Bringing innovation into the mainstream – overcoming challenges in funding unique projects through regular program offerings

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ABSTRACT

Thomas Edison once said, "genius is 1% inspiration and 99% perspiration". This is sometimes also true of energy efficiency innovation, where success can be less about having an innovative idea and more about the incremental innovations along the way to successful implementation.

This paper will detail the insights gained from collaborating with a large mining customer (Glencore) to turn their vision of a diesel free, all electric mine, into an economic reality, with strong support from energy efficiency. The focus will be on how the IESO was able to use existing program offerings to help the customer create a viable business case for the electrification of the vehicle fleet, and achieve significant reduction in ventilation and air cooling requirements. Program enhancements included the funding of an Energy Design Review, when the mine was still in the design phase (to uncover significant energy savings opportunities early on) and wrestling with Measurement and Verification (M&V) for a hypothetical base case (the diesel mine that will never be built). The energy savings from the reduced ventilation and cooling was a key contributing factor to the mine construction receiving the green light.

Before We Begin

It is worth noting at the start, that the greatest innovation in this project is the trail blazing mining project that is described below. The considerations and risk analysis required by the IESO to enable the project to be funded through existing energy efficiency programs are not necessarily ground breaking in themselves, and some are, in fact, relatively straightforward. What makes this partnership and collaboration a process worth learning from, and repeating, is in how the IESO was able to work with the customer to accommodate unusual project requirements into an industrial energy-efficiency program[1]. This flexible and risk based approach sets the IESO industrial energy-efficiency program apart from many custom project programs, and these differences are highlighted in the paper.

[1] The IESO SaveOnEnergy Large Custom Program for industrial energy efficiency was originally called the "Industrial Accelerator Program" but the name was changed to "Process & Systems Upgrades" in 2019. For ease of reading, the programs will be referred to generically in this paper as the "industrial energy-efficiency program".

Greener Mining – Battery Electric Vehicles Underground

Glencore, one of the world's largest globally diversified natural resource companies, has plotted a path to reach "net-zero emissions", with a plan that includes the use of battery-electric vehicles (BEVs) at one of its underground operations in Canada. The company has committed to reducing its total greenhouse gas (GHG) emissions footprint by 40% by 2035 compared with 2019 levels, with an ambition of achieving "net zero" on its total emissions footprint by 2050. This deep mine, currently under development, has been designed to utilize state of the art battery-electric mobile mining equipment, to maximize real-time remote operation, and monitoring and management utilizing advanced Wi-Fi systems. The benefits of using such technology include the elimination of diesel emissions and the reduction of noise pollution. The design includes the use of innovative ventilation technology, with cooling systems designed to be energy efficient. On BEV technology specifically, the company expects these zero-emission vehicles to play an increasingly important role in underground operations. After an initial BEV trial at another of their mines, the project that is the subject of this paper, is expected to reduce energy usage by 44% for ventilation systems and by 30% for cooling equipment, compared to an equivalent diesel-fueled operation. In addition, the new mine is expected to reduce GHG emissions by 44% and deliver considerable cost savings through reduced fuel and energy usage.

The Power of Partnerships – Meeting the Actual Needs of Industry

Ontario launched a renewed and expanded focus on energy conservation in 2005. Over the next few years, much thought was given to how industrial energy efficiency can, and should, play a role in system operations. This included significant consultation with stakeholders, including Glencore, to inform the program design of a large industrial energy-efficiency program that was launched in June 2010 focusing on custom projects. This was the beginning of a decade-long partnership between the IESO and large industrial companies in Ontario, to drive energy efficiency in the sector. Industry presented, at that time, two key messages that became the guiding principles of the program design. Firstly, the simple need for capital to turn energy efficiency project ideas into reality, specifically aiming to bring the simple payback to within striking distance of two years, recognizing that these projects often compete with other productivity improvements for capital. Secondly, to provide funding for the up-front engineering studies that are needed to develop business cases from identified opportunities. With limited access to capital, companies are often not willing to risk conducting feasibility type work, given that the study could show the project not to be economically viable. If, however, the studies were funded, the risk to the company would be much less, given that costs would still be recovered if the study resulted in a project that did not proceed. The resulting industrial energy-efficiency program incorporated both of these concepts, with full funding available for third party engineering studies pre-approved by the IESO and with project funding available to supplement capital for the implementation of the project, scaled to the expected electricity savings.

