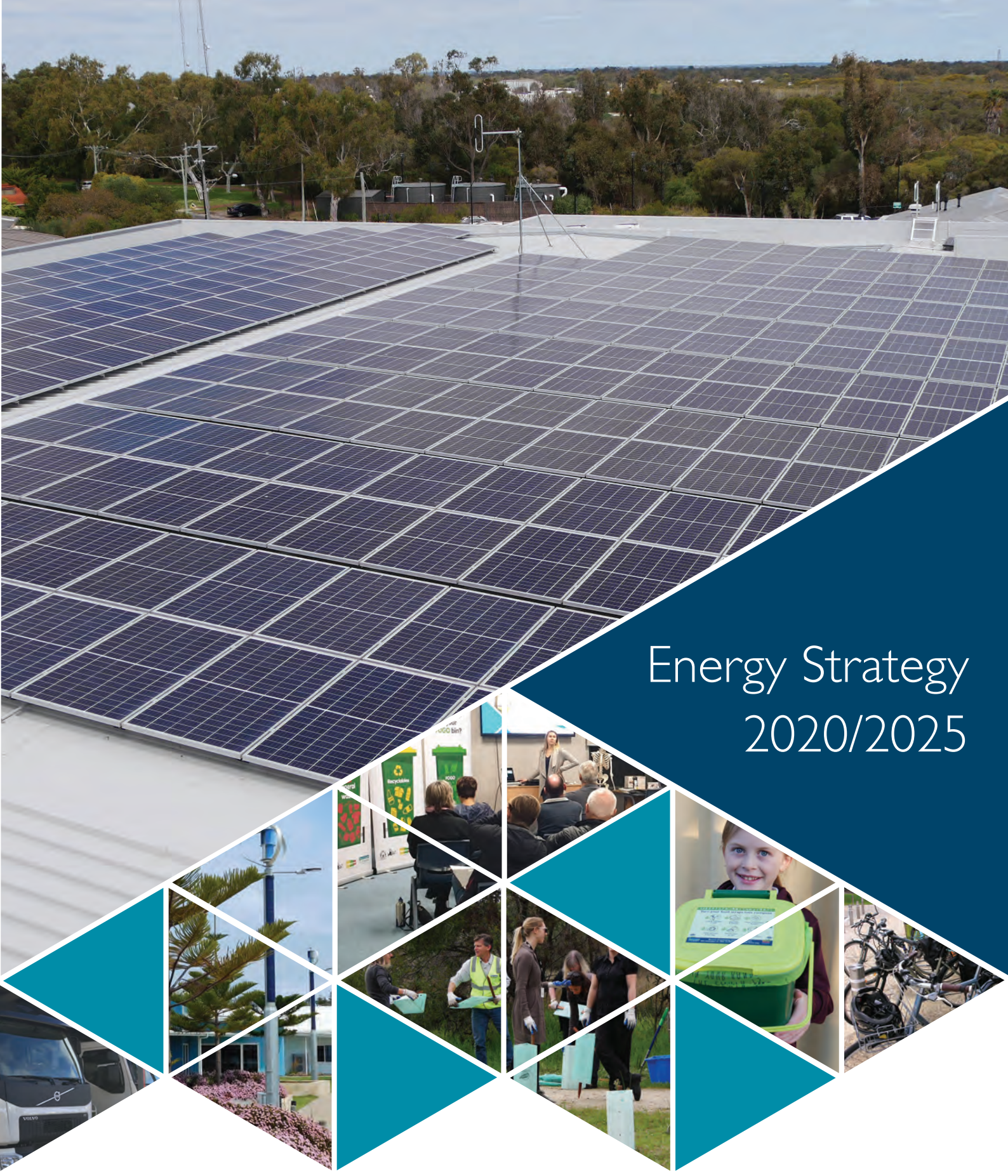


Energy Strategy 2020/2025

Where environment lifestyle and opportunity meet!

City of Busselton
Geographe Bay


IRONMAN
WESTERN AUSTRALIA
BUSSELTON
City of Busselton

Contents

Figures 4

Tables 4

Abbreviations 5

Summary 6

1. Introduction 12

1.1 Need for an Energy Strategy 12

1.2 Past and Current Energy Efficiency and Renewable Energy Initiatives 12

1.3 Energy Strategy Scope and Focus Areas 13

1.4 Vision 14

2. City of Busselton Energy Profile - Baseline Assessment 15

2.1 Electricity 15

2.2 Gas 20

2.3 Fleet and Plant 21

3. Targets 23

3.1 Energy Action Plan Targets 23

3.2 Energy Strategy Targets 24

4. Delivering Energy Savings 28

4.1 Monitoring and Reporting 29

4.2 Efficiency Upgrades to Facilities 35

4.3 Leased Sites 38

4.4 Design/Procurement for New Facilities 39

4.5 Public Lighting 40

4.6 Rooftop Solar 45

4.7 Mid-Scale Solar 48

4.8 Waste 50

4.9 Fleet and Plant 57

4.10 Behaviour and Organisational Change 61

5. Implementation of the Energy Strategy .. 65

5.1 Innovation 65

5.2 Financing and Potential Incentives 66

5.3 Implementation Management 67

5.4 Review 69

6. References 70

Appendix 1. List of Strategic Actions 73

Appendix 2. Review of Energy Action Plans 75

ENERGY ACTION PLAN 2010-2014 75

ENERGY ACTION PLAN 2014-2019 77

Appendix 3. Environment Policy 79

Appendix 4. Sustainable Work Practice Operational Practice and Procedure .. 81

Figures and Tables

Figures

FIGURE	TITLE	PAGE
Figure 1	Energy Strategy scope	13
Figure 2	Energy Strategy focus areas	14
Figure 3	Proportional electricity consumption by the City of Busselton for 2018-19, excluding street lighting. Shows all single assets and asset groups with ≥1% consumption. Number of accounts included for each asset/group shown in brackets	17
Figure 4	Energy use and cost for financial years 2014-2015 to 2018-19	17
Figure 5	City of Busselton 2018/19 Fuel use (litres)	22
Figure 6	City of Busselton per capita corporate greenhouse gas emissions 2006/07 to 2018/19	23
Figure 7	Achieving a 50% carbon emissions reduction target	25
Figure 8	Ambitious climate change commitments by Australia's states and local governments, 100% Renewables Ltd.'s blog (October 2019)	26
Figure 9	Integrated Energy Monitoring and Reporting System	33
Figure 10	YCAB daily electricity load profile in winter (top) and summer (bottom)	44
Figure 11	Map of proposed solar farm site	48
Figure 12	Estimated Methane and Landfill Gas Generation Rates (m3/hr)	51
Figure 13	Existing biofuel facility in the Pilbara region of WA	52
Figure 14	Example of a Biological Waste Treatment facility	54
Figure 15	Schematic of Hitachi Zosen Inova's Fluidised Bed Incineration system	55
Figure 16	Electrical load daily fluctuation	60
Figure 17	Continuous improvement cycle approach	69
Figure 18	City's strategic planning cycle	69

Tables

TABLE	TITLE	PAGE
Table 1	Electricity use profile for the City of Busselton 2018-2019	16
Table 2	Summary of City-owned street lighting (currently identified)	19
Table 3	City of Busselton's current rooftop solar installations	19
Table 4	City of Busselton gas consumption 2018/19	20
Table 5	City of Busselton's fuel consumption and cost summary 2016-2019	21
Table 6	Examples of targets set by other LGAs across Australia	27
Table 7	Energy use benchmarking reports for facilities	30
Table 8	List of facilities and monitoring equipment recommended	30
Table 9	2018 Efficiency recommendations for key City facilities (Yeoman 2018)	36
Table 10	LED upgrades of City owned street lighting (2019/20 FY)	41
Table 11	List of sporting venues	43
Table 12	Recommended roof-top solar for priority installation	45
Table 13	Recommended battery installation when the price reaches a suitable payback period (likely in 2020-2022) (Yeoman, 2018)	47
Table 14	Proposed roles and responsibilities of City of Busselton staff	68

Abbreviations

AD	Anaerobic Digestion
ADR	Australian Design Rules
BEACH	Busselton Entertainment and Creative Hub
BMS	Building Management System
BPEM	Best Practice Environmental Management
CAPEX	Capital Expenditure
CCP	Cities for Climate Protection
CFL	Compact Fluorescent Light
C&I	Commercial and Industrial waste
CH_4	Methane
CO_2e	Carbon dioxide equivalent
CO_2	Carbon Dioxide
CRC	Community Resource Centre
CNG	Compressed Natural Gas
DWER	Department of Water and Environmental Regulation
EAP	Energy Action Plan
EfW	Energy-From-Waste
EOI	Expression of Interest
EPC	Engineering, Procurement and Construction
EPC	Energy Performance Contract
EV	Electric Vehicle
FOGO	Food Organics and Garden Organics
GHG	Greenhouse Gas
GJ	Gigajoule
GLC	Geographe Leisure Centre
H	Hydrogen
HVAC	Heating, Ventilating, and Air Conditioning
kWh	Kilowatt hour
LGC	Large Scale Generation Certificate
$LiFePO_4$	Lithium iron phosphate
LFG	Landfill gas
MWac	Mega Watt alternating current
MSW	Municipal Solid Waste
N20	Nitrous Oxide
NOx	Nitrous Oxide
LED	Light Emitting Diode
NCC	Naturaliste Community Centre
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PV	Photovoltaic
PF	Power Factor
REC	Renewable Energy Certificates
REF	Revolving Energy Fund
RRF	Resource Recovery Facility
RRTS	Rendezvous Road Transfer Station
SCADA	Supervisory Control and Data Acquisition
SEWG	Sustainability and Energy Working Group
STC	Small Scale Technology Certificate
YCAB	Youth and Community Activities Buildings
V2G	vehicle-to-grid
VRPL	Vidler Road Putrescible Landfill
WEM	Wholesale Electricity Market
WtE	Waste-to-Energy

Summary

The City of Busselton is committed to addressing climate change and future-proofing its community against rising energy prices.

There are expectations from the community that the City will be a climate leader. Local Governments, businesses, states and countries are setting ambitious renewable energy and carbon emission reduction targets to demonstrate their commitment and set a trajectory for reduced emissions.

In 2018-19, the City of Busselton had 157 electricity accounts using over 3MWh annually with a total annual cost of nearly $850,000. Unmetered street lighting accounts, operated by Western Power, cost a further $850,000 annually. Gas use at 11 facilities amounts to around $20,000 p.a. The City owns 117 light fleet vehicles, including 94 diesel and 23 petrol vehicles, which contribute 25% of the City's total fuel costs. The remainder of the City's fuel usage is predominantly diesel for trucks and major plant. Total fuel consumption in 2018-19 was 32,705L of petrol and 626,754L of diesel at a cost of $952,954.

As the City continues to grow, new assets, facilities and upgrades will result in further consumption increases. It is imperative that action is taken to minimise costs and emissions into the future. That is the purpose of this strategy.

The City has developed this Energy Strategy under the guidance of its Sustainability and Energy Working Group, comprised of Councillors and City staff. The process has created a greater understanding of the organisation's energy issues and opportunities for efficiency and cost-savings. The strategy aims to embed energy management within the City's organisational culture, optimising energy use and uptake of renewable energy.

The vision for the Energy Strategy is:

Minimise energy costs and greenhouse gas emissions, through using energy as efficiently as possible and optimising our approach to generation and use of renewable energy, and to maximise returns to ratepayers through becoming a net energy generator.

The energy targets adopted by the City are:

1. To generate 100% of the City of Busselton electricity needs from renewable sources by 2030.
2. To reduce City of Busselton corporate carbon emissions per capita to 50% on 2017/18 levels by 2030.
3. Develop efficiency targets for fleet and plant by 2025.

To achieve these targets, this Energy Strategy includes 52 strategic actions for ten focus areas, summarised in the table below. Key strategic actions proposed for implementation in the short to medium term are:

- an integrated energy monitoring and reporting system, which allows to dynamically and proactively manage energy use from the City's facilities, public lighting and water pumping and renewable energy generation including solar energy across the organisation.
- 208kW of solar PV Systems, including 100kW at the Geographe Leisure Centre, 40kW at the Naturaliste Community Centre, 40kW at the Busselton Library and 28kW at the Depot and installation of batteries when financially viable.
- a mid-scale solar farm at Lot 27 Rendezvous Road, to allow the City to reach its 100% renewables target.
- strategic energy efficiency upgrades at large facilities as recommended by the *Energy Opportunities Analysis and Prioritisation Report* (Yeoman 2018).
- a Design for New Buildings Policy, which specifies minimum energy efficiency and renewable energy generations for all new City's facilities.

Summary

- LED upgrades of high priority City-owned streetlighting, sporting facilities and Public Open Space.
- investigations into multiple resources recovery systems through the South West Regional Waste Group.
- towards more electrically operated fleet, plant and equipment as technologies mature and the price of energy storage decreases, starting with the purchase of a plug-in hybrid electric vehicle (EV).
- viability assessments of alternative fuel sources to power the City's fleet, plant and equipment.
- a watching brief of new and innovative technologies including microgrids, virtual net metering and peer to peer energy trading.

The process of developing this Energy Strategy has generated a greater understanding of the City's energy issues and opportunities, and a greater capacity for the organisation to achieve ongoing savings in energy use, costs and greenhouse gas emissions. The strategy provides a starting point for improved energy management, and changes to culture around energy use across the organisation.

Energy Monitoring and Reporting

OBJECTIVE	To implement an integrated monitoring and reporting system, which fosters collaboration and accountability and is fit-for-purpose.

STRATEGIC ACTIONS	
1.	Continue subscription to Azility Carbon Emissions Reporting module (or equivalent) to allow tracking of progress towards the carbon emissions reduction target.
2.	Report to Council (annually) and Senior Management (quarterly) on energy use and costs.
3.	Send weekly facility-based energy benchmarking reports and set up usage anomalies alerts for relevant facility managers.
4.	Prepare an energy monitoring equipment strategy outlining priority recommendations for installing sub-metering, data-logging and BMS at key City's facilities.
5.	Install smart monitors on all PV systems, both existing and new.
6.	Report to the community as opportunities arise on the City's energy use, solar energy generation and implementation of energy projects.
7.	Develop a Project Business Case template for energy projects.
8.	Undertake an audit and efficiency assessment of key precinct areas, including the Busselton Foreshore, Dunsborough Playing Fields and Vasse Lakeview Entrance.
9.	Review accounts with no energy usage (electricity and gas) and disconnect if no longer required.
10.	Undertake a review of the City's electricity tariffs and implications for energy costs.

Efficiency Upgrades to Facilities

OBJECTIVE	To progressively and proactively increase the energy efficiency performance of the City's facilities portfolio.

STRATEGIC ACTIONS	
11.	Replace all lights due for replacement with LED.
12.	Review all existing lighting in City's facilities to identify opportunities for LED replacement.
13.	Review and upgrade lighting to LED at the NCC, Busselton Library, Depot and Busselton Tourist Park.
14.	Implement efficiency recommendations for key facilities from the Energy Opportunities and Prioritisation report (Yeoman, 2018).
15.	Investigate building improvement opportunities (e.g. glazing, insulation) that can be implemented as part of the City's annual asset maintenance and renewal program.
16.	Undertake supply voltage business cases for suitable City's facilities and implement voltage optimisers if installation is warranted.
17.	Investigate power factor correction (in parallel to voltage optimisation) to secure reduced electricity tariffs.

Leased Sites

OBJECTIVE	To facilitate cost-effective energy reduction and production at all of the City's leased sites.

STRATEGIC ACTIONS	
18.	Undertake a review of leased sites to determine which would benefit from sub-metering and/or data-logging.
19.	Investigate opportunities for installing solar PV systems at City's leased facilities, either through promoting solar leasing and solar PV PPAs or up-front purchase.

Design/Procurement for New Facilities

OBJECTIVE	To aim for lowest life cycle costs when designing and procuring new facilities.

STRATEGIC ACTIONS	
20.	Prepare a Design For New Buildings Policy (or similar) which sets the standard for energy efficiency and renewable energy for all new City buildings and major upgrades and investigate options for increasing upfront capital investment to achieve future operational savings. Use the BEACH project as a test case.

Public Lighting

OBJECTIVE	To pursue 100% LED public lighting, via new installations or retrofits and advocacy where there is no operational control of lighting assets.

STRATEGIC ACTIONS	
21.	Maintain a watching brief for opportunities to reduce Western Power owned street lighting costs.
22.	Investigate opportunities to reduce operating hours of street lighting (and use of smart and adaptive lighting) in selected areas to reduce energy use and cost.
23.	Upgrade the following City owned street lighting to LED: Naturaliste Terrace, Cyrillean Way, Dunn Bay Road, Hannay Lane, Seymour Boulevard, Keel Retreat and Queen Street (Cultural Precinct).
24.	Develop a program to upgrade the remainder of City owned street lighting to LED.
25.	Complete a review of City-owned public lighting to identify all lighting infrastructure, associated meters, and opportunities for LED replacement.
26.	Commission a condition assessment of all sports lighting and make recommendations for efficiency upgrades and use of smart lighting.
27.	Develop Public Lighting specifications.
28.	Commission an energy efficiency assessment of lights and pumps for key public open spaces.

Rooftop Solar

OBJECTIVE	To maximise rooftop solar systems with associated batteries on all City's facilities to achieve best financial return on investment.

STRATEGIC ACTIONS	
29.	Implement all recommended rooftop solars in 2019/20.
30.	Pursue additional rooftop solar installations as opportunities arise.
31.	Maintain a watching brief for installation of battery systems and undertake a feasibility study when they become financially viable.

Mid-Scale Solars

OBJECTIVE	To offset the City's energy use with renewable electricity generation, while achieving lower energy costs through the development of a mid-scale solar farm.

STRATEGIC ACTIONS	
32.	Progress investigations into developing a solar farm at Lot 27 Rendezvous Road.

Waste

OBJECTIVE	To lower districtwide Greenhouse Gas Emissions overall by reducing the organic faction of waste being decomposed and exploring renewable energy generation as technologies become financially viable and sustainable.

STRATEGIC ACTIONS	
33.	Incorporate all relevant recommendation or actions contained in this Energy Strategy into the review of any existing or new strategic waste documents.
34.	Conduct detailed viability investigations into financially sustainable resource recovery systems that are modular and scalable.
35.	Determine and make recommendations on progressing projects and initiatives that achieve the quadruple bottom line on sustainability.

Fleet and Plant

OBJECTIVE	To reduce reliance on fossil fuels through a combination of green procurement and investments into alternative fuel sources.

STRATEGIC ACTIONS	
36.	Continue to make plant decisions on a best value basis looking at whole of life cycle costs.
37.	Implement initiatives towards incorporating more electrically operated Fleet, Plant and Equipment into the City's mobile asset inventory, as technologies mature and the price of energy storage decreases.
38.	Conduct viability assessments into technologies that offer tangible benefits when considering plant and equipment using alternative fuel sources.
39.	Trial a plug-in-hybrid as pool car replacement.

Behavioural and Organisational Change

OBJECTIVE	To embed energy management in all levels of the City's organisational culture. To embed life cycle costs and overall energy efficiency in the overall 'best value for money' assessment.

STRATEGIC ACTIONS

40.	Continue to support the Green Taskforce in raising awareness of climate change and the importance of reducing energy use throughout the organisation.
41.	Develop and implement enhanced behaviour change and education programs for each major facility, targeting City staff and other regular facility users.
42.	Report energy use and efficiency outcomes to staff, when monitoring capacity is available, and acknowledge outcomes of energy savings initiatives.
43.	Investigate opportunities and promote the need for energy management training for Western Australia's Local Government Sector.
44.	Update the City's Purchasing Policy and associated Operational Practice to direct greater application of sustainable procurement, with particular reference to energy efficiency.

Implementation and Review

STRATEGIC ACTIONS

45.	Monitor the development of emerging and innovative energy technologies (i.e. microgrids, virtual net metering and peer to peer energy trading) and facilitate the development of trials in the City.
46.	Continue to allocate expenditures under the City's Energy Sustainability Reserve as per priorities identified in the Energy Strategy.
47.	Consider options for increasing capital expenditure for implementing projects with the lowest life cycle costs.
48.	Consider the development of a Revolving Energy Fund once an integrated Energy Monitoring and Reporting system is well established.
49.	Consider alternative financing options when implementing energy projects.
50.	Continue the Sustainability and Energy Working Group.
51.	Review specific responsibilities for implementation of the Energy Strategy as part of the yearly action planning cycle.
52.	Annually update the Energy Strategy with new information and review every 5 years.

Introduction

1.1 Need for an Energy Strategy

Climate change is forecasted to severely impact the south west of Western Australia, including the City of Busselton, with increasing temperatures and more hot days, decreasing winter rainfall, increasing intensity of extreme rainfall events, rising mean sea level and height of extreme sea-level events and a harsher fire-weather climate (CSIRO and Bureau of Meteorology, 2015). This is likely to significantly impact almost all aspects of the City's operations and responsibilities, our local community, economy and the natural environment.

There is also a strong financial incentive for the City to decrease energy consumption as costs of electricity and fuel continue to increase. Payback periods for efficiency measures and behind-the-meter renewables are decreasing, further improved by improvements in technology and affordability. Development of in-front-of-the-meter renewables provides a financial advantage by paving the way to sell and purchase power, and will offset reliance on fossil fuels.

The City of Busselton is committed to addressing climate change, in part through reducing its operational carbon emissions and future-proofing its community against rising energy prices. There are high expectations from the community that the City will be a climate leader. More and more organisations, councils, states, businesses and countries are setting ambitious renewable energy and carbon emission reduction targets to demonstrate their commitment.

The aim of the Energy Strategy is to take energy management within the City to the next level and embed the optimisation of energy usage and uptake of renewable energy within the City's organisational culture.

Tahe Sustainability and Energy Working Group, comprised of Councillors and City staff played a key role in guiding the development of the City's Energy Strategy. The focus has been on developing a greater understanding of energy issues and opportunities, and a greater capacity for the organisation to achieve ongoing savings in energy use, costs and greenhouse gas emissions, rather than the development of a document per se. Significant effort was put towards bringing operational staff, Senior Management and Council along the journey of developing the Energy Strategy and achieve greater buy-in and commitment.

1.2 Past and current energy efficiency and renewable energy initiatives

The City of Busselton has been acting on climate change for a decade now with the preparation of the City's Energy Action Plan (EAP) 2010-2014, updated for 2014-2019. These focused on reducing the City's energy use and carbon emissions and included guidance for reducing community emissions.

