



# UNSCHEDULED COUNCIL MEETING

# AGENDA

Wednesday 10 April 2024

at 4:00 PM

# COPACC

95 - 97 Gellibrand Street, Colac



# COLAC OTWAY SHIRE UNSCHEDULED COUNCIL MEETING

### Wednesday 10 April 2024

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## COLAC OTWAY SHIRE UNSCHEDULED COUNCIL MEETING

NOTICE is hereby given that the next **UNSCHEDULED COUNCIL MEETING OF THE COLAC OTWAY SHIRE COUNCIL** will be held at COPACC on Wednesday 10 April 2024 at 4:00 PM.

#### **AGENDA**

#### 1 DECLARATION OF OPENING

#### **OPENING PRAYER**

Almighty God, we seek your blessing and guidance in our deliberations on behalf of the people of the Colac Otway Shire. Enable this Council's decisions to be those that contribute to the true welfare and betterment of our community.

AMEN

#### 2 PRESENT

3 APOLOGIES

#### 4 WELCOME AND ACKNOWLEDGEMENT OF COUNTRY

Colac Otway Shire acknowledges the original custodians and law makers of this land, their elders past, present and emerging and welcomes any descendants here today.

#### **RECORDING AND PUBLICATION OF MEETINGS**

Please note: Council meetings will be live streamed and recorded when the meeting is held either at COPACC or online. This includes the public participation sections of the meetings. When meetings are held in other locations, Council will endeavour to make an audio recording of the meeting for community access. Matters identified as confidential items in the Agenda will not be live streamed or recorded regardless of venue or mode.

By participating in open Council meetings, individuals consent to the use and disclosure of the information they share at the meeting (including any personal and/or sensitive information).

As soon as practicable following each open Council meeting, the live stream recording will be accessible on Council's website. Audio recordings are also taken to facilitate the preparation of the minutes of open Council meetings and to ensure their accuracy. Recordings will be retained by Council for a period of four years.

This meeting will be livestreamed to the public via Council's YouTube channel (search Colac Otway Shire Council at <u>www.youtube.com</u>).

The sole purpose of this Unscheduled Council meeting is to consider the following agenda item:

• Bluewater Electrification Funding Opportunity.

#### 5 QUESTION TIME

Please note that as this is an Unscheduled Council meeting, only questions pertaining to this agenda will be responded to. A maximum of 15 minutes is allowed for question time at Unscheduled Council meetings. Any person wishing to participate in question time by videoconference will need to register their intention to do so by contacting the shire prior to 5pm on Monday 1 April 2024. Question time is not a forum for public debate or statements.

- 1. Questions received in writing prior to the meeting. Written questions must be received by 5pm Monday 1 April 2024.
- 2. Questions by videoconference (by prior arrangement).
- 3. Questions from the floor.

#### 6 DECLARATIONS OF INTEREST

A Councillor who has declared a conflict of interest, must leave the meeting and remain outside the room while the matter is being considered, or any vote is taken.



## Item: 7.1

**Bluewater Electrification Funding Opportunity** 

OFFICER	James Myatt
GENERAL MANAGER	lan Seuren
DIVISION	Community and Economy
ATTACHMENTS	<ol> <li>Final Report - Bluewater Electrification Heat Pump Concept Report - Bridgeford Group [7.1.1 - 30 pages]</li> </ol>

# **1. PURPOSE**

To consider an opportunity to apply to the Community Energy Upgrades Fund for the electrification of Bluewater Leisure Centre.

# **2. EXECUTIVE SUMMARY**

The Community Energy Upgrades Fund (CEUF) is a new Federal Government grant program which aims to help local government to deliver energy upgrades and lower greenhouse emissions and energy bills.

Funding of between \$25,000 and \$2,500,000 is available, with local governments required to contribute at least 50% of eligible project costs. Local governments can submit one project and will have 24 months to complete the project if successful. Applications to Round 1 of the CEUF close on 30 April 2024. A second round of the program will open in 12-months' time with successful applicants to Round 1 being unable to apply to the second round.

In anticipation of this funding program and as an action in Council's 2023-24 Annual Plan, Council engaged consultants to review and update the *Bluewater Heat Pump Concept Report* (December 2021) which outlines options for electrification of the Bluewater Leisure Centre as attached to this report. The review found full site electrification costs have decreased since 2021 due to reducing the need for a full system back-up, as well as the maturing of existing technology which has reduced equipment costs.

This report outlines the strategic justification for the electrification of the Bluewater Leisure Centre, which would reduce Council's carbon emissions and provide ongoing operational savings to Council into the future. The report then presents potential electrification options for Council to consider, the

likely cost of each option, and scenarios to fund each of the options should Council determine to implement full or partial electrification of the Centre.

## **3. RECOMMENDATION**

That Council:

- **1.** Notes the Community Energy Upgrades Fund provides funding on a \$1:\$1 basis towards projects that decarbonise local government facilities.
- 2. Notes that the transition away from natural gas at all Council facilities, including the Bluewater Leisure Centre, is an action in Council's Climate Change Action Plan adopted by Council in October 2023.
- **3.** Determines whether to lodge an application to Round 1 of the Community Energy Upgrades Fund program for the Bluewater Electrification Project.

## **4. KEY INFORMATION**

#### **Strategic Context**

An objective of the Council Plan 2021-2025 (Theme 2) is for Council to "operate sustainably with a reduced carbon footprint". Furthermore, the Council Plan includes a priority to "improve Council's sustainability practices through the reduction of Council's carbon emissions and/or need to pay for carbon offsets."

Subsequently, Council's 2023-2024 Annual Plan includes an action to *"investigate further the electrification of Bluewater Leisure Centre including exploration of external funding opportunities."* To implement this action, Council has undertaken a recent review of the Bluewater Leisure Centre Heat Pump Concept Report and has been made aware of a funding opportunity through the Federal Government's Community Energy Upgrades Fund (CEUF) leading to the presentation of this report.

Council's Climate Change Action Plan 2023-2033 identifies 50 actions to adapt to climate change including "a transition away from natural gas use at all existing facilities, including Bluewater Leisure Centre." Over the preceding 10 years, Council has significantly reduced emissions, transitioned to renewably sourced electricity and purchased offsets for remaining emissions. Potential emission reduction projects with low capital requirements and/or low payback periods have been completed, meaning further emission reduction activities are likely to require more significant investment.

Bluewater Leisure Centre is Council's largest gas consumer. Table 1 below shows Council's current annual emission with gas consumption being 26% of Council's total emissions in the 2022-23 financial year. Bluewater Leisure Centre creates the majority of Council's gas emissions so full electrification would reduce Council's overall emissions by almost a quarter.

Total COS Greenhouse Emissions (CO2-e tonnes)							
Buildings	Buildings	Gas	Street/Public Lighting	Fleet	Total		
2010-11	1,999	311	1,181	2,114	5,605		
2011-12	1,916	290	1,202	1,727	5,135		
2012-13	1,879	323	1,182	1,698	5,082		
2013-14	1,484	186	1,014	1,523	4,207		
2014-15	1,356	3	872	1,530	3,761		
2015-16	1,846	282	436	1,269	3,833		
2016-17	1,881	478	412	1,560	4,331		
2017-18	1,887	488	406	1,329	4,110		
2018-19	1,747	470	406	1,263	3,886		
2019-20	1,389	466	417	1,333	3,605		
2020-21	0* (1,121)	412	0* (368)	1,108	1,520 (3,009)		
2021-22	0* (1,254)	431	0* (327)	1,276	1,707 (3,288)		
2022-23	0* (1,128)	446	0* (321)	1,273	1,719 (3,168)		

\*Numbers in brackets show emissions avoided by purchasing 100% clean renewable electricity (VECO)

Table 1 – Colac Otway Shire Councils greenhouse emissions 2010-2023.