Over the 11-year life of the industrial energy-efficiency program, Glencore conducted close to 15 detailed engineering studies and implemented more than 10 large projects with an effective conversion rate of nearly 70% which is above what is typical for efficiency programs. The total contracted savings (not all projects have been declared in service yet) amount to approximately 100 GWh (which includes the BEV project that is the subject of this paper). Many of the early projects were relatively straightforward equipment retrofit projects, such as addition of variable frequency drives, albeit at large scale. However, as the partnership grew, the projects became more complex, requiring innovations in the program's technical review process and challenging some of the assumptions on which the program's application process was based. Some examples of these types of projects, each with a two to five year implementation cycle, are: mine ventilation control system, relocation of surface cooling plant underground, mine dewatering pump optimization and a hydraulic air compressor (HAC).

Early Efficiency Intervention – The Energy Design Review

As the saying goes, "measure twice - cut once". This is generally intended as a reminder that good planning up front makes the task of implementation easier, and increases the likelihood of getting it "right the first time". Design of large engineering projects commonly follows a well-established "stage gate" approach, sometimes called Front End Loading (FEL), that moves from more conceptual design decisions to more detailed design decisions, culminating in a final design that is implemented. What is not as common, is incorporating energy efficiency design considerations into these same phases, along with other aspects of the project, in order to reduce the cost of implementation, or cost of design changes (if done early enough). Typically, retrofitting for energy efficiency takes place after the project has been implemented, at a more costly time to introduce energy efficiency.

Inspired by this concept of early intervention (by conducting an independent review of energy efficiency opportunities during a project's design phase) which was first introduced into an energy efficiency program by BC Hydro, the IESO funded a pilot program in 2011 to explore the potential benefits and practical implications of this approach. The process was called an Energy Design Review (EDR). The EDR pilot was proposed by a large multidisciplinary Canadian based Engineering consulting firm, which had achieved some initial success when using this approach with some of their large industrial customers. The concept made good sense to industrial customers, however, the main challenge for the pilot was to find meaningful projects that were at just the right phase of design during the pilot's window of activity. Although Glencore strongly supported the concept, they were not able to participate in the pilot due to the timing of projects in their portfolio.

The Energy Design Review pilot project was a cross-functional energy-efficiency and renewable-energy design review that targeted industrial facilities located in Ontario. The engineering firm delivering the pilot conducted reviews of early stage projects at participating firms at no cost to the participant and provided recommendations on potential design modifications. Industrial facilities typically have long lives (30 years) and consume large amounts of energy and, as such, intervention in the earlier design phases can have a significant impact on long-term energy consumption. The pilot was intended to explore the process with projects of various sizes from different industrial sectors, including both greenfield sites and large expansion projects. Each participant obtained their energy savings results and recommendations promptly after the design review in order to maintain project implementation deadlines. This was clearly a critical success factor, as delaying recommendations would likely miss the window of opportunity to influence the project design, which is typically on a fast moving schedule.

Each participating facility received a workshop-based design review, basic energy-efficiency training and a draft work-plan for implementing the recommended energy efficiency and renewable energy opportunities. Participants also obtained the added benefit of being exposed to energy best practices within their facilities. See Figure 1 for a flow chart of the overall EDR process.