Many energy efficiency and renewable energy projects have been delivered over the last ten years that have resulted in significant energy use and carbon emissions reduction. It is not possible to quantify total energy and financial savings achieved over the years, due to the lack of an integrated monitoring and reporting system and the rapid population growth (with associated additional facilities, infrastructures and services) seen in the City. However, the benefits have been many and wide-ranging. This Energy Strategy builds on previous achievements and lessons learnt over that time. For a full list of actions implemented under the two Energy Action Plans, 2010-2014 and 2014-2019, refer to Appendix 2 Review of Energy Action Plans.

Key initiative implemented through the EAPs were:

- annual monitoring and reporting of the City's energy use, cost and carbon emissions;
- completion of energy audits for the City 5 largest facilities and implementation of a wide range of recommendations to improve energy efficiency;
- set up of the City's Green Taskforce to oversee a whole of organisation staff behaviour change program;
- installation of a geothermal system at the Geographe Leisure Centre (GLC);
- purchase of a bike fleet for use by City staff;
- installation of solar hot water systems at the Kookaburra Caravan Park and Winderlup Court units (Aged person homes).
- upgrade of all GLC lighting to LED;
- installation of more energy efficient public lighting, including LED, solar and wind powered;
- provision of teleconferencing capabilities to reduce car-based travel for meetings; and
- installation of 100kW solar system on the new Administration Building.

While good progress was made, not all recommended initiatives were implemented. This reflects the constantly changing nature of energy management and barriers in achieving organisational change.

1.3 Energy Strategy scope and focus areas

The scope of the Energy Strategy is restricted to the City's operations and services and divided into the following four streams:

Figure 1. Energy Strategy scope

The following ten focus areas, with associated strategic actions have been identified in the Energy Strategy:

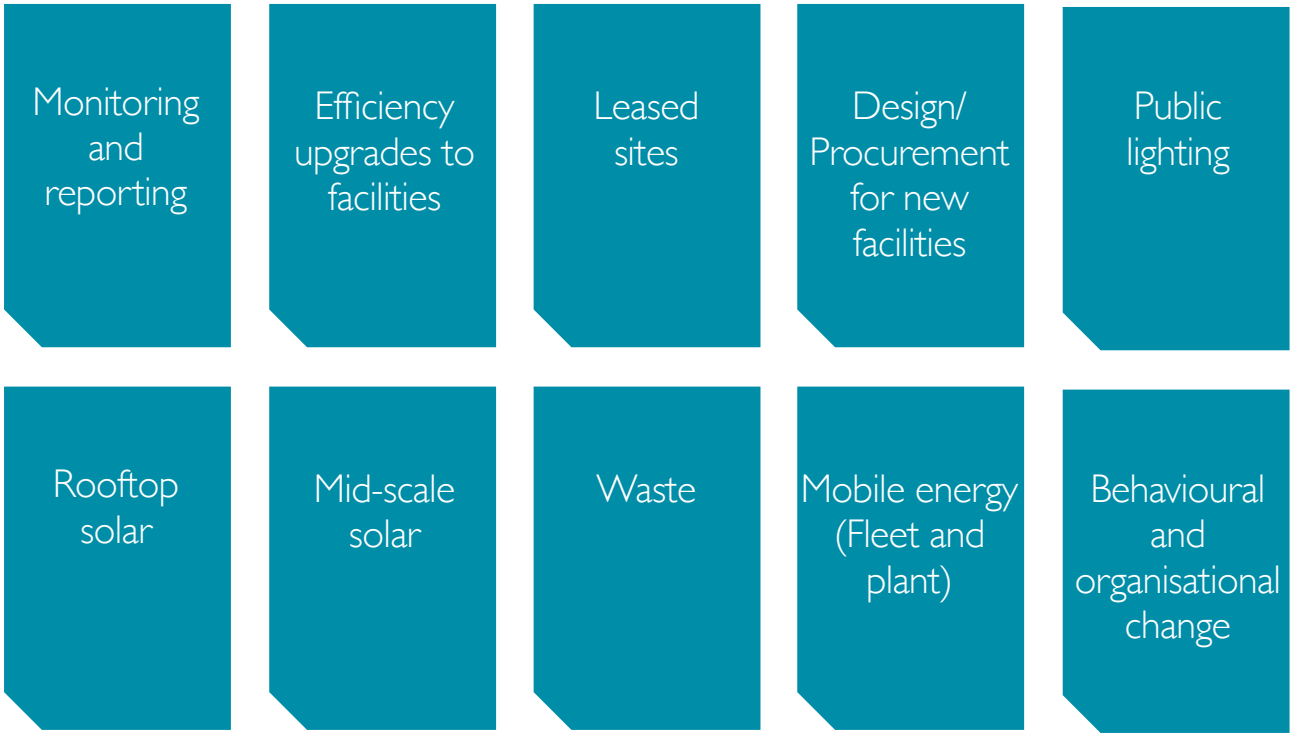


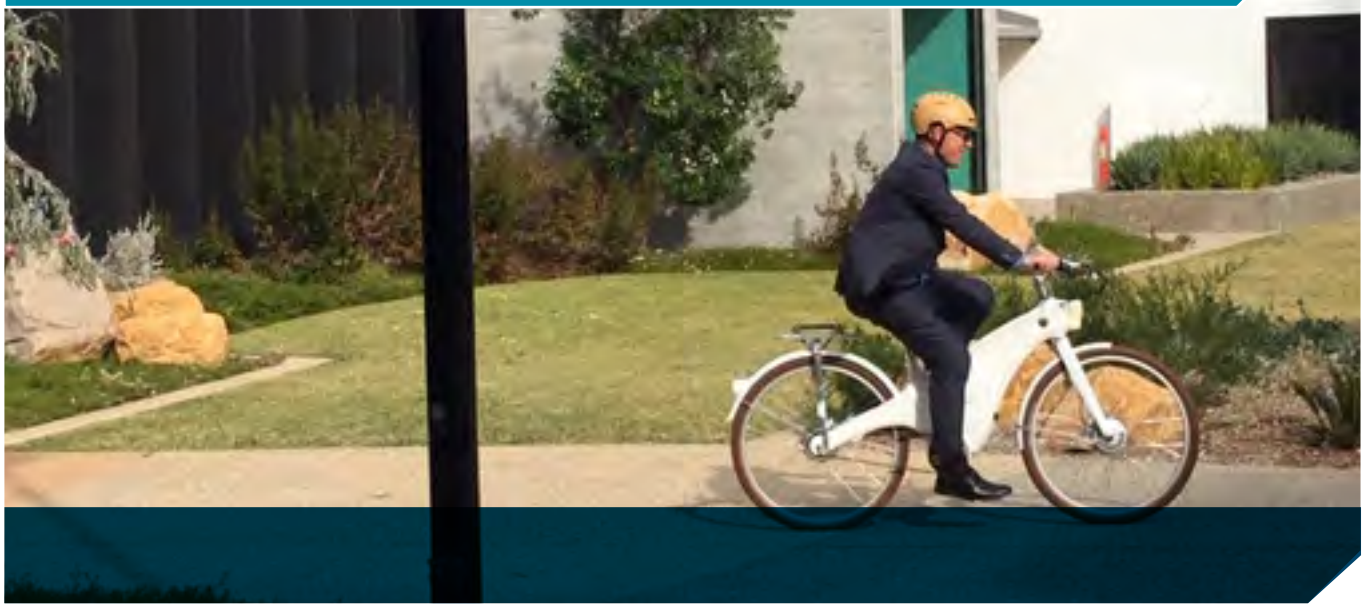
Figure 2 Energy Strategy focus areas

Energy management has become a very complex and dynamic space, with technologies and best practice rapidly changing. One of greatest challenges of this Energy Strategy will be to respond to this constant state of flux and embrace new opportunities as they arise.

1.4 Vision

The following (working) vision for the City's Energy Strategy was developed by the Sustainability and Energy Working Group (SEWG):

Minimise energy costs and greenhouse gas emissions, through using energy as efficiently as possible and optimising our approach to generation and use of renewable energy, and to maximise returns to ratepayers through becoming a net energy generator.



2.1 Electricity

2.1.1 Consumption Summary

Excluding public street lighting, the City of Busselton currently has 157 electricity accounts, with a total annual cost for the 2018-19 financial year of $846,169 for supply of 3,530,257kWh of electricity (table 1). Eighteen sites (with 37 accounts) consumed 85% of electricity used and incurred 78% of costs (Figure 3). These currently include 13 contestable site accounts, plus two additional sites that meet the threshold for contestable sites. The Geographe Leisure Centre (GLC) and the Administration building are the largest consuming facilities.

Electricity cost has been increasing since 2015-16. The higher costs in 2017-18 could be mainly attributed to new buildings including the Administration building ($77,469 increase), Milne Street Pavilion ($13,786 increase), and Youth and Community Activities Building (YCAB) ($12,274 increase). Cost was again higher in 2018-19 despite 3% lower consumption. The highest cost increase was streetlighting, which is unmetered and therefore not reflected in consumption.

There were significant cost decreases for the Administration Building (-$34,968; 36%) and the GLC (-$19,366; 11%) in 2018-19 compared to the previous year. For the Administration Building, this can be attributed to the installation of a 100kW solar PV system. The reason for cost reduction at the GLC is unclear.

[1] Contestable sites are metered sites with an annual supply greater than 50,000 kWh, as defined by the Electricity (Licencing) Regulations 1991 (Contestable Sites). Supply of these sites can be offered for tender to the WA Wholesale Electricity market. Sites under this threshold must be supplied by Synergy.

Table 1. Electricity use profile for the City of Busselton 2018-2019.

ASSET DESCRIPTION	ELECTRICITY USE (kWh)	ELECTRICITY COST	NUMBER OF ACCOUNTS
Single large assets:	**3,023,983**	**$655,162**	**36**
Geographe Leisure Centre*	979141	$164,250	1
Administration Building*	320271	$64,032	2
Busselton Jetty Tourist Park*	239676	$60,678	3
Busselton Library*	200311	$53,822	1
Busselton Regional Airport	182305	$42,410	2
Naturaliste Community Centre*	133467	$34,296	2
Barnard Park and Pavilion^	133467	$32,822	3
Busselton Depot*	112033	$27,632	2
Community Resource Centre*	102205	$25,623	2
YCAB & Skate Park (YCAB)^	98862	$25,739	1
Vasse Lakeview Entrance*	94307	$20,511	2
ArtGeo Complex*	85453	$20,116	2
Dunsborough Playing Fields*	82005	$18,695	3
Bovell Park*	63947	$10,393	1
Churchill Park	56426	$16,758	5
Interpretive Centre & Jetty lighting	49630	$13,299	2
Underwater Observatory	46080	$12,344	1
Railway House	44397	$11,742	1
Grouped & smaller assets	**506,274**	**$ 191,007**	**121**
Major POS/Reserves	143070	$44,856	16
City-owned street lights#	97894	$27,585	6
Community Buildings	63620	$18,778	10
Car parks, boat ramps, bridges	37748	$13,903	8
Bushfire sheds & pumps	29558	$16,719	18
Waste Facilities	28932	$8,231	2
POS, Reserves, Gardens	25994	$33,027	41
Toilets	22340	$11,141	10
Butter Factory	14714	$4,934	1
Barnard Park Tennis Club (new)	12412	$3,607	1
Animal Pound	11572	$3,400	1
Lou Weston Oval and Netball Pavilion	11081	$2,808	1
Cemeteries	4354	$2,780	3
Old Donga City	2985	$2,487	3
Sub-total City Assets	**3530257**	**$846,169**	**157**
Street Lighting	**(unmetered)**	**$850,703**	**2**
Total	**3530257**	**$ 1,696,872**	**159**

*Contestable sites. These are for single accounts with the exception of Busselton Jetty Tourist Park, for which all 3 accounts are contestable.

^Sites that meet the threshold for contestable sites but are not included in the current Energy Sales Agreement.

#Only includes accounts that have been identified as solely used for street lighting or whose proportion of electricity used for street lighting is known.

Figure 3. Proportional electricity consumption by the City of Busselton for 2018-19, excluding street lighting. Shows all single assets and asset groups with ≥1% consumption. Number of accounts included for each asset/group shown in brackets

City of Busselton Electricity Use Profile

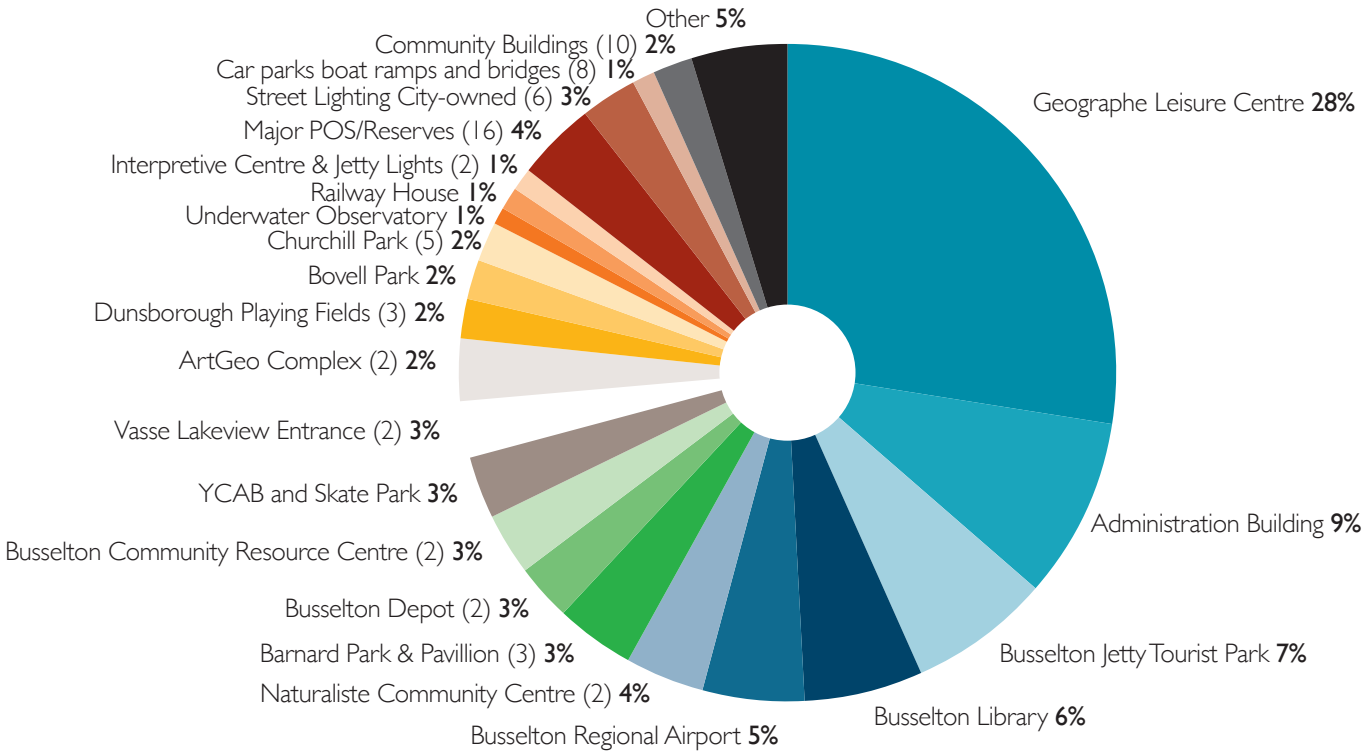
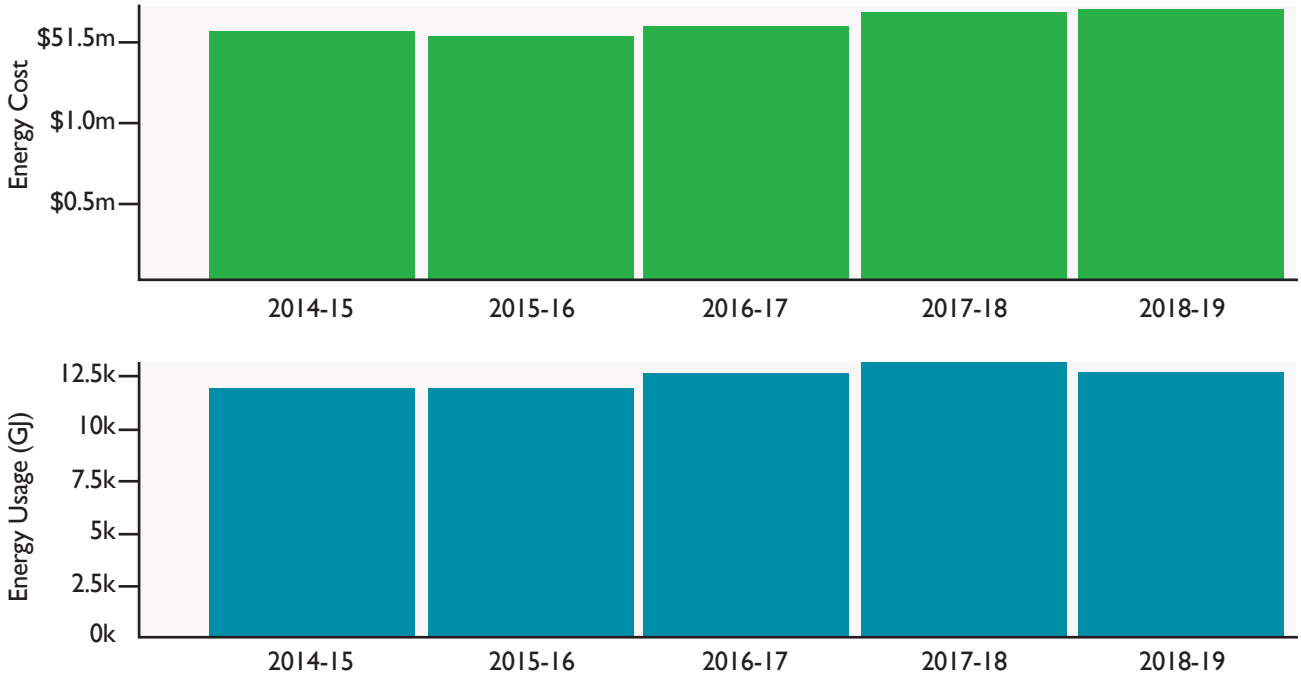


Figure 4. Energy use and cost for financial years 2014-2015 to 2018-19.



2.1.2 Street lighting

Western Power owned street lighting

Western Power street lighting costs a similar amount to the annual asset consumption ($850,703 in 2018-19), but this is an unmetered tariff with no consumption data available. Costs are based on the number and type of lights installed. The City currently has 4,897 streetlights (Mar 2019), comprising of Mercury Vapour (80W, 125W, 250W), High Pressure Sodium (70W, 150W, 250W), Metal Halide (70W, 150W, 250W), Compact Fluorescent Light (42W) and LED (22W). The City holds one main account for street lighting (Synergy account 620324270) and one minor account for 30 decorative lights at Keel Retreat, which contributes 0.2% of total cost (Synergy account) 506847610.

As noted, street lighting had the greatest cost increase in 2018-19, up 6% from $799,767 in 2017-18. Street lighting costs can be expected to continue to increase along with development in the City of Busselton.

City-owned street lighting

The City owns and maintains street lighting in the following areas:

- Dunsborough CBD, including Dunn Bay Road, Cyrillean Way, Hannay Lane, Seymour Boulevard, Naturaliste Terrace , Lions Park and Dugalup Brook reserve;
- NCC access road;
- Cape Naturaliste Road;
- Busselton CBD, including Queen street, Kent Street, Duchess Street, Prince Street and Marine Terrace (east of Queen Street);
- Busselton Foreshore including Foreshore Parade and Jetty Way; and
- Port Geographe, including Layman Road, Freycinet Drive and Keel Retreat.

For the purpose of accounting electricity use for City-owned street lighting, only those accounts that have been identified as solely used for street lighting or whose proportion of electricity used for street lighting is known have been included. These amounted to 86MWh and $25,696Table 1 (Table 2), which is equivalent in cost to 3% of Western Power owned lighting.

Table 2. Summary of City-owned street lighting (currently identified).

LOCATION	NMI	CONSUMPTION (kWh) 2018/19	COST 2018/19
Mitchell Park – 29 Prince St (67%)	8001019184	17,748	$7,186
Signal Park (50%)	8002304400	3,974	$1,871
Port Geographe	8001452577	20,709	$5,797
Dunsborough Town Centre	8001167156 8001157795 8002076474	43,511	$10,842
Total for known City-owned street lights		**85,942**	**$25,696**

Car parks, boat ramps and bridges have been identified by staff as primarily lighting assets, and these consumed 37748 kWh in 2018/19 at a cost of $13,903. It is not currently possible to account accurately for the electricity used for the remainder of City-owned street lighting as these meters are also used for park/security lighting and water pumping, which is likely to be significantly more.

2.1.3 Existing renewables

The City has 133.9kW of existing rooftop solar installations (Table 3). The earlier PV systems were small and mainly installed to demonstrate best practice and leadership in sustainability (as opposed to reducing electricity costs). Rooftop solar installations now make good financial sense with relatively short-term payback periods (2-5 years) and significant long-term cost savings.

Current rooftop solar installations produce an estimated 195,074 kWh of renewable electricity per year or the equivalent of 6% of the City's electricity use (excluding unmetered streetlighting). The City's solar electricity is currently estimated based on a general kWh/kW/annum assessment developed by the Clean Energy Council. This will vary depending on the panels' orientation, any shading, panel/inverter performance, weather etc.

Table 3. City of Busselton's current rooftop solar installations

FACILITIES	SYSTEM SIZE	INSTALLATION DATE
Geographe Leisure Centre	5 kW	2009
Naturaliste Community Centre	2.6 kW	2011
Community Resource Centre	3.5 kW	2012
YCAB	16 kW	2016
Milne Street Pavilion	6.8 kW	2017
Administration Building	100 kW	2018
Total	**133.9 kW**	**-**

2.2 Gas

Mains gas is used at the Barnard Park Pavilion, YCAB and the Busselton Visitor Centre (Railway House). Bottled gas is supplied to the Administration Building, GLC, Dunsborough Waste Facility, Busselton Jetty Tourist Park, Churchill Park, and the Meelup and Castle Rock barbeque areas. In total the City spent $21,443 and purchased 613,521 MJ of gas in 2018/19.