The recently announced CEUF provides a potential opportunity to achieve Council's strategic objectives through subsidising capital works required to electrify the Bluewater Leisure Centre. This is a new funding program by the Federal Government, and it is expected that there will be two rounds of funding available. Therefore, Council could seek to lodge an application to Round 1, which closes 30 April 2024, or defer a decision on an application to a later date prior to Round 2 of the CEUF.

There is no guarantee an opportunity like CEUF will be made available under future governments. Therefore, if Council determines not to submit an application to the CEUF and electrify Bluewater Leisure Centre when existing infrastructure is due for replacement, it will potentially need to fund 100% of these works.

#### **Project Description**

When the Bluewater Leisure Centre redevelopment was undertaken approximately 10 years ago, gas infrastructure was installed as electric heat pumps for leisure centres were still in their infancy and significantly more expensive than gas, whilst also being less reliable. In 2024 multiple manufacturers now offer competitively priced electric heat pumps that are more reliable than gas infrastructure. Currently Bluewater Leisure Centre has the following gas infrastructure:

- Pool Heat Pumps the current heating plant consists of four condensing gas boilers in a N+2 (2 boilers operating with 2 back-up) arrangement.
- 2. Domestic Hot Water (DHW) the DHW consists of a solar pre-heat storage system, with six 400L Chromagen solar storage units which serve three gas continuous flow units.
- 3. HVAC Systems (VRF) the office and general areas are served by a gas fired system.

In December 2021 Council engaged Bridgeford Group to undertake a 'Heat Pump Concept Report' to scope the feasibility of electrifying the Bluewater Leisure Centre. In 2024, Council re-engaged Bridgeford Group to update the report to consider current technology, current utility prices, current construction costs and to reduce heat pump capacity to a N+1 arrangement. Whilst current utility prices have been used, it should be noted gas prices are forecast to increase significantly over coming years which will further increase the cost to Council of operating Bluewater.

When considering electrification there are three factors worth highlighting; the centre's electrical capacity, space for installation and future asset renewal.

- <u>Electrical Capacity</u> The current site supply is limited to 400 Amp which is not sufficient for full site electrification. Engagement with Powercor occurred to understand the surrounding grid capacity, which indicated that supply requirements for full electrification are available but require an upgraded substation. In the options presented in the Bluewater Heat Pump Concept Report and table 2 of this report, options 1 to 4 can be completed within existing site electrical capacity. However, option 5 (full site electrification) would require an upgraded substation, which is included in the project cost estimate. If options 2, 3 or 4 are carried out, then no further electrification works can occur in the future without an electrical supply upgrade.
- 2. <u>Space</u> To replace existing infrastructure with electrical, both the DHW and VRF can be sited in existing infrastructure locations. However, Electric Heat Pumps will not fit in the existing plant room and require significant air circulation leading to outdoor installation being the recommended practice. There are two options to site the heat pumps; on a small amount of additional land outside of the existing plant room or on the roof of the existing plant room. Council has engaged with the Department of Education, as landowner of the Bluewater Leisure Centre, to discuss these options and would require a letter of support from the Department prior to submitting a CEUF funding application. The cost estimate in the Bluewater Heat Pump Concept Report assumes access to additional land to site the new external plant room. As a risk mitigation measure for the scenario the Department of Education do not provide access to additional land, additional budget has been allocated to Option 5 (full site electrification) in Table 2 below for siting the external plant room on the existing plant room cost quoted to the Bridgeford Group report.
- 3. <u>Future</u> The scheduled replacement of existing gas infrastructure assets at Bluewater Leisure Centre based on effective life varies between the different assets. The VRF is due for renewal in four years, the DHW in six to eight years and the gas heat pumps in eight years. If Council elects not to seek funding assistance for electrification through the CEUF, it will likely need to fund the full replacement costs of gas infrastructure at the end of life with new gas or electrical infrastructure.

	Option 1 DHW only	Option 2 Single Heat Pump	Option 3 DWH & Single Heat Pump	Option 4 DWH & VRF	Option 5 Full Site Electrification
Capital Costs	\$151,960	\$627,000	\$773,960	\$942,910	\$2,685,910
Total Annual Savings	\$7,538	\$61,764	\$69,302	\$16,915	\$140,443
Payback Period (no grant)	40 years	10.2 years	11.2 years	56 years	19.2 years
Council contribution if grant secured from CEUF	\$75,980	\$313,500	\$386,980	\$471,455	\$1,342,955
Payback period (subject to receipt of grant)	20 years	5.1 years	5.6 years	28 years	9.6 years
Emissions Reductions (tCO2p.a)	15	170	185	39	379

**Options from the Bluewater Heat Pump Concept Report** 

The following table (Table 2) provides an overview of the options for electrification of the Bluewater Leisure Centre as detailed in the *Bluewater Heat Pump Concept Report*.

Table 2 – Options for electrification of Bluewater from 'Heat Pump Concept Report March 2023 – Bridgeford Group'. In the 2023 calendar year Bluewater used 463 tCO2p.a. however due to an equipment fault, pre-COVID emission figures and utility consumption have been used to prevent any over-estimation. Figures include project management and contingency.

If Council resolved to submit an application to the CEUF, Option 5 (full site electrification) in Table 2 would provide the greatest benefits based on the following:

- 1. It would provide the highest environmental return and almost eliminate Council's overall gas usage.
- 2. Provides a high return in terms of financial savings and a reasonable payback period, subject to receiving external funding.
- 3. It is most economical to achieve full electrification of the centre in one project if this is Council's long-term objective.
- 4. The existing air conditioning (VRF) system is scheduled for replacement in four years. This will trigger an electrical supply upgrade if any other electrification upgrades (eg: heat pumps) are completed beforehand. If Council undertakes replacement of the VRF and in turn an electrical upgrade in the future, an external contribution through a funding program such as the CEUF may not be available.
- 5. Works can occur in construction stages to keep the site remaining operational for equipment changeover, except for the VRF which will require a staged shutdown of areas to replace the internal units.

If Council determines to prioritise either one of options 1 to 4, then it will likely be required to fully fund any further equipment and power supply upgrade costs in the future, rather than having these potentially subsidised through an external grant.

	Do nothing	Option 1 DHW only	Option 2 Single Heat Pump	Option 3 DWH & Single Heat Pump	Option 4 DWH & VRF	Option 5 Full Site Electrification
Total Upfront Project Cost	\$0	\$151,960	\$627,000	\$773 <i>,</i> 960	\$942,910	\$2,685,910
CEUF Grant @ 50%	\$0	\$75 <i>,</i> 980	\$313 <i>,</i> 500	\$386,980	\$471,455	\$1,342,955
Council Contribution if applying to CEUF @ 50%	\$0	\$75,980	\$313,500	\$386,980	\$471,455	\$1,342,955
Additional future capital costs to achieve full Electrification over 10 years	\$2,685,910	\$2,533,950	\$2,058,910	\$1,911,950	\$1,743,000	\$0
Total Council Funded Capital Costs over 10 years	\$2,685,910	\$2,609,930	\$2,372,410	\$2,298,930	\$2,214,455	\$1,342,955

Table 3 below demonstrates the future electrification cost to Council over the next 10 years.

Table 3 – Comparison of 10 year capital costs to Council for each option should Council seek to fully electrify Bluewater Leisure Centre over 10 years (based on 2024 prices).

#### **Funding Models**

If Council resolve to submit a CEUF application, it will need to provide a financial contribution to any of the options presented. The funding requirements differ for each option with the financial contribution for option 5 being significant. Council has competing priorities for infrastructure upgrades and should Council want to progress this project, it would need to determine a suitable funding model.

Should Council determine to proceed with any one of options 1-4, it would be recommended to fully fund Council's contribution through a cash allocation. It would only be recommended to borrow funds for option 5 considering the amount of Council's financial contribution required.

