

Tenterfield Council Waste to Energy (W2E) Feasibility Study Outline

1. Background

Australia is facing a well-publicised paradigm shift in relation to energy generation as well as waste management. In most aspects, Australia is falling behind solutions which have been adopted in almost every other developed country. As a nation, we are now operating on a global stage which brings with it global competition. Maintaining antiquated systems of any nature for any length of time will eventually affect our local competitiveness. This project therefore is as much about timing and delivery as it is about technical solutions and obstacles related to W2E.

Australian electricity consumers principally rely on receiving energy via a complicated and vast distribution and retail network (grid) that by design harbours much inefficiency. As so much of our power generation is supplied by burning fossil fuels, these inefficiencies are both detrimental to the environment as an artificially higher rate of extraction and production is required to overcome energy losses (attenuation), as well as being costly to the consumers who pay for those losses.

Australia is not seeing the amount of new investment in traditional base-load energy generation that is required to replace the 8GW of coal fired generation capacity expected to be retired over the next 20 years (and 28GW of retirement over the next 50 years). It is therefore an imperative that this future shortfall in base-load coal-fired generation is replaced with other technologies such as renewable energy on a smaller decentralised scale.

In 2014-15, Australia produced 64 million tonnes of waste, which is equivalent to 2.7 tonnes of waste per capita. Almost 60% of this was recycled (Australian National Waste Report 2016). Transporting waste materials away from households such as food scraps, green-waste, paper and non-recyclable plastics, just like electricity transmission losses, consumes considerable energy.

Councils face substantial and ever-increasing expense regarding waste management and rising energy costs for Council infrastructure. Burying waste creates multiple risks and by its nature is unsustainable; no matter how big the hole, it will eventually fill.

The project will also determine the net environmental impact of reducing coal-fired energy and removing methane, leachate, excess transport of waste and inter-generational risk currently embodied in landfills.

Looking at the two issues in parallel, the need to generate electricity locally and reduce waste to landfill, offers regional Australia in particular much opportunity.

2. Problems to be Solved

The key problems/questions at the centre of this feasibility proposal are:

- What do we do with our waste?
- How do we develop alternative base-load energy solutions that don't rely on the vagaries of climate or battery storage?
- What are the implications for the existing electricity transmission network (the grid) from alternative renewable energy options, including the issue of scale?
- What synergies can be made to input into the grid in lieu of additional capital works by energy distributors and generators to deal with lack of network capacity?
- How can local government best work with energy suppliers and distributors so that a win-win situation is achieved?
- Are the environmental and cost objections of W2E valid?
- Is the classic waste management hierarchy valid in regional areas in all instances?
- Can regional areas assist metro areas with their waste problem?
- Does the proposal satisfy relevant NSW Government regulations relating to waste management and energy from waste?

Whilst there has been much effort made in WA, and recently QLD and Victoria regarding larger scaled Waste to Energy investigations, and in some instances development has commenced, there has been no efforts to look at the advantages of small scale plants. This is despite the fact that smaller scale micro grids are less of a challenge to input into the existing electricity distribution network.

As noted by Transgrid (2018), the interest in renewable energy projects in NSW already significantly exceeds the capacity of the network to carry that new electricity generation. For example in the Northern NSW zone, there have been enquiries for around 3.5GW of wind and 5GW of wind generation, however the network only has a capacity to carry another 0.8GW. For this reason, small-scale 'behind the meter' projects which do not utilise the grid, or smaller scale grid-connected projects may be more feasible from a grid-capacity perspective.