Table 4 City of Busselton gas consumption 2018/19

SITE	TYPE	CONSUMPTION	COST	DATA SOURCE
Railway House	Mains gas	45,091 MJ	$2,511	Azility
YCAB	Mains gas	11,355 MJ	$563	Azility
Barnard Park	Mains gas	0 MJ	$164	Azility
GLC	LPG bulk	18,060 litres 451,500 MJ*	$13,820	Kleenheat
Admin. Building	LPG bulk	0	$0	Kleenheat
Dunsborough Waste Facility	45kg VAP CYL	2 cylinders 4,410 MJ^	$200	Kleenheat
Busselton Jetty Tourist Park	45kg VAP CYL	16 cylinders 35,280 MJ^	$1,759	Kleenheat
	LPG bulk	1,577 litres 39,425 MJ^	$1,187	Kleenheat
Churchill Park	45kg VAP CYL	2 cylinders 4,410 MJ^	$236	Kleenheat
Meelup Beach BBQ area	45kg VAP CYL	7 cylinders 15,435 MJ^	$662	Kleenheat
Castle Rock BBQ area	45kg VAP CYL	3 cylinders 6,615 MJ^	$341	Kleenheat
Total	-	613,521MJ	$21,443	-

* Based on 1 L= 25 MJ ^ Based on one 45kg cylinder = 2,205 MJ

2.3 Fleet and Plant

A summary of fuel use and cost is provided in Table 5. In 2018-19, the City owned 117 light fleet vehicles, including 94 diesel and 23 petrol vehicles. These vehicles consumed 132,255 litres of diesel and 30,719 litres of unleaded fuel at a total cost of $236,884 (average $2,024 per vehicle). Light fleet accounts for 25% of the City's total fuel costs. The remainder of the City's fuel usage is predominantly diesel for trucks and major plant, with combined consumption of 494,441 litres at a cost of $714,816 in 2018-19. Lower-emissions diesel fuels included biodiesel and ultra-low-sulfur diesel accounted for a small fraction of diesel used (227L).

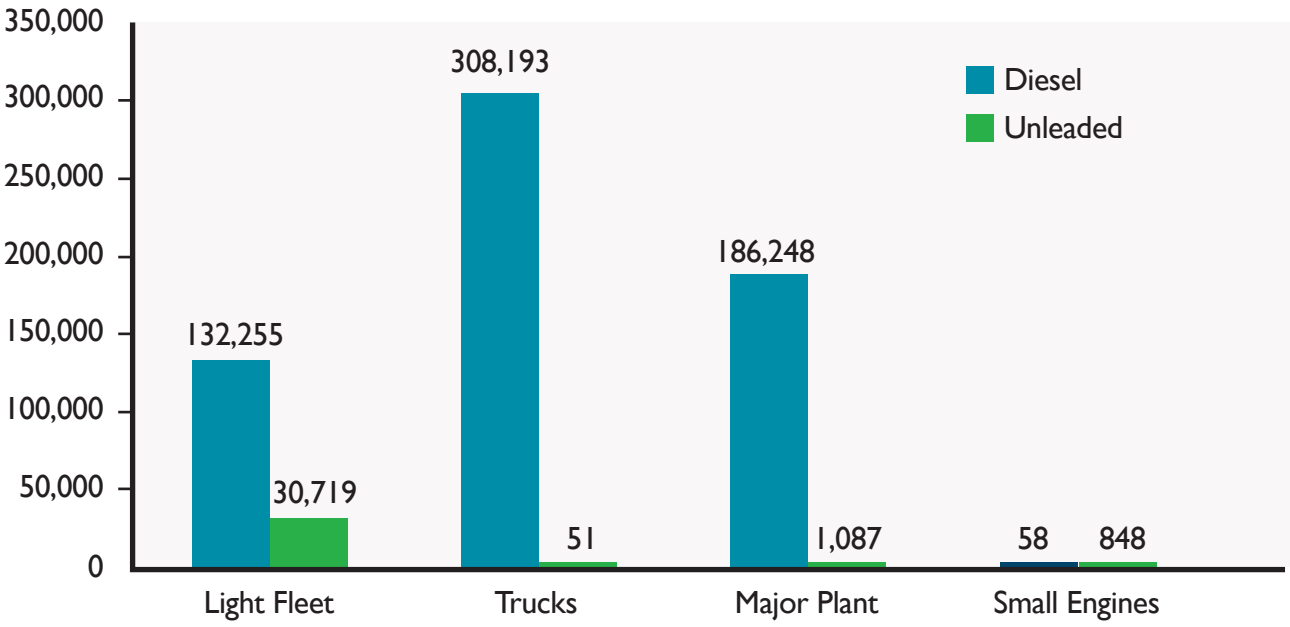
Fuel consumption and costs have been increased over the past three years, mainly owing to an increase in diesel consumption by major plant.

Table 5. City of Busselton's fuel consumption and cost summary 2016-2019

	2016-17*	2017-18	2018-19
Light Fleet			
Petrol			
Number of vehicles	15	20	23
Consumption (L)	28,179	30,512	30,719
Cost	$32,335	$42,577	$44,085
Diesel			
Number of vehicles	95	87	94
Consumption (L)	143,376	140,219	132,255
Cost	$161,459	$192,199	$192,799
Light fleet cost per vehicle	**$1,761**	**$2,194**	**$2,024**
Trucks			
Number of vehicles	Not available	49	50
Diesel (L)	342,533*	325,594	308,193
Petrol (L)	3,913*	0	51
Cost	$628,511*	$437,432	$442,638
Truck cost per vehicle	**-**	**$8,927**	**$8,853**
Major Plant			
Number of plant	Not available	36	39
Petrol (L)	*	893	1,087
Diesel (L)	*	142,304	186,248
Cost	*	$195,054	$272,178
Small Engines			
Number of small engines	Not available	10	8
Petrol (L)	*	460	848
Diesel (L)	*	102	58
Cost	*	804	1,254
Total Petrol (L)	**32,092**	**31,865**	**32,705**
Total Diesel (L)	**485,909**	**608,219**	**626,754**
Total Cost	**$822,305**	**$868,066**	**$952,954**

*Includes fuel consumption and cost for trucks, major plants and small engines in 2016/17.

Figure 5. City of Busselton 2018/19 Fuel use (litres)



3.1 Energy Action Plan Targets

The City has previously set staggered greenhouse gas emission reduction targets as: 50% per capita reduction by 2015 and a 70% per capita reduction by 2020 in corporate emissions on 2006/07 levels. (EAP 2014-2019).

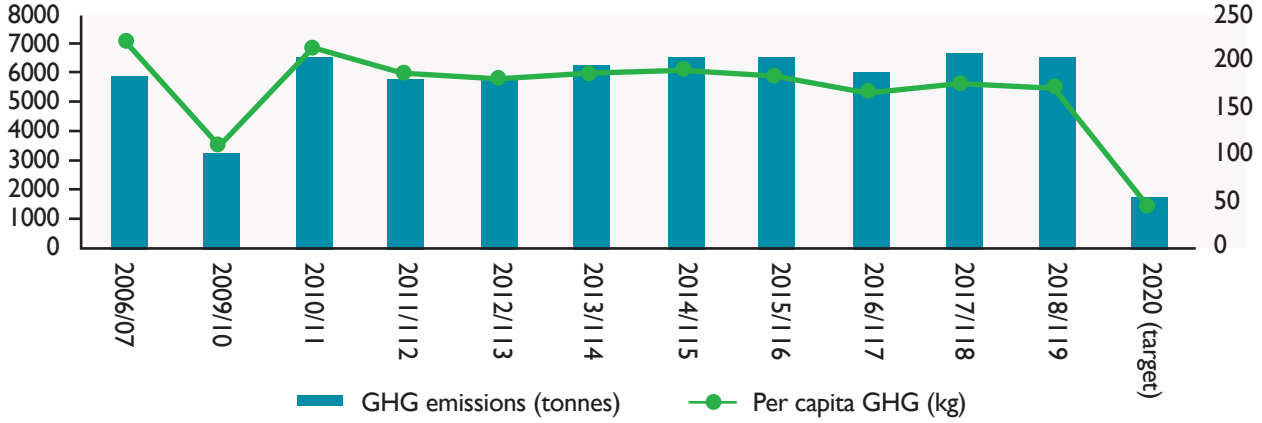
As part of the now defunct Cities for Climate Protection Program (CCP™), corporate greenhouse gas emissions were calculated using electricity, gas and fuel bills of all City's assets during the financial year 2006/07. This was considered the baseline. Energy use, costs and carbon emissions were reported to Council from 2009/10 until 2015/16, when it was decided to review the energy inventory reporting process as part of the preparation of the Energy Strategy. Corporate waste emissions from the disposal of Council-owned building waste to landfill were estimated in the absence of a detailed waste audit. (Figure 6).

The significant reduction in emissions in 2009/10 was mainly due to the purchase of accredited GreenPower, which was subsequently discontinued following Council's decision to invest in energy efficiency improvements instead.

2017/18 and 2018/19 GHG emissions were calculated used the Azility energy management software (emissions module). Emissions associated with Western Power owned street lighting were extrapolated from 2016/17 figures until they are included in the Azility online reporting platform. Reporting of waste related emissions also warrants further work to increase its accuracy. Consideration will need to be given as to the scope as to which waste related emissions are included in future energy inventories.

2018/19 per capita emissions were estimated to be 22.3% lower than the 2006/07 baseline. While this represents a good reduction in emissions, it still falls short of the previous targets.

Figure 6. Figure 6 City of Busselton per capita corporate greenhouse gas emissions 2006/07 to 2018/19.



3.2 Energy Strategy Targets

Most jurisdictions at all levels of government have committed to substantially reducing their emissions and sourcing their own energy needs from renewables through the adoption of renewable energy and/or carbon emissions reduction targets. These have proven to provide impetus for increased action and allowed for monitoring progress when driving sustainability outcomes (Figure 8).

The following targets were developed by the Sustainability and Energy Working Group (SEWG):

3.2.1 To generate 100% of the City of Busselton electricity needs from renewable sources by 2030.

The global standard for leadership in climate change action is 100% renewable energy. The City through taking a 100% renewable energy pledge aims to become a leader in climate change mitigation. While there is no official definition of what a 100% renewable energy target means, it is usually interpreted as when the amount of renewable energy produced is equal to or more than what is consumed. The City would still be connected to the electricity grid as the intent is not to match current energy consumption with real time renewable energy supply, but using a concept called 'net use accounting' to balance yearly consumption by an equal amount of renewable energy generation (Albert B., 2017). The proposed target however specify that the renewable energy needs to be generated on site (i.e. within the City of Busselton).

As per the City's Energy Strategy Vision, this goal will be achieved through reducing energy use, improving energy efficiency and increasing the uptake of renewable energy, in particular solar energy. The proposed project to build a mid-scale solar plant on the Rendezvous Road site which would cater to all and more of the City's operational electricity needs is key to meeting this target (section Mid-scale solar). Should this project not go ahead, the City may need to review the wording of its renewable energy target to allow the purchase of renewable energy produced off site through government accredited GreenPower, LGCs or Power Purchase Agreements (PPAs).

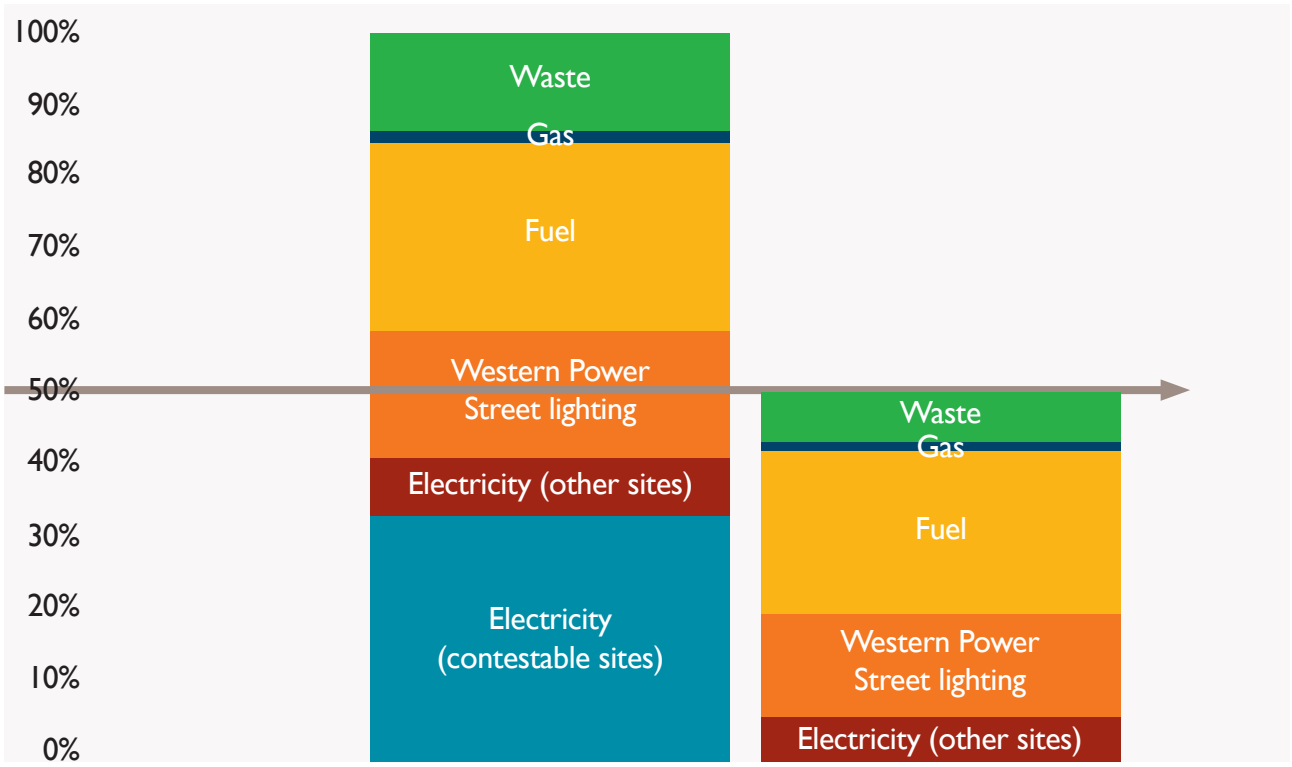
3.2.2 To reduce City of Busselton corporate carbon emissions per capita to 50% on 2017/18 levels by 2030.

The City also has the desire to reduce its operational carbon emissions to achieve environmental outcomes and mitigate the impacts of climate change. A carbon emission reduction target also captures any progress made in other energy-related emissions such as transport fuels from fleet and plant and from waste deposited in landfill. The target only relates to carbon emissions from the City's operations and activities.

Previous energy inventories have estimated electricity related emissions for all contestable sites to be approximately 33% of all City's carbon emissions. A switch to 100% renewable electricity with the proposed construction of a mid-scale solar farm (in addition to further energy efficiency upgrades and increased rooftop solar uptake) should bring the City's electricity related emissions of contestable sites to zero. We can also expect reductions in non-contestable sites (approximately 8% of City's emissions) through energy efficiency upgrades and increased rooftop solar uptake. Overtime the Western Power owned street lighting portfolio which represents approximately 17.5% of the City's emissions will also become more energy efficient with the progressive installation of LEDs.

Fleet related emissions have been estimated to be approximately 27% of all City's emissions and we can expect some improvements over the next 10 years with the uptake of Electric Vehicles and alternative fuels for heavy plant. The increasing recycling trend and removing organics from the waste stream will also drive down waste-related emissions which have been estimated to be approximately 14% of City's emissions (from City's facilities only) (refer to Figure 7). These improvements coupled with any reductions in emissions intensity of electricity production (driven by the Federal Government carbon emissions and renewable energy targets) should allow the City to achieve a 50% per capita emissions reduction by 2030. The proposed City's target is also in line with the Federal Government current climate change target of 26-28% emissions reduction on 2005 levels by 2030, which represents a 50-52% reduction in emissions per capita between 2005 and 2030.

Figure 7. Achieving a 50% carbon emissions reduction target



While more and more governments are moving to zero net emissions targets, including the WA Government, the City still has an ongoing reliance on fossil fuels for fleet and plant, limited control on street lighting and significant emissions from legacy waste disposal. The suitability of a zero net emission target will need to be reviewed and may be suitable for the next phase of the Strategy. The target may also need to be reviewed if significant sections of the City's operations are contracted out which would result in some carbon emissions becoming scope 3.

3.2.3 Develop efficiency targets for fleet and plant by 2025.

It is still considered too premature to set specific targets for the Fleet and Plant sector. This will need to be reviewed once we have a more thorough understanding of feasible options and as new technologies continue to emerge. A possible fleet reduction target could be an emissions intensity target or the uptake of electric vehicles over time. In the meantime any reductions in fleet energy use will be reflected in the overall carbon emissions reduction target.

STRATEGIC ACTION 1

Continue subscription to Azility Carbon Emissions Reporting module (or equivalent) to allow tracking of progress towards the carbon emissions reduction target.

Figure 8. Ambitious climate change commitments by Australia's states and local governments, 100% Renewables Ltd.'s blog (October 2019)

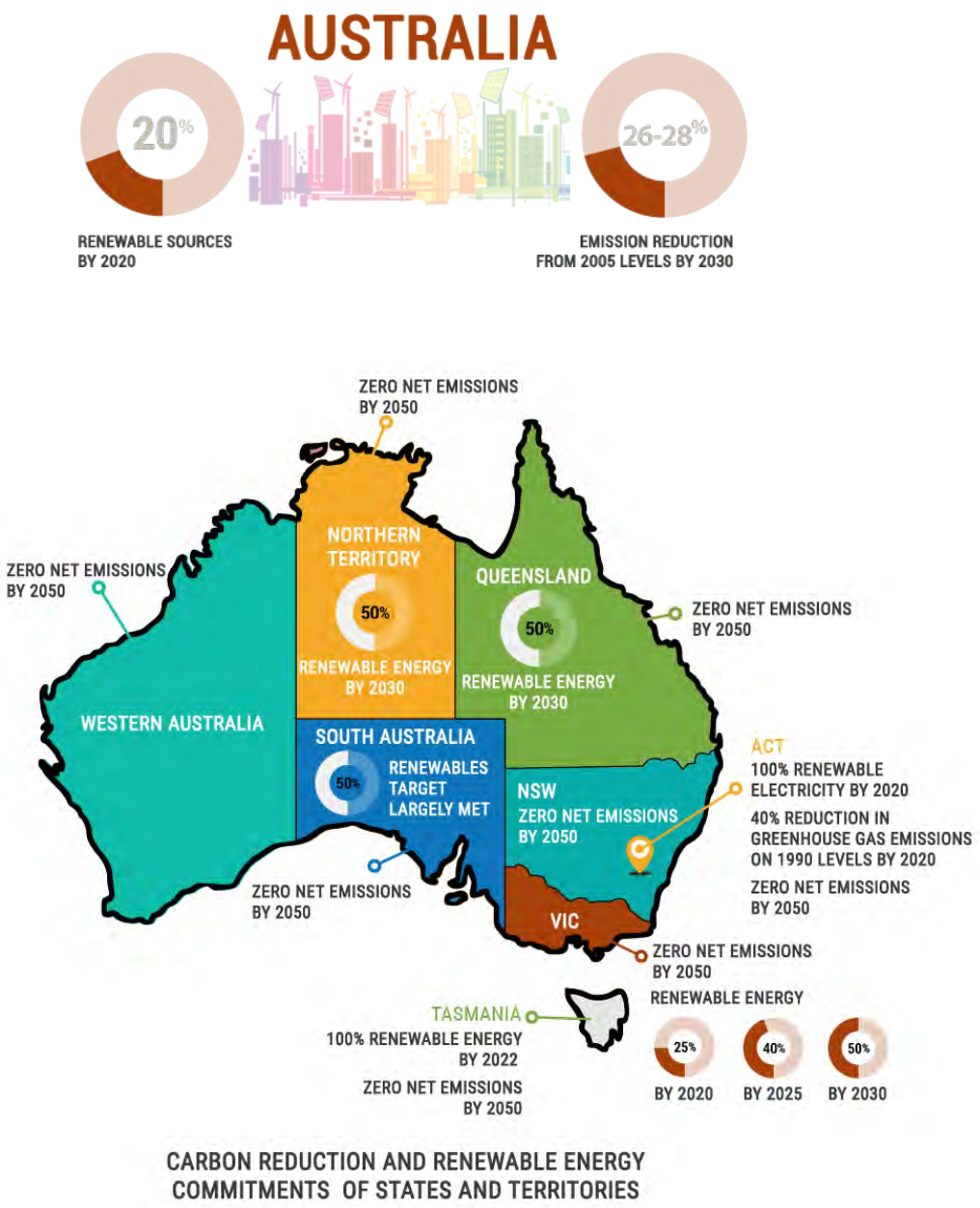


Table 6 Examples of targets set by other LGAs across Australia

STATE	LGA	TARGET
Western Australia	City of Perth	• Reduce emissions by 20% by 2020 • 32% reduction in citywide emissions by 2031.
	City of Fremantle	• 100% renewable energy by 2025 • Carbon neutral since 2009 • Zero carbon for LGA by 2025
	City of Mandurah	• Carbon neutral by 2020
	City of Bayswater	• Corporate renewable energy target of 100% by 2030. • Corporate GHG emissions reduction target of 100% by 2040
Victoria	City of Melbourne	• 100% renewable energy from 2019 • Carbon neutral from 2012 • Net zero emissions for the LGA by 2050
	City of Port Phillip	• Zero net emissions by 2020
	City of Greater Bendigo	• 100% renewable energy by 2036
	City of Moreland	• 100% renewable energy y 2019 • Carbon neutral for operations since 2012 • Zero carbon emissions by 2040
New South Wales	City of Sydney	• 100% renewable energy for Council operations by 2021 • Carbon neutral from 2008
	City of Willoughby	• By 2028 emit 50% less GHG emissions from operations compared with 2008/09 • Achieve net zero emissions by 2050
	City of Lismore	• Self-generate all electricity from renewable sources by 2023
	Shire of Eurobodalla	• 100% renewable energy by 2030
Queensland	City of Brisbane	• Carbon neutral since 2017
	City of Gold Coast	• Carbon neutral by 2020
	Shire of Noosa	• Net zero emissions by 2026
	City of Sunshine Coast	• Net zero emissions by 2041

Information extracted from 100% Renewables Ltd.'s blog (October 2019). For a more comprehensive list of targets set by LGAs across Australia, refer to https://100percentrenewables.com.au/ambitious-commitments-local-governments-2019/

Delivering Energy Savings

The City will work towards its vision and energy targets through reduced energy use, improved energy efficiency, energy production, behavioural changes and improved monitoring and reporting. Potential projects are grouped into the following categories:

- Monitoring and reporting
- Efficiency upgrades to facilities
- Leased sites
- Design/ Procurement for new facilities
- Public lighting
- Rooftop solar
- Mid-scale solar
- Waste
- Mobile energy (Fleet and plant)
- Behavioural and organisational change

Given that the City does not have an objective to become carbon neutral at this time, it is not recommended for the City to invest in voluntary carbon offsets, whether through purchasing accredited GreenPower, Renewable Energy Certificates (RECs) or green power via a PPA.

