

Tweed Shire Council Renewable Energy Action Plan
Electricity in Council facilities

October 2017

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Definitions

BAU	Business As Usual
Behind the Meter	A Behind the Meter system is a renewable energy system designed to optimise renewable energy generation and use for a single building or facility rather than to maximise export of excess renewable energy to the grid.
BMS	Building Management System - computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire, and security systems
c/kWh	Cents per kilowatt hour – energy unit costing metric
CST	Concentrating Solar Thermal – a relatively new renewable energy technology involving the use of mirrors or solar concentrators to heat conductors (salts or fluids) which super heats water to power steam turbines to generate electricity, day and night.
EE	Energy Efficiency
GWh	Gigawatt hour – a measure of energy (1 GWh=1000 MWh)
HVAC	Heating Ventilation Air Conditioning
kWh	Kilowatt hour – a measure of energy
kW	Kilowatt – a measure of power
KWp	Kilowatt peak – amount of peak demand reduction potential
LED	Light-Emitting Diode - a semiconductor diode which glows when a voltage is applied
LGA	Local Government Area
MWe	Megawatts electric – a measure of electrical power
MWh	Megawatt hours (1MWh = 1000kWh) – a measure of energy
MW	Megawatts – a measure of power
NPV	Net Present Value
PPA	Power Purchase Agreement
RE	Renewable Energy
PV	Photo-voltaic
REAP	Renewable Energy Action Plan
ROI	Return on Investment
SPS	Sewer Pumping Station
STP	Sewerage Treatment Plant
ToU	Time of Use – refers to a particular electricity tariff structure

Tonnes CO₂-e Tonnes of Carbon Dioxide equivalent – greenhouse gas measurement unit

WTP Water Treatment Plant

WWTP Wastewater Treatment Plant

1 Introduction

This Renewable Energy Action Plan (REAP) has been developed by Council in response to energy consultants, *100% Renewables*, Renewable Energy Study (October 2017). The Renewable Energy Study is a complementary document to this action plan, and includes detailed analysis and business cases for the projects recommended in the REAP.

The aims of the REAP are:

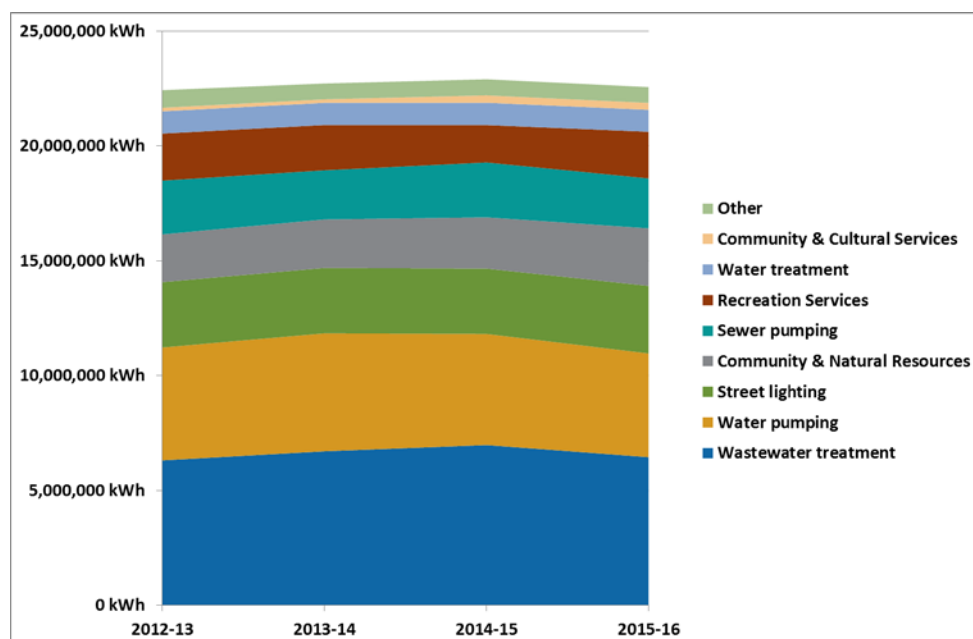
1. To describe an achievable pathway and timeframe to meet Council's renewable electricity self-sufficiency goal for Council's operations.
2. To establish a staged action plan.