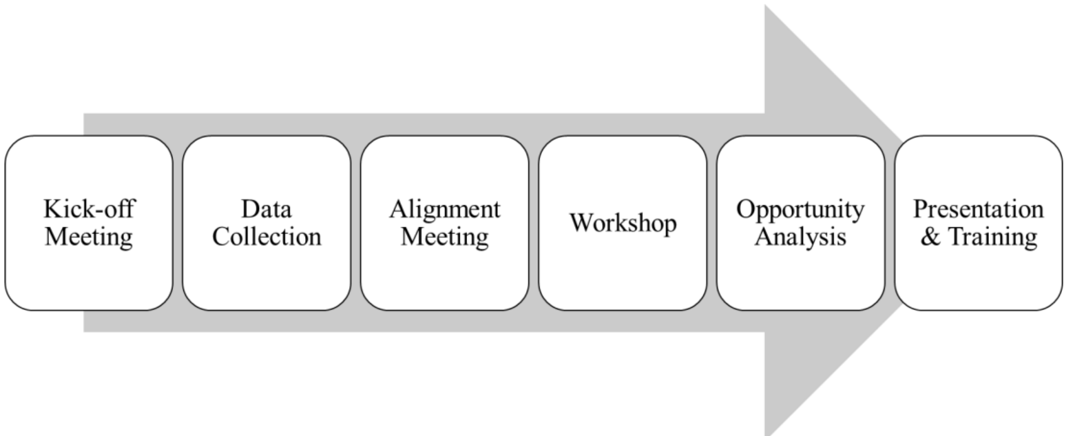

Figure 1. Flow of overall EDR Process

Given that the EDR approach was novel at the time, Glencore's support of the concept was another indication of their willingness to innovate in order to achieve uncommon success. This initial interest proved to be the seed that grew into what is anticipated to be a global showcase of what a modern, highly-efficient, low-carbon mine can, and should, look like. This was not blindly forging ahead, but slowly and deliberately taking calculated and well considered risks along the way.

Funding innovation – Using existing mechanisms

Mainstream resource acquisition focused energy efficiency programs are generally designed with specific goals in mind, and typically focus on driving the implementation of known energy efficient technologies, or best operational, maintenance and energy management practices. They are not usually designed to encourage, or even accommodate, early stage innovation, which is funded under programs specifically designed for that, for example the IESO's Grid Innovation Fund[2]. There are times, however, where the innovation fits close enough to existing programs that it can still be funded using existing mechanisms. After the EDR pilot, the first opportunity to apply the process to a large scale project, was when Glencore approached the IESO in 2016 with an opportunity to conduct a full scale EDR for a major mine expansion being planned for one of their operating mines. A mine expansion bears a significant energy burden, particularly in ventilation, but also in dewatering and, with this being a depth increase, the need for air cooling. (The cooling is critical to providing a safe and comfortable working environment for personnel underground, as the rock temperatures can reach well above 50 ^{o}C.)

[2] https://www.ieso.ca/en/Get-Involved/Funding-Programs/Grid-Innovation-Fund/Overview

The IESO's industrial energy-efficiency program had funding available for a Detailed Engineering Study (DES) in existing facilities which covered many of the key requirements of an EDR, for example, evaluating energy saving opportunities and estimating the energy savings and associated costs, and providing a report that describes the engineering work done and key recommendations. What the DES requirements did not anticipate was situations where baseline metered data collection was not possible, as well as the potential impacts of this on the level of estimation accuracy that can be achieved, when energy efficiency is considered early in the project. Given that the intent of a DES and an EDR were essentially the same (to evaluate and quantify energy efficiency opportunities that will lead to implemented measures), the IESO was able to support Glencore in undertaking this study using the DES funding mechanism. Funding an EDR style study, without a measured baseline at the project design stage, is not something that typical programs are able to fund, due to specific program requirements.

Using the partnership approach, the IESO worked diligently with the customer to create a set of requirements for an EDR that would deliver outcomes that were in line with program intent while making allowances for the early intervention nature of the innovative approach. These allowances were considered within the framework of a risk analysis, to ensure that both upsides and downsides were considered. The timelines to approve and implement the EDR for the active project where understandably short, given that the mine design was proceeding at pace, with only a relatively short window of opportunity to influence the design. With all parties committed to success, the EDR outcomes were above expectations, and not only quantified opportunities for the project at hand, but provided insights into future potential opportunities for Glencore's operations. The EDR was scoped to include two sections: a list of all potential opportunities; plus, detailed analysis of the most promising measures which was limited to six.