4.1 Monitoring and Reporting

OBJECTIVE

To implement an integrated monitoring and reporting system, which fosters collaboration and accountability and is fit-for-purpose

4.1.1 Energy use and cost monitoring and reporting

"You can't manage what you can't measure".

While the City has a desire to improve its energy efficiency and achieve the optimal level of ongoing significant energy savings it currently also lacks the ongoing measurement and monitoring system required to achieve the optimal outcome (Yeoman, 2018).

The City will monitor and report on energy use and cost from all energy intensive activities and assets, including all City's facilities such as libraries, leisure centres, work depots, administration buildings and community halls; public lighting including street lighting, sports lighting and park lighting; water pumping for irrigation; and fleet and plant such as light vehicles, rubbish trucks, loaders and small machinery and equipment.

Monitoring and reporting energy use and cost has the following benefits:

- quantifying savings from sustainability projects;
- identifying priorities for investment;
- detecting performance anomalies; and
- building Senior Management and Elected Members' support for energy initiatives.

The purpose of monitoring and reporting energy use and cost can be broken down into the following three streams:

- operational management: to reduce energy use and costs of City's facilities;
- communication and community engagement: to build support and engage with Councillors, City staff and the community on energy management; and
- revolving Energy Fund: to track energy savings of projects to management financial funds used to finance sustainability projects (section Revolving Energy Fund).

The City used to annually report to the Council on energy use, costs and greenhouse gas emissions using a process developed in-house.
The City recently subscribed to the Azility (ex-Planet Footprint) online reporting platform with a view to streamlining the monitoring and reporting process. This will be used to report to Council and Senior Management on energy use and costs (and carbon emissions as per the target).

However it is important this information is also regularly made available to facility managers so that they can manage energy use at the facility level. Facility managers also need to be made aware of anomalies in energy use in a timely fashion to give them the opportunity to investigate and rectify the issue(s).

STRATEGIC ACTION 2

Report to Council (annually) and Senior Management (quarterly) on energy use and costs.

STRATEGIC ACTION 3

Send weekly facility-based energy benchmarking reports and set up usage anomalies alerts for relevant facility managers (as per table below).

Table 7 Energy use benchmarking reports for facilities

FACILITIES	OFFICER
Geographe Leisure Centre	Recreation Facilities Coordinator
Naturaliste Community Centre	Recreation Facilities Coordinator
Library	Library Services Coordinator
Depot	Manager Operations Services
Administration Building	Facilities Maintenance Coordinator
Airport	Airport Operations Coordinator
Foreshore	Foreshores Supervisor

The current billing cycle means that information on electricity usage is provided retrospectively, on a monthly or quarterly basis and per meter. There is usually one meter per facility but sometimes one meter caters for several assets. This lack of detailed information significantly impacts on facilities managers' capacity and accountability to proactively manage energy use at various facilities. The use of sub-metering and smart meters which record real time data provides much finer detail which would allow better analysis and management of energy use.

Building Management Systems (BMS), which are computer-based control systems installed in buildings that control and monitor the building's mechanical and electrical equipment may be appropriate for the City's largest and more complex facilities.

This is an important tool in measuring and identification of areas to improve building energy efficiency. This matched with building occupant training can have a significant impact on the success of energy efficiency measures.

When recommending more intensive energy monitoring, there is a need to be mindful of the expected objectives and resources required. The following facilities have been earmarked as benefiting from more intensive energy monitoring:

Table 8 List of facilities and monitoring equipment recommended

FACILITIES	MONITORING EQUIPMENT RECOMMENDED
Geographe Leisure Centre	BMS (or other logging system), sub-metering, data-logging
Administration Building	BMS (or other logging system), sub-metering, data-logging
Naturaliste Community Centre	Sub-metering
Busselton Library	Sub-metering

STRATEGIC ACTION 4

Prepare an energy monitoring equipment strategy outlining priority recommendations for installing sub-metering, data-logging and BMS at key City's facilities.

4.1.2 Solar Monitoring and Reporting

PV solar arrays require real time monitoring to detect reduction in generation and fault and help identify whether and when additional generation capacity is warranted (Yeoman, 2018).

The most efficient way to monitor the performance of solar systems is through the installation of smart monitors which provide live reading of electricity used, produced or exported to the grid and financial savings. Smart monitors also allow the timely detection of faults or underperformance.

The Administration Building solar panels are currently the only system equipped with a smart monitor.
It is recommended all existing and new solar systems are equipped with smart monitors.

The monitoring systems should be linked to the City's online Energy platform Azility to allow for whole of energy portfolio monitoring and reporting.

A City staff should be allocated responsibility to monitor and report monthly on all PV generation as part of ongoing regular energy monitoring and management.

STRATEGIC ACTION 5

Install smart monitors on all PV systems, both existing and new.

4.1.3 Community Reporting and Engagement

Relevant information from the City's energy monitoring system can be used to raise community's awareness on how to reduce energy use and increase the uptake of renewable energy. This may include presenting up-to-date and interactive information to the community (via the website or display screens located at key facilities) on the City's achievements with regards to energy use and generation.

STRATEGIC ACTION 6

Report to the community as opportunities arise on the City's energy use, solar energy generation and implementation of energy projects.

4.1.4 Projects Monitoring and Reporting

While most energy efficiency projects provide sufficient information to justify their implementation, it has proven difficult to assess success or otherwise of various projects and actual energy and financial savings. The lack of a detailed monitoring system (including sub-metering and BMS) prevents the monitoring and quantification of the effectiveness of implemented energy efficiency projects (Yeoman, 2018).

Projects monitoring and reporting occurs prior to the project being implemented to demonstrate that it provides best value for money and after the project has been implemented to demonstrate that it achieved what it was set out to do.

When considering implementation of energy projects, consideration should be given to total lifecycle costs and whole of business benefits. While up-front costs for more energy efficient options may be higher, lifetime operating costs, including operation and maintenance are often lower. There may also be a range of non-related financial benefits (i.e. reduced maintenance costs, improved performance).

Energy monitoring requirements need to be considered at the onset of a project to facilitate project-specific energy reporting. Consideration also needs to be given to any changes to facilities (new/added infrastructures or use/management change i.e. operating hours).

It is recommended a Project Business Case is prepared prior to energy projects being implemented. As a minimum the following information should be provided:

- implementation cost;
- date implemented;
- payback period. More sophisticated evaluation methods may be required for larger projects such as net present value (NPV), internal rate of return (IRR) and Levelised cost of electricity (LCOE) (Albert, 2018);
- estimated annual financial savings;
- annual GHG savings;
- other business benefits;
- energy monitoring requirements (if applicable); and

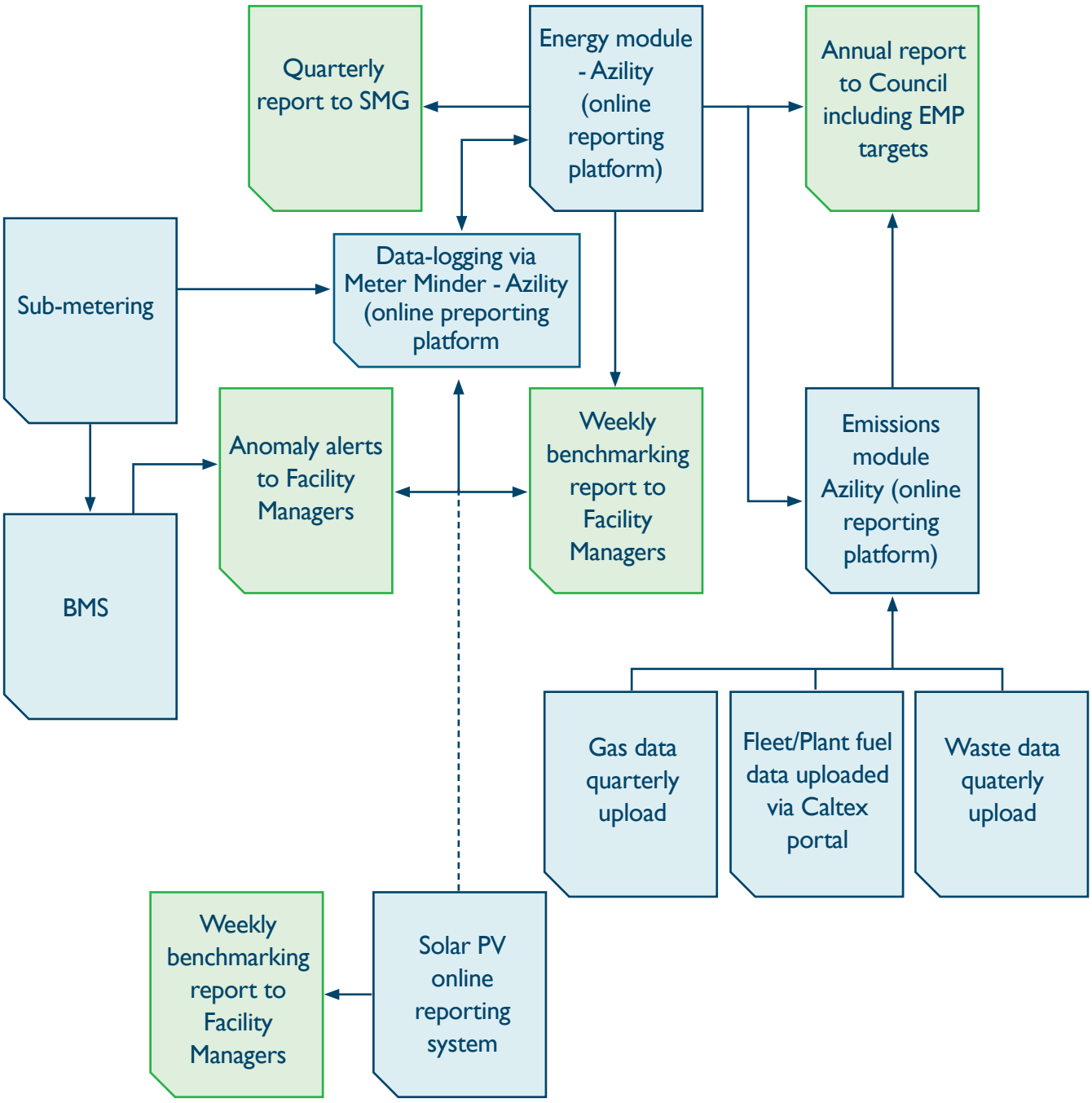
This will allow actual performance to be compared with business-as-usual performance.

STRATEGIC ACTION 7

Develop a Project Business Case template for energy projects.

Through the City's participation in the Cities Power Partnership, access is provided free of charge to the Projects module of the Azility platform to record and track savings from energy projects. All new energy projects implemented by the City should be uploaded onto the platform.

Figure 9. Integrated Energy Monitoring and Reporting System



Project Business CaseTemplate

4.1.5 Precinct auditing and analysis

Further to information provided for each project type, there has been an identified need for an audit and efficiency assessment in the following precinct areas:

- Busselton Foreshore area;
- Dunsborough Playing Fields; and
- Vasse Entry Statement.

This would:

- analyse energy use by various facilities;
- identify future energy uses and assess capacity;
- review adequacy of existing sub-metering;
- identify energy efficiency and renewable energy opportunities; and
- assess pump station use and opportunities for improving efficiency through SCADA or similar.

STRATEGIC ACTION 9

Undertake an audit and efficiency assessment of key precinct areas, including the Busselton Foreshore, Dunsborough Playing Fields and Vasse Lakeview Entrance.

4.1.6 Contractual improvements

Account review

A number of electricity and gas accounts have been identified as having no usage. If they are deemed not required, the City should request disconnection from the utility supplier and save on unnecessary account charges.

Strategic Action 9: Review accounts with no energy usage (electricity and gas) and disconnect if no longer required.

Tariffs analysis and management

The City is currently on on/off peak energy charges for contestable sites. Without reviewing interval data, available upon request by the electricity provider or through smart meters, we do not know whether it would be better to have anytime tariffs instead. We also cannot look at how we are optimising power use by running power during off peak periods as much as possible. Furthermore, we cannot readily assess rooftop PV outcomes without knowing daily use profiles.

STRATEGIC ACTION 10

Undertake a review of the City's electricity tariffs and implications for energy costs.

4.2 Monitoring and Reporting

OBJECTIVE

To progressively and proactively increase the energy efficiency performance of the City's facilities portfolio.

The focus of the Energy Action Plans has been on improving the energy efficiency of City's facilities. For a full list of energy efficiency upgrades implemented, refer to Appendix 2. Most of the recommendations for efficiency upgrades to City's facilities in this Energy Strategy are based on the Energy Opportunities Analysis and Prioritisation report (Yeoman, 2018). These potential projects can be broadly grouped as:

- Lighting upgrades (short & long term);
- Equipment upgrades (short & long term); and
- Voltage optimisation.

Major redevelopment or additions to existing City buildings, which will include a broader range of energy efficiency measures tailored to each project is addressed in the Design/procurement for new facilities section.

4.2.1 Lighting upgrades

LED are installed in many facilities, with the whole of the GLC having been converted and all new buildings featuring LED lighting including the Administration Building.

The replacement of faulty bulbs with LEDs in all remaining facilities should be standard practice as this usually has a payback period of between two and three years. The modern LED bulbs also have a much longer life, saving on maintenance costs. In some instances there will be a benefit in early replacement of existing lighting with LED (prior to them failing).

STRATEGIC ACTION 11

Replace all lights due for replacement with LED.

STRATEGIC ACTION 12

Review all existing lighting in City's facilities to identify opportunities for LED replacement.

STRATEGIC ACTION 13

Review and upgrade lighting to LED at the NCC, Busselton Library, Depot and Busselton Tourist Park.

4.2.2 Equipment Upgrades

Most of these recommendations will require more detailed feasibility studies before deciding whether to progress their implementation. For further detail and information on these recommended upgrades, refer to the Energy Opportunities Analysis and Prioritisation report (Yeoman, 2018).

Table 9 2018 Efficiency recommendations for key City facilities (Yeoman 2018)

FACILITIES	EFFICIENCY RECOMMENDATIONS
Geographe Leisure Centre	Reengineer air handling system
	Gas-boosted solar thermal pool heating and hot water system – feasibility study first
	Variable speed drives for filtration pumps - feasibility study first
	Long term installation of more efficient pumps, motors, filters
Naturaliste Community Centre	Level 3 audit and review of HVAC, prior to replacing old units with a better system
	Timer for bore pump
Library	Check double metering issue – appears that 2 meters read the same consumption
Depot	Replacement of old inefficient air-con units
Administration Building	Address HVAC design flaws (4 options)

STRATEGIC ACTION 14

Implement efficiency recommendations for key facilities from the Energy Opportunities Analysis and Prioritisation report (Yeoman, 2018).

When the City undertakes significant works to existing facilities, the viability of replacement of glazing and insulation with higher performing options will be considered in the context of overall building performance and potential energy savings. New buildings and facilities will include high performance glazing and insulation where this is demonstrated to have a direct benefit in lowering operational energy costs and achieve a viable payback period.

STRATEGIC ACTION 15

Investigate building improvement opportunities (e.g. glazing, insulation) that can be implemented as part of the City's annual asset maintenance and renewal program.

4.2.3 Voltage Optimisation and Power Factor

Often the supply voltage maintained by the network operator is higher than the optimum operating voltage required for most of the equipment in a building or facility, and there can be significant scope to reduce energy consumption by optimizing the voltage level. When incoming voltages exceed the required equipment voltages, energy gets wasted in the form of heat. This results in wasted costs and potentially reduces the lifespan of electrical appliances. In effect, 1% of voltage increase leads to 1% increase in energy consumption and 1.7% or more increase in reactive power consumption (depending on load types and power factor). Equipment manufacturers and implementation experience suggest that the technology can reduce electricity consumption and carbon emissions on average by 12-15%20 especially if they include power conditioning to reduce harmonics and power factor losses. Voltage optimisers not only reduce the energy consumption of the building but due to lower, more stable voltage reduce maintenance requirements and extend the life of the equipment (Yeoman, 2018).

Power logging at the GLC and at YCAB meter (Jetty Precinct) indicates very high grid supply voltage and thus potential for energy (and cost) savings through installation of voltage optimisers. For the GLC this would likely achieve savings of 15%. For other sites it is less clear. Equipment suppliers usually undertake business case/feasibility studies at no, or little charge on the understanding that they would be engaged to install the equipment if the business case is sufficiently good to warrant installation.

STRATEGIC ACTION 16

Strategic Action 16: Undertake supply voltage business cases for suitable City's facilities and implement voltage optimisers if installation is warranted.

The Power Factor (PF) reflects energy use efficiency in terms of conversion to useful output. A PF of 1 is perfect, and anything less reflects wasted electricity. Consumers can be charged power factor penalties if the power factor is too low. Low Power Factor has been recorded at the GLC. If the City can implement power factor correction (as part of installation of voltage optimisers) before the electricity supply tariffs are due for renewal or state they will implement this shortly thereafter, they could earn a cheaper electricity tariff.w

STRATEGIC ACTION 17

Investigate power factor correction (in parallel to voltage optimisation) to secure reduced electricity tariffs.

4.3 Leased Sites

OBJECTIVE

To facilitate cost-effective energy reduction and production at all of the City's leased sites.

The City has many leased sites with many different arrangements including:

- leases of whole building to single lessees – eg Dunsborough Football Club;
- leases of whole building to multiple tenants - eg CRC;
- leases of individual units within a complex - eg Winderlup Court;
- leases of land – eg Locke Estate and commercial leases;
- leases with shared facilities – eg Railway House, Butter Factory, Youth and Community Activities Building (YCAB); and
- short term licences and hire – eg Churchill Park Hall.

The City has a number of leased sites for which costs are recouped. This is calculated by manual readings of sub meters and, where there are multiple tenants, splitting costs on an area occupied basis. Arrangements for payment of electricity costs include accounts held by and paid for by tenants; and accounts held by the city with variable cost recovery from 0 to 100%. Railway House (owing to multiple tenants and PV owned by Busselton Jetty Inc.,) and YCAB have been identified as two leased facilities which would benefit from data-logging. The Butter Factory Museum is not sub-metered and user groups get charged a certain percentage of electricity use. Data logging on oval lights and sporting facilities such as Barnard Park and other buildings where lessee occupies only a very small part would be beneficial.

STRATEGIC ACTION 18

Undertake a review of leased sites to determine which would benefit from sub-metering and/or data-logging.

Leased sites are a special case because although opportunities for energy efficiency or renewable energy exist, the capital expenditure for this would not (all) be recouped over time through reduced energy charges, as savings would be made by the tenant (split incentive). This extends the pay-back period for investment, or in some cases there would be not payback for investment.

Solar leasing and solar PV Power Purchase Agreements (PPAs) may alleviate some of these issues and allow tenants to install PV systems and start reducing their energy costs and carbon emissions. Given the reduced payback periods for installing solar systems, down to 2-5 years depending on size of the system and electricity use patterns, there may even be a case for tenants to purchase solar systems up-front, in particular for longer-term tenants with greater energy use. Up to a dozen currently leased facilities may be suitable. The City may want to investigate how it can provide support, administratively and financially for this to occur, as it would achieve the triple objectives of reducing carbon emissions in the broader community, assisting community groups become more financially sustainable and potentially increasing the value of City's assets.

STRATEGIC ACTION 19

Investigate opportunities for installing solar PV systems at City's leased facilities, either through promoting solar leasing and solar PV PPAs or up-front purchase.

4.4 Design/Procurement for new facilities

OBJECTIVE

To aim for lowest life cycle costs when designing and procuring new facilities.

The following future new buildings are planned as per the City's Long Term Financial Plan (LTFP):

- Busselton Entertainment and Cultural Hub (BEACH): New building. Consider solar glass concept, which could align with funding from Australian Renewable Energy Agency (ARENA);
- Lou Weston Oval Pavilion: demolition and replacement;
- Yalyalup Oval Development: new building;
- Churchill Park: upgrade; and
- Busselton Depot redevelopment.

There are considerable opportunities, at much lower whole of life costs to implement high levels of energy efficiency and renewable energy when a building is at the design stage as opposed to retrofitting when funding allows. The same principles should apply to major redevelopments or additions to existing City's buildings, as well as establishing the status in lifecycle of these existing facilities and reviewing opportunities for renewal.

Consideration should be given to alternative financing mechanisms such as loan financing, equipment lease and Energy Performance Contracts (refer to section Other third-party financing arrangements) to increase the City's capacity to implement leading sustainability features at the design stage above and beyond its existing CAPEX budget.

Key to successfully integrating energy efficiency into development of new facilities is ensuring it forms a key part of design specifications from early in project development, and, somewhat more challenging, a capacity to increase upfront capital investment to achieve future operational savings.

The City is already integrating asset management with design of new facilities to better quantify benefits of higher upfront investment with mid to long term payback periods.

STRATEGIC ACTION 20

Prepare a Design For New Buildings Policy (or similar) which sets the standard for energy efficiency and renewable energy for all new City buildings and major upgrades and investigate options for increasing upfront capital investment to achieve future operational savings. Use the BEACH project as a test case.

4.5 Public lighting

OBJECTIVE

To pursue 100% LED public lighting, via new installations or retrofits and advocacy where there is no operational control of lighting assets.

Public lighting includes the following:

- Western Power owned street lighting;
- city owned street lighting;
- sports lighting, including sporting ovals, courts and skate parks; and
- parks and other public lighting such as car parks, boat ramps, public toilets, cemeteries.

They each present unique sets of challenges and opportunities and are being presented separately in the Energy Strategy. However some recommendations, in particular with regards to better understanding how energy is being used will apply to public lighting in general.

4.5.1 Street Lighting – Western Power owned

Street lighting accounts for 50% of the City's electricity costs, with unmetered charges based on types of installed lighting and hours of operation. Streetlight charges include both consumption and maintenance, and there is a level of subsidisation for maintenance in regional areas, including Busselton, although the extent of this is not known. Costs vary for different types of lights, but accounts list only total cost for each type and not the numbers of each type, preventing comparison of costs. Street lighting is the largest single electricity bill received by the City, and is a vital community asset, yet there is little control over its operation as the infrastructure is owned by Western Power.

Street lighting efficiency can be improved greatly by converting luminaires to LEDs and incorporating smart controls that allow lights to be dimmed. Switching to more energy efficient street lighting has the following benefits:

- economic benefits, including increased energy efficiency, decreased power bills, reduction in operation and maintenance costs. Total long term cost could be reduced by more than 50% (WALGA presentation 2018);
- environmental benefits including a reduction in energy use and carbon emissions, mercury pollution and light pollution (well-designed LED application can address light trespass, glare and skyglow); and
- safety benefits, including improved road and personal safety.

