are trying to achieve.

### Do not under-estimate sub-metering

On the surface, the sub-metering may seem straight forward and simple. As you delve deeper into it, however, you begin to understand the complexities involved, not only with the energy meters, but the communication networking as well. Go into this with your eyes wide open.

### Utilize existing systems

Avoid reinventing the wheel for every initiative, piggyback where possible, on existing systems. At New Afton, we utilized the existing INX systems for incident reporting and training, the SharePoint system, the PASS® safety system and incorporated an energy component into already existing meetings. Once again, this saves you, and others, time.



Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit [www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).