2 Council's current electricity profile- overview

From 1 July 2016 – 30 June 2017, Council used an estimated 22,776 MWh of electricity across 390 sites, at a cost of \$3.9 million.

Council's overall electricity consumption has remained stable over the past four years, despite services, population and infrastructure increasing in this time. Council's stable electricity use profile is attributed to facility managers' energy efficiency initiatives in recent years, and following on from state government programs requiring councils to prepare and implement Energy Savings Action Plans.

Figure 1: Tweed Shire Council's electricity consumption from 2012-13 to 2015-16



Five of Council's facilities already have solar installations, generating almost 1% of Council's electricity use from a renewable source.

Table 1: Tweed Shire Council's existing rooftop solar systems

Site	System size	% of site electricity use met by solar
Tweed Heads Library and Civic Centre	20 kW	To be determined, works in progress
Murwillumbah Art Gallery	99.18 kW	25%
Murwillumbah Works Depot and Building C	91.26 kW	73%
Mech and Elec building, Kingscliff Wastewater Treatment Plant	9.9 kW	14%
Banora Point Wastewater Treatment Plant	3 kW	<1%
Tyalgum Water Treatment Plant	6 kW	<1%

3 Strategic directions guiding Council's renewable electricity goals

3.1 Stakeholder input

Stakeholder input has helped to shape the plan. The following key messages from stakeholder groups have been taken into account in the development of the plan:

Councillors:

- detailed analysis is needed before significant investment can be made
- be bold and innovative
- be strategic about where funding is sourced as Council reserves are currently allocated for future infrastructure projects
- purchasing carbon offsets to 'buy our way out of the problem' is not an attractive option.

Executive Management:

- the plan needs to describe tangible, achievable projects that Council can reasonably deliver within available budgets and staff resources
- we need to acknowledge that delivering renewable electricity beyond the scope of what the current technology and regulatory settings can confidently deliver isn't prudent

Facility Managers and Finance:

- projects that are scheduled in the plan need to have budget assigned and be technically feasible to deliver
- ongoing maintenance and replacement funds need to be budgeted
- Council needs access to specialist expertise to seek grant funding, plan, project manage and monitor and report on energy efficiency and renewable energy

projects, and centralise the management and maintenance of new renewable energy assets across the organisation.

Community stakeholders:

- Tweed Climate Action Network (CAN) has shared a favourable economic analysis for a US-based concentrating solar thermal technology (CST).

Council has been advised by 100% Renewables to keep a watching brief on this form of concentrating solar thermal technology, and look for its successful application in other Australian contexts before further analysing its suitability in the Tweed. Open tendering processes would also need to be followed if Council were to embark on any major capital projects.