Potential funding models specifically for option 5 are outlined below:

- A) Fund through an allocation of the Strategic Projects Reserve (which includes the remaining proceeds from the sale of the Bruce Street property).
- B) Fund 50% (\$671,478) of Council's contribution through the Strategic Projects Reserve and the other 50% funded through a 10-year loan. Service the loan through annual savings.
- C) Fund \$500,000 from the Strategic Projects Reserve and fund \$842,955 through a 10-year loan. Service the loan through annual savings.
- D) Fully borrow Council's contribution (\$1,342,955) with loan repayments being partially offset by annual savings. Any additional funds required to service the loan would be funded through the annual budget.

Table 4 below table demonstrates the different funding scenarios if Council determined to borrow all or part of its matching contribution:

	Option 5 Council contribution 100% funded by loan	Option 5 Council contribution 50% funded by Ioan, 50% from Strategic Projects Reserve	Option 5 Council contribution \$500k from Strategic Projects Reserve, remainder funded by Ioan
Capital Costs	\$2,685,910	\$2,685,910	\$2,685,910
Council Contribution if CEUF grant received	\$1,342,955	\$1,342,955	\$1,342,955
Loan Term (years)	10	10	10
Interest Rate*	4.67%	4.67%	4.67%
Annual Loan Repayment	\$168,338	\$84,169	\$105,664
Total Annual Savings	\$140,443	\$140,443	\$140,443
Annual Budget Contribution (or savings in red) to Loan Repayment	\$27,895	-\$56,274	-\$34,779

Table 4 – Representation of impact on Option 5 if fully funded through a loan. Estimated interest rate of Treasury Corporation of Victoria which is RBA Cash rate + 0.32%.

Table 5 compares the financial impact for option 5 (full site electrification) of each funding model against doing nothing and retaining the status quo. Status quo includes replacing existing gas infrastructure with new gas infrastructure when renewal is due as well as an option to replace gas equipment with electric equipment when they require replacement. For all options current pricing is used with no indexation or inflation applied. Whilst this allows for a direct comparison, it is noted that gas prices are forecast to significantly increase by higher than inflation over coming years so utility savings will potentially increase.

		Total		Total			Total	Payback
		(	5 years)	(1	.0 years)	(1	15 years)	Period
De Nethine	Council Cash Contribution	\$	336,000	\$:	L,195,600	\$1	1,195,600	
Boplace with Gas	Emission Offset Costs	\$	34,110	\$	68,220	\$	102,330	NA
Replace with das	Total Costs	\$	370,110	\$:	L,263,820	\$:	1,297,930	
	Council Cash Contribution	\$	790,950	\$2	2,685,910	\$2	2,685,910	
Do Nothing,	Additional Maintenace Costs	\$	-	\$	59,400	\$	158,400	
Replace with	Utility Savings	-\$	17,890	-\$	510,579	-\$1	1,277,684	NA
Electric	Emission Offset Savings	\$	19,602	-\$	2,268	-\$	36,378	
	Total Costs	\$	792,662	\$2	2,232,463	\$1	1,530,248	
	Council Cash Contribution	\$1	1,342,955	\$:	L,342,955	\$1	1,342,955	
Model (A)	Additional Maintenace Costs	\$	99,000	\$	198,000	\$	297,000	Q voars
Strategic Project	Utility Savings	-\$	767,105	-\$:	L,534,210	-\$2	2,301,315	7 months
Reserve	Emission Offset Savings	-\$	34,110	-\$	68,220	-\$	102,330	7 11011015
	Total Costs	\$	640,740	-\$	61,475	-\$	763,690	
	Council Cash Contribution	\$	671,478	\$	671,478	\$	671,478	
Model (B)	Loan Repayment (4.67%)	\$	420,845	\$	841,690	\$	841,690	
50% Strategic	Additional Maintenace Costs	\$	99,000	\$	198,000	\$	297,000	10 years
Reserve,	Utility Savings	-\$	767,105	-\$:	L,534,210	-\$2	2,301,315	
50% Loan	Emission Offset Savings	-\$	34,110	-\$	68,220	-\$	102,330	
	Total Costs	\$	390,108	\$	108,738	-\$	593,477	
	Council Cash Contribution	\$	500,000	\$	500,000	\$	500,000	
Model (C)	Loan Repayment (4.67%)	\$	528,320	\$:	L,056,640	\$1	1,056,640	
\$500K Strategic	Additional Maintenace Costs	\$	99,000	\$	198,000	\$	297,000	11 years
Reserve, Loan	Utility Savings	-\$	767,105	-\$:	L,534,210	-\$2	2,301,315	1 month
\$842,955	Emission Offset Savings	-\$	34,110	-\$	68,220	-\$	102,330	
	Total Costs	\$	326,105	\$	152,210	-\$	550,005	
	Council Cash Contribution	\$	-	\$	-	\$	-	
	Loan Repayment (4.67%)	\$	841,690	\$:	L,683,380	\$1	1,683,380	
Model (D)	Additional Maintenace Costs	\$	99,000	\$	198,000	\$	297,000	12 voors
100% Loan	Utility Savings	-\$	767,105	-\$:	L,534,210	-\$2	2,301,315	12 years
	Emission Offset Savings	-\$	34,110	-\$	68,220	-\$	102,330	
	Total Costs	\$	139,475	\$	278,950	-\$	423,265	

Table 5 – Comparison of net financial impact of funding models over 5, 10 and 15 years for option 5 of full electrification at Bluewater Leisure Centre should Council receive a CEUF grant.

The comparison over 5, 10 or 15 years finds that all funding models provide a financially favourable position over doing nothing if a CEUF grant was received. Over 5 years, Model (D) (100% loan) is the most favourable however with a longer-term view, Model (A) (fund through Strategic Projects Reserve) is the most favourable. However, the upfront capital allocation of \$1,342,955 required for Model (A) is a significant contribution and would impact Council's ability to progress other priority projects.

Between Models (B), (C) and (D), Model (D) has the benefit of not requiring an upfront capital investment however an annual 10-year budget commitment of \$27,985 a year is required to service the loan in addition to the operational savings achieved. Models (B) and (C) have the benefit of requiring no ongoing budget commitment as the loan can be fully serviced through savings, however a level of upfront capital commitment would be required by Council, albeit smaller than for Model (A).

# **5. CONSIDERATIONS**

#### **Overarching Governance Principles** (s(9)(2) *LGA 2020*)

The project as outlined in this report aligns with Governance Principles b) and c) relating to their focus on achieving positive outcomes for future generations of our community as well as ongoing sustainable management of our facilities.

#### Policies and Relevant Law (s(9)(2)(a) LGA 2020)

The Council Plan supports action by Council to actively reduce its carbon emissions. As noted above, the Climate Change Action Plan commits Council to transitioning its facilities away from gas over time, and to Council achieving net zero emissions. Electrification of the Bluewater Leisure Centre would be consistent with these policy directions.

#### Environmental and Sustainability Implications (s(9)(2)(c) LGA 2020

Emissions reductions presented by the Bluewater Leisure Centre Electrification project are discussed earlier in this report. The different options provide different benefits in terms of reduction of Council's overall carbon emissions. The following table provides an overview of the potential reduction:

	Option 1 DHW only	Option 2 Single Heat	Option 3 DWH & Single	Option 4 DWH & VRF	Option 5 Full Site
		Pump	Heat Pump		Electrification
Emissions Reductions	15	170	185	39	379
(tCO2p.a)					
% reduction of	3.6%	41.3%	44.9%	9.5%	92%
Council's overall					
residual gas emissions					

#### **Community Engagement** (s56 LGA 2020 and Council's Community Engagement Policy)

Environmental sustainability including the decarbonisation of Council's operations was a regular occurring theme through community consultation during the development of the Colac Otway Shire Community Vision 2050 and the Colac Otway Shire Council Plan 2021-2025. Thorough engagement with the community informed the development of Council's Environmental Sustainability Strategy and the Climate Change Adaptation Plan. These strategic plans, developed in partnership with our community, support the further reduction of carbon emissions through Council operations including the Bluewater Leisure Centre.