Current street light bulbs are mostly inefficient, with 57% being very old mercury vapor and very low LED deployment thus far. Western Power has only recently introduced a full range of LED luminaires to cater for all lighting requirement categories and now routinely changes all failed luminaires to LED. This will over time lead to a higher percentage of LED in the Western Power street lighting portfolio. Clearly more action than this is needed to achieve significant benefits in a reasonable time frame.

The high costs of street lighting and lack of management control this is a situation common to all local governments in WA, prompting many to investigate opportunities to improve efficiency and reduce costs. Barriers to increasing street lighting efficiency include non-contestability, lack of transparency and misalignment of objectives (i.e. greater income generated from less efficient, shorter life-span bulbs). WALGA is supporting local governments to address barriers and increase uptake of more efficient public lighting. This includes:

- advocacy for regulatory reforms such as contestability of street lighting services and improved transparency and benchmarking;
- increasing the range of available LED luminaires;
- investigating potential transfer of ownership;
- developing a business case assessment model for LED bulk replacement; and

- investigating funding opportunities (WALGA, 2017).

Over time it is hoped that State Government commitment to addressing climate change will also help to overcome barriers to reduce power consumption by street lighting.

Currently the only option for significant change currently available to the City is to fund a LED bulk replacement of Western Power owned street lights in high priority areas to accelerate the changeover. Western Power has recently created a lower LED tariff to cater for these types of projects. No other local governments have so far taken up this offer as the economics are not yet favourable. It is therefore not currently recommended as part of this Energy Strategy.

A small number of trials are currently underway in the metropolitan area for smart controllers, mainly looking at light trimming (I. Duncan WALGA, personal communication, 15 October 2019).

The Institute of Public Works Engineering Australia (IPWEA) has recently released a resource to assist local governments to develop a business case and guide decision making for changing to LED street lighting and smart controls (IPWEA, 2019). National Street Lighting and Smart Controls Programme (SLSC) aimed at accelerating deployment of LEDs and smart controls. It is recommended the City monitors development and implementation of smart controls to assess future potential application.

STRATEGIC ACTION 21
Maintain a watching brief for opportunities to reduce Western Power street lighting costs.

STRATEGIC ACTION 22
Investigate opportunities to reduce operating hours of street lighting (and use of smart and adaptive lighting) in selected areas to reduce energy use and cost.

4.5.2 City-owned street lighting

City-owned street lighting presents an opportunity for important energy and cost savings through conversion to efficient luminaires as the City has full operational control of the assets. Engineering and Works Services currently implements a program of replacement with more efficient LED globes. It is estimated 32% of the City owned luminaires (33% Busselton/28% Dunsborough) are currently LEDs, either through upgrades or new installation.

The following LED upgrades are planned for the 2019/20 financial year:

Table 10 LED upgrades of City owned street lighting (2019/20 FY)

TOWN	LOCATION
Dunsborough	Naturaliste Terrace (Central) Cyrillean Way Dunn Bay Road Hannay Lane Seymour Boulevard
Busselton	Keel Retreat Queen Street (Cultural Precinct)

Once implemented this will bring the total percentage of City owned luminaires to 59% LEDs (54% Busselton/71% Dunsborough).

STRATEGIC ACTION 23

Upgrade the following City owned street lighting to LED: Naturaliste Terrace, Cyrillean Way, Dunn Bay Road, Hannay Lane, Seymour Boulevard, Keel Retreat and Queen Street (Cultural Precinct).

It is recommended 100% of City owned street lighting is upgraded to LEDs as soon as possible.

STRATEGIC ACTION 24

Develop a program to upgrade the remainder of City owned street lighting to LED.

It is currently difficult to identify priority for upgrades and quantify and track cost savings as most meters measure the electricity use of several assets, including non-street lighting assets (i.e. park/security lighting, water pumping). It is also unclear which meters measure which assets. There are also incomplete records of the City's street lighting assets and their condition.

STRATEGIC ACTION 25

Complete a review of City-owned public lighting to identify all lighting infrastructure, associated meters, and opportunities for LED replacement.

4.5.3 Sports lighting

Lighting at sporting grounds and skate parks would use a considerably amount of electricity at these venues, but has not been quantified. Total electricity consumption by sporting facilities with a flood lighting component is very high (411MWh and almost $100k, Table 11), however the proportion attributable to these lights is not known. There is likely to be considerable potential for consumption and cost savings by using more efficient luminaires and managing lights more effectively. In some cases there may be justification for solar-battery systems.

Of these facilities, the YCAB, Barnard Park and Bovell Park were included in the energy opportunity assessment by Yeoman (2018). For YCAB, daily load profiles showed an obvious high level of consumption by the skate park and youth precinct flood lighting (Figure 10). The solar PV system results in almost no draw from the grid during the day, when there is little activity; but does not contribute to the energy requirement of the lights.

Barnard Park and Bovell Park also show load profiles which indicate evening consumption spikes associated with oval lights (Yeoman, 2018). They also show early morning spikes associated with irrigation. As for parks (see below), there may also be scope to reduce electricity consumption by pumps for these facilities.

Table 11 List of sporting venues

SPORTING VENUE	NMI	CONSUMPTION (KWH) 2018/19	COST 2018/19	NOTES
Dunsborough Playing Fields	80020935976	70,642	$14,756	Skate park and ovals
	80019654952	11,648	$3,550	
YCAB	80022592881	86,178	$21,755	Includes skate park
Barnard Park Pavilion and Lights	80018347400	73,514	$18,345	35% recoup for Pavilion
Barnard Park Central and Western	80010123982	39,448	$8,251	• Lights and Pump. • Events recoup.
Barnark Park Tennis Club	80023119554	10,252	$2,965	
Bovell Park	80010189579	63,070	$10,167	• Main oval paid for by Football Club • Ovals 2 and 3 paid for by the City
Churchill Park	80019553997	36,946	$9,633	Oval and buildings
	80021868225	7,430	$2,449	Western oval
	80021868192	1,335	$968	Eastern oval
Lou Weston Oval	80015647827	10,781	$2,899	
Total		411,244	$97,738	

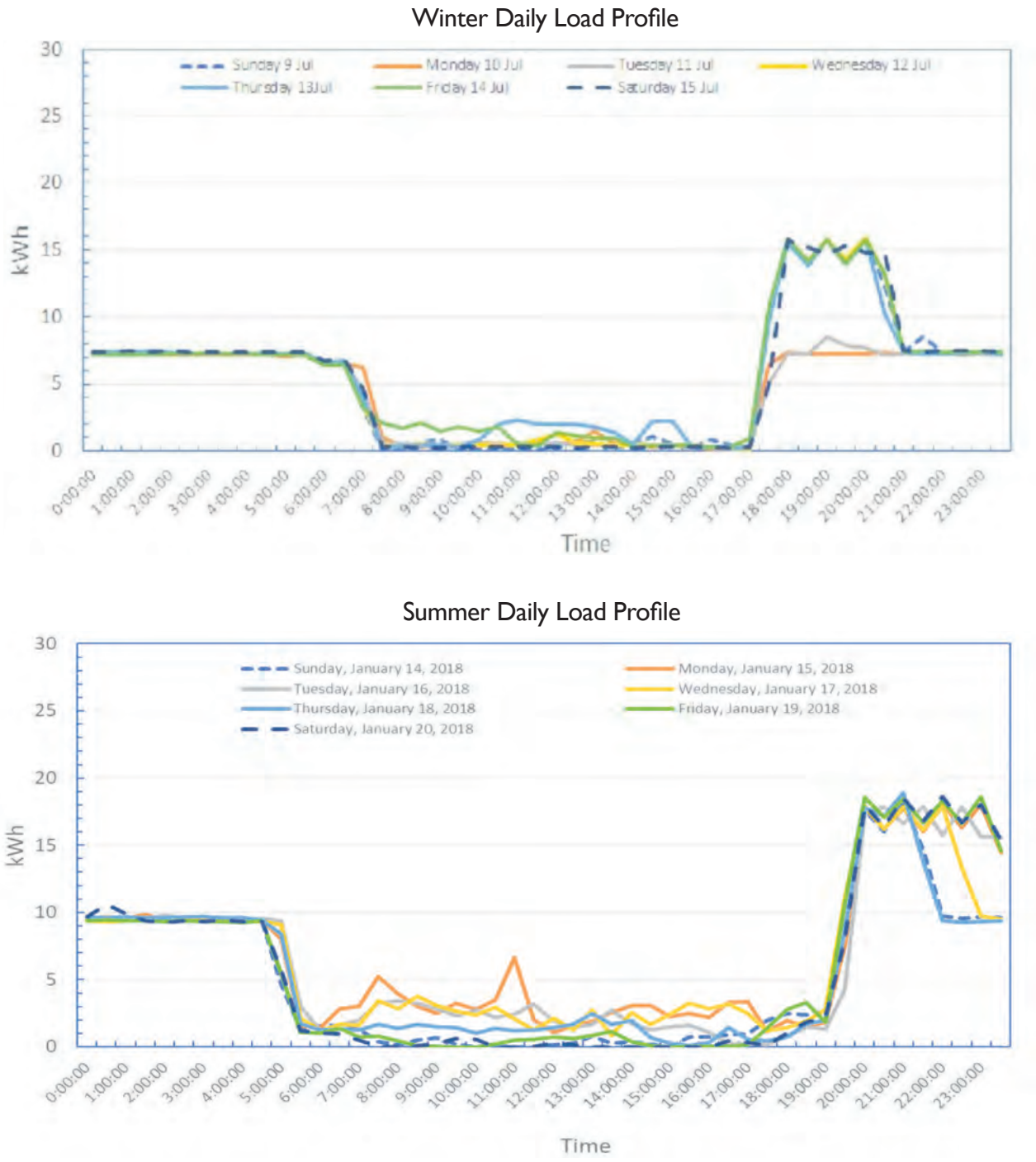


Figure 10. YCAB daily electricity load profile in winter (top) and summer (bottom).

STRATEGIC ACTION 26

Commission a condition assessment of all sports lighting and make recommendations for efficiency upgrades and use of smart lighting.

4.5.4 Parks and other public lighting

Public lighting is a significant component of many public assets, such as public open spaces, car parks, boat ramps, toilets, cemeteries, etc. A review of City-owned lighting assets is needed, to better understanding public lighting to inform better energy management for these assets. In many cases for reserves, the main power use is likely to be lights and pumps. To determine the opportunities for improved efficiency across public spaces, it is recommended that a prioritised assessment of lights and pumps is undertaken as a priority.

STRATEGIC ACTION 27
Develop Public Lighting specifications.

STRATEGIC ACTION 28
Commission an energy efficiency assessment of lights and pumps for key public open spaces.

4.6 Rooftop Solar

OBJECTIVE
To maximise rooftop solar systems on all City's facilities before the value of STCs significantly decreases.

For an outline of current rooftop PV systems, refer to 2.1.3 Existing renewables.

The following rooftop installations are planned for this financial year (Table 12).

Table 12 Recommended roof-top solar for priority installation

BUILDING	SYSTEM SIZE	ESTIMATED PAYBACK PERIOD	ESTIMATED COST	ESTIMATED FINANCIAL SAVINGS	YIELD FROM SOLAR ENERGY SYSTEM
Busselton Depot	28kW	2.3 yr	$20,196	$8,618.66 (ex GST)	42,731kWh
NCC	40kW	2.4 yr	$30,177	$12,550.93 (ex GST)	58,981kWh
Busselton Library	40kW	2.5 yr	$30,177	3$11,709.19 (ex GST)	57,759kWh
GLC	100kW	3.1 yr	$87,940	$27,750.68 (ex GST)	135,407kWh
Total	**208kW**	**2.8 yr**	**$168,490**	**$60,629.46**	**294,878kWh**

Delivering Energy Savings

It is recognised that the Busselton Depot and NCC may be redeveloped in the mid to long term future. However given the short payback period of these installations it is still recommended to implement rooftop solar for these facilities.

Systems below 100 kW attract Small Scale Technology Certificates (STCs), which under a federal government program introduced under the Renewable Energy Act 2000, reduces the cost of buying a solar system. The deeming period for solar PV systems is decreasing every year until zero STCs will be created for new solar systems in 2030. There is therefore an impetus to install proposed PV systems as early as possible to start capitalising on electricity savings and make the most use of STCs.

With proposed rooftop solar installations, the City will produce an estimated 391,864 kWh per annum of renewable energy or the equivalent 11% of the City's electricity use (excluding unmetered streetlighting and based on Clean Energy Council kWh/kW/annum estimates).

STRATEGIC ACTION 29
Implement all recommended rooftop solars in 2019/20.

Additional opportunities may arise for installing either new solar systems on other City's facilities or adding panels to existing systems as technologies and return on investment improve. These should be proactively identified and pursued where possible.

STRATEGIC ACTION 30

Pursue additional rooftop solar installations as opportunities arise.

Refer to the Solar Monitoring and Reporting section on page 27 for recommendations on the installation of smart monitors for PV systems.

Batteries

Solar batteries are currently too expensive for their financial return. This is expected to change within the next three years as the capital cost reduces and it is recommended that the City undertake a feasibility study at this time. A watching brief is recommended for installation of battery systems, with the YCAB a priority to address skate park lighting consumption.

Table 13 Recommended battery installation when the price reaches a suitable payback period (likely in 2020-2022) (Yeoman, 2018)

SITE	BATTERY KWH
Administration Building	300
Naturaliste Community Centre	100
Busselton Library	200
Geographe Leisure Centre	300
YCAB	100
Bovell Park	150
Underwater Observatory (leased)	200

STRATEGIC ACTION 31

Maintain a watching brief for installation of battery systems and undertake a feasibility study when they become financially viable.

4.7 Mid-scale solar

OBJECTIVE

To offset the City's energy use with renewable electricity generation, while achieving lower energy costs through the development of a mid-scale solar farm.

Implementing Rooftop solar (behind the meter) on as many City's facilities as practical is more economical than in-front of the meter renewable energy developments. This Energy Strategy therefore recommends to prioritise implementation of rooftop solar over the development of a mid-scale solar farm. However rooftop solar will ever only offset a set percentage of the City's energy use due to restrictions in roof structure, shading etc.

The City owns a parcel of land at 131 (portion of Lot 27) Rendezvous Road, Vasse. A portion of this land is currently used as a waste transfer station ("tip"), with the balance (approximately 17ha) considered suitable for development of solar infrastructure (Figure 11).

The Site is located in vicinity of a nearby Western Power transmission line with a capacity of 22kV. Western Power indicated that an application to:

- connect the proposed solar installation at the Site to the Western Power Infrastructure; and
- supply and sell up to 6.5MW electricity generated at the Site back to the grid.

would be favourably considered.

However this correspondence from Western Power does not guarantee approval of a future solar farm project at this site.

By developing a mid-scale solar farm, the City aims to achieve the following goals:

- obtain lower cost energy for the City;
- seek an alternative income source;
- gain some reputational benefits by implementing a 'green' source for its energy needs; and
- ensure internal renewables KPIs are satisfied.

Figure 11. Map of proposed solar farm site

The City recently issued an expression of interest (EOI) calling for interest in working with the City to build a 6.5 MW solar farm on part of the City-owned land at lot 27 Rendezvous Rd. In terms of the process, the Request for Expressions of Interest was an informal (non-statutory) EOI process (rather than an EOI run pursuant to the Local Government (Functions and General) Regulations 1996 that is aimed at making a preliminary selection from amongst prospective tenderers). Objectives of the EOI was to gain interest from the market and investigate concepts. Seven responses were received, which were thoroughly reviewed and included public presentations from a selected number of proponents. Capital costs for building a 6.5MWac solar farm ranged from $8-12 million plus GST.

In summary there are three commercial models that the City can use to develop this Project:

- the City can pay for the Project to be built and run (ie an EPC/O&M model); or
- the City can have an independent power producer build and operate the Project at its own cost, with a much lower capital contribution from the City (ie an IPP/development deed model). City will need to enter into a long-term offtake arrangement, which arrangement will likely involve either:
  - a long-term bilateral power purchase agreement with the Project owner who is also a registered Market Customer in the Wholesale Electricity Market (WEM); or
  - a sleeved power purchase agreement negotiated with the Project owner and the City's electricity retailer.
- The City can enter into a Limited Liability Partnership with one or more partners to build the solar farm. Benefits of this approach include receiving a share of profits without commercial risk beyond its subscribed equity and without raising compliance issues under the Local Government Act (Conway Highbury 2019).

Initial investigations focused on a 6.5MW solar farm, however future size may vary depending on the City's projected electricity load, chosen business model and if electricity offtakers can be confirmed. A 6.5MWac solar farm would generate in the order of 9,400-11,500 MWh of electricity. This is four to five times the estimated demand for the City's contestable sites.

Further analysis was conducted to determine the optimal size of a future solar farm, with reference to the City's contestable sites and taking into account potential future growth. The analysis also included two of Busselton Water's contestable sites, as Busselton Water expressed an interest in partnering with the City on this project. The recommendation was to construct a solar farm with an inverter size of 2.5MWac with photovoltaic solar panels totalling approximately 3MW (to be optimised as part of a design process) (EPC Technologies, 2019).

There may also be benefits in running a private line between the proposed solar farm and some large energy users such as the GLC. This would avoid the many regulatory constraints and costs of connecting to the electricity network.

The next stages for implementing the Busselton Solar Farm project have been identified as follow:

1. geotechnical investigation of the Rendezvous Road site;
2. basic design of proposed solar development; and
3. Western Power Project Initiation Phase.

The Harris Road vacant land, owned by the City of Busselton[2] was also investigated as an alternative site for installing solar panels on shade structures when the public car park was to be developed. However the cost of providing the shade structures was found to be prohibitive for a solar farm to be cost effective.

STRATEGIC ACTION 32

Progress investigations into developing a solar farm at Lot 27 Rendezvous Road.

[2] Lot 4, 5 and 10 Harris Rd and lot 6, 7, 181 and 181 Peel Tce, Busselton.

4.8 Waste

OBJECTIVE

To lower district-wide Greenhouse Gas Emissions overall by reducing the organic faction of waste being decomposed and exploring renewable energy generation as technologies become financially viable and sustainable.

4.8.1 Waste management and Resource Recovery

The City operates two waste facilities and manages approximately 30,000 tonnes of Municipal Solid Waste (MSW), from kerbside collections, Commercial and Industrial (C&I) waste, as well as domestic deliveries. Furthermore, the City manages approximately 10,000 tonnes of Greenwaste that has historically been incorporated in commercial composting systems located within the district.

The City's predominant waste disposal facility is the Vidler Road Putrescible Landfill (VRPL) site, where it owns and operates a Department of Environmental Regulation (DWER) licenced, Class II landfill that incorporates a liquid waste facility as well. With a facility lifespan in excess of 20 years, the newly built, lined cell is constructed to the Victorian Best Practice Environmental Management (BPEM) standards.

Additionally, Busselton's Rendezvous Road Transfer Station (RRTS), consisting of a recycling centre that operates as a community drop-off area for waste and recycling material, as well as a material transfer facility for the City's refuse trucks collecting MSW from the Busselton area. MSW and C&I waste deposited at the RRTS are loaded into triaxle, semi-trailers via a static compactor, for transport to the landfill site.

4.8.2 Landfill Gas Generation

Phasing out uncontrolled tip sites and upgrading other landfills to appropriately designed and operated facilities are the first necessary steps towards sustainable waste disposal practices. The City has transitioned towards better practice by closing the former tip site at Rendezvous Road in 2012, ceasing waste disposal into the unlined cell and constructed a lined, Victorian BPEM cell at the VRLF site in 2018. Next, operational practice improvements towards landfill gas (LFG) capture for potential energy recovery become the subsequent priority.

From the organisational perspective, one of the main sources of GHG emissions, aside from energy consumption, is LFG; a complex mix of Nitrous Oxide (N_20), Carbon Dioxide (CO_2) and approximately 50% Methane (CH4), produced from the aerobic and anaerobic degradation of MSW at the VRPL. CH_4, which has a comparative impact more than 25 times greater than CO_2 over a 100-year period, is the largest source, accounting for 1 – 2% of total GHG emissions.

If left uncollected, LFG not only contributes to atmospheric GHG, it may build up in pockets within the landfill, or migrate horizontally underground.

To minimise this lateral migration and gas escaping into the atmosphere, not only does the landfill have to be appropriately designed and lined, other infrastructure such as appropriately timed and spaced gas collection wells require installation, and operational practices have to be modified to align with CH_4 gas production and collection. Then, the collected LFG may be used a fuel source in combustion by flaring the methane and other non-methane organic constituents, or in gas turbines for the production of electricity. Using the methane generated by the decomposition of in-situ waste to produce energy is the best method of reducing GHG emissions. It also provides a more renewable alternative fuel source, in comparison to a fossil based one, such as diesel.

Although the foundation of any landfill gas generation project involves appropriate design and construction of the landfill infrastructure, a critical component in determining the project's actual viability is underpinned by the quantity and quality of LFG produced given the landfill's footprint, and if there

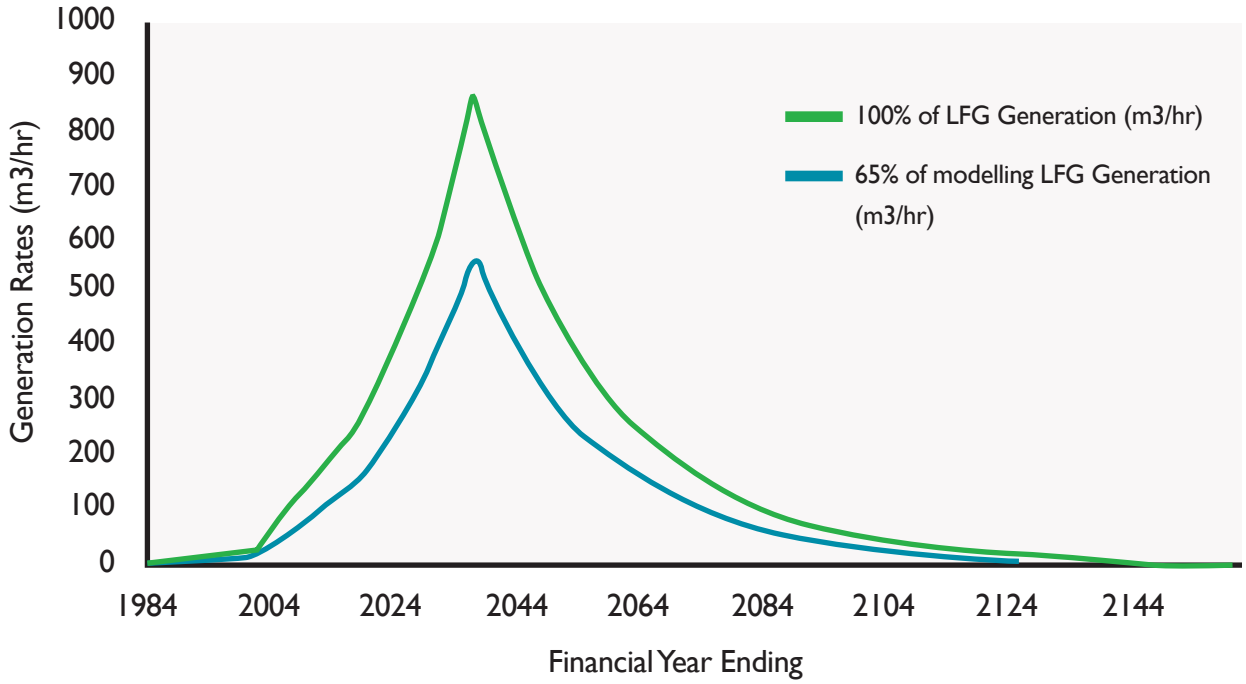
is a consumer for the energy produced, as it equates to potential revenue, project design requirements and capital and operating costs.

