IMPACT EVALUATION OF INDUSTRIAL ACCELERATOR PROGRAM FOR 2012

Final Report

June 2013

Prepared for:

Ontario Power Authority

Prepared by:

ADM Associates, Inc.
3239 Ramos Circle
Sacramento, CA 95827
916-363-8383

TABLE OF CONTENTS

Section	*Title*	*Page*
	Executive summary	ES-1
1.	Introduction and Purpose of Study	1
2.	Description of IAP and Participation in 2012	2
3.	Methods of analysis	4
4.	Evaluation Findings	5
5.	Summary of Findings	8

EXECUTIVE SUMMARY

This report presents and discusses the findings from the impact evaluation of the Industrial Accelerator Program (IAP) for 2012. The Ontario Power Authority (OPA) launched the IAP in June 2010, and it targets OPA's transmission-connected industrial customers. The findings presented in this report pertain to the energy savings and peak demand reductions that resulted from projects completed in 2012 as part of the IAP. It also discusses the persistence of savings from projects completed in 2010 and 2011.

Table ES-1 below presents a summary of IAP savings, and persistence of savings, for completed projects over the last three years.

Table ES-1 Summary of Evaluation Findings for 2012 IAP

Project	2012 Achieved Savings (MWh)	2012 Achieved Peak Demand Reduction (MW)	Annualized MWh	Annualized Peak Demand Reduction
2012 Project	11,822	--	40,808	5.13*
2011 Project Persistence of Savings	1,490	.08	1,490	.08
2010 Project Persistence of Savings	1,077	.15	1,077	.15
Total	14,389	.23	43,375	5.36

*M&V data were not available to estimate summer peak reductions because the generator measure went into service in October 2012. M&V data for the period October 2012 through March 2013 were used to estimate peak savings reductions during the summer on the assumption that the generator's net hourly output would be similar during that period. This assumption is reasonable because the measure is not weather sensitive.

OPA customers participated in the IAP during 2012 by submitting applications for preliminary engineering studies, detailed engineering studies, or capital incentives. Although a number of engineering studies were completed over the program year, only one facility implemented measures that resulted in savings in 2012. Based on recommendations developed in a 2009 study, the facility implemented a steam-driven turbine generator to utilize the byproduct gases from a blast furnace and coke oven. ADM's evaluation effort focused on verifying the savings that resulted from implementing the turbine-generator, as well as the persistence of savings resulting from completed projects in 2010 and 2011.

Major findings from the evaluation effort can be summarized as follows:

- Gross annual savings during 2012 for the 2012 IAP project were 11,822 MWh. Estimated annualized MWh savings were 40,808 MWh.

- Because the 2012 IAP project did not become operational until October 2012, there were no summer 2012 peak demand reductions.
- The MWh savings resulting from the project completed in 2012 are fully attributed to the incentive provided through the IAP, equating to net annualized energy savings of 40,808 MWh.

The IAP project that was completed in 2011 involved the installation of a new blower, equipped with a VFD. The analysis of the persistence of savings for this project showed that energy savings did persist but were somewhat lower than the savings reported in 2011. Reported savings for 2012 were 1,490 MWh, down from 1,584 MWh as calculated in 2011. The ex post verified savings for the project is less than 90% of the ex ante estimated savings of 3,937. Peak demand savings for 2012 were .08 MW.

The IAP project completed in 2010 involved the calibration and modification to the settings of the fan damper position while in low idle mode. Analysis of the persistence of savings for this project showed that savings did persist but that the savings were higher in 2012 than in 2011. Annualized 2012 electricity savings were calculated to be 1,077 MWh, up from 876 MWh per year in 2011. The increase in savings reflected an increase in heats per day for the process. The average heats per day in 2012 were 23.8, compared to an average of 22.2 heats per day in 2011. Peak demand savings for this project in 2012 were .15 MW.

1. INTRODUCTION AND PURPOSE OF STUDY

Under contract with the Ontario Power Authority (OPA), ADM Associates, Inc. (ADM) is conducting evaluations of two programs that OPA has developed for industrial facilities in Ontario. The Industrial Accelerator Program (IAP) is offered to OPA's transmission-connected customers. Through the Process Systems Upgrade Initiative (PSUI), OPA is working with local distribution companies (LDCs) in Ontario to provide energy efficiency services to the LDCs' distribution-connected industrial customers.

This report presents the evaluation of the OPA's Industrial Accelerator Program for 2012. This program, initiated in June 2010, is targeted at OPA's transmission-connected industrial customers. The purpose of this report is to present the findings from the evaluation effort to verify the energy savings and peak demand reductions that resulted from projects in the IAP during the 2012 program year. In addition, the IAP projects implemented in 2010 and 2011 were reviewed to determine the amount of savings that persisted through 2012.