In addition, Transgrid (2018) have identified priority renewable energy zones in NSW, including the Northern NSW zone to which Tenterfield is very close. These zones are characterised by:

- Abundant renewable energy;
- Existing network infrastructure with capacity to connect new generation;
- Proximity to population centres where energy is consumed;
- Compatible land use with low opportunity cost;
- Low transmission augmentation costs;

- Located on corridors between major population centres and maximise the use of the existing network

At present, catering for the unprecedented volume of renewable network connection enquiries (30GW) is not possible without network augmentation. However, coal-fired retirements over the next 50 years are projected to reach 28GW of lost generation, freeing up considerable network capacity. The challenge is to ensure the new renewable generation capacity is connected ahead of thermal energy retirements, and in a staged manner that minimises connection costs and avoids the development of stranded generation assets (Transgrid 2018).

Small scale W2E developments could assist in avoiding these challenges due to their minimal (or zero if behind the meter) use of the existing transmission network (less than 1.5 MW). Moreover, the question as to whether small scale W2E Plants could be managed by a larger scale providers and amalgamated via Supervisory Control and Data Acquisition and Automation (SCADA) to form what would effectively be a large scale generator as far as the energy market is concerned, has not been answered.

Although this is extensively an electricity generation project, many other endemic problems faced by rural areas in particular could be addressed; waste management; localised employment; reduced heavy vehicle transportation, environmental liabilities, and energy costs.

3. Questions to be Answered in this Feasibility Study

The feasibility study will examine the latest evidence to address the following questions:

- What are the obstacles/objections to W2E in a regional setting and are they valid (e.g. cool technologies are a better option environmentally & economically)?
- Can waste be used to supply power on demand – meaning there is no need for energy storage (batteries)?
- What technologies to convert W2E have been used in other countries?
- Who can we seek advice from such that we don't start from ground zero?
- Is there a scale of operation that is technically, financially, environmentally and socially viable in regional areas, including small scale electricity generation and feed-in? (Note: this includes a consideration of both spatial scale and population size/density at the same time)
- What is the scope for integrating W2E with other forms of renewable energy (e.g. solar)?
- What are the sources of waste that could be utilised and are they available in sufficient volumes?
- Are available volumes likely to be consistent through time in particular over the estimated design life of a facility?

- What is the smallest scale that when off-set with waste charges, provides an economically suitable solution?
- What is the environmental impact of any feasible options identified and how does this compare to alternatives (e.g. burying in landfill either locally or elsewhere);
- Can a local W2E system providing energy at a cost to local consumers, also provide an incentive to divert waste from landfill?
- What could regional areas offer urban areas, in not only electricity generation, but waste management?
- What are the issues surrounding the use of the local electricity grid system (run by Essential Energy) by a W2E operation?
- What is the public's appetite for change now, given the public discourse of rising energy prices, the crisis in waste management/recycling and the (incorrect) public perception that most recycling material goes to landfill?
- How is local government going to gain assistance and overcome the initial financial risk to trial and install suitable technologies?
- Should we review all energy paradigms, W2E, Waste Water Sludge to Biogas to Energy, and Photovoltaic Arrays in parallel and homogenise?
- Other than electricity being inputted into the grid, what other uses can waste to energy supply; diesel fuel, steam for industrial uses, raw materials, intensive horticulture etc.

4. Project Proponent

The project will be managed solely by Tenterfield Shire Council with input and assistance as required from Regional Development Australia – Northern Inland, Moree Plains Shire Council, and technical experts as required.

5. Content of the Feasibility Study

5.1 Background

An overview of the issues and challenges including:

- An overview of W2E issues in Australia – waste volumes, resource recovery issues, NSW Government regulation and policy objectives etc.;
- Current energy issues – transmission inefficiencies, retirement of existing base-load facilities, high capital costs of new fossil-fuel base load facilities, transmission system augmentation requirements;

- Landfill issues;
- The current NSW Government's Waste to Energy Policy;
- Environmental problems associated with transporting landfill long distances;
- Triple bottom line issues for regional economies – the cost of energy, the cost of landfill, the environmental impacts, and the social impacts (e.g. scope for local generation and industry).

5.2 Obstacles to W2E

An overview of real and perceived obstacles to small-scale distributed W2E systems.