Other important factors to consider are cell configuration, in terms of landfilling operations to optimise generation and collection of LFG produced, related costs of capturing and pre-treating the landfill gas to make it suitable, and the commitments of the energy end-user.

In 2017, the City undertook a high level assessment of landfill generation profile for the VRPL. Consultants, GHD authored the report entitled "Dunsborough Waste Facility, Western Cape Drive, Naturaliste WA – High level feasibility assessment of electricity generation from landfill gas". The report modelled landfill gas generation and capture rate scenarios over the 20 year landfill site's lifetime and the consequent viability of different landfill gas powered electrical generation capabilities.

The LFG generation model developed for the site during the desktop study, indicated that between the year's 2035 and 2040, peak landfill gas generation rates of about 900 m3/hour were expected, as indicated in the figure below. However, the study concluded that there are significant uncertainties associated with the landfill gas generation and capture rates' potential, both on-site now, and into the future. While sufficient LFG may be collected from the site to support the operation of a 0.25 MW capacity engine on-site, the commercial uptake for a project of this small scale generation is unclear, and likely to be low (GHD, 2017).

Figure 12. Estimated Methane and Landfill Gas Generation Rates (m^3/hr)



The study further recommended a landfill gas pumping trial, to be undertaken for a 12 month period of to confirm actual volumes of landfill gas that may be collected from the site; to obtain data necessary to conduct a feasibility analysis for a landfill gas power generation project. At the time, the study recommended the trial commence in June 2018, to gain a reasonable understanding of LFG generated and obtainable.

When the City has sought quotes for such a trial, submissions in the order around $75,000 returned. Without a firm, beneficial energy user taking up the electricity produced, the decision was made to postpone the gas pumping trial until the years leading up to the peak generation periods.

The City may then reconvene conversations with service providers on installing landfill gas turbines onsite to utilise the LFG in electricity generation.

4.8.3 Waste to biofuel

Around 10% of the world's primary energy consumption comes from bioenergy. Currently, bioenergy resources consist of residues from forestry and agriculture, various organic waste streams and dedicated biomass production from pasture land, wood plantations and sugar cane. A chemical conversion process converts this stored energy derived from organic material such as plant matter and animal waste, into Biofuel, more specifically ethanol and biodiesel. There are two main types of biofuels currently in production in Australia, bioethanol and biodiesel.

Bioethanol is used in place of petroleum whilst biodiesel is used as a replacement for diesel, both entirely or blended (Australian Institute of Petroleum, 2017).

The figure below shows an existing biofuel facility in the Pilbara region of WA. It produces biodiesel and biodiesel/diesel blends from used cooking oil, collected from the region's mining camps and businesses, and is used for blast and drill operations, as well as in industrial, agricultural and chemical applications. Furthermore, the facility provides training opportunity for students and work experience, together and employment opportunities to individuals as well.

Figure 13. Existing biofuel facility in the Pilbara region of WA

The City previously engaged Green Values Australia (GVA) to undertake a preliminary assessment on the viability of constructing a Biofuels Facility to convert waste vegetable oil generated within the region, into biofuel. GVA's experience in developing biofuel systems particularly, uncovered two potential treatment options (or a mixture of both), that may be subject to a preliminary feasibility assessment, on the basis of reducing the City's reliance on hydrocarbon based fuel source for its Fleet, Plant and equipment.

Detailed analysis and viability trials would be required prior to switching across to this alternate fuel source, preserve the equipment manufacturer's warranty, and (or) to prevent premature engine failure. However, the study determined, based upon the 2017 data, that approximately 90,000 litres of waste is generated within the Busselton-Margaret River region per annum and a Biofuel production facility may even achieve a 3-plus year payback period, based on the following assumptions:

- 100% uptake of filtered waste vegetable oil for conversion into biofuels for use in power generation; and
- sole use of biofuels in landfill operations plant and equipment (e.g. compactor, loaders, etc.) and 5% biofuel blend with 95% diesel for light vehicles.

Consequently, the two options worth considering include: –

1. in-depth analysis into the viability of constructing a biofuel facility to treat and produce biofuel; and
2. treatment of vegetable oil to a quality consistent to operate power generators (Green values Australia, 2018).

4.8.4 Biological Waste Treatment for Energy Production

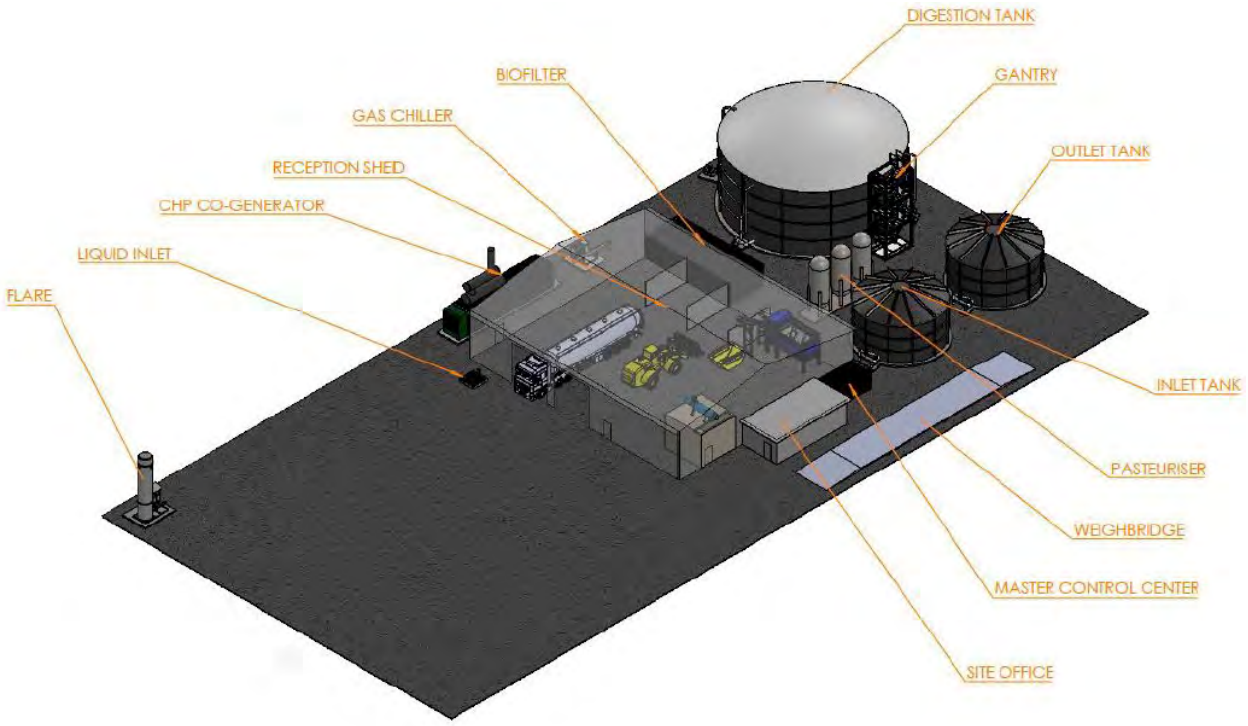
Biological Treatment, also known as Biochemical Conversion or Digestion; refers to the natural and simple process of breaking down organic waste into molecules by bacteriological action in the presence of Oxygen (Aerobic), or in the absence of Oxygen (Anaerobic). Generally, aerobic digestion produces compost, with the by-products of the decomposition being Carbon Dioxide (CO_2) and water vapour that is usually discharged to the atmosphere. Anaerobic digestion, in contrast, decomposes wet and green biomass to produce a mixed gas output of CH_4 and CO_2, known as "biogas", which can be used as a substitute for fossil fuels heating or to generate electricity.

Previously, the City obtained funding from the Waste Authority to undertake an extensive research project into identifying potential sources and quantities of organic waste material within the Busselton and Margaret River region, for use as feedstock in a Biological Waste Treatment facility. The study also undertook a preliminary concept design for such a facility, and a preliminary determination of its feasibility (EVA Environmental, 2018; Biogass Renewables Pty Ltd, 2019).

An initiative of the study, conducted in parallel to the feedstock analysis, was a trial to collect Food Organics and Garden Organics (FOGO) in Busselton. Done to ascertain the viability of recovering organic material from the Municipal Solid Waste (MSW) and C&I waste streams, the FOGO collection concept was to reduce the organic fraction found within these streams from entering and decomposing in the landfill to form CH_4. Consequently, Busselton pursued the recommendation and commenced the trial of collecting 700 FOGO specific bins in the residential locality of Provence, Yalyalup for the next few months.

The study has identified extensive opportunities for regional cooperation amongst the group to substantiate a procurement process for a private partner to deliver an organics recovery project from municipal and C&I streams. From the information provided, which included quantifying sources (and quality) of feedstock material, technical performance forecasts, such as potential bio-methane yields, amount of compost derived, the concept design and prospective gate fee, etc. regional waste management within the context of the South West Regional Waste Group may be progressed. In total approximately 77,000 tonnes, comprising just over 67,400 tonnes of organic material from C&I waste and just under 10,000 tonnes of FOGO, per annum, is estimated to be generated in the project area from sources that include, the tourism sector, agriculture (i.e. viticulture and dairy), liquid waste, Biosolids and sludge. Further, more detailed investigations into the logistics, training, infrastructure would be required as part of the detailed feasibility analysis.

Figure 14. Example of a Biological Waste Treatment facility



The study report provided a roadmap with the steps necessary to progress the project from feasibility, to design and development, through to eventual construction phase. The report contained information about engaging a private contractor or consortium to fund, build and operate a 35,000 – 50,000 tonne per annum food waste to bioenergy Anaerobic Digestion (AD) plant, capable of producing 2.4 – 2.6 MW. Modelled very closely on the West Australian specific, 2016 commissioned, Richgro Bioenergy Plant in Jandakot, the approximately $10 million facility combines organic waste recovery with energy production from biogas. Power generation associated with the implementation of an AD facility further reinforces the potential for micro-grid scale sites around the district, such as the former waste disposal facility at Rendezvous Road site, as potential hubs for V2G renewable energy production.

It also promotes a multi-industry approach to waste management by identifying opportunities to create an organic waste generator network that, through co-processing, can benefit the region with economies of scale whilst facilitating the implementation of innovative waste management technologies at the heart of the waste hierarchy and Circular Economy concept.

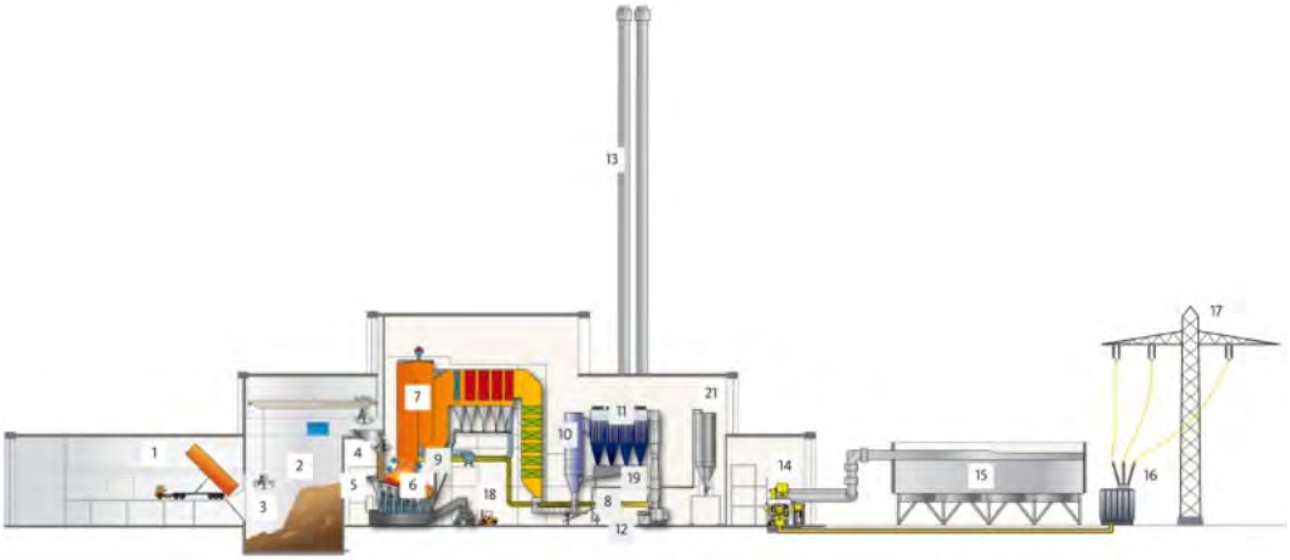
4.8.5 Thermal treatment of waste for energy production

Thermal technologies are processes that use heat to decompose waste into a stable, inert residue; with the main purpose of applying any form of heat to MSW, being overall volume and hazard reduction. In some instances, this process of utilising waste may provide energy and the recovery of certain material fractions from the residues, such as metals (if not separated beforehand) and minerals. Given the vast amount of energy channelled into these Waste-to-Energy (WtE), also known as Energy-From-Waste (EfW) facilities, energy recovered can be in the form of steam, heat and electricity (EPA, 2013).

There are a number of WtE technologies used worldwide, with the most common one being incineration. Incineration is the controlled combustion of waste in an oxygen rich environment, and include the recovery of energy. Used in the 2, upcoming Perth based, Kwinana WtE project and East Rockingham Resource Recovery Facility (RRRF), these 300,000 to 400,000 tonnes of residual waste per annum facilities work typically under a long (i.e. 20 year) waste supply agreement, and recover released heat in the form of steam to generate baseload renewable energy (Kwinana WTE Project Co Pty Ltd, 2015; New Energy Corporation Pty Ltd, 2018).

The Figure below shows a schematic of Hitachi Zosen Inova's Fluidised Bed Incineration system used in the East Rockingham RRF where flue gas treatment system consists of a scrubbing reactor, a bag filter and a catalytic reactor, to reduce the resultant flue gas emission concentration (Hitachi Zosen INOVA, n.d.).

Figure 15. Schematic of Hitachi Zosen Inova's Fluidised Bed Incineration system



Waste receiving and storage	Grate combustion and boiler	Flue gas treatment	Energy utilization	Residue handling
1 Tipping hall	4 Feed hopper	10 Semi-dry reactor	14 Extraction-condensation turbine	8 Bottom ash extractor
2 Waste bunker	5 Ram feeder	11 Fabric filter	15 Air cooled condenser	19 Boiler ash conveying system
3 Waste crane	6 Hitachi Zosen Inova grate	12 Induced draft fan	16 Trafo	20 Residue conveying system
	7 Five-pass steam boiler	13 Stack	17 Electricity	21 Residue silo
	8 Recirculation air			
	9 Secondary air injection level			

Delivering Energy Savings

As the majority of incineration systems often require feedstock tonnages in excess of 100,000 tonnes per annum to be viable, WtE Projects form part of the market sounding exercise conducted by the South West Regional Waste Group. Led by the City, the project's aim is to harness economies of scale to minimise the costs associated with the investment and operations into achieving the State's per capita reduction targets and overall landfill diversion.

STRATEGIC ACTION 33

Incorporate all relevant recommendation or actions contained in this Energy Strategy into the review of any existing or new strategic waste documents.

STRATEGIC ACTION 34

Conduct detailed viability investigations into financially sustainable resource recovery systems that are modular and scalable.

STRATEGIC ACTION 35

Determine and make recommendations on progressing projects and initiatives that achieve the quadruple bottom line on sustainability.

4.9 Fleet and Plant

OBJECTIVE

To reduce reliance on fossil fuels through a combination of green procurement and investments into alternative fuel sources.

As battery technologies improve, electrical motors become more efficient, and the price of power storage reduces, more equipment manufacturers start investing into these advancements and reduce the reliance on fossil fuel sources. In the case of a lithium iron phosphate (LiFePO4) batteries particularly, the uptake rate of more manufactures in recent years has steadily increased.

4.9.1 Fleet procurement and maintenance

During the fleet procurement process, the following factors are taken into account:

- record based actual fuel consumption when comparing model updates for vehicles of the same make;
- preferential rating for Plant and Equipment with lower fuel consumption, or alternative fuel sources;
- preferential rating for Plant and Equipment that accommodate Euro VI emission standards, with a minimum being Australian Design Rules (ADR) compliant;
- a needs base analysis during replacement and turnover (e.g. if the replacement of a smaller plant is possible or if a larger plant than existing is required).
- appropriate plant utilisation and charge-out rates; and
- adherence to the Long Term Financial Plan's plant replacement schedule for the Triple bottom line (i.e. to take advantage of technological advancements in engine efficiencies, improvements in emissions reduction technology, and ensure the best value for money).

STRATEGIC ACTION 36

Continue to make plant decisions on a best value basis looking at whole of life cycle costs.

From a maintenance perspective, scheduled servicing, at specific intervals recommended by the manufacturer, are adhered to, and carried out by authorised technicians, using only equipment manufacturer approved products, oils and lubricants. Officers monitor and update the City's new Fleet Admin system in TechOne weekly. Periodic mechanical servicing aside, workshop staff monitor the City's Light and Heavy Vehicle fleets' tyres for appropriate inflation, timely wheel alignments, rotation and balancing to ensure no negative impact on fuel consumption.

Operationally, the fleet and plant's engine hours, fuel usage, and distance travelled are monitored to ensure the plant items are correctly utilised.

The plant's actual consumption figures are periodically compared with the manufacturer's recommended consumption figures, noting any exceptions and to determine the reason(s) why.

The City will continue to monitor fuel-efficiency and gas emissions performance of trucks that are available in the Australian market, and consider that component as part of procurement decisions.

Prior to making any investment in new or modified depot facilities, the City will consider potential impacts of a shift towards electric fleet or plant – which may require charging and/or hydrogen fuelling infrastructure.

4.9.2 Alternative Fuel Source and Electric Vehicle (EV) Refuse Truck

The City's internal combustion engine refuse trucks burn between 40 – 50 L/100km on average. Given these fuel consumption figures, they are a prime target for fuel efficiency measures with the prime initiative being the procurement of more fuel efficient, yet emission stringent vehicles.
Being a dual control vehicle, the unit of measure for these trucks are in engine hours, with each vehicle turned over at approximately 8,000 engine hours.
This strategy has enabled the City's refuse collection fleet to be kept updated with the latest technology available in Australia, in terms of emission controls and fuel efficiency.

Previously, one of the initiatives the City investigated was the viability of an alternative fuel source fleet, particularly around Compressed Natural Gas (CNG). The engine technologies were not only mature, the emissions met some Euro VI criteria, emitting zero particulate matter and less than 0.2 gr of Nitrous Oxide (NOx) per kilowatt hour in some examples. Unfortunately, the refuelling requirements of CNG trucks dictated a back to base type operation, making the practicality of such vehicles prohibitive at the time.

However, the concept may lead to a viability assessment of Hydrogen (H), the most abundant element in the universe, as an alternative fuel source. In particular, green hydrogen, obtained by applying electricity obtained from renewable sources, such as wind and solar, to water, breaking it down to gaseous Oxygen (O_2) and H in a process known as electrolysis. The hydrogen can then be stored and transported, used directly as a fuel, injected back into the natural gas supply network or converted into electricity in a fuel cell.

Another area the City looked into, was the possibility of converting an existing rubbish trucks into a hybrid, internal combustion turbo-diesel and electric power train. At the time, the technology was deemed to be more efficient in heavy-duty, frequent start-stop drive cycle applications; purportedly achieving reduction in overall fuel consumption, in both greenhouse gas (GHG) and noise emissions, whilst reducing brake wear. However, attempts to engage a local partner to pilot a demonstration project proved unsuccessful.

In September this year, the City's waste contractors, Cleanaway and Suez, rolled out the State's first electric side-loading collection trucks in the City of Belmont and Fremantle.
Costing approximately, $600,000 each, the all electric trucks were collaboratively developed by waste collection equipment manufacturer, SuperiorPak and La Trobe, Victoria based electric truck maker, SEA Electric. The up to 26 tonne GVM class trucks are powered by a 195kW electric motor that deliver approximately 1,850 Nm of torque, with a realistic range of 160 km from its 216 kWh battery. Having a three phase, 32 A charger on-board, full charge times are in the order of 10 hours (Sea Electric Pty Ltd, n.d.). Given their method of manufacture, in which they obtain a glider (i.e. a vehicle with no engine and drivetrain) from the chassis manufacturer and then add their Electric propulsion unit to those mules, the City may be able to revisit the retrofit a refuse collection truck that is due for replacement initiative.

Hybrid vehicles and Electric-Powered Vehicles may offer the potential for significant reductions in fuel use and the City will continue to monitor pricing and technology.
We anticipate an increased take up in local government as the price point lowers and improvements make them more attractive in the second hand market.

STRATEGIC ACTION 37

Implement methods of incorporating more electrically operated Fleet, Plant and Equipment into the City's mobile asset inventory, as technologies mature and the price of energy storage decreases.

STRATEGIC ACTION 38

Conduct viability assessments into technologies that offer tangible benefits when considering plant and equipment using alternative fuel sources.