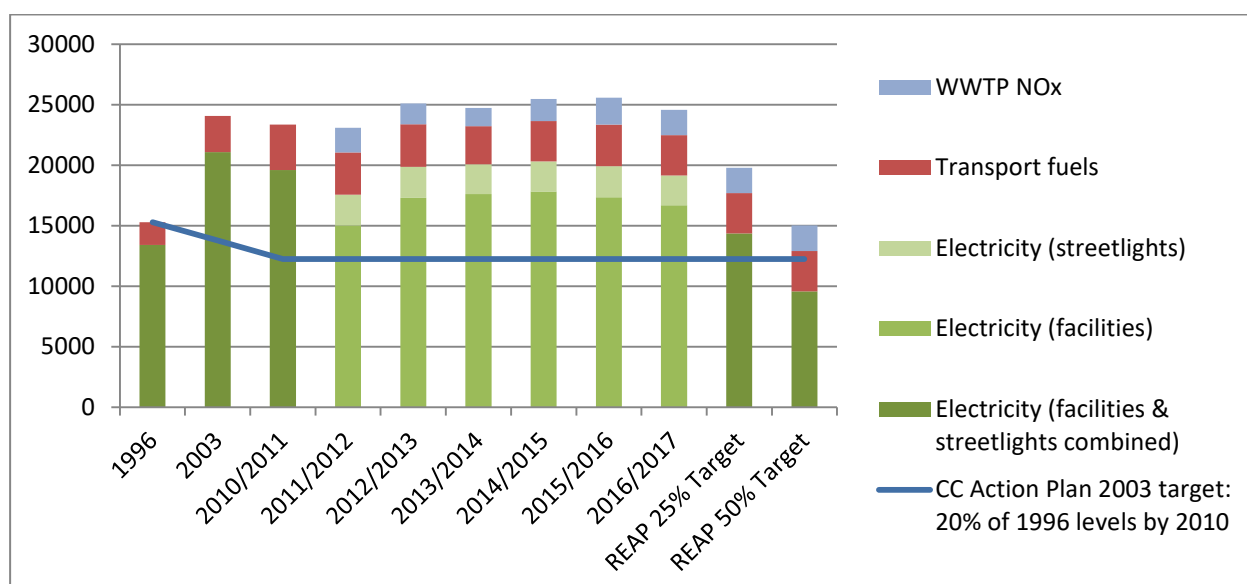
- Correspondence to Council has reflected some community sentiment encouraging Council to supply affordable renewable energy to the community.

Council responses have highlighted Council's focus on new energy efficiency and solar projects at Council facilities as the best return for Council investment and more closely aligned to our core business of providing public infrastructure in a sustainable way in the short term, while further changes at the national level in terms of policy and the energy sector are likely to happen.

3.2 Reduce greenhouse gas emissions from Council's energy use

78% of Council's carbon footprint in 2016/2017 was attributed to emissions from Council's use of electricity from the national electricity grid. Pursuing large reductions in emissions from Council's electricity use will help meet Council's Climate Change Action Plan goal of reducing Council's organisational carbon footprint by 20% of our 1996 level.

Figure 2: Greenhouse Gas Emissions - Tweed Shire Council operations, tonnes CO₂-e



3.3 Reduce electricity use

From 2013/2014, Council set a target to reduce its electricity use in Council facilities by approximately 2% every year, primarily through demand management and energy efficiency

improvements. The target was achieved in 2014/2015, and in 2015/2016. Estimated figures for 2016/2017 highlight a potential 1% increase in electricity use across all of Council's facility classes (water, wastewater, general, streetlighting) compared to the previous year. A dedicated program of works will be required to continue to meet Council's objective of reducing electricity use, under increasing demands to maintain and grow its services.

3.4 Pursue Council's aspirational goal of becoming self-sufficient in renewable energy

In May 2013 Council adopted the aspirational goal of becoming self-sufficient in renewable energy. Inspired by other local governments and organisations in Australia, Tweed Shire Council indicated its commitment to using renewable energy, which has subsequently been adopted in the Community Strategic Plan 2017 – 2027.

3.5 Consider investment in large scale solar energy systems

In February 2014 Council resolved to note the investment by the Sunshine Coast Council to create the Valdora solar farm and seek a report to consider investment in large scale solar energy systems and energy efficiency initiatives and possible options for funding.

4 Tweed Shire Council's renewable energy target

A staged approach to pursuing Council's aspirations to be self-sufficient in renewable energy is recommended based on the following achievable and affordable renewable energy targets for electricity:

1. 25% of Council's electricity self-generated from solar by 2022, compared to 2016/2017 use.
2. 50% of Council's electricity self-generated from solar, incorporating storage, by 2025, compared to 2016/2017 use.

Currently, to bring Council's use of renewable electricity to 100%, Council would need to enter into a Power Purchase Agreement (PPA) or develop a large scale renewable energy generation project.

The PPA would involve Council buying accredited renewable electricity from a new or existing generator or retailer, assuming renewable electricity could be purchased at the same or lower cost compared to non-renewable electricity offers. The Renewable Energy Study (100% Renewables, October 2017) suggests 2027 as a possible timeframe for reconsidering a 'Power Purchase Agreement', however the feasibility and range of risks described in the Renewable Energy Study (100% Renewables, October 2017) will need further investigation.