- The definition of renewable energy. Can burning waste that has a non-biological source be regarded as renewable? Does this even matter if the net result is a better environmental outcome (e.g. are there less emissions from W2E than from fossil fuels, burying in landfill, transporting large distance for disposal etc.);
- Scale issues – in both feedstock supply and electricity generation;
- Saleable products – the lack of a local heat distribution system compared to European situation;
- Environmental Regulations, Compliance and Audit;
- Diversion from recycling or composting – are there better options for using waste, particularly landfill waste? Cool technologies – are they feasible in a regional setting?
- The waste management hierarchy – how relevant is it to regional locations, and does it raise the credibility of W2E options in regional areas?

5.3 Methods to convert W2E

An overview of alternative methods of converting W2E, including:

- Identification of current commercial technologies with a focus on those which already operate at a smaller scale;
- Discussion of their pros and cons;
- Feedstock requirements;
- Scalability;
- Outputs;
- Efficiency;
- Technical complexity;
- Mass and heat balances and thermal efficiency of the technical options;
- Operations and Logistics - legal, commercial, environmental and compliance requirements need to be 'hard-wired' into the design from the onset;

- Experiences in other locations;
- Identify potential technology providers and rate/rank their suitability;
- Short-list potential technology providers and rate/rank their suitability;
- Conclusion – most suitable small-scale technology for local operations based on technical aspects of the options.

5.4 Feedstocks

- What volumes are available locally?
- What volumes could be sourced from elsewhere?
- Calorific value;
- Seasonality of supply;
- Reliability of supply (including over the design life of the preferred technologies)
- What pre-processing would be required for the chosen technology?
- Operations and logistics for feedstock consolidation, transport and handling;
- Gate fees – applicable? Likely levels?
- Feedstock supply contracts – how would they work?
- The unprocessed waste issue – illegal to incinerate in NSW? What feedstocks are eligible for incineration for energy in NSW? (the NSW Energy from Waste Policy Statement);
- Variability in feedstock sources – likelihood of fuel types changing over time and the implications including flexibility of the technology to handle changes in feedstocks;
- Transport logistics – routes, number of truck movements, impacts;
- Can regional areas solve metro waste problems where W2E plants may be too aesthetically/environmentally confronting? If so, what are the parameters around this, in particular relating to distances for waste transport?
- What are the limits to re-use/recycling?
- Cross-border challenges with regard to waste-management or sourcing feedstock e.g. NSW/QLD.

5.5 Environmental and Planning/Regulatory

- Identify statutory and regulatory approval pathways;
- Define environment assessment requirements;
- Requirements to connect to the grid;
- Requirements to participate in the National Energy Market

5.6 Grid access

- One critical problem with most distributed energy projects in the region has been the need to distribute generated electricity to users via the Essential Energy network. Typically, Essential Energy would charge around 14c/kWh for the use of the grid, and Transgrid may charge an additional 3c/kWh. This has rendered similar projects (e.g. the Tamworth biogas project) economically unfeasible. The projects only work if all the energy is consumed on-site and not distributed elsewhere via the grid;
- This feasibility study will examine this problem, potential solutions, and the impacts on financial viability for regional W2E projects. In particular it will focus on what regulatory or policy changes might be needed to enhance the role of the existing grid as it moves from a distribution network to an energy exchange network;
- The issue of micro-grids and virtual grids will be examined;
- Options for use ‘behind-the-meter’ in various locations to avoid the grid issues (e.g. powering an industrial estate within which the facility is located).
- Need for and whether there is any justification for “dual systems” with connections to the main grid and also a local Microgrid.

5.7 Electricity supply & demand

- Demand and supply issues will be examined – energy use profiles and trends in the case study locations;
- The wholesale electricity market – likely future prices with the retirement of old technologies and the onset of new technologies;
- What is the scope for selling the majority of the generated electricity at peak times to maximise the financial returns? To what degree does this approach constrain other options?
- Examine the frameworks to sell power downstream to customers, including the option of becoming an electricity retailer and what that entails (costs, legal obligations etc.).
- Any local options for using heat or gas from the process?