#### Public Transparency (s58 LGA 2020)

Decisions relating to the potential electrification of the Bluewater Leisure Centre through a funding application to the CEUF will be made by Council in an open Council meeting.

#### Alignment to Plans and Strategies

Alignment to Council Plan 2021-2025: Theme 2 - Valuing the Natural and Built Environment Objective 1: We mitigate impacts to people and property arising from climate change

#### Financial Management (s101 Local Government Act 2020)

Financial requirements have been discussed previously in the report. Should Council determine to take out a loan to fund part or all of its matching contribution, there would be a need to engage with the community, which could be achieved through the 2024-25 budget process.

Investment in electrification of the Centre has potential to reduce ongoing running costs and utilise grant income to replace aging infrastructure that Council will need to otherwise fund in future years.

#### Service Performance (s106 Local Government Act 2020)

The project will not impact the service performance of Bluewater Leisure Centre.

#### **Risk Assessment**

There is a risk of landowner consent not being provided by the Department of Education. Whilst this is a low risk due to the Joint Use Agreement in place for the management of the Bluewater Leisure Centre, it will be mitigated by seeking a letter of support from the Department prior to submission of an application.

#### **Communication/Implementation**

Not applicable.

#### **Human Rights Charter**

No impact.

#### **Officer General or Material Interest**

No officer declared an interest under the Local Government Act 2020 in the preparation of this report.

#### Options

# <u>Option 1 – Resolve to submit an CEUF application for one of the options presented in this report and determine a matching funding contribution method.</u>

A number of options have been presented in this report for consideration by Council. The electrification of the Bluewater Leisure Centre has strategic justification, would reduce carbon emissions and provide ongoing operational savings to Council. However, a financial contribution from Council would be required, with the level of contribution dependent on which option is to be progressed.

#### Option 2 – Defer the matter and consider an application to Round 2 of the CEUF.

The Federal Government has advised that there will be two rounds of the CEUF. The first round closes on 30 April 2024, with Round 2 commencing in 2025. Council could defer its decision and consider an application to the CEUF in 2025 prior to the closing of Round 2.

#### Option 3 – Resolve not to submit an application to the CEUF.

The electrification of the Bluewater Leisure Centre has strategic justification and a number of options relating to part or full electrification of the centre have been identified for Council's consideration. Whilst the CEUF is a good opportunity to potentially provide 50% funding to electrification works, the contribution required from Council for many of the options is significant. Therefore, Council could determine not to progress an application to the CEUF.

Attachment 7.1.1 Final Report - Bluewater Elect



Bluewater Leisure Centre, Colac



# Heat pump concept report

Bluewater Leisure Centre, Colac

Submission date: 5/03/2024

Attachment 7.1.1 Final Report - Bluewater Electrification Heat Pump Concept Report - Bridgeford Group

Heat pump concept report



Document Control

Client Contact



Bridgeford Group Contact



### **Document Version**

Title	Bluewater Leisure Centre, Colac
Date Created	20-Sep-21
Date of Change	5-Mar-24
Author	
Review and Approval	
Approval Date	5/03/2024
Version	V3.0

Table 1: Document Version Control



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Attachment 7.1.1 Final Report - Bluewater Electrification Heat Pump Concept Report - Bridgeford Group

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Heat pump concept report

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#### 1 Executive Summary

#### 1.1 Background

Colac Otway Shire Council (COSC) has engaged the Bridgeford Group to perform a review of the gas equipment at the Bluewater Leisure Centre at Colac, in support of COSC's Carbon Neutral Target in 2021.

This version of the report is an update in early 2024 with specific reference to utility and installation costs.

This concept report provides an overview of the existing gas fired equipment and the opportunities to electrify the systems including benefits and detractors, buildability considerations, expected carbon reduction, capital and future operating costs. In addition, this report provides commentary on the impact of pool chemicals to the proposed electrification system options.

#### 1.2 Summary of Findings

Bridgeford Group conducted site audits, operational and maintenance staff interviews and data analysis, and understand that:

- The site electrical supply is limited, and only minor works can be undertaken without a site electrical infrastructure upgrade (currently limited to 400A, with only 90kWe spare)
- Land is owned by Department of Education, so that amendments and alterations need to be reviewed and approved by the Department.
- Existing air conditioning system (VRF) is gas fired which is uncommon.
- Adjacent school buildings are approximately 6m from the plant area of the pool building and so acoustic considerations are key for new plant to the south of the building.
- Existing gas consumption is for 4 main purposes Pool heating, Pool hall space heating (via heating hot
  water coils in the ERVs), domestic hot water (DHW) and VRF AC to the gym and office areas. The bulk
  of the consumption is for the Pool and Pool hall heating.
- The pool hall air temperature is normally set at 25-26°C which is below the temperature of the pools, this is unusual and not in accordance with ASHRAE recommendations, however, there is no evidence of damage to the building fabric due to this setting which would be a typical symptom.

#### 1.3 Investment Criteria / Financial and Energy Outcomes

The table below outlines the capital costs, running costs and high level concerns for each option.

ltem	Option 1 - DHW only	Option 2 – Single Heat pump	Option 3 – DHW & Single Heat Pump	Option 4 – DHW & VRF replacement	Option 5 – Full Site Electrification
Description	Replace instantaneous gas fired DHWU with heat pumps. Retain existing solar panels and tanks	Install new Heat Pump to connect to the HHW system	Option 1 plus Option 2	Option 1 plus replace gas fired VRF with electric VRF system	Option 4 plus replace all gas boilers with heat pumps
Capital cost including 30% contingency	\$151,960	\$552,000	\$698,960	\$942,910	\$2,555,910
Additional Electricity Consumption kWh p.a.	5,782	179,888	185,670	36,556	396,333
Reduction in Gas Consumption, MJ p.a.	283	3,302	3,585	754	7,357
Energy Cost saving \$, p.a.	\$7,268	\$68,604	\$75,872	\$16,213	\$153,421
Change Maintenance Cost \$, p.a.	-	\$9,900	\$9,900	-	\$19,800

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ltem	Option 1 - DHW only	Option 2 – Single Heat pump	Option 3 – DHW & Single Heat Pump	Option 4 – DHW & VRF replacement	Option 5 – Full Site Electrification
Reduction Emissions, tCO <sub>2</sub> p.a.	15	170	185	39	379
Electrical upgrade required	No	No	No	No	Yes
Comments	Plant works occur on/adjacent to existing platform.	New plant space (outdoor) required for heat pump. Consideration to be given to sound attenuation by supplier.	New plant space (on roof) required.	Re-use existing platform. Internal works required to replace VRF units	Significant site infrastructure upgrades required.

Table 2: Financial summary

#### 1.4 Recommended Option Justification/Solution benefits

Bridgeford Group recommends Option 5 – Full Electrification for the site

This recommendation is based on the following:

- It is the most economical to achieve full electrification in one project, which is the ultimate goal of the council.
- The VRF system is approaching end of life anyway and will require replacement in the next 4 years. This will trigger an electrical supply upgrade if any other electrification works are completed beforehand
- Works can occur in construction stages to keep the site remaining operational for equipment changeover, with the exception of the VRF, which will require staged shutdown of areas to replace the internal units
- The project is eligible for the CEUF grant, which could contribute 50% of the project cost if successful

Should the required funding for the project not be available, and Full Electrification is not an option, Bridgeford recommends Option 3 - replacement of the gas fired domestic hot water and the installation of a 200kW nominal heat pump connected to the heating hot water system as an alternate first step for electrifying the site.