One of the risks that the analysis uncovered, which is inherent in any EDR type of initiative, is the fact that capital expenditure approval to proceed with the capital project implementation is typically not given until after the design phase is sufficiently completed. Custom energy efficiency programs are not typically able to fund studies where there is not only a risk that the measure may not be feasible, but also where the capital project itself may not receive funding. For the EDR to be successful, it needs to be conducted as early as possible, and in the case of Glencore, well before the capital approval for the project is given. The IESO had to carefully consider that, even as the process identified significant energy efficiency opportunities, these may never be realized if the project is not implemented. (This is always a risk at the DES stage of a project, so was not considered unusual or unique.) On the other hand, there was significant potential that the reduced operating and maintenance costs could make a substantial contribution to the project business case, and increase the likelihood of project approval. This would include non-energy benefits, such as GHG reductions, improved productivity, and a positive impact on sustainability.

One interesting outcome of the initial EDR was that Glencore decided to conduct a similar review on another mine project in their portfolio, a year later, that was also a deep mine expansion. Although the capital expenditure for that mine has not yet been approved (and may never be), the information contained in it has been useful for the rest of the company's operations. More germane to the topic however, this second EDR clearly illustrates that Glencore saw enough value in the process to include it in the design process of another major project. Given this support and interest from a significant player in the mining industry, and the success of the process in substantially improving the energy efficiency of the final design, it will be prudent to explore ways to ensure that this early intervention approach can be more broadly adopted in industry.

EDR Outcomes – Reduced Ventilation and Cooling

Table 1 shows the list of electrical energy savings opportunities[3] that were identified through the EDR for detailed analysis. Due to the short timeline, and due to the philosophy that it is better to have a short list of opportunities that are likely to be implemented, rather than a long list of “possibilities”; only a few of the identified opportunities were studied in detail. This broad scope of opportunity identification is typically funded through an energy audit approach. A hybrid model, where only select opportunities are studied in detail is relatively unusual. It is however an essential component of an EDR due to the tight timelines involved. In total, over 40 potential opportunities were identified and screened for feasibility. (The selection of the priority opportunities were chosen in collaboration with the customer and their engineering team.)

Table 1. Significant Opportunities Identified by the EDR including rough magnitude of savings

Opportunity	**Magnitude**
Reduced ventilation from Diesel to BEV fleet	Large
Auxiliary Fan Plastic Ductwork	Large
Hydraulic Pressure Recovery Turbine	Large
Larger Service Shaft Diameter	Medium
Smaller Cooling Plant	Medium
Waste Rock Deposition Underground	Medium
Air compressor optimization	Medium
Dynamic Ventilation on Demand	Medium
Dynamic Cooling on Demand	Small
Turboexpander	Small
Bunton Modification	Small

For the project in question, only two opportunities made it through to the IESO Incentive Application stage in the industrial energy-efficiency program[4]. These two opportunities are described in more detail below. The actual MWh energy reductions are still commercially

[3] The EDR also identified gas saving opportunities but these are not included in this paper, as the IESO is only able to directly support electricity saving measures.
[4] The IESO SaveOnEnergy Program that provided funding for large capital projects was not continued into 2021 and resulted in the 3rd opportunity not having enough time to apply for funding.

sensitive, as there are now other BEV mines in various stages of development and operation around the world, so only percentage savings can be provided at this stage. The ventilation savings represent an expected 40% reduction in ventilation energy use, and the cooling system savings represent an expected 1% reduction in energy use.