5.8 Operations & logistics

- Legal, commercial, environmental and compliance requirements need to be ‘hard-wired’ into the design from the onset;
- Emissions and their treatment (e.g. scrubbing) – what is the best feasible option from both an environmental and economic perspective?
- How will residues (ash) be handled and site requirements

5.9 Governance and Control

- Explore governance frameworks, and establish a system including ownership and control (commercial structure);
- A W2E plant will have multiple stakeholders, other government entities, private industry, suppliers, and those residing within the locality. What is the best governance framework to manage this situation? (Including implications around Public Private Partnerships in NSW)
- Risk management procedures;
- Develop a structure for a Stakeholder and Communications Plan;

5.10 Economics & Financing

- Conduct financial modelling of the identified best option to ensure financial viability – rate of return on the investment, IRR, payback period etc.;
- Document assumptions for key parameters such as gate fee, energy offtake price, capital and operating costs;
- Explore the financing options available – potential sources of debt & equity;
- Conduct broader economic modelling of the identified best option, thus including broader social and environmental issues (e.g. local economic benefits, any cost savings over alternative waste-use methods, economic value of any environmental impacts) to arrive at a triple bottom line cost-benefit approach, in addition to a financial cost-benefit approach;
- How do the emissions from the identified best W2E option compare to the alternatives (landfill, other energy sources, recycling, composting etc.) and what is the economic value (cost) of the alternatives to be considered in a triple bottom line approach?
- How do the employment benefits of W2E compare to the alternatives (e.g. further segregation for additional recycling or composting)?
- How do the costs (capital & operating) of W2E compare to the alternatives (e.g. further segregation for additional recycling or composting)?
- What roles do subsidies and incentives play in financial viability? Are they essential for viability?

5.11 Risk Assessment & Mitigation Strategies

- Technical risks;
- Feedstock supply risks;
- Environmental risks;
- Contracting risks;

- Political/Economic/Societal/Community/Cultural risks;
- Financial risks including financing;
- Transport risks;
- Regulatory risks, including the risk of changes to subsidies/incentives;
- Market risks.

5.12 ARENA Requirements

- Reporting and project management in accordance with the funding agreement milestones;
- Lifecycle analysis demonstrating the greenhouse and environmental benefits of the Project, including transport and preparation of the feedstocks. Impacts on:
 - Climate change
 - Fossil fuel energy use
 - Fossil fuel resource depletion
 - Particulate matter formation
 - Eutrophication
 - Consumptive water use
- A knowledge sharing report for publication (this document).

6. Challenges to Fund the Feasibility Study; ‘Waste to Energy at a Local Scale’

Gaining financial partners for the feasibility study has been extraordinarily difficult. In short, nearly all council’s that tacitly support Tenterfield Shire Council’s endeavours are either waiting to see ARENA’s appetite for granting funding, or waiting for Tenterfield to deliver a solution without taking a financial risk - classic Catch 22 situation.

Outside of the political arena, operationally, many General Managers working within local government in NSW are very risk adverse, as they see the EPA (in particular) as a huge impediment for change here. This only adds weight to the need for the project to lead a thorough and scientifically validatable endeavour.

Tenterfield Shire Council, through the New England Joint Organisation, became involved late in the NSW Department of Premier & Cabinet (DPC) microgrid development project, though this had a focus on photovoltaic solutions Multiple Joint Organisations across NSW (and individual local governments in other States) are in support of the need to also undertake a W2E feasibility study.

The DPC, have now included it on their (Regional) agenda. Although it is fortuitous to be on the agenda, no funding to progress W2E studies has been forthcoming (unlike the solar solution). Unlike solar, there are no true W2E examples to learn from and develop a blueprint to allow replication. So having a desk top project that in effect data mines non-existent intellectual property will result in a sub-optimal conclusion. If it