This recommendation is based on the following:

- Covers 84% of the typical heating load requirements (based on Apr to Nov 2021 data), offering significant reduction of the gas consumption and subsequent emissions of the site.
- Lower cost to the replacement of the VRF system with a much better return.
- Can be accomplished without requiring an electrical infrastructure upgrade
- Does not affect the redundancy of the system, keeping existing boilers in place
- Allows for a staged changeover for the site

The full site electrification can then be considered in the future once an electrical upgrade takes place.



#### 1.5 Key project risks

The following are the key project risks –

- Approval process through Department of Education time frames and key considerations for the Department are unknown.
- Site electrical infrastructure Limits the upgrade capability of the site without significant works. The existing kiosk will need to be upgraded to 750kVa. The cost contribution from Powercor are unknown at this point however the total cost of the project will be up to \$210,000 with a contribution from Powercor between \$0 and \$200,000. Costs provided in this report assumes worst case scenario of no contribution from Powercor.
- Structural capacity of roof for new heat pump plant room. This will need to be reviewed further in the design phase of the project.

#### 1.6 Additional recommendations

The following items should be considered in terms of overall plant efficiency -

- Use of natural ventilation Reinstatement of the interlock between the openable windows/doors and the operation of the ERVs will reduce the energy consumption during shoulder seasons.
- Building insulation this would minimize heat loss from/gain to the pool hall.



#### 2 Summary

The table below presents the key concept options and recommendation

Item	Option 1 - DHW only	Option 2 – Single Heat pump	Option 3 – DHW & Single Heat Pump	Option 4 – DHW & VRF replacement	Option 5 – Full Site Electrification
Description	Replace instantaneous gas fired DHWU with heat pumps	Install new Heat Pump to connect to the HHW system	Option 1 plus Option 2	Option 1 plus replace gas fired VRF with electric VRF system	Option 4 plus replace all gas boilers with heat pumps
Required Additional Electrical Capacity (kW)	12	60	72	67	187
Spatial requirement	Units floor space is roughly 1000 x 1500. One unit will fit on existing platform. Second unit will need additional support.	New external plant deck roughly 6.3m by 15.5m will be required. This this can be located on the roof adjacent the existing Plant	New external plant deck roughly 6.3m by 15.5m will be required. This this can be located on the roof adjacent the existing Plant	Replanning of the existing platform should allow for DHW and VRF condensing units to be located on the existing platform.	New external plant deck roughly 6.3m by 15.5m will be required. This this can be located on the roof adjacent the existing Plant
Proposed System Redundancy	The existing DHW system has solar panels and with two heat pumps there is a level of redundancy	The new heat pump would connect to the secondary loop and be used in combination with the existing boilers and so not affect the redundancy of the system	Refer option 1 for DHW. Refer Option 2 for HHW	Refer option 1 for DHW. The VRF system does not have redundancy currently	Matches current redundancy levels for DHW & VRF, with boiler plant being N+1 instead of 2N.
Buildability	-	New plant deck required. Pipework connection required from plant deck to the existing plantroom.	New plant deck required. Pipework connection required from plant deck to the existing plantroom.	VRF replacement includes indoor and outdoor units and associated pipework. Will require builders works in association to modify ceilings to suit.	
Additional Electricity Consumption kWh p.a.	5,782	41,799	45,177	36,556	396,333
Reduction in Gas Consumption, MJ p.a.	283	3,302	3,585	754	7,357
Emissions Savings (Tonnes CO2. pa)	15	170	185	39	379
Capital Cost, \$	\$151,960	\$552,000	\$698,960	\$942,910	\$2,555,910
Net Energy Savings p.a.	\$7,268	\$68,604	\$75,872	\$16,213	\$153,421
Additional Maintenance Costs p.a.	-	\$9,900	\$9,900	-	\$19,800
Net savings p.a.	\$7,268	\$58,704	\$65,972	\$16,213	\$133,621

#### Attachment 7.1.1 Final Report - Bluewater Electrification Heat Pump Concept Report - Bridgeford Group

#### Heat pump concept report



Benefits of solution	Smallest scope of works with minimal downtime to the site Should not raise objections from the Department of Education	Targets largest gas consuming system on site within current electrical requirements	Biggest reduction in gas consumption and hence emissions for to the site within current electrical requirements.	Replaces VRF system which will be close to end of economic life. Should not raise objections from the Department of Education	Fully electrified site.
Table 3: Summary Table					

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#### 3 Context

#### 3.1 Otway Colac Shire Council's Carbon Neutral Target

Council's 2020 Carbon Neutral Target – originally established in 2010 – set a mandate for significant emissions reduction activities, ultimately achieving reductions of 36% by the end of 2019-20. This was achieved across a wide range of Council operations and significantly reduced the quantity of offsets required to claim carbon neutrality.

At the April 2021 Council Meeting, Councillors voted to honour the 2020 Carbon Neutral Target by purchasing carbon offsets for remnant emissions, also committing to further emissions reduction in the years to come. Gas consumption at Bluewater was flagged as a clear focus area for emissions reduction. Colac Otway Shire intends to offset remnant emissions from 2020-21 onwards, thus becoming a carbon neutral organisation - the first rural Shire in Victoria to achieve this.

#### 3.2 Report outcomes

As noted above the Bluewater Leisure Centre has been identified as a focus for reduction in emissions. The following are the Key outcomes/items mentioned by COSC to be presented in the report.

- Cost benefit analysis.
- Balance of environmental goal and costs.
- Maintain conditions for users.

With the primary purpose of the report to provide clarity on options on improving environmental impact and reducing operational costs with capital cost information for discussion by council.



#### 4 Existing System Overview

#### 4.1 Building Description

The Bluewater Leisure Centre is located at 118-134 Hearn Street, Colac and comprises 3 main areas - Gymnasium, Aquatic Centre and Childcare Service. The building is located on Department of Education Land and there is a school at the rear of the building. The building was extended and refurbished in 2015.

#### 4.2 Pool operation

There are 4 main pools -

- Spa set at 38°C
- Main pool set at 30.5°C
- Toddler pool set at 30.5°C
- Warm water pool set at 35°C

The temperature of the pool is varied by 1 or 2°C seasonally.

The pool opening hours are

- Monday Thursday: 6.00am 8.30pm
- Friday: 6.00am 7.30pm
- Saturday & Sunday: 8.00am 3.45pm
- Public Holiday: 10.00am 4.00pm





#### 4.3 Heating hot water system

The heating hot water systems serves Heating hot water (HHW) coils in the Energy recovery ventilation (ERV) units serving the pool area as well as providing heating to the pools.

The current heating plant consists of 4-off Chappee 260kW condensing gas boilers in an N+2 arrangement. They are staged such that two are in operation at a time rotated every 7 days. Total volume of water heated is 665kL via a heat exchange loop (main pool 425kL @ 28°C, hydrotherapy 120kL @ 32°C, spa 20kL @ 38°C).

The supply temperature on the boilers was noted at 70°C.



Figure 2a and b: Boilers and heat exchangers.

#### 4.4 Domestic Hot water

The domestic hot water system consists of a solar pre-heat storage system, with 6 off 400L Chromagen solar storage units, this serves 3 off gas continuous flow units with 1 off 400L hot water storage tank. There are 16 flat plate solar panels on the roof that pre-heat the water.



Figure 3 Storage tanks



Figure 4 Gas continuous flow units and DHW pump controller

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#### 4.5 HVAC systems

#### 4.5.1 Pool Hall

The pool hall is supplied by 2-off ERV units. These units use heat exchangers to reclaim energy from the air exhausted from the pool to the incoming supply air. Heating hot water coils are provided to supply additional heating in winter.



Figure 5: ERV unit on the roof.



Figure 6 BMS screen shot showing the ERV in schematic form

#### 4.5.2 VRF units

The office and general areas are served by gas fired VRV systems. This are similar to an electric VRF system with a roof mounted condensing unit connected to a number of indoor units with refrigerant pipework. The difference is that these units are powered by gas rather than electricity.