Reduced Ventilation Requirements

Although the need for managing ventilation in a mining operation is well known and well understood (mine ventilation typically represents around 30% to 40% of the electrical energy use in an underground mine), the energy savings from the reduced ventilation requirements when moving from a diesel mining fleet to a BEV fleet is not. In order to estimate savings, the engineering team needed to use a more theoretical and model based approach to determine the most likely ventilation requirements for a non-diesel fleet. Industrial efficiency programs do not typically allow the use of theoretical baselines and model based approaches. This is a relatively complex matter as a mining ventilation system has three broad categories of ventilation systems, which interact with each other: very large surface fans that bring fresh air into the mine and exhaust stale air (primary fans); underground large fans that move the air supplied by the surface fans to deeper areas of the mine (booster fans); and smaller fans that provide ventilation directly to the tunnels (drifts) where the mining is taking place (auxiliary fans). Although the primary and booster fans are fixed in place, the auxiliary fans are moved from time to time, and are turned off when mining operations are not currently active in the area they serve.

The challenge of determining ventilation energy savings from a fleet change in a deep mine has two facets. Firstly, ventilation requirements (air volume) for a diesel fleet is determined by the number of vehicles actively operating underground, as the ventilation is primarily required to remove diesel exhaust particulate so that miners don't breathe in the fumes. On the other hand, BEVs, with zero emission require ventilation to remove the heat emitted from the vehicle engines, which requires much less air flow. Secondly, as a mine gets deeper, the temperature of the rock increases, to the point where the ventilation is primarily driven by the need to cool the working environment underground to acceptable levels of occupant comfort. In the case of Glencore, the modelling showed that the airflow required due to the rock temperature far outweighed the requirements to remove vehicle heat. This meant that for the base case, ventilation was driven by number of vehicles (as the airflow required to remove the diesel fumes was sufficient to provide the required work area cooling), while in the efficient BEV case the ventilation requirements are independent of the number of vehicles underground.

Having two different drivers of ventilation requirements not only made the savings estimates more challenging, but also impacted the M&V Plan which required separate modelling approaches for the two cases, as well as a calibration methodology that was more complex than is typically required for an IPMVP[5] Option D. The calibration approach that was developed would not typically be accepted in many industrial programs as it does not strictly follow the process that is generally used in approaches where building modelling is used. There is, however, a developing body of knowledge in the use of Option D in industrial projects. A risk analysis of the calibration approach used here showed that the uncertainty of the savings

[5] International Performance Measurement and Verification Protocol, published by the Efficiency Valuation Organization (EVO).

determination is within acceptable limits. More details on the M&V approach and challenges is covered in the last section.

Reduced Cooling Requirements

This opportunity is relatively straightforward as the reduced requirements for chilled water are directly related to the reduced airflow requirements from the BEV fleet. The modelling of the chiller performance used conventional methods. This made savings estimates and the associated M&V Plan simpler, which was a welcome addition to an otherwise complicated process.

The Project Today – Heading Towards In-Service

Not too long after the successful completion of the EDR in the fall of 2016, Glencore informed the IESO that the capital project had not received board approval to proceed. Undaunted and ever hopeful, the IESO kept the EDR Report and the Technical Reviewer's[6] Report on file, in the event that circumstances changed. As is sometimes the case with major projects, in early 2019 the project was back on the list of capital projects to be funded, and the EDR recommendations were now required to inform detailed design and project implementation.

With the passage of time and changing circumstances, the EDR Report, as anticipated, needed to be updated, and the level of detail expanded, in preparation for the two opportunities to be included in a project incentive application to meet the industrial energy-efficiency program requirements. Given the "new build" nature of the project, there would also once again be some adjustments required in order to meet program requirements. Fortunately, the IESO already had experience with the challenges of evaluating savings potential for projects with no existing facility baseline to measure, from several smaller scale projects. The lack of measured baseline data impacts both the technical assessment of the savings estimates and the development of a defensible and credible M&V Plan. One of the strategies for dealing with this is to move some of the energy savings estimates risk to the M&V Reporting stage, when actual savings are determined. Most industrial programs will not permit this movement of risk to a later stage and typically have clear requirements for savings accuracy at the application stage. This shifting requires that the customer is willing to accept that the actual (measured and verified) savings might be significantly different to what was estimated, with the associated risk that final incentive funding may be reduced. (IESO industrial energy-efficiency program incentives are paid out based on M&V data analysis[7], and as such the study report and application review process is intended to provide a relatively accurate estimate of savings that can form part of the business case for the project.) There are, however, cases where the savings cannot, for a variety of reasons, be determined to the level of accuracy required by the program. Given the early intervention nature of the EDR, Glencore was prepared to move some of the savings estimate risk to the M&V Reporting phase.