This report is organized as follows.

- Section 2 provides a description of the IAP and participation in the program during 2012.
- Section 3 presents and discusses the methods used to verify MWh savings and MW reductions for projects implemented through the program.
- Section 4 presents the findings from the evaluation effort.
- Section 5 summarizes the results of the evaluation effort.

2. DESCRIPTION OF IAP AND PARTICIPATION IN 2012

This section provides a description of the IAP and participation in the program during 2012.

2.1 DESCRIPTION OF IAP

The Industrial Accelerator Program (IAP), initiated in June 2010, is targeted at OPA's transmission-connected industrial customers, which are generally large industrial facilities. Approximately 50 firms in Ontario are eligible for participation in the program.[1]

Participating facilities can receive the following through the IAP:

- Enabling Initiatives are intended to help transmission-connected customers identify and implement energy efficiency projects and increase uptake of capital incentive projects. Enabling Initiatives for IAP include funding preliminary and detailed engineering studies to identify energy efficiency opportunities at eligible industrial facilities.
- Project incentives are provided for approved projects, based on $230 per MWh for annualized electricity savings or 70% of eligible project costs or achieving a one-year simple payback. The maximum incentive for a project is $10 million.

Participants may elect to complete non-incentive projects as a result of the Enabling Initiatives, either in addition to, or instead of, capital incentive projects.

As part of the evaluation process, the OPA seeks to verify the energy and demand savings that are achieved through capital incentive projects and savings from Enabling Initiatives, hereby known as Program Enabled Savings. Program Enabled Savings may be accrued both from participants who have completed additional non-incentive projects (outside of their capital incentive project) or from participants who have completed non-incentive projects instead of capital incentive projects.

2.2 PARTICIPATION IN IAP IN 2012

The IAP funds preliminary and detailed engineering studies to assist participants with the identification of energy savings opportunities. There were sixteen (16) engineering studies completed during 2012. Eight of these projects were preliminary engineering studies and eight were detailed engineering studies.

[1] The full listing of eligible transmission-connected customers can be found on the OPA's website at: http://www.industrialaccelerator.ca/eligible-firms

2.3 MEASURES IMPLEMENTED BY IAP PARTICIPANTS IN 2012

One project was put into service during 2012. Based on recommendations developed in a 2009 study, the facility installed a 6MW steam-driven turbine generator to utilize the by-product gases from a blast furnace and coke oven. The main purpose of the project was to utilize steam produced during the steel-making process to supply electrical energy.

Further discussion of this measure and its effects is provided in Section 4.

3. METHODS OF ANALYSIS

Because the generator implemented at the facility in 2012 was powered by steam produced in the facility as a byproduct from a blast furnace and a coke oven, savings were analyzed through an engineering analysis of the power generation process.

3.1 DATA FOR ANALYSIS

Documentation pertaining to the project was obtained from OPA and the Technical Reviewer. The available documentation included the report from the M&V Plan and M&V data and savings calculation work papers prepared by the Technical Reviewer. This documentation and data were reviewed, with particular attention given to the calculation procedures and documentation for savings estimates. Documentation was reviewed for the following types of information:

- Documentation for the operating characteristics of the equipment after the operational change was implemented, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information.
- Information about the savings calculation methodology, including (1) what methodology was used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations.

After additional review of the documentation, ADM worked with OPA and the Technical Reviewer to obtain further information to ensure that the M&V analysis was based on proper information.

3.2 METHODS FOR ESTIMATING SAVINGS

Electricity savings for the project are defined as follows:

Electricity Savings = Generator Output (kWh) - Parasitic Load - Non-Routine Adjustments

The parasitic load is the electrical draw of equipment used to operate the generator. The non-routine adjustments are periodic operational changes that occur during periods of low byproduct steam production. The first of these non-routine adjustments is the use of extra bunker C oil to generate additional steam to stabilize the pressure of the steam feeding the generator. Because the use of oil to reduce electrical demand is not allowed under the IPA, the electricity generation from the oil is estimated based on the amount of steam produced by the oil and subtracted from the generator output. The second non-routine adjustment occurs when byproduct steam is diverted from a cooling pump to power the generator. On these occasions an electrically powered backup cooling pump is operated. Thus, the power consumption from the backup pump is subtracted from the gross generator output.

4. EVALUATION FINDINGS

The findings from the evaluation effort are presented in this section. Section 4.1 presents the findings for gross and net savings for the one project in 2012. Section 4.2 presents findings on the persistence of savings from the IAP 2010 and 2011 projects.