Figure 7 Gas fired condensing unit



#### 4.6 Electrical

#### 4.6.1 Mains power

There is an existing 400Amp supply to site from a pillar substation. The main switch is currently limited to 250Amp with a 200Amp supply to the MSSB. All purchased electricity is nominated as green power by the retailer.





Figure 9 – Pillar substation

From the BMS, the demand of the site currently varies up to 120kWe (est. 150kVA at 0.8PF) with 35-40kWe being the current mechanical services load.

A review of the capacity indicates that there is currently 90kWe available without a central MSB and site supply upgrade for mechanical/hydraulic plant items.

	Current, A	Power, kVA	kWe at 0.8PF
Maximum Capacity	400	277	221
Existing Load	217	150	120
Spare	20	14	11
Available for new mechanical	163	113	90

Table 4 - Electrical capacity review.

#### 4.6.2 Solar system

The 99kWe solar system at Bluewater was commissioned in July 2018. High output PV panels (LG NeonR 360W) were necessary due to roof loading restrictions, paired with highly efficient Fronius inverters. Overall, the system generates around 133 MWh annually, providing just under 20% of total electricity consumption and preventing 178 tonnes of CO<sub>2</sub> from entering the atmosphere.

At the time of the site inspection in 2021, a large number of panels had been dislodged by high winds and the system was not operational. The system has since undergone repairs and is fully operation at time of writing 2024.





Figure 10: One of the solar inverters, adjacent to MSB.

#### 4.7 Controls

A control system based upon Alerton BACtalk equipment on an Optergy front end was installed by BAE Automation.

The ERVs to the pool hall run continuously, this is normal in a pool environment where maintaining humidity levels prevents condensation. There was a traffic light indicator that shows when north sash windows can be opened by turning green, subsequently switching the ERVs off. It was noted that at the time of the inspection this traffic light system was not operational, and the opening of the windows did not stop the ERV operation. The staff were not aware of when this system stopped operating. The ERV to the pool hall change area operates continuously to provide a positive pressure to the pool hall.

The ERV to the fitness change area operates under time clock control.

The VRF systems are enabled on time clock and start/stop based on local control.

The boilers run in pairs in lead/lag arrangement with the lead boiler rotated on a weekly basis.

#### 4.8 Plant Areas

The boilers and heat exchangers are located in a Mechanical services plantroom.



POOL PLANT ROOM LAYOUT

Figure 11 Mechanical services plantroom.

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#### 4.9 Constraints

There are a number of constraints on the site, these are summarized as follows -

- Land is owned by Department of Education, so that amendments and alterations need to be reviewed and approved by the Department.
- There are school classrooms in the buildings to the rear of the site, currently 6m from the wall of the plantroom.
- There is a stormwater drain to the rear of the building
- The electrical supply to the site is 400A from a pillar substation in the street. With a 400A supply, (227kVA, 221kWe at 0.8PF) and preference to load to no more than 380A, there is 163A (112kVA/90kWe) for new mechanical/hydraulic loads.
- Plant space within the building is limited.

#### 4.10 Gas consumption data

Bridgeford Group understand that even during COVID-19, there was significant gas consumption, with \$3,944 ex GST spent on natural gas from 21/10/20 to 18/12/20. Average daily gas use of 16.1MJ/day was lower than the same period in 2019, at 22.5MJ/day, however, still represents an average heating load of over 150kW thermal during warmer months. When compared to the updated 2023 data, the average daily gas use for the same period is 18.8MJ/day, which is in between the 2020 and 2019 figures. During recent discussions, it was noted that the plant had been operating with issues, as well as reduced insulation to part of the building for some period. As such the baseline year has been used in lieu of 2023 data. It can be seen that over the winter months, the sites gas consumption is the highest since 2016, consuming more than 10% more from May to August since the next highest year (2017).

The BMS data shows a lower consumption for the Boiler and DHW for the time period at 9.9MJ/day in Oct and 5.3MJ/day in Nov/Dec. The BMS gas meter for the VRF systems and the kitchen are not showing any readings. In 2016 and 2018 the VRF consumption was approximately 6% of the sum of the boilers, the domestic hot water and the VRF supply. Allowing for a VRF consumption similar to that in 2016 the gas consumption recorded by the BMS for 2020 and 2021 does not match the gas consumption recorded in the bills.



Figure 12 - Boiler gas consumption from BMS in MJ. Data for 2023 has been scaled to match the provided bills

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#### 4.11 Load duration Curve

The graph below presents the proportion of time that the heating system sat at a certain load point (during Apr to Nov 2021). What can be seen is that 90% of the heating requirement required only 1 boiler, meaning an electric heat pump would offset the same proportion of operating hours for the current boilers, thus providing significant opportunity to electrify pool heating for reduced investment cost, paving the way to understand the benefits of electrification before further investment is committed.



Figure 13: Load duration curve.

From a review of the BMS data from 2016 to 2021 for gas consumption, the April 2021 to November 2021 trends for the Pool and ERV thermal consumption, and comparison with predicted load for each of the systems a baseline gas consumption has been determined for the site. The equipment energy breakdown is shown below in Figure 14. These figures show that the main gas consumption is from the boilers and is a combination of the ERV and the pool heating requirements.



Figure 14 Gas consumption by use



From a review of the BMS data from 2016 to 2021 for gas consumption, the April 2021 to November 2021 trends for the Pool and ERV thermal consumption, and comparison with predicted load for each of the systems a baseline gas consumption has been determined for the site.

These figures show that the main gas consumption is from the boilers and is a combination of the ERV and the pool heating requirements.

	Pool (MJ)	ERV (MJ)	DHW (MJ)	VRF (MJ)	Total (MJ)	MJ/day
January	275.84	115.24	15.31	38.45	444.84	14.35
February	257.40	100.60	16.62	34.80	409.42	14.62
March	259.63	144.82	18.75	26.50	449.70	14.51
April	319.56	199.81	22.25	19.39	561.01	18.70
Мау	355.46	300.00	28.46	38.60	722.52	23.31
June	374.14	350.00	28.22	50.97	803.33	26.78
July	381.84	370.00	31.29	60.04	843.18	27.20
August	351.39	360.00	30.84	54.48	796.72	25.70
September	333.54	280.00	26.75	36.19	676.48	22.55
October	314.50	265.00	23.35	41.48	644.33	20.78
November	329.64	175.46	20.83	36.71	562.63	18.75
December	242.80	146.63	20.65	32.66	442.75	14.28
Total	3,795.74	2,807.56	283.33	470.28	7,356.90	20.16

Table 5 - Baseline monthly gas consumption



Figure 15 - Baseline gas consumption data



## 5 Proposed system

#### 5.1 Domestic hot water

The proposed system to replace the 3 off instantaneous gas fired hot water units which have a flow rate of 26L/min (0.43L/s) and a 20°C rise is 2 off 17kW heat pump units which have a flow rate of 2.9m3/hr (0.81L/s) and a 5°C temperature rise.

The units would be located on and adjacent to the existing platform, they would work to keep the water above 60°C in accordance with AS 3500 requirements. At this size the units can be single phase, new supplies would be required to run to the roof. The recommended units use R290 as a refrigerant, units using CO2 as a refrigerant are available, however these are twice the cost and require 3-phase power.

The existing solar panels and storage tanks would remain with the heat pumps used for top-up only.



Figure 16: Example DHW heat pump unit (with tanks and control unit)



#### 5.2 VRF system

The proposed system to replace the gas fired VRF system is a standard electrical based VRF system. This will work as the existing system. Unfortunately, both the indoor and outdoor units for the system, including refrigerant pipework, need replacement.

The noise level of the Outdoor units will be higher than that of the gas fired units, however, given the location on the external plant deck this is unlikely to affect the surrounding areas.

A Chilled water/Heat hot water fan coil unit system was considered for this site. This would require significant additional works including ductwork and piping, causing even more disruption to the site.