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[6] The IESO uses an independent 3rd Party engineering firm to conduct the Technical Reviewer of large custom projects and the associated Detailed Engineering Studies.

[7] Large custom projects over $1 million incentive also have the option of an up-front payment, provided that a letter of credit for the incentive amount is provided as security.

The updating of the EDR once the mine design was finalized did have the advantage that much of the information and data that was only estimated at the time of the original report issuance, was now sufficiently accurate to begin mine construction. On the other hand, most of the consultant's mine design team that was involved in supporting the EDR were now involved in other projects and were largely unavailable to assist with the update. Fortunately, good documentation and document retention greatly eased these challenges. Faced with the natural effects of a lapse of time, the IESO and Glencore worked diligently together to explore alternative estimation methods, and different types of data, to land on an approach that effectively balanced the cost and accuracy of the additional information required. Table 2 provides a summary of the type of detailed information that was used to update the portions of the EDR required to support the project incentive application. The table highlights the type of information, as well as the level of detail, required to bridge the gap between the EDR and the business case for project funding. Although there is inherently an information gap between a study and project, especially where the study was conducted several years prior, it seldom makes sense to comprehensively update the study, although this is what many custom programs require. A better practice is to take a risk based approach and to focus on the areas that have the most material impact on the project business case.

Table 2 Additional Information Requirements from EDR

Information Update Required	**Notes**
Update of project scope to reflect final design.	• The final mine configuration for ventilation and cooling. • Final Equipment Specifications • BEV fleet inventory. • CAPEX estimates for the energy efficiency portion of the project.
Update of diesel base case to reflect final BEV design.	• Equivalent vehicles, fans and cooling system. • Equipment specifications.
Development of energy model for final BEV design (with the ability to adjust calibration parameters to reflect installed fans, cooling system and active vehicles).	Energy use of ventilation and cooling systems, and vehicle charging system.
Development of energy model for equivalent diesel base case design. (with the ability to adjust calibration parameters to reflect BEV equivalent installed fans, cooling system and active vehicles).	Energy use of ventilation and cooling systems.
Rationale and assumptions for estimates.	Energy use, maintenance costs and capital costs.

Measurement & Verification Plan – Without a Measured Baseline

In addition to the earlier mentioned challenges with the EDR and savings estimates, building a credible and defensible M&V Plan for a project this size, as a new construction, was probably the most challenging aspect of the process, from a program administrator perspective.

Where a baseline does not exist and cannot be measured, the IPMVP provides an approach called "Option D" that allows for modelling of both the baseline and the energy efficiency case, in order to measure and verify savings. This process is most commonly used in commercial building new construction M&V, where standard and commonly available building modelling programs are used. Critical to this approach is the calibration of the efficient case model against actual energy use data and then to use the same calibration adjustments to effectively calibrate the base case model. Figure 2 illustrates the typical process[8] and Figure 3 below shows the adapted calibration process used for the BEV project. Once the calibration steps are complete, the base case model also needs to be adjusted to actual operating conditions to reflect how much energy a diesel mine would be expected to use, under the same operating conditions, and in particular the same number of vehicles underground. This enables comparison of the measured energy use against the theoretical energy use of the diesel case, and hence provides verified savings.

