EFFICIENCY
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ESP

Savings Summary

Year 1 Report

Auckland Council

Moana Nui a Kiwa – Gas Boilers to Heat Pumps

Sep 2022

Executive Summary

Purpose

This document reports on the year to date savings made as a result of gas boilers replaced with heat pumps at the Moana Nui a Kiwa Leisure Centre.

Savings Summary

This M&V Report relates specifically to verification of ECM performance across the period between 1st of Aug 2022 to 31st July 2023. The following table summarises the annual proposed and guaranteed savings from electricity as well as the verified savings for this reporting period.

Total Energy Savings	**Consumption Savings (kWh)**	**Cost Savings* ($/a)**	**GHG Emissions Savings* (tonne.CO_2-e)**
Year to Date Verified Savings (Aug 22 – Jul 23)	1,444,239	$109,918	307.42
Total Verified Savings Year 1	**1,444,239 (+/- 160,935 at 85% CI)**	**$109,918**	**307.42**

* Note that the savings verification only applies to energy consumption savings (not cost or emissions savings)

Contents

Project Information

Energy Solution Providers (ESPNZ) was engaged by Auckland Council to complete a measurement and verification report for the Moana Nui A Kiwa to quantify and verify savings for the gas boiler replacement to heat pumps.

This M&V Report is based on the principles of measurement and verification outlined in the International Performance Measurement and Verification Protocol (IMPVP) Volume 1, EVO 10000 – 1:2012. The measurements in this report were obtained from the ESP's electricity and gas metering data and an Option B (Retrofit Isolation with all parameter measurement) measurement strategy was employed.

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Project Details

Project Ref:	Moana Nui A Kiwa – Boiler to Heat Pump Replacement
Issued:	26/09/2023
Company:	Auckland Council – Moana Nui A Kiwa Leisure Centre
Site Location:	66R Mascot Avenue, Māngere, Auckland 2022
Site Activity:	Leisure Centre
Compiled by:	Mannat Choksi
Position:	Services Manager
Approved by:	Mannat Choksi – CMVP
Position:	Services Manager

Confidentiality Statement

Disclaimer Statement

Project Background

Project Information

Project	
Client Name	Auckland Council – Moana Nui a Kiwa
Site Location	66R Mascot Avenue, Māngere, Auckland 2022
Activity Description	Leisure Centre
Funding Partner	

M&V Information

Framework	
IPMVP Option	Hybrid Option B (Retrofit Isolation with all parameter measurement) + Option C (Whole Site)
Measurement	
Measured Parameter	Gas Usage before and after the upgrade + Electricity usage of heat pumps
Measurement Strategy	Energy usage data from ESP Metering
Measurement Boundary	Natural Gas Usage at the Site Location and Heat Pumps submeters
Measurement Periods	Jan 2019 to Dec 2019 (12 month-baseline)
Analysis	
Savings Determination	Avoided Energy
Basis of Routine Adjustments	Multi-linear Regression Model
Basis of Non-Routine Adjustments	None Applied
Analysis Methodology	Comparison of predicted energy use and actual usage during reporting periods
Target Uncertainty	As per IPMVP practice, the uncertainty should not be more than 50% of the reported savings
Reporting Schedule	
Year 1	Verified energy savings to end Jul 2023

Savings Information

Total Energy Savings	Consumption Savings (kWh)	Cost Savings* ($)	GHG Emissions Savings* (tonne.CO_2-e)
Year to Date Verified Savings (Aug 22 – Jul 23)	1,444,239	$109,918	307.42

Total Energy Savings	Consumption Savings (kWh)	Cost Savings* ($)	GHG Emissions Savings* (tonne.CO_2-e)
Total Verified Savings To Date	**1,444,239 (+/- 160,935 at 85% CI)**	**$109,918**	**307.42**

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The greenhouse gas emission rates were calculated in tonnes of carbon dioxide equivalent, using the Ministry for the Environment's emission factors summary: *Measuring Emissions: A Guide for Organisations – 2022 Summary of Emission Factors.*

Total Carbon Savings	Emissions for Natural Gas kg.Co2-eq per kWh
Energy Generation	0.195
Total Emission Factor for Electricity	**0.120**

Project Savings Verification

Measurement and Reporting Periods

The baseline period was selected to be calendar year 2019 spanning over 12 months to provide a complete annual gas consumption profile during normal operation. This was selected mainly to exclude any COVID lockdown periods.

The heat pumps were commissioned on the 19th of July 2022. The savings start date is taken to be 1st of Aug 2022. This report is a part year report, and a complete year 1 report will be completed in Aug 2023.