4.1 FINDINGS ON SAVINGS FROM 2012 IAP PROJECT

The findings on savings determined from evaluation of the 2012 IAP project are presented in this section.

4.1.1 Estimates of Ex Post Verified Gross kWh Savings

Data with which to verify savings for the 2012 project were collected through the M&V efforts of the OPA's Technical Reviewer. ADM reviewed the Technical Reviewers savings estimation methodology and calculated the savings methodology outlined in the project M&V plan. The 2012 Achieved Savings were calculated using data from the period October 1 to December 31. Data for the Parasitic Load, P2 Pump energy, and Bunker C Oil were missing for the period of December 18-31. As was done in the Technical Reviewers M&V report, the generator output was reduced by prorated values for these factors for the December 18-31 period.

Annual savings were estimated using M&V data for the October 1 to December 31 and the January 1 to March 31 periods. The estimated annual savings for the generator project are 40,808 MWh based on 8,736 annual operating hours.

Table 4-1 MWh Savings Achieved for 2012

Period	Anticipated Electricity Savings (MWh)	Achieved Savings
Estimated Annual Savings	34,400	40,808
October 1, 2012 through December 31, 2012	-	11,822

Table 4-2 displays the expected annual savings from the M&V Plan and the savings reported in the M&V report annualized. The annualized savings of 40,808 MWh exceeded the expected savings of 34,400 MWh. The generator output exceeded expectations and the parasitic load and electrical power required for the backup pump were less than expected. Although the M&V Plan described the methodology for the treatment of the steam generated using the Bunker C oil, the plan did not report an expect value for the associated energy.

Table 4-2 Calculation of Estimated Annualized kWh Savings

Parameter	Expected Annual Savings (MWh)	Calculation of Annualized Savings Using M&V Data (MWh)
Estimated annual gross electrical generation	45,900	46,141
Estimated annual parasitic electricity consumption	1,420	642
Estimated annual electrical back up pump electricity consumption	10,080	3,166
Estimated annual electrical generation from Bunker C Oil	-	1,428
Estimated annual net electrical generation	34,400	40,808

4.1.2 Estimates of Ex Post Verified Peak kW Reductions

Because the project did not become operational until October 2012, there were no summer peak kW reductions attributable to the project during 2012.

4.1.3 Attribution of Savings

The goal of the IAP is to stimulate energy savings in the industrial sector that would not otherwise occur without the program. An attribution analysis was therefore undertaken to determine whether the energy and demand savings that resulted at the facility can be attributed to participation in the IAP in 2012. A review of program documentation supports the influence of the program incentive on the decision to complete the project. Program documentation indicated that the project had been seriously considered for several years but did not meet the firm's capital allocation threshold to receive funding. Moreover, a capital request for the project was submitted internally and was conditionally approved on receiving the incentive funds through the Industrial Accelerator Program. Consequently, all of the savings from the project can be attributed to the IAP.

4.2 FINDINGS ON PERSISTENCE OF SAVINGS FROM 2011 IAP PROJECT

For the IAP blower project completed in 2011, the 2012 savings were calculated as follows:

Electricity Savings= Baseline Annual Consumption (MWh) – Actual Annual Consumption (MWh)

Baseline kWh consumption was determined using measured data on the load duty cycle for the Existing Blower that were collected during preparation of the Preliminary Engineering Study for the project. Actual MWh consumption was determined using M&V data on the load duty cycle

for the New Blower. These duty cycle data show the number of hours that a blower operates at different levels of MW.

Data for actual savings were collected through the M&V efforts of OPA's Technical Reviewer. To determine the savings for 2012, power consumption data collected between January and December 2012 were used. The savings of 1,490 MWh for 2012 were somewhat less than the annualized savings of 1,584 MWh calculated for 2011. As was the case in 2011, the savings for the project were less than 90% of the expected 3,937 MWh. The peak demand savings for 2012 were .08 MW.

The approach used by the Technical Reviewer to calculate the baseline for assessing savings in effect addressed the attribution problem. The baseline as calculated in the Preliminary Engineering Study incorporated a measure that the facility intended to install on its own. The Technical Reviewer calculated an adjusted baseline that removed this measure from the assessment of project savings. In effect then, all savings from the project as calculated with the adjusted baseline are attributable to the IAP.

4.3 FINDINGS ON PERSISTENCE OF SAVINGS FROM 2010 IAP PROJECT

For the IAP project implemented in 2010, M&V data on operation of the process during 2011 showed that the process continued to be operated with the operational changes made in 2010. However, during 2011 the process operated for an average of 22.2 heats per day, over 348 days. Average horsepower was 1,992 hp. With these values, annualized electricity savings for the project for 2011 were calculated to be 875 MWh for the year.