Figure 17; DHWU and VRF condensing units on platform.



#### 5.3 Boilers

There are two options to replace the boilers.

The first is a staged option, which installs a single heat pump and associated primary pump, sized to be within the available electrical capacity. This heat pump is connected in parallel to the boilers to the secondary circuit. The heat pump can then operate to meet the initial loading on the system with the boilers available to top up the load to the full capacity as required. Based on the current BMS data for April to November the heat pump would be able to meet the base load around 60-70% of the time.

The second is a replacement of all of the boilers with heat pumps. In this case the heat pumps will be configured in an N+1 arrangement, which differs from the existing 2N arrangement.

At this stage, commercially available heat are typically using R32, R290 or R410A, with a small number on the market using R454b, alternative refrigerants such as CO2 and ammonia are not in common use. This should be reviewed during the detailed design phase if these works are undertaken sometime after the production of this report.

The existing plantroom does not have space to accommodate the heat pumps and a new external plant area will be required. A ground-level plant area to the south was originally proposed however an alternate location has been requested to avoid an approvals process. The new proposed plant area is on the roof adjacent the existing boiler plant. A new platform will be required and a structural review will need to be conducted to ensure the existing roof will support the weight of the new heat pumps.

Pipework will need to reticulate from the existing plantroom to the new roof plant area.

A query was raised regarding having separate units for each pool, higher redundancy is provided through a centralized system connecting to the heat exchangers as per the existing design.



Figure 18: Indicative heat pump layout for N+1 arrangement

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#### 5.4 Solar system sizing for heat pumps

#### 5.4.1 Size to power Heat pumps

The sizing of a solar panel system to serve the heat pumps indicatively is based on a typical production of 3.5-4kWh per day, per installed 1kWe of PV panels. This means that to power the heat pumps, that replace the boilers, then a solar system at around 275kWe is required to produce the required electricity over a year.

A battery system to store the generated power would also be required to store the electricity so that it was available for cloudy (low production) days. The battery sizing would consider the potential number of days without sun, this can be a period of a month or more, generally in winter when heating is required. This would need to be significant in sizing, potentially up to 500kWh, at a cost of \$0.5-\$0.7M.

We have reviewed the capacity of the roof to take solar panels, and note that the capacity of the solar system based on available roof area is 265kW.



Figure 19 265kW of solar panels on roof.

#### 5.4.2 Site power supply limits

The sizing of the solar system is limited by the size of the connection to the grid, and in this case, with only a 400A power supply, the ability to expand solar to match the electrical demand of the site may be limited. To provide 275kWe (approx. 400A) of power, the site connection would need to be upgraded.

Based on the requirement that the quantity of connected solar is less than 40% of the nearest transformer, the scope of works is most likely to require the nearby transformer to be upgraded or an additional transformer added to increase the transformer to 750kVA (1000A). For context, the Kiosk substation installed at the school in 2008 is 500kVA.

#### 5.4.3 Ability to claim certificates

Furthermore, the increasing of the solar system >100kW will have implications on its definition under the Renewable Energy (Electricity) Act 2000 and its supporting regulations. The Act specifies that a system of >100kW may be classified as a 'power station', rather than a 'small generation unit'.

This classification impacts the certificates that can be generated by the solar system, with a small generation unit being eligible for Small Scale Technology Certificates (STCs) under the Small-scale Renewable Energy Scheme and a power station being eligible for Large-Scale Generation Certificates (LGCs) under the Large-scale Renewable Energy Target. It also means that the additional capacity would need to be sub-metered to ensure LGCs are only generated off the newly installed solar capacity.



In order for a power station to be accredited, an application for accreditation needs to be made that meets the requirements set out in the Renewable Energy (Electricity) Act 2000 (REE Act) and Renewable Energy (Electricity) Regulations 2001 (Regulations).

For comparison, STC certificates (as received for the existing system) are calculated for up to 10 years (based on 10 years of emission reduction), and the benefit received up front off the capital cost. The LGCs are an annual certificate, thus there is no guarantee these will be received beyond 2025.



#### 5.5 Key Design Criteria

#### The proposed concept design conforms to the following key criteria:

Criteria	Requirement	Description
System Redundancy	N+1 Configuration	The boiler replacement with heat pumps provides redundancy as described above. The domestic hot water system has 2 units The VRF system has no redundancy as per the existing system
Fit for Purpose	Efficient in terms of cost and operation	The proposed systems are energy efficient and use electricity rather than gas.
Environmental Benefits	Low emissions	The heat pump system will be powered via on or offsite renewable energy. Removes reliance upon natural gas and need to offset combustion emissions.
	Low GWP refrigerant	The VRF and large heat pump typically use R410a, commercial equipment of these types have not yet changed to newer refrigerants. Availability of alternative refrigerants should be reviewed at time of detailed design. The DHWUs use R290 which is a low GWP refrigerant
Energy Efficient	Support Net Zero goals	Energy Efficient design supporting, removing reliance on natural gas.
	Thermal storage	The heat pump systems will include thermal storage tanks which allows the storage of heated water allowing the modification of the electricity consumption to match solar production.
Buildability	Installation with minimum interruption	The DHWU and Boiler changes can occur with minimal disruption to the operation of the building. The replacement of the VRF will require areas to be closed to allow access to the units and pipework.
Suitability for pool environment	Is the system suitable for heating water with chemicals required for commercial pool operation, including Chlorine, CO <sub>2</sub> , PAC (poly aluminium chloride)	The treatment of the pool water would remain similar to the existing system with heat exchangers used to transfer heat from the Heating hot water side to the pool water side. If the heat exchangers are replaced, then the materials used would be selected to suit the pool water chemicals.
Maintainability	Comparable maintenance to gas-based systems	The heat pump system will have comparable maintenance to a local gas fired DHW boiler system.
	Likely availability of technicians to conduct emergency maintenance	A heat pump should be able to be maintained by a refrigeration mechanic with experience on DX split units and chillers. During the DLP this maintenance requirement would rest with the installing contractor, emergency maintenance response time requirements can be included in the specification
Control	System capable of maintaining/ set heat to within 0.2°or better	This level of accuracy is normally a function of the control system. The tighter the accuracy, the more expensive the sensors. The proposed system control will be similar to the existing control. Due to the sometimes-fast changes in OA and humidity, result in changes to space temperature. A narrow temperature band will also lead to increased energy consumption.
Staff training	Indicative costs involved in training staff on how to use the system	Control of the plant will be through the BMS Minimal requirement for staff, other than understanding to reset equipment on fault

Table 6: Key design criteria

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#### 6 Financial summary

The following financials are provided as a budget estimate only for the equipment supply and installation for the options.

#### 6.1 Total Project Budget

The total project budget is presented below.

Please note that for all items other than equipment supply, this is pricing is budget only.

ltem	Option 1 - DHW only	Option 2 Single Heat Pump	Option 3 – DHW & Single Heat Pump	Option 4 – DHW & VRF replacement	Option 5 – Full Site Electrification
Equipment	\$44,000	\$120,000	\$164,000	\$164,000	\$524,000
Installation	\$37,400	\$120,000	\$157,400	\$277,400	\$637,400
Controls	\$15,000	\$15,000	\$30,000	\$82,000	\$102,000
Electrical	\$5,000	\$25,000	\$30,000	\$16,250	\$346,250
Demolition	\$-	\$0	\$0	\$26,000	\$26,000
Buildings works	\$-	\$100,000	\$100,000	\$65,000	\$165,000
Sub total	\$101,400	\$380,000	\$481,400	\$630,650	\$1,800,650
Project Management (10%)	\$10,140	\$38,000	\$48,140	\$63,065	\$180,065
Professional fees allowance	\$10,000	\$20,000	\$25,000	\$60,000	\$35,000
Contingency (30%)	\$30,420	\$114,000	\$144,420	\$189,195	\$540,195
Total	\$151,960	\$552,000	\$698,960	\$942,910	\$2,555,910

Table 7: Equipment pricing.