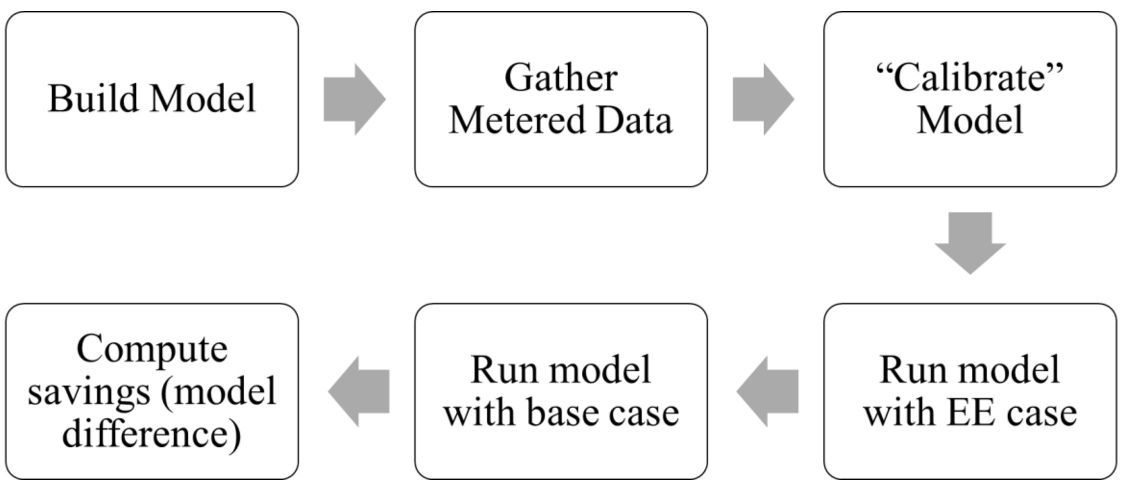

Figure 2: Basic "Option D" model calibration process

Although "Option D" has most commonly been used for buildings, where industry standard modelling software is available, there is now a growing body of knowledge and experience where this option is being used for industrial applications. The key requirement for its application in industry is the availability of a modelling approach for the key variables impacting energy use (and most likely modelling software) that is acceptable to both parties (the customer

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[8] IPMVP does not mandate a specific process, just an overall approach with two options for savings calculations. One approach is to compare the efficient case and base case calibrated model with each other. The second approach is to adjust the models for model error and then to compare the adjusted base case model with actual metered energy data.

and whomever requires the M&V, in this case Glencore and the IESO). It was this part of the process that required the next incremental innovation step. A standard energy modelling approach for underground mines does not currently exist and a significant amount of effort and resources were required to develop an approach that both parties were comfortable with.

This approach had two components: the modelling of air flow requirements using a modelling tool (Ventsim™) that is widely used within the mining industry; and the use of standard engineering calculations, including fan affinity laws (conservatively applied), to determine the theoretical power requirements for the fan system. Note that the bulk of the energy savings come from the reduced ventilation, so the focus was on the modelling of the air flows, however the Ventsim™ tool also provided cooling load outputs that are used for determining the associated savings. Figure 3 shows the overall process for the Option D calibration and savings determination approach as per the current M&V Plan.