The large scale renewable energy generation project is not considered Council's core business and would have a high level of risk associated with it. At present, while energy policy at the national level is still uncertain and the market is quite volatile in response to this lack of clarity, it is not recommended that Council pursues this approach until all other energy efficiency and small scale renewable energy options have been exhausted. Setting a timeframe and approach for Council to meet 100% of Council's electricity needs from renewable sources is therefore not recommended at this time due to:

- the risks associated with investing significant public funding in large scale energy generation project
- the ongoing uncertainty about energy policy at the national level and therefore the reaction of the energy market
- the variability expected in the price and availability of renewable electricity products in future
- the large scope of the task ahead for Council to achieve the short term energy efficiency and renewable energy projects outlined in the REAP.

Pursuing the shorter term goals of 25% by 2022 and 50% by 2025 provide less risk to Council and can be more realistically managed within Council's available resources.

Supporting information (solar modelling, Excel analysis of all projects including assumptions and calculations) and feasibility assessment of a range of renewable energy initiatives is provided in the consultants' Renewable Energy Study (100% Renewables, October 2017). Council will review the feasibility assessment as resources become available to progress each project. The estimates for longer term initiatives will be revisited after Phase Two has been completed at the end of 2025.

5 Phase One efficiency and renewable electricity projects to 2022

Costs and savings estimates for 20 energy efficiency and renewable electricity projects have been calculated. Based on current industry pricing, these projects would cost \$5.2 million, and offer a payback of 5.2 years. The projects would reduce Council's consumption of electricity from the grid by an estimated 5,000 MWh per year, or 25% of Council's electricity use compared to 2016/2017.

A suggested time schedule of investments was developed in consultation with Council stakeholders. The following criteria have been used to select and prioritise the recommended projects:

1. Early solar projects are across both the Water & Wastewater sections and General Fund properties
2. Known capacity to fund projects
3. Focus on flat roof-mounted solar PV systems that are generally less expensive to implement than tilted or ground mounted systems, with less planning requirements
4. Selection of both large and small projects to achieve some significant 'wins' as well as demonstrate benefits at smaller sites

5. Defer work at sites where other works – eg roof assessment, repairs or replacement – are required
6. Defer projects that require more detailed feasibility assessment and/or comparison of technologies that could be used (eg Banora Point WWTP) to Phase Two
7. Projects that require battery storage are deferred to Phase Two - to be re-evaluated ahead of 2020 and timing / budget revised on the basis of this review
8. Staging of expenditure across several years so that the program of work is manageable both in terms of cost and Council resources.

The proposed timing of Phase One project investments is shown below.

Table 2: Estimated costs, savings, schedule and payback for Phase One REAP projects