4.9.3 Electric Vehicle (EV) to Grid

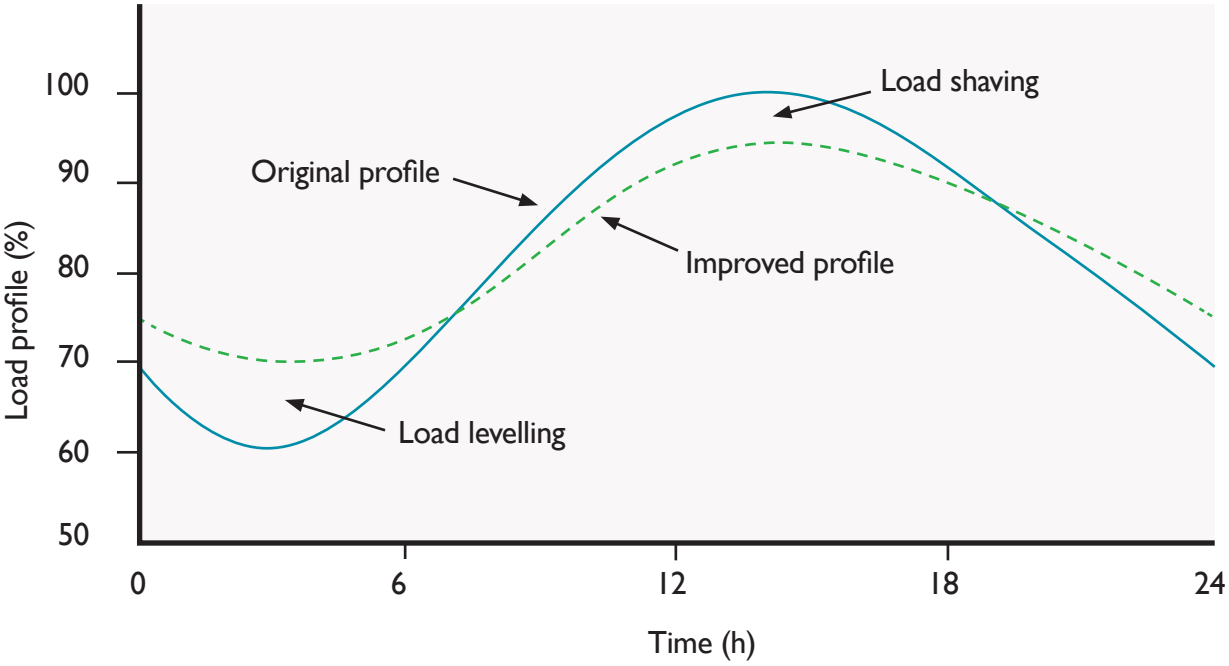
Due to significant advancement in battery storage and information technologies in recent years, the vehicle-to-grid (V2G) initiative is becoming one of the most emerging system-crossover technologies for EVs. Currently, a single EV's battery can only store a limited amount of electricity (i.e. an Average of between 10 – 56 kwh), making an individual V2G operation inefficient and ineffective. However, as the City's number of EVs increase, the group of EVs achieve economies of scale, and no longer become a simple transportation means, but a mobile power-plant capable of feeding electricity to the point of demand.

Since each EV communicates with the power grid in either a storage or electricity generation capacity, it may be combined with a crypto currency styled ledger, such as blockchain for real-time information exchange. By controlling the charging rate for each EV, since most are parked for a significant period of time post travel, their batteries can be used to let electricity flow between the vehicles and the grid, effectively selling electricity back into the grid.

Renewable power generation from wind and solar are intermittent in nature and typically require very large and costly energy storage systems, in order to be fast and efficient in times of power outages. Furthermore, the use of hydrocarbon fuel based standby generators to provide intermittent backup power during outages is not only expensive from a capital depreciation perspective, they are largely inefficient and sluggish.

Since a large fluctuation in the load demand significantly increases the capital cost and operating cost of the power system, the blockchain based V2G operation can utilize the EVs' batteries to absorb and store electrical energy bought from the grid during the off-peak period (i.e. load levelling), followed by generate or sell this stored electrical energy to the where the demand is during the peak period (i.e. load shaving).

Figure 16. Electrical load daily fluctuation



As these discharging processes are much faster than the usual shutdown and start-up processes of a traditional standby generator, the power generation capacity of a group of EVs in a mature V2G operation have the capability to match with the load demand and fully utilize the EV batteries as back up during intermittent power outage events (Kempton, W., Tomic, J., Letendre, S., Brooks, A., Lipman, T. 2001; Folkson, R., 2014).

Further down the track, when an aggregation of EVs in multiple V2G systems are sufficiently mature, the City may be ready for an energy arbitrage; where an aggregator is introduced to coordinate the intragrid power flow to minimise the total power demand and power loss, and together with optimising the voltage deviation, maximises profit of this intragrid operation.

To enable the organisation to gain some early understanding of the potential implications of a future shift towards electric fleet, however, it is seen as appropriate to consider the changeover of the 'pool car' to a 'plug-in hybrid' – which is a kind of vehicle where the wheels are driven by an electric motor, powered by a battery, and the battery can be charged either by electricity (e.g. from the grid) or through a petrol engine.

STRATEGIC ACTION 39

Trial a plug-in-hybrid as pool car replacement.

4.10 Behaviour and organisational change

4.10.1 Staff behaviour change

OBJECTIVE

To embed energy management in all levels of the City's organisational culture.

There is a need to foster an energy saving culture throughout the organisation. The City's Sustainable Work Practice Operational Practice and Procedure (Appendix 4) provides guidance for general energy efficient behaviours but it is unclear the extent to which this is adopted.

A staff awareness campaign exists through the Green Taskforce to reduce energy usage across the organisation. It has targeted staff in the Administration Building, promoting 'switching off' and providing a bicycle fleet to reduce fuel consumption. However, it is difficult to determine the effectiveness of this program with regards to actual reduction in energy use. The Green Taskforce also has a broader program of sustainability awareness.

STRATEGIC ACTION 40

Continue to support the Green Taskforce in raising awareness of climate change and the importance of reducing energy use throughout the organisation.

There are likely to be considerable efficiency gains achievable through staff behaviour changes in the City's other facilities, such as recreation centres, libraries, depot and community buildings. Observed examples include:

- switching off lights in GLC group fitness and stadium when not in use;
- switching off air conditioners and lights at Busselton Depot after hours; and
- reducing temperature or switching off drink cabinet when not in use at Barnard Park Pavilion.

More intensive, ongoing energy savings and efficiency behaviour change programs should be developed for each large facility, which includes the City's full time staff as well as regular casual users of the City's facilities (such as fitness program leaders). This would aim to ensure they understand where, how, by what and at what time energy is used (especially in their area), what this means in terms of the tariffs structures and resulting costs, as well as effective ways in which energy can be reduced (Yeoman, 2018).

This should be developed by operational and facility managers, and their capacity to do this would be improved by energy management training (see below). Facility managers should work with their staff to implement. This process will create more ownership of proposed initiatives than an organisation-level report/program.

STRATEGIC ACTION 41

Develop and implement enhanced behaviour change and education programs for each major facility, targeting City staff and other regular facility users.

As behavioural initiatives are implemented, these would be reinforced if staff could see that their efforts were achieving outcomes.

As the City's monitoring and reporting capacity improves (e.g. with introduction of submeters and loggers, and increased use of reporting platforms), it would be valuable for this to be used to identify and acknowledge energy efficiency achievements attributable to staff behaviours.

STRATEGIC ACTION 42

Report energy use and efficiency outcomes to staff, when monitoring capacity is available, and acknowledge outcomes of energy savings initiatives.

4.10.2 Energy management training

Energy management is an emerging field of training for staff, as businesses realise that enhancing internal capability can lead to improvements in energy outcomes. Increasing Energy Literacy can help people think more clearly in terms of energy use and energy systems. An energy literate person has greater knowledge of energy management and how to improve and will have greater competency in identifying opportunities and achieving efficiency outcomes.

As new building management systems (BMS) are installed for large facilities, it is important that staff receive training in management of the BMS.

Energy management training would provide professional development opportunities for staff and may contribute to a culture of energy efficiency awareness throughout the organisation. It should be targeted firstly at operational and facility managers, who can then share knowledge with their staff.

There are currently no energy management training courses available in Western Australia. WALGA and the Cities Power Partnership are potential avenues for developing and delivering training.

STRATEGIC ACTION 43

Investigate opportunities and promote the need for energy management training for Western Australia's Local Government Sector.

4.10.3 Sustainable procurement

OBJECTIVE

To embed life cycle costs and overall energy efficiency in the overall 'best value for money' assessment.

Sustainable procurement is defined as procurement that has the most positive environmental, social and economic impacts possible over the entire life cycle of a product or service (ISO20400:2017 Sustainable Procurement – Guidance). It is widely adopted in local government policy, however this approach is more informative than coercive, and there is limited evaluation of outcomes (Dawkins et al., 2019).
The City of Busselton includes provisions for sustainability in its current Purchasing Policy (26/07/2018), but the extent to which this is adopted in practice is not clear.

Energy efficiency is a key component of sustainability for which purchasing officers have strong potential to influence outcomes for both cost and consumption. The City's Purchasing Policy includes two objectives consistent with sustainability outcomes, including ensuring energy efficient goods and services are procured:

- achieving 'best value for money' with respect to all purchasing; and
- ensuring that sustainable benefits, such as environmental, social and local economic factors are considered in the overall 'best value for money' assessment.

The most advantageous outcome is determined based on factors other than prices, including:

- all relevant whole-of-life costs and benefits; and
- purchasing of goods and services from suppliers that demonstrate sustainable benefits and good corporate social responsibility.

While the consideration of other sustainability components may be difficult at times, selection of energy efficient goods and services is a clear example of how the best value for money approach does not equate to selection of the lowest price option. Energy efficient equipment may (not always) have higher up-front costs, but this may be offset by lower energy use of the life cycle or the product. Examples include lighting (e.g. LED), appliances (e.g. fridges) and fleet (e.g. electric vehicles). Life-cycle assessment is therefore an essential consideration in determining best value for money.

Although this document is focused on energy management, this should be continue to be considered as part of broader sustainable procurement. The Purchasing Policy should be reviewed in the context of the ISO 20400:2017 standard and adopt more directive sustainable procurement requirements. This should include specific reference to energy efficiency as part of selection of goods and services, including a requirement for full life-cycle assessment of all energy consuming equipment. This would be further supported by an Operational Practice (OP) to ensure its application in practice. Involving key staff in the development of these tools may encourage leadership and more effective implementation.

An example of a directive process to maximise future selection of efficient products is outlined below:

1. identify the need good or service to be procured;
2. assess the direct and indirect energy needs of the good or service;

3. research options that may reduce direct or indirect energy consumption;
4. if low-consumption options are available for a similar price and quality, purchase more efficient option; and
5. if low-consumption options are more expensive, conduct a cost-benefit analysis including:
    - assessment of energy use over the life-cycle of the product;
    - life span comparison; and
    - energy profile and potential to meet needs during the day when solar power is available.
6. If additional up-front costs can be reasonably offset by these factors, purchase more efficient option.

STRATEGIC ACTION 44

Update the City's Purchasing Policy and associated Operational Practice to direct greater application of sustainable procurement, with particular reference to energy efficiency.

The process of developing this Energy Strategy has generated a greater understanding of energy issues and opportunities, and a greater capacity for the organisation to achieve ongoing savings in energy use, costs and greenhouse gas emissions.

The document provides a starting point for improved energy management by providing information and currently relevant strategic actions.
Ongoing implementation of the strategy will be driven by changes in the energy sector, financial considerations and changes to culture around energy use across the organisation.

5.1 Innovation

The energy industry is a rapidly changing environment, and what constitute innovative and ground-breaking technologies today can become the new norm tomorrow. Significant progress is currently being made both on the technological and regulatory front, with numerous successful trials of microgrids and associated distributed energy resource technologies being implemented in Western Australia (Economics and Industry Standing Committee, 2019) and further afield. Whether it is the use of smart grids, virtual power plants, community batteries or peer-to-peer trading, these present significant opportunities for radically changing the way the City uses and produces energy.

There may also be synergies between the proposed development of a solar farm at the Rendezvous Road site and the creation of a New Energy hub, which could combine solar energy, waste-to-energy production, hydrogen production and EV charging.

STRATEGIC ACTION 45
Monitor the development of emerging and innovative energy technologies (i.e. microgrids, virtual net metering and peer to peer energy trading) and facilitate the development of trials in the City.

5.2 Financing and potential incentives

5.2.1 Grants and funding

A range of government grant programs are available to assist organisations with funding energy projects. An up-to-date list of current grant opportunities is available at https://www.environment.gov.au/about-us/grants-funding.

A project is more likely to be grant funded if it seeks to use new and innovative technologies.

5.2.2 Annual budgeting and long-term financial planning

As part of the annual planning for implementation of the Energy Strategy, City staff will be required to give consideration to budgeting requirements. In addition, there is currently $100,000 (plus indexation) per annum allocated in an Energy Sustainability Reserve in the City's 10-year Long Term Financial Plan to implement sustainability projects.

STRATEGIC ACTION 46

Continue to allocate expenditures under the City's Energy Sustainability Reserve as per priorities identified in the Energy Strategy.

While energy efficient equipment and assets can be more expensive upfront, they usually have a lower life-cycle costs and can provide other business benefits. Consideration should be given to increasing capital expenditure, either through budgeting or through using alternative financing options (refer to Revolving Energy Fund, Borrowing and Other third party financing arrangements below) to enable the implementation of projects with the lower life cycle costs.

STRATEGIC ACTION 47

Strategic Action 47: Consider options for increasing capital expenditure for implementing projects with the lowest life cycle costs.

5.2.3 Revolving Energy Fund

A Revolving Energy Fund (REF) is when savings from sustainability projects are tracked and used to replenish a fund for the next round of investments. Robust energy monitoring systems are required for REFs to be successful. It is not currently recommended the City establishes a REF until an integrated monitoring system is established and operating well.

STRATEGIC ACTION 48

Consider the development of a Revolving Energy Fund once an integrated Energy Monitoring and Reporting system is well established.

5.2.4 Borrowing

The City, like all WA Local Governments has access to low interest rates from WA Treasury. If loans are used to fund energy projects, interest repayments should be factored in the business case assessment.

5.2.5 Other third-party financing arrangements

There are a number of alternative financing arrangements, funded by third parties, which can alleviate the need for capital to undertake energy projects. The most common ones are listed below.

5.2.6 Leasing

Leasing equipment enables companies to avoid upfront costs and manage energy efficiency projects within operational budgets.

5.2.7 On-bill financing

On-bill financing allow businesses to install and upgrade energy efficiency equipment which is financed by the energy utility. Repayments are made by the business through their monthly power bill and ownership is transferred on final payment of the finance. Up-front capital is not required and repayments can be equal or less than the energy cost savings achieved.

5.2.8 Energy Performance contracts (EPCs)

EPCs are commonly used as a financing method in the commercial building sector. Energy service companies guarantee reduced energy bills for commercial tenants by identifying potential savings in a building's operations, commissioning and funding a retrofit of the building, and using the energy saved to fund the upfront costs. This financing model overcomes the inherent barrier of split incentives where building tenants benefit from retrofits through reduced energy bills, but building owners are responsible for the upfront infrastructure costs (DEE, 2019)

STRATEGIC ACTION 49
Consider alternative financing options when implementing energy projects.

5.3 Implementation management

Implementation of energy initiatives is a whole of organisation responsibility. While there will often be a leading Directorate/Service Unit responsible for implementing specific actions, collaboration and partnerships across the organisation will be required to implement the Energy Strategy. Leadership from Senior Management will also be necessary to drive implementation of the Energy Strategy.

The City Environment Policy (Appendix 3.) and Sustainable Work Practice Operational Practice and Procedure (Appendix 4.) provides the overarching planning framework for implementing the Energy Strategy. A key element for the City to successfully manage its energy portfolio will be to build in relevant responsibilities and associated accountability amongst Senior Management and operational staff and for energy optimisation to become part of the City's organisational culture.

The SEWG was instrumental in developing the Energy Strategy. It is recommended the group continues to regularly review and monitor implementation of the Energy Strategy.

STRATEGIC ACTION 50
Continue the Sustainability and Energy Working Group.

Table 14 Proposed roles and responsibilities of City of Busselton staff

DIRECTORATE	ROLES AND RESPONSIBILITIES
Planning and Development Services	• Energy Management and Planning Coordination • Community engagement and communication • Solar Farm project
Engineering and Works Services	• Monitoring Energy Use and Costs* • Fleet and Plant • Waste • Street lighting • Public lighting • Pumping • PV solar systems and monitoring systems* • Energy Sustainability Reserve Implementation • Utilities budgeting (facility-specific)*
Finance and Corporate Services	• Contestable electricity procurement* • Utility bill management
Commercial and Community Services	• Operation of Recreational and Cultural Facilities • Utilities budgeting (facility-specific)*

* indicates potential changes to existing responsibilities

The following changes to responsibilities are proposed as part of the Energy Strategy:

- it is proposed to hand over overall energy monitoring and reporting to Engineering and Works Services as they have more operational control of facilities that use energy;
- engineering and Works Services is currently responsible for preparing utilities budget. Facilities Managers have a greater understanding of a facility's energy use patterns and therefore it is considered Facilities Managers should be responsible for preparing their utilities budget; This would allow for operational changes to be better incorporated into budget planning;
- it is recommended all new PV systems should be installed with an associated monitoring systems to report and control on their performance (section Solar Monitoring and Reporting). Operational management of PV monitoring systems along with ensuring the information that feeds into the monitoring software is up-to-date is recommended to be allocated to Engineering and Works Services; and
- as the City's energy portfolio changes, either through the addition of new sites or changes to the energy use of existing sites, it is necessary to periodically review whether they meet the contestability threshold of 50,000 kWh per annum and whether they should be included in the City's contestable electricity contract. This can potentially lead to substantial financial savings through securing lower electricity tariffs. The Azility online platform can be used to easily review contestability thresholds. Review of contestable sites status is recommended to be allocated to Finance and Corporate Services.

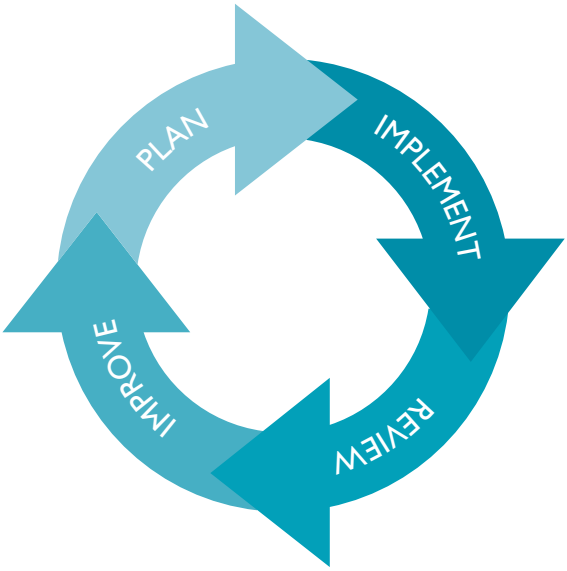
These arrangements will be reviewed as part of the Strategy's yearly action planning cycle.

STRATEGIC ACTION 51

Review specific responsibilities for implementation of the Energy Strategy as part of the yearly action planning cycle.

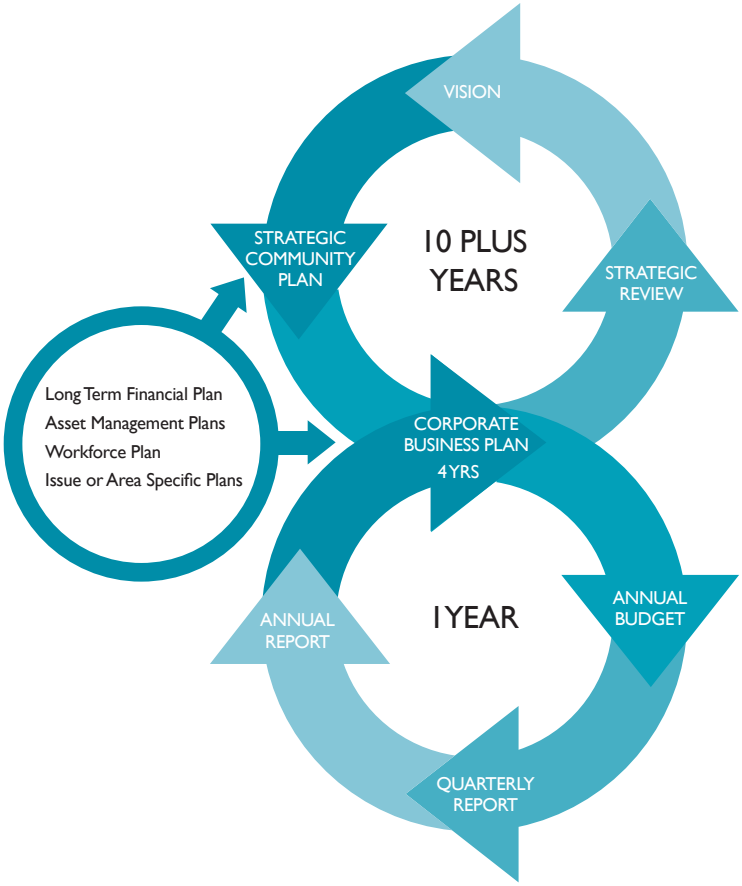
The Energy Strategy intends to provide direction to the City on how to optimise energy usage and potential savings from the development and implementation of energy initiatives across the organisation. However it is recognised that technologies and best practices are rapidly changing, therefore it is recommended a continuous improvement cycle approach is taken while implementing the Energy Strategy.

Figure 17. Continuous improvement cycle approach



It is essential implementation of the Energy Strategy is built into the City's existing strategic planning cycle.

Figure 18. City's strategic planning cycle



More detailed yearly action planning will be required to progress with the implementation of the Energy Strategy. This will include allocating responsibilities for implementation to relevant staff.

5.4 Review

The Energy Strategy will be annually updated and fully reviewed every 5 years. However this is a dynamic document that will need to proactively respond to rapidly changing technologies and what constitutes best practice.

STRATEGIC ACTION 52

Annually update the Energy Strategy with new information and review every 5 years.

References

Albert B., Energy Unlimited (2017)

Australian Competition & Consumer Commission, Biofuels https://www.accc.gov.au/consumers/petrol-diesel-lpg/biofuels, accessed November 2019

Australian Institute of Petroleum, Biofuels Factsheet (2017) https://aip.com.au/sites/default/files/download-files/2017-10/BioFuelFactSheet.pdf, accessed November 2019

Biogass Renewables Pty Ltd, Anaerobic Digestion Facility Design Report (2019)

City of Busselton, Energy Action Plan 2010-2014 (June 2010)

City of Busselton, Energy Action Plan 2014-2019 (June 2014)

Conway Highbury, Compliance advice (unpublished report) (2019)

CSIRO and Bureau of Meteorology, Climate Change in Australia website (http://www.climatechangeinaustralia.gov.au/), accessed 8 October 2019

Dawkins, E., Andre, K., Axelsson, K. (2019) Advancing sustainable consumption at the local government level: A literature review. *Journal of Cleaner Production 231*: 1450-1462.