Analysis Overview

Adjustments	
Routine Baseline Adjustments	None Applied
Non-Routine Baseline Adjustments	None Applied
Data Corrections	None Applied
Valuing Savings	
Average variable Gas costs	8.0704 c/kWh
Average Variable Electricity Costs	10c/kWh

Routine Baseline Adjustments

Routine Baseline Adjustments Normal fluctuations in the key factors that influence energy use have been recorded as an independent variable throughout the reporting period. These data points are applied to the baseline model, as shown below, to predict energy use under the same conditions prevailing during this reporting period. The following equation describes the regression model for the total gas consumption for the site's main incomer:

$$PMGC = 371,558.55 + 0.05368 * MPV - 13,375.558 * MAT$$

PMGC = Predicted Monthly Gas Usage

MPV = Monthly Pool Visits

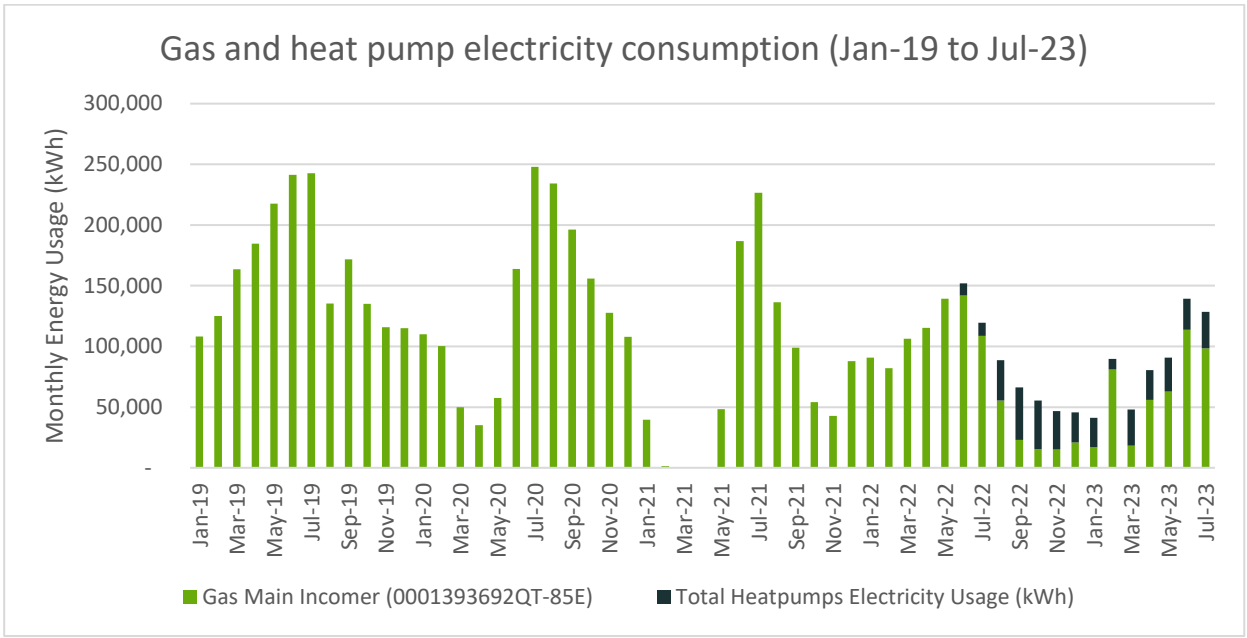
MAT = Monthly Mean Ambient Temperature (NiWA Station ID 43711)

Non-Routine Baseline Adjustments

None yet. Changes to any static factors can affect the level of savings achieved by the ECMs which would require non-routine baseline adjustments.

Observed Data and Energy Savings Analysis

As part of the data analysis carried out, see below the baseline and reporting period. The graph below shows the sum of total gas main incomer usage and the heat pump submeters.



In the graph above, we can see the reduction in gas users as the heat pump units were commissioned in July 2022.

*Note that the savings verification only applies to energy consumption savings (not cost or emissions savings)

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Appendix A: Baseline Year Observed Data

Month	Gas Main Incomer (0001393692QT-85E)
Jan-19	108,282
Feb-19	125,140
Mar-19	163,415
Apr-19	184,730
May-19	217,663
Jun-19	241,450
Jul-19	242,716
Aug-19	135,267
Sep-19	171,709
Oct-19	135,066
Nov-19	115,701
Dec-19	115,108

Appendix B: Year1 Observed Data

Date	Gas Main Incomer (0001393692QT-85E)	Pool Visit	Mean Air Temperature	Predicted Usage	Total Heat Pump Usage (kWh)	Savings
Aug-22	55,480	7403	13.5	191385.9	33,178	102,728
Sep-22	22,870	9269	15.2	168747.6	43,418	102,460
Oct-22	15,406	10735	17.7	135387.4	40,100	79,882
Nov-22	15,190	452	19.7	108084.3	31,466	61,428
Dec-22	20,867	823	16.8	146893.4	24,754	101,272
Jan-23	16,844	14704	20.1	103499.1	24,263	62,392
Feb-23	81,114	7586	18.2	128530.6	8,546	38,870
Mar-23	18,170	10200	17.7	135358.7	29,994	87,194
Apr-23	56,075	6676	15.8	160583.1	24,466	80,042
May-23	62,746	4485	12.4	205942.3	28,065	115,131
Jun-23	113,627	7482	12.4	206103.2	25,676	66,800
Jul-23	98,362	7887	10.8	227525.9	30,063	99,101