Site & Project	Capital cost	Year 1 savings	Payback (years)	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Projects commencing 2017/2018											
Mooball WWTP 5 kW solar PV	\$5,715	\$1,213	4.71	\$5,715							
Crematorium office roof 8 kW solar PV	\$9,144	\$1,803	5.07	\$9,144							
Bray Park #2 pump 25 kW solar PV	\$28,575	\$4,413	6.48	\$28,575							
Council facilities HVAC efficiency improvements	\$80,000	\$19,381	4.13	\$40,000	\$40,000						
Kingscliff WWTP Sustainability Centre 99 kW solar PV	\$126,361	\$20,572	6.14	\$126,361							
WWTP operating / process control	\$300,000	\$58,000	3.53	\$150,000	\$75,000	\$75,000					
Council facilities lighting upgrade to LED	\$487,053	\$109,013	4.02	\$162,351	\$162,351	\$162,351					
Bray Park WTP 215 kW solar PV	\$415,360	\$61,923	6.71	\$415,360							
Projects commencing 2018/2019											
Tweed Regional Aquatic Centre 165 kW solar PV	\$313,500	\$52,024	6.03		\$313,500						
Stotts Creek facility 50 kW solar PV on new FOGO shed	\$56,886	\$13,390	4.25		\$56,886						
Kingscliff Library 16.8 kW solar PV	\$19,568	\$4,499	4.35		\$19,568						
Mech & Elec building Kingscliff - extra 30 kW solar PV	\$34,131	\$6,969	4.9		\$34,131						
Tweed Heads depot 15 kW solar PV	\$17,066	\$3,484	4.9		\$17,066						
HACC Tweed Heads 6 kW solar PV	\$6,826	\$1,394	4.9		\$6,826						
Tweed Regional Museum 38.40 kW solar PV	\$49,727	\$7,672	6.48		\$49,727						
Administration Centre Tweed Heads 95 kW solar PV	\$108,082	\$16,138	6.7		\$108,082						
Projects commencing 2019/2020:											
Civic Centre Murwillumbah 98 kW solar PV	\$113,996	\$16,647	6.85			\$113,996					
Tweed Heads South Pool 55 kW solar PV	\$62,374	\$10,772	5.79			\$62,374					
Street lighting upgrade to LED* ¹	\$2,960,692	\$589,142	5.03				\$2,960,692				
	\$5,195,056	\$998,449	5.20								
COST				\$937,506	\$883,137	\$413,721	\$2,960,692	\$0	\$0	\$0	\$0
SAVINGS (CUMULATIVE)				\$328,342	\$398,535	\$398,535	\$998,449	\$998,449	\$998,449	\$998,449	\$998,449
NET CASHFLOW (CUMULATIVE)				-\$609,164	-\$1,093,766	-\$1,108,952	-\$3,071,195	-\$2,072,746	-\$1,074,297	-\$75,848	\$922,601

¹ Subject to confirmation from Essential Energy about upfront capital costs, energy savings and reduced SLUOS charges and that the bulk replacement program could be completed across the whole network in a single year.

6 Phase Two solar and storage to 2025

Larger behind-the-meter solar and battery storage projects should be revisited from 2019, assuming a reduction in costs for storage technology of around 40% compared to 2016/2017 pricing or to the extent that a positive return on investment can be calculated. Currently, the estimated cost of \$5.3 million for these projects and estimated \$530,000/year savings suggests these initiatives are only marginally cost effective.

Scheduling Phase Two projects is not recommended until technology and costs mature, and sufficient evidence is available to ensure Council can confidently deliver effective electricity generation and economic returns from renewable electricity projects at these sites.

Table 3: Estimated costs, savings and payback for Phase 2 REAP projects

Site & Project	Project cost	Year 1 savings	Payback (years)
Banora Point WWTP 700kW solar PV	\$1,597,178	\$171,842	9.29
Banora Point community centre - 23 kW solar PV + Battery Energy Storage	\$64,594	\$6,890	9.37
Museum storage and Records storage Honeyeater Circuit - 17 kW solar PV + Battery Energy Storage	\$47,744	\$5,093	9.37
South Tweed Community Hall - 12 kW solar PV + Battery Energy Storage	\$33,701	\$3,595	9.37
Expansion of TRAC Murwillumbah / Civic Centre Murwillumbah with 150 kW solar PV + BESS on carpark awning	\$379,907	\$38,015	9.99
Expansion of Murwillumbah Art Gallery with 100 kW solar PV + BESS	\$253,271	\$25,343	9.99
Expansion of Kingscliff WWTP on west side with 500 kW solar PV + BESS	\$1,151,771	\$121,938	9.45
Expansion of Banora Pt WWTP with 700 kW solar PV + BESS	\$1,503,550	\$136,371	11.03
Expansion of Bray Park solar with 50 kW + BESS on #2 pump reservoir roof	\$107,396	\$8,048	13.34
Hastings Point WWTP floating array on southern overflow, 60 kW	\$152,830	\$11,498	13.29
TOTAL PHASE TWO	\$5,291,942	\$528,633	10

7 Phase Three: Other renewable electricity options

7.1 Grid-connected self-generation

Three Council-owned sites have attributes that may make them suitable for up to 15MW solar generation capacity, or up to a maximum of 17,000 MWh of electricity generated per year, which equates to 78% of Council's current electricity use, and more than 100% of projected future consumption with the implementation of Phase One and Phase Two efficiency and solar projects on Council's sites.