Department of Environment and Energy, https://www.energy.gov.au/business/grants-and-funding, accessed 22 May 2019

Economics and Industry Standing Committee, Report 5 Implications of a distributed energy future, Interim Report (April 2019)

Environmental Protection Authority Report 1468: Environmental and health performance of waste to energy technologies (2013)

EPC Technologies, Solar Sizing Exercise City of Busselton (2019)

EVA Environmental, City of Busselton Organic Waste Review (2018)

Folkson, R., Alternative Fuels and Advanced Vehicle Technologies for Improved Environmental Performance (2014)

GHD, Dunsborough Waste Facility, Western Cape Drive, Naturaliste WA – High level feasibility assessment of electricity generation from landfill gas (2016)

Green Values Australia, Biofuels assessment City of Busselton (July 2018)

Hitachi Zosen INOVA, Thermal EfW Process, http://www.hz-inova.com/cms/en/home/?page_id=230, accessed November 2019

IPWEA (2019) *Model Business Case for Street Lighting and Smart Controls Upgrades*. Institute of Public Works Engineering Australia. https://www.slsc.org.au/slsc-publications/model-business

Kempton, W., Tomic, J., Letendre, S., Brooks, A., Lipman, T., Vehicle-to-Grid Power: Battery, Hybrid, and Fuel Cell Vehicles as Resources for Distributed Electric Power in California (2001)

References

Kwinana WTE Project Co Pty Ltd, Environmental Protection Authority Report 1538: Kwinana Waste to Energy Project (2015)

New Energy Corporation Pty Ltd, Environmental Protection Authority Report 1624: East Rockingham Waste to Energy revised proposal (2018)

Sea Electric Pty Ltd, Sea Drive 180 ebrochure (2019) https://www.sea-electric.com/wp-content/uploads/2019/10/Sea-Drive-180-ebrochure-AUS.pdf

Yeoman, Analysing and Prioritising Energy Opportunities for the City of Busselton (2018)

WALGA (2017) Energy Efficient Public Lighting – Member Update. Western Australia Local Government Association.

WALGA, WALGA Guide to Sustainable Procurement (2017)

Appendix 1 - List of Strategic Actions

STRATEGIC NUMBER	ACTION	PAGE
Strategic Action 1	Continue subscription to Azility Carbon Emissions Reporting module (or equivalent) to allow tracking of progress towards the carbon emissions reduction target.	22
Strategic Action 2	Report to Council (annually) and Senior Management (quarterly) on energy use and costs.	26
Strategic Action 3	Send weekly facility-based energy benchmarking reports and set up usage anomalies alerts for relevant facility managers (as per table below).	26
Strategic Action 4	Prepare an energy monitoring equipment strategy outlining priority recommendations for installing sub-metering, data-logging and BMS at key City's facilities.	27
Strategic Action 5	Install smart monitors on all PV systems, both existing and new.	27
Strategic Action 6	Report to the community as opportunities arise on the City's energy use, solar energy generation and implementation of energy projects.	27
Strategic Action 7	Develop a Project Business Case template for energy projects.	28
Strategic Action 8	Undertake an audit and efficiency assessment of key precinct areas, including the Busselton Foreshore, Dunsborough Playing Fields and Vasse Lakeview Entrance.	30
Strategic Action 9	Review accounts with no energy usage (electricity and gas) and disconnect if no longer required.	30
Strategic Action 10	Undertake a review of the City's electricity tariffs and implications for energy costs.	30
Strategic Action 11	Replace all lights due for replacement with LED.	31
Strategic action 12	Review all existing lighting in City's facilities to identify opportunities for LED replacement.	31
Strategic Action 13	Review and upgrade lighting to LED at the NCC, Busselton Library, Depot and Busselton Tourist Park.	31
Strategic Action 14	: Implement efficiency recommendations for key facilities from the Energy Opportunities Analysis and Prioritisation report (Yeoman, 2018).	32
Strategic action 15	Investigate building improvement opportunities (e.g. glazing, insulation) that can be implemented as part of the City's annual asset maintenance and renewal program.	32
Strategic Action 16	Undertake supply voltage business cases for suitable City's facilities and implement voltage optimisers if installation is warranted.	32
Strategic Action 17	Investigate power factor correction (in parallel to voltage optimisation) to secure reduced electricity tariffs.	32
Strategic Action 18	Undertake a review of leased sites to determine which would benefit from sub-metering and/or data-logging.	33
Strategic Action 19	: Investigate opportunities for installing solar PV systems at City's leased facilities, either through promoting solar leasing and solar PV PPAs or up-front purchase.	33
Strategic Action 20	Prepare a Design For New Buildings Policy (or similar) which sets the standard for energy efficiency and renewable energy for all new City buildings and major upgrades and investigate options for increasing upfront capital investment to achieve future operational savings. Use the BEACH project as a test case.	34
Strategic Action 21	Maintain a watching brief for opportunities to reduce Western Power street lighting costs.	41
Strategic Action 22	Investigate opportunities to reduce operating hours of street lighting (and use of smart and adaptive lighting) in selected areas to reduce energy use and cost.	41
Strategic Action 23	Upgrade the following City owned street lighting to LED: Naturaliste Terrace, Cyrillean Way, Dunn Bay Road, Hannay Lane, Seymour Boulevard, Keel Retreat and Queen Street (Cultural Precinct).	42
Strategic Action 24	Develop a program to upgrade the remainder of City owned street lighting to LED.	42

Appendix 1

STRATEGIC NUMBER	ACTION	PAGE
Strategic Action 25	Complete a review of City-owned public lighting to identify all lighting infrastructure, associated meters, and opportunities for LED replacement.	37
Strategic Action 26	Commission a condition assessment of all sports lighting and make recommendations for efficiency upgrades and use of smart lighting.	38
Strategic Action 27	Develop Public Lighting specifications.	39
Strategic Action 28	Commission an energy efficiency assessment of lights and pumps for key public open spaces.	39
Strategic Action 29	Implement all recommended rooftop solars in 2019/20.	40
Strategic Action 30	Pursue additional rooftop solar installations as opportunities arise.	40
Strategic Action 31	Maintain a watching brief for installation of battery systems and undertake a feasibility study when they become financially viable.	41
Strategic Action 32	Progress investigations into developing a solar farm at Lot 27 Rendezvous Road.	43
Strategic Action 33	Incorporate all relevant recommendation or actions contained in this Energy Strategy into the review of any existing or new strategic waste documents.	50
Strategic Action 34	Conduct detailed viability investigations into financially sustainable resource recovery systems that are modular and scalable.	51
Strategic Action 35	Determine and make recommendations on progressing projects and initiatives that achieve the quadruple bottom line on sustainability.	51
Strategic Action 36	Continue to make plant decisions on a best value basis looking at whole of life cycle costs.	51
Strategic Action 37	Implement methods of incorporating more electrically operated Fleet, Plant and Equipment into the City's mobile asset inventory, as technologies mature and the price of energy storage decreases.	53
Strategic Action 38	Conduct viability assessments into technologies that offer tangible benefits when considering plant and equipment using alternative fuel sources.	53
Strategic Action 39	Trial a plug-in-hybrid as pool car replacement.	54
Strategic Action 40	Continue to support the Green Taskforce in raising awareness of climate change and the importance of reducing energy use throughout the organisation.	55
Strategic Action 41	Develop and implement enhanced behaviour change and education programs for each major facility, targeting City staff and other regular facility users.	55
Strategic Action 42	Report energy use and efficiency outcomes to staff, when monitoring capacity is available, and acknowledge outcomes of energy savings initiatives.	55
Strategic Action 43	Investigate opportunities and promote the need for energy management training for Western Australia's Local Government Sector.	56
Strategic Action 44	Update the City's Purchasing Policy and associated Operational Practice to direct greater application of sustainable procurement, with particular reference to energy efficiency.	57
Strategic Action 45	Monitor the development of emerging and innovative energy technologies (i.e. microgrids, virtual net metering and peer to peer energy trading) and facilitate the development of trials in the City.	58
Strategic Action 46	Continue to allocate expenditures under the City's Energy Sustainability Reserve as per priorities identified in the Energy Strategy.	58
Strategic Action 47	Consider options for increasing capital expenditure for implementing projects with the lowest life cycle costs.	59
Strategic Action 48	Consider the development of a Revolving Energy Fund once an integrated Energy Monitoring and Reporting system is well established.	59
Strategic Action 49	Consider alternative financing options when implementing energy projects.	59
Strategic Action 50	Continue the Sustainability and Energy Working Group.	60
Strategic Action 51	Review specific responsibilities for implementation of the Energy Strategy as part of the yearly action planning cycle.	
Strategic Action 52	Annually update the Energy Strategy with new information and review every 5 years.	

Appendix 2 - Review of Energy Action Plans

ENERGY ACTION PLAN 2010-2014

NB	ACTION	IMPLEMENTED
BUILDINGS		
1	Prepare and implement a Council policy to mandate inclusion of energy efficiency requirements and investigation of energy generation in all future Shire of Busselton design and construction tenders.	✗
2	Undertake a feasibility study on geothermal heating (pool and buildings) and cogeneration/trigeneration at the Geographe Leisure Centre.	✓
3	Implement the recommendations of the feasibility study on geothermal heating and cogeneration/ trigeneration at the Geographe Leisure Centre.	✓
4	Insulate all ceiling spaces in the Shire Administration Centre with R 3.5 wool or Polyester insulation.	✓
5	Paint IT House roof with Insultec reflective paint or similar.	✓
6	Install load-shedding control system to all air-conditioning units via Ethernet in the Shire Administration Centre.	✗
7	Upgrade APAC ducted units to VRF system with possible removal/deactivation of some split system units in the Shire Administration Centre.	✓
8	Remove unnecessary fluorescent tubes (294) in the Shire Administration Centre.	✗
9	Replacement of older style fluorescent tubes.	✓
10	Develop and implement procedures for all unnecessary IT equipment to be turned off after hours.	✓
11	Install a 5 kW Solar PV System at the Geographe Leisure Centre	✓
12	Install a 2 kW Solar PV system at the Naturaliste Community Centre.	✓
13	Install a 5 kW Solar PV system at the Shire Civic Centre.	✓
14	Install a 25 kW Solar PV system at the Shire Civic Centre.	✓
15	Implement recommendations from the Geographe Leisure Centre energy audit.	✓ PARTLY
16	Undertake energy audits for the Kookaburra Caravan Park, Busselton Library, Busselton Depot and the Naturaliste Community Centre.	✓
17	Implement recommendations of the energy audit for the Kookaburra Caravan Park.	✓ PARTLY
18	Implement recommendations of the energy audit for the Busselton Library (only actions with payback periods of 5 years or less).	✓ PARTLY
19	Implement recommendations of the energy audit for the Busselton Depot.	✓ PARTLY
20	Implement recommendations of the energy audit for the Naturaliste Community Centre.	✓ PARTLY
WASTE		
21	Review and improve procedures and provide staff education to aim towards 100% paper recycling.	✓
22	Purchase at least 20% recycled paper.	✓
23	Implement a 3-bin system (mingled, recycling and putrescible waste).	✗
STREET LIGHTING		
24	In consultation with Western Power, investigate and implement if cost-effective the retrofit of Shire-owned streetlights to more energy efficient technologies such as fluorescent lights.	✗
25	In partnership with Western Power, review Shire Technical Specifications to include requirements for energy efficient streetlights in new subdivisions.	✓
26	Lobby Western Power to speed up the roll out of energy efficient street lights.	✓

Appendix 2

NB	ACTION	IMPLEMENTED
FLEET		
27	Undertake an audit of the greenhouse gas emissions performance of the light vehicle fleet utilising data acquired through the Australian Green Vehicle Guide.	✗
28	Develop a Shire policy requiring a minimum green star rating for new light fleet passenger vehicles.	✗
29	Undertake a feasibility study on the use of alternative technology vehicles and fuels.	✗
30	Continue to update the fleet to ensure more vehicles meet latest environmental standards.	✓
31	Investigate staff incentives for sustainable transport to and from work.	✗
OTHER		
32	Implement a staff awareness campaign to reduce energy usage across the organisation.	✓
33	Investigate the feasibility of allocating financial savings from reducing the Shire's energy usage into the Shire Energy Efficiency and Generation Reserve.	✗
34	Investigate how to attract or facilitate renewable energy projects in the Shire (i.e. planning incentives, joint-ventures etc).	✗

ENERGY ACTION PLAN 2014-2019

NB	ACTION	IMPLEMENTED
BUILDINGS		
1	Investigate energy performance contracts for the Busselton Library and the Naturaliste Community Centre.	✗
2	Develop a program of internal audits and retrofits for small facilities.	✓ PARTLY
3	Install automated lighting in all large ablution facilities.	✓
4	Retrofit hot water systems with solar hot water system or heat pumps - Churchill and Bovell Parks.	✗
5	Upgrade all lighting at the GLC with LED technology.	✓
6	Design new Administration building to 5 green star rating (without certification) or equivalent.	✓
7	Prepare a Council policy or guidelines to mandate inclusion of energy efficiency requirements and investigation of energy generation in all future City of Busselton design and construction works.	✗
8	Install an additional 5 kW solar PV system at the NCC.	✗
9	Install a 5 kW solar PV system at the Busselton Library.	✗
10	Install an additional 25 kW Solar PV system at the City Civic Centre.	✓
11	Attend the applied energy efficiency course or equivalent.	✗
WASTE		
12	Enhance drop off facilities for fluoro tubes, mobile phones and dry cell batteries at the City Administration Building.	✗
13	Review recycling facilities at all City's facilities and upgrade where required.	✓
14	Review and improve procedures and provide staff education to aim towards 100% paper recycling.	✓
15	Purchase 50% recycled office paper at all City's facilities.	✓
16	Increase purchase of products with recycled content	✓
FLEET		
17	Develop a City policy requiring a minimum green star rating for new light fleet passenger vehicles.	✗
18	Implement the CleanEco Drive program, with an initial trial with rubbish truck drivers.	✗
19	Implement a Maintenance program to ensure best environmental performance of fleet.	✓
20	Investigate feasibility of alternative fuels and technologies.	✓
21	Review rubbish trucks routes with a view to reduce fuel use.	✗
22	Investigate alternatives to providing private use of vehicles.	✗
23	Support use of City's existing Bike fleet for short business trips.	✓
24	Facilitate travel smart to work, including cycling, walking and car-pooling.	✓
25	Investigate teleconferencing and use of Skype or other technologies to reduce travel for off-site meetings.	✓ PARTLY
STREET LIGHTING		
26	Upgrade City's owned streetlights to 42W CFL or LED.	✗
27	Complete audit of open space lighting.	✓
28	Implement high priority recommendations from open space lighting audit.	✓
29	Prepare energy efficiency guidelines for new City-owned public lighting.	✓
30	Investigate options for reducing hours of operation of existing streetlights.	✓
31	Lobby Western Power for use of more efficient street lighting.	✗

Appendix 2

NB	ACTION	IMPLEMENTED
OTHER		
32	Continue to report on energy use and cost and greenhouse gas emissions annually to Council.	✗
33	Continue to implement staff awareness campaign through the Green Taskforce to reduce energy usage across the organisation.	✓
34	Investigate Carbon Farming Initiative (CFI) opportunities.	N/A
35	Review purchasing procedures to facilitate the implementation of the sustainable purchasing component of the City's purchasing policy.	✗

Additional actions not listed in the Energy Action Plan

NB	ACTION
BUILDINGS	
1	Installation of solar powered security lighting at various community halls.
2	Installation of solar hot water systems at the Kookaburra Caravan Park and Winderlup Court units (Aged person homes).
3	Installation of a pool blanket on the indoor pool at the Geographe Leisure Centre.
4	Completion of an Energy Strategy for the GLC and NCC.
RENEWABLE ENERGY	
9	Installation of a 3.5kW PV system at the CRC.
10	Installation of a 6.8kW PV system at Barnard Park Pavilion (relocated from the old Administration Building).

Appendix 3 - Environment Policy

1. PURPOSE

1.1. The purpose of this Policy is to outline Council's commitment towards continuous improvement in environmental management practices and the long-term protection of environmental values within the District.

2. SCOPE

2.1. This Policy applies to all land managed by the City and to all operations of the City.

3. DEFINITIONS

TERM	MEANING
Policy	this City of Busselton Council policy entitled "Environment Policy"

4. STRATEGIC CONTEXT

4.1. This Policy links to Key Goal Area 3 - Environment of the City's Strategic Community Plan 2017 and specifically the following Community Objective/s:

a. 3.1: Development is managed sustainably and our environment valued;

b. 3.2: Natural areas and habitats are cared for and enhanced for the enjoyment of current and future generations;

c. 3.3: The health and attractiveness of our waterways and wetlands is improved to enhance community amenity.

5. POLICY STATEMENT

5.1. The City will ensure:

a. the proactive management of City land to protect and enhance environmental values;

b. the establishment and maintenance of effective working relationships and partnerships with the community and other stakeholders to undertake environmental management;

c. decision making by the City gives due regard to environmental values alongside economic and social considerations

5.2. The City will maintain an Environment Strategy to provide direction on how the City will meet the environmental aspirations of the community, as set out in the Strategic Community Plan, and to guide the City's activities.

5.3. The City will ensure its decision making considers potential impacts on the environment by integrating environmental protection, social advancement and economic prosperity principles within sound governance frameworks.

5.4. The City will implement best practice in its management of the environmental values of the District in order to identify and protect the City's exceptionally high biodiversity values.

5.5. The City will develop and maintain an Environmental Volunteer Management and Engagement Strategy with the aim of building and maintaining community capacity and engagement in relation to the management of the environmental values of the District, in particular through:

a. encouraging and supporting community participation and inclusiveness;

b. promoting community engagement and collaboration;

c. encouraging and nurturing partnerships

5.6. The City will plan, design, operate and conduct operations in a manner that minimises waste and resource consumption.

Appendix 3

6. RELATED DOCUMENTATION / LEGISLATION

6.1. Local Environmental Planning Strategy

6.2. Environment Strategy 2016-2021

6.3. Environmental Volunteer Management and Engagement Strategy 2017

Appendix 4 - Sustainable Work Practice Operational Practice and Procedure

PURPOSE

To recognise the importance of minimising the environmental impact of the organisation and to ensure that sustainability is part of ordinary work practices.

SCOPE

The objective of this policy is to empower City of Busselton employees to adopt environmentally sustainable work practices which reduce harm on the environment, minimise waste of resources and save money.

BACKGROUND

In 2011, the Council resolved to update their Environment Policy as part of the wider Environment Strategy adopted in 2004. The Environment Policy commits to continuous improvement and the creation of a sustainable balance between environmental, social and economic values.
The Council has also adopted an Energy Action Plan to reduce the organisation's energy consumption. The Green Taskforce was created to support staff in reducing their impacts on the environment in their work practices.

PRACTICE AND PROCEDURE

The following are general guidelines for sustainable work practices but will vary according to the nature of a particular work environment and the practices therein.
As such, these guidelines are not limited, and any other practice and procedure that contributes to the overall aim of this policy should be brought to the attention of the Green Task Force for future consideration and addition to the list as appropriate. It is expected that all employees will consider sustainable practice within their work environment and act in accordance with the following general guidelines.

GUIDELINES

Energy

- Use these strategies to minimise energy wastage:
  - Maintain air-conditioning at a constant temperature of 23-24°C.
  - Close blinds or curtains to minimise heat transfer.
  - Maintain only security lighting after business hours.
  - Switch off equipment (including computers, monitors, printers, air-conditioners) overnight wherever possible.
  - Repair or report malfunctioning utilities (e.g. leaking taps) as soon as possible.
  - Turn off lights in an unoccupied room.
  - Service Council vehicles regularly and consider lower emissions vehicles.

Paper

- Buy and use recycled paper or recycled content paper where possible.
- Make double-sided copies when printing and photocopying, wherever possible.
- Make double sided copies when printing and photocopying, wherever possible.
- Consider using electronic communication means where appropriate.
- Only print documents when necessary.
- Use the blank side of used paper for notepaper before recycling.
  - Re-use envelopes for internal mail.

Change your thinking from 'waste' to 'resource recovery'

- Reduce:
  - Use goods which stop waste being generated.
  - Reduce waste by choosing products that have minimal packaging and can be used productively and then recycled.

- Re-use:
  - Re-use containers, packaging or waste products, wherever possible.
- Recycle:
- Recycle waste material into useable products, wherever possible.
- Place recyclable materials in the yellow topped bins, including:
  - Paper & cardboard
  - Aluminium (including foil wrap and trays)
  - Glass
  - Steel
  - PET and HDPE plastics (with symbols 1,2,3 & 5)
- For waste that cannot be avoided, reused or recycled:
  - Treat the waste to make it less harmful to the environment or reduce the volume of the harmful component (note: dilution is not the solution).
  - Dispose of the waste safely.

RESPONSIBILITIES

Strategies to be implemented by the Manager and Supervisors

- Consider sustainability issues when making planning and managing decisions.
- Promote and encourage environmental awareness to ensure employees are aware of their environmental responsibilities.
- Aim to continually improve environmental performance by identifying and addressing environmental risk.
- Make resources available to implement environmental risk management procedures.
- Consider improvements to work practice to increase sustainability as part of business planning and performance evaluation.

Employees' responsibilities

- Identify and manage environmental risks associated with work activities to minimise their impact on the environment.
- Be proactive in putting forward suggestions for alternative or improved methods of contributing to environmental sustainability.
- Use the City's bicycles for short journeys around Busselton.
- If using Council vehicles, drive conservatively.

Environmental purchasing guidelines

- Research the environmental impacts of products purchased and give preference to environmentally-friendly products where possible.
- Choose products with less packaging.
- Choose products with recyclable or reusable packaging.
- Re-use plastic bags and all types of containers if possible.
- Buy quality goods that will last.
- Buy recycled goods that have already saved resources and raw materials, and help reduce the overall quantity of waste.

Owner Unit	Green Taskforce
Originator	Sharon Woodford-Jones
Procedure Approved By	
Date Created	December 2012
Date Reviewed	
Review Frequency	Annually
Related Documents	Environmental Policy Environmental Strategy Energy Action Plan


GRUNDFOS

City of Busselton
Geographe Bay

2 Southern Drive, Busselton
Locked Bag 1, Busselton WA 6280
(08) 9781 0444
city@busselton.wa.gov.au
www.busselton.wa.gov.au