M&V data on the operation of the process during 2012 showed that the process operated for an average of 23.8 heats per day over a 343 day period. The average operating horsepower was 1,893 hp. With these values, the annualized savings for the project for 2012 were calculated to be 1,077 MWh for the year. The peak demand savings were .15 MW.

The operational changes that were made to the induced draft fan were in response to recommendations made in the Preliminary Engineering Study funded by the OPA. Thus, savings from the project can be considered to be Program Enabled Savings that are attributable to study and to the participation of the facility in the IAP.

5. SUMMARY OF FINDINGS

The findings from the impact evaluation of the one IAP project put into service during the 2012 program year are reported in Table 5-1.

Table 5-1 Summary of Evaluation Findings for 2012 IAP

Project	2012 Achieved Savings (MWh)	2012 Achieved Peak Demand Reduction (MW)	Annualized MWh	Annualized Peak Demand Reduction
2012 Project	11,822	--	40,808	5.13*
2011 Project Persistence of Savings	1,490	.08	1,490	.08
2010 Project Persistence of Savings	1,077	.15	1,077	.15
Total	14,389	.23	43,375	5.36

*M&V data were not available to estimate summer peak reductions because the generator measure went into service in October 2012. M&V data for the period October 2012 through March 2013 were used to estimate peak savings reductions during the summer on the assumption that the generator's net hourly output would be similar during that period. This assumption is reasonable because the measure is not weather sensitive.

As shown in Table 5-1, findings from the evaluation effort can be summarized as follows:

- Gross annual savings during 2012 for the 2012 IAP project were 11,822 MWh. Estimated annualized MWh savings were 40,808 MWh.
- Because the 2012 IAP project did not become operational until October 2012, there were no summer 2012 peak demand reductions.
- The MWh savings resulting from the project completed in 2012 are fully attributed to the incentive provided through the IAP, equating to net annualized energy savings of 40,808 MWh.

The IAP project that was completed in 2011 involved the installation of a new blower, equipped with a VFD. The analysis of the persistence of savings for this project showed that energy savings did persist but were somewhat lower than the savings reported in 2011. Reported savings for 2012 were 1,490 MWh, down from 1,584 MWh as calculated in 2011. The ex post verified savings for the project is less than 90% of the ex ante estimated savings of 3,937. Peak demand savings for 2012 were .08 MW.

The IAP project completed in 2010 involved the calibration and modification to the settings of the fan damper position while in low idle mode. Analysis of the persistence of savings for this project showed that savings did persist but that the savings were higher in 2012 than in 2011.

Annualized 2012 electricity savings were calculated to be 1,077 MWh, up from 876 MWh per year in 2011. The increase in savings reflected an increase in heats per day for the process. The average heats per day in 2012 were 23.8, compared to an average of 22.2 heats per day in 2011. Peak demand savings for this project in 2012 were .15 MW.

The following presents a selection of key conclusions from the evaluation effort:

- Projects completed through IAP have been well documented. The methodologies for estimating savings are clear, and appropriate M&V data were collected and made available to the evaluator via the SharePoint system. Moreover, the project documentation substantiated the savings attribution claimed by the IAP.
- Two of the three projects completed during the program year cycle produced realized savings that were at least 90% of expected savings. The underperforming project was a blower with a VFD that operated at higher load than expected. However, this underperformance was offset by the larger than expected savings from the generator project that was put into service in 2012.
- Although the savings realized for the IAP were less than anticipated, the program would likely benefit from continuing into future years. It typically takes a number of years for programs that target industrial facilities to develop the social and organizational capital to effectively deliver savings. Consequently, longer term partnerships between the OPA and its customers are needed before the potential of the program will be fully realized. This time allows customers to complete engineering studies to assess the potential benefits of energy efficiency improvement, to move through approval processes, and to purchase and schedule the projects. This latter point is particularly important because the energy efficiency projects targeted by this program may involve industrial processes that are central to the customer's business. Consequently, making improvements to these processes may require a non-trivial amount of operational downtime. Customers will have to carefully consider when this downtime can be scheduled so as to minimize the impact on production.
- Additionally, the IAP has already made a number of investments that may result in future realized energy savings. It is particularly noteworthy that a number of preliminary and detailed engineering studies have been completed through the program. These studies may later develop into IAP incentive projects or program enabled savings projects.
- However, it should be noted that the number of incentive projects completed may have been limited by the program's stringent M&V requirements. As noted in the process evaluation of the program, the 10-year contract period for M&V and the claw back provision may act as a deterrent to prospective participants.