Note that these figures exclude cost escalation factors.

Professional fees include an allowance for services engineering and structural review of plant platforms noted as being required.

#### 6.2 Lifecycle Cost

The table below provides an overview of the lifecycle cost for the three options:

Item	Option 1 - DHW only	Option 2 Single Heat Pump	Option 3 – DHW & Single Heat Pump	Option 4 – DHW & VRF replacement	Option 5 – Full Site Electrification
Additional Electricity Consumption kWh p.a.	5,782	98,635	107,403	36,556	396,333
Reduction in Gas Consumption, MJ p.a.	283	3,302	3,585	754	7,357
Emissions Savings (Tonnes CO2. pa)	15	170	185	39	379
Energy Cost savings p.a.	\$7,268	\$68,604	\$75,872	\$16,213	\$153,421
Additional Maintenance Costs p.a.	\$0	\$9,900	\$9,900	\$0	\$19,800
Net saving p.a.	\$7,268	\$58,704	\$65,972	\$16,213	\$133,621

Table 8: Concept option lifecycle cost. Note: 0 tCo2 p.a. for Option 2 as electricity assumed to be from renewable sources.

HEAT PUMP CONCEPT REPORT | Bluewater Leisure Centre, Colac



#### 7 Project buildability and high-level project risks

#### 7.1 Installation methodology and buildability

#### 7.1.1 Domestic hot water

The need for a minor extension to the existing platform would need to be determined and these works completed first.

Secondly, a new power supply would need to be run to the platform from with the Mechanical services switchboard or the main MSB. The new connection would require a brief shut down of the associated board.

The domestic hot water unit changeover should be accomplished within a day or two, within this time-period the domestic hot water would need to be isolated. The existing gas fired units will need to be disconnected and the gas supply capped and made safe. The new electrical units would then need to be connected.

#### 7.1.2 VRF

The VRF system changeover could be completed system by system. A detailed changeover plan would need to be determined during the detailed design, looking at which indoor units are connected to which outdoor unit and allowing for the replanning of the platform to accommodate the new condensing units.

Areas would be shut down as the replacements occurred.

New power supplies would be required for the outdoor units, the existing power supplies to the indoor units are likely to be able to be reused.

Builder's work associated with the removal and replacement of ceilings to allow the replacement of refrigeration pipework and indoor units will be required.

#### 7.1.3 Boiler Changeover to Heat Pumps

A new external plant platform on the roof, adjacent the existing boiler plant would need to be built first.

Interconnecting pipework from the existing plant area to the new external plant area would need to be reticulated. This could be cut into the existing pipework with blanked valves, a shutdown would be required. An electrical shut down will be required to add new circuit breakers to the MSSB, these shutdowns could be coordinated to occur together.

The heat pumps would be craned in and installed on the external platform. New pumps would then be installed on the platform and pipework connections finalized.

Lastly, for the whole site replacement the boilers would be removed, and the gas capped.

#### 7.2 Project Risks

The following key project risks are identified below with a rating based on the likelihood and severity. A postmitigation rating has been provided.

Dick	Description		Pre-install mitigation		Heat-pump	
RISK	Description	Likelihood	Severity	Rating	Description	Rating
Acoustic issues	The new equipment will result in increased noise in compared to the existing system.	Moderate	Moderate	3	Acoustic impacts should be considered in detailed design and final heat pump selection. Units located on roof of structure should not impact neighboring properties	1
Electrical capacity issues	Site electricity supply is limited	High	High	8	Replacement of DHW and VRF or installation of a single running heat pump can be undertaken without an electrical supply upgrade. Complete electrification of the site will require a site infrastructure upgrade.	2
System redundancy	N+1 redundancy on the pool heating	High	High	8	Proposed option continues to provide the same redundancy	2

#### 7.2.1 Identified project risks

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Diele	Description	Pre-install mitigation		on	Heat-pump		
RISK	Description	Likelihood	Severity	Rating	Description	Rating	
Spatial	Spatial constraints during installation	Moderate	Moderate	3	VRF and DHWU spatial requirements can use space of existing. Heat pumps to replace boiler will need additional plant platform on roof, this would need to be coordinated as part of detailed design works.	2	
Shutdown during installation	Requirement for shut-down of spaces during installation	High	High	8	Shut downs of VRF and DHW systems would need to be coordinated. Interconnection of heat pumps will require a shut down.	2	
Maintainability	Increased potential for maintenance of new equipment.	Moderate	Moderate	3	The proposed systems should not require increased maintenance, the heat pumps will require fractionally more maintenance than the boilers.	2	
Structural	New heat pumps to be installed on existing roof	Moderate	Critical	7	Structural review to be undertaken of roof capacity. Upgrade if required	1	

Table 9: Identified Project Risks.

#### 7.2.2 Risk reference table

This table below provides a reference for use for the above identified project risks.

	Severity				
Likelihood	Low	Moderate	High	Critical	
Severe	4	6	9	10	
High	3	5	8	9	
Moderate	2	3	5	7	
Low	1	2	4	5	

Table 10: Risk rating table.

#### 8 Grant Eligibility

#### 8.1 CEUF Grant

The CEUF is a targeted, competitive grant program that provides co-funding for energy upgrades at existing local government facilities. Grants between \$25,000 and \$2.5 million will be awarded on a merit basis.

The program aims to help local governments to make their facilities more energy efficient and lower their greenhouse emissions and energy bills.

The Grant will be awarded in 2 rounds, with the first round (\$50 Million total) of application closing on 30 April 2024. The second round is set to open in January 2025. **There will be a maximum of one grant for capital upgrades per local government over the life of the program.** Local governments will be expected to share knowledge from their projects for local government and community benefit, to build the capability and skills of local governments and the wider community to undertake energy upgrades.

The electrification project will be eligible for consideration under the grant, where up to 50% of the project cost can be awarded (up to \$2.5 Million).

Attachment 7.1.1 Final Report - Bluewater Electrification Heat Pump Concept Report - Bridgeford Group

Heat pump concept report



#### 9 Appendix

#### 9.1 Assumptions

The following assumptions were used:

- Pricing for equipment based on quotations received from suppliers
- Costing based on the following
  - o \$1,000 per BMS control point
  - o \$5,000 for a high-level interface
  - o \$250 per GPO point
  - Large pump and VSD \$ 15,000 each installed
  - No additional structural reinforcement to roof required for installation of heat pumps. This will need to be verified by a structural engineer in the design phase
- All quoted figures are excluding GST.
  - Other pricing is based on general industry standard allowances.
- Energy rates based on Nov 2023 bills
  - Electricity: \$ 0.1304 /kWh for peak and \$0.0898/kWh for off-peak.
  - Gas: \$24.38 /GJ
- Maintenance costs based on industry standards including CIBSE and AIRAH
- Emissions factors:
  - Electricity carbon emissions: 0 kg CO<sub>2</sub> per kWh (assumed all electricity from renewable sources)
  - Gas carbon emissions 51.4 kgCO<sub>2</sub>/GJ (NGERs workbook 2019)
  - Certificate prices (VEECs) at \$90.25 as at 23/02/2024
- Hours of operation assumed to be as per website and operational data provided.
- Reverted to Gas baseline data from Version 1 of report recent discussions have revealed that the
  plant was over-using gas in 2023 due to poor control and reduced insulation in the building for part of
  the year
- No allowance has been made for an Authority Gas Abolishment Fee

#### 9.2 References documentation and data

The following documentation and data was used during this concept design:

Description	Document or Information Source
As built and design documentation	COSC
Trends and Metering data from BMS	BMS
Site walk through	Site walk through on 08/11/2021
Utility Information	Bills, smart meter data and BMS
	gas metering.

Table 11: Referenced documentation and data



#### **General Disclaimer**

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