This would allow Council to produce more energy than we need, however there is a high degree of uncertainty about the feasibility of developing renewable electricity at these sites due to:

- limited capacity of nearby transmission lines to accept surplus power to the grid
- the considerable demands on staff skills and resources required to assess project development options at these sites

- the need for a full cost benefit analysis.

Section 10.1.4 of the Renewable Energy Study (*100% Renewables*, October 2017) provides more detail.

7.2 Renewable energy purchasing

Purchasing GreenPower accredited renewable electricity from electricity retailers is not recommended as this approach would impose a significant annual expense (an additional \$1.24m - \$1.8m per year) and reduce funds for other initiatives.

An alternative approach is to negotiate a direct purchase of renewable electricity from generation sites around Australia.

Through an existing or new buying group (eg of local councils), or by engaging directly with existing renewable energy projects, Council may be able to source 20-30% of its electricity from renewable energy sources. This is based on the approach that other organisations have taken such as University of Technology Sydney, World Wildlife Fund and South Sydney Regional Organisation of Councils buyers groups.

As Council's current energy contracts are in place until 2018/2019 (small sites) and 2019/2020 (large sites), the primary task at this time is for Council to engage with stakeholders to understand opportunities and what the future market for direct renewable energy purchasing will be. This will ensure decisions can be taken in future when current electricity agreements expire.

If pre-existing renewable energy generators are not able to provide power for purchase, then given the complexities in both aligning contract dates for multiple parties and lead time to generation, it may be practical to assume that a preferred renewable energy purchasing approach and agreement is in place from 2023-24 (5,000 MWh pa), rising to say 15,000 MWh pa from 2026-27.

Appendix E of the Renewable Energy Study (*100% Renewables*, October 2017) provides more detail.

8 Energy management practices

Embarking on an organisation-wide uptake of renewable electricity projects and assets will also require:

- 1. Appointment of an Energy Manager:** the contracting, delivery, review and reporting of the projects identified in this plan will rely on the dedicated resources of a part time energy manager, and the shared responsibility of senior management staff, to support facility managers with energy asset management, review of KPIs and benchmarks, employee engagement and pursuit of grants.
- 2. Energy Policy:** An overarching sustainable energy policy may also be a useful way to drive the integration of Council's energy goals into all facets of Council's energy decisions such as energy contracts, equipment and facility design and renovation, asset management, carbon offsets etc.
- 3. Equipment and project efficiency requirements:** Council's equipment purchasing processes need to focus on maximising the energy efficiency of all new building designs and equipment purchases. All major new work needs to achieve high levels of energy efficiency and renewable electricity generation.
- 4. Funding:** Implementation of the REAP will require funding from internal sources, grants and incentives, and potentially from external sources such as via power purchase agreements. Section 2.1 of the Renewable Energy Study (*100% Renewables*, October 2017) provides more detail.
- 5. Regular review:** The plan will require a broad representation of Council staff to be involved in its implementation. For example, councillors, management, finance, contracts, facility managers, and sustainability staff should be involved in steps to govern, manage, implement, monitor and maintain the rollout of initiatives. Internal and external expertise will be required to review emerging opportunities, costs, and resource availability so that future plans (eg battery storage) can be re-assessed and new ideas or technologies can be considered.

9 Conclusion

To get to self-sufficiency in renewable electricity now would require large and/or risky investment in either power generation or buying GreenPower, both of which are not advised in the short term. Focusing first on the affordable, low risk options available in rooftop solar installations on Council facilities, as well as demand management and energy efficient designs and purchases offers the best return on investment in the short term.

Given the significant changes in the electricity and renewable energy industry, and predicted improvement in the cost of electricity storage options, a review of this REAP in 2025 is recommended to get a better idea of the most efficient and effective ways to get closer to Council's aspirations to use 100% renewable energy.



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