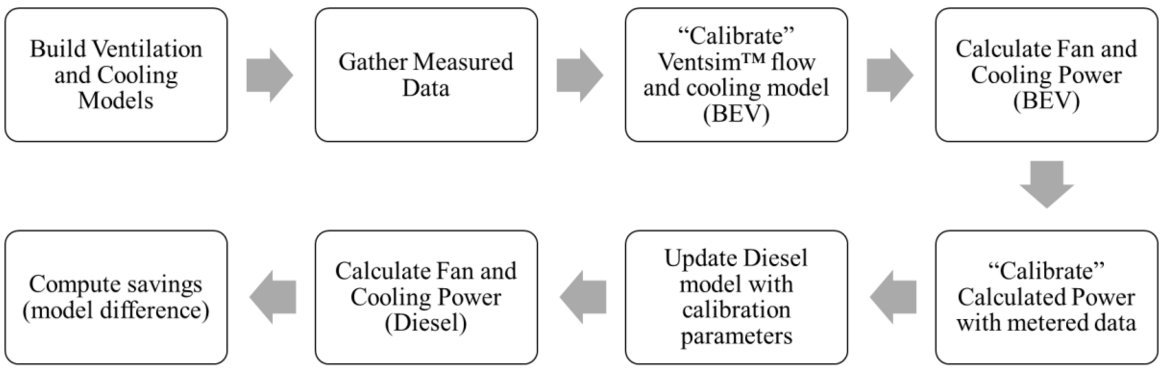

Figure 3: Adapted Calibration and Savings Determination Approach

There are two aspects of this approach that bear specific mention. Firstly, the IESO needed to conduct a risk analysis on the use of this approach, given that this was essentially a ground breaking approach (no pun intended) to conduct M&V for this type of project, and almost certainly for a project of this size. One of the key factors that mitigated this risk was that, with the mine still undergoing development during the course of the 4-year M&V period [9], the savings will keep increasing over time as more BEVs are added. This effectively reduced the risk of the project not performing as anticipated. (The project incentive was capped at a maximum amount per project, so only a minimum performance was required, as over-performance would not incur additional incentive payments.) Secondly, although the two cases have different energy drivers (number of vehicles vs. rock temperature) the shaft and tunnel diameters used for air movement are essentially the same size for both cases, given that the diameter is determined by the size of

[9] The project will be considered in-service and delivering contracted savings at "Stage 7" of a development process that is considered complete at "Stage 9". The incentive value will reach its maximum cap with the savings being delivered at "Stage 7" so waiting till the mine is fully developed is of no advantage to Glencore. In addition, the program requires that the project be in service by 31 December 2022 whereas "Stage 9" is only anticipated to be reached in 2024.

the ore body and the size of underground vehicles. This greatly simplified the calibration adjustments and the plan for routine adjustments of the base case.

What We Learned – What We Recommend

The 11-year journey that led to the successful implementation of this innovative project has clearly come with some lessons, which are contained in the summary below. One note that is specific to the EDR approach: one needs to bear in mind that early intervention has an inherent downside that the information available to determine energy savings is mostly still estimates, and more detail will likely be required to create a sound business case for the project.

Partner Engagement Process

- As a program administrator, it is important to build relationships with your large energy users so that you can start conversations as early on in the project design process as possible.
- Actively listen to the needs of customers, avoiding pre-conceived ideas of what might motivate them to implement energy efficiency projects and best practices in energy management.
- Be prepared that a partnership requiring incremental innovation is most effective over a significant period of time. It is vital to have a long-term view, and to stay the course through the inevitable ups and downs. The lifetime of a large capital project may be several years and depend upon market forces well beyond energy. One will not always be able to make accommodations, where the risks are not tolerable. The payoff can however be substantial and well worth the effort.

Project Selection Process

- The EDR approach of early intervention in large capital projects with an energy efficiency lens should be more widely promoted and adopted.
- When customers bring projects to the table that don’t quite meet program rules or program requirements, avoid outright rejection of the project. Adopt a risk based approach to evaluate the risks and benefits of supporting implementation of projects that may not have energy efficiency as the primary driver, but still meet the intent of programs through the secondary benefits realized.
- Actively seek to support the customer’s business goals and work with them to identify how energy efficiency can align with productivity enhancements or other objectives of large capital projects; the project boundary may not be what you initially think.
- When evaluating risks, focus on actual potential risks and actual potential benefits, not ones that are only perceived, which can often occur when a team is conducting a theoretical risk analysis. (As a purely hypothetical example, a review could identify meter accuracy as a risk to M&V reporting. If, however, the meters have already been specified or perhaps even purchased, then this is no longer an actual risk.) Time spent assessing theoretical risks does not add value to the risk assessment process.

- Consider moving some of the risks of savings achievement to the customer through rigorous M&V Reporting requirements, rather than imposing specific constraints on savings estimation accuracy at the engineering study or project application stage.
- When seeking information and data from the customer avoid being overly prescriptive in the form of the request and allow the customer to find a solution that meets the intent of the program requirements. (E.g. instead of insisting on copies of electricity bills, perhaps data from the energy management system would meet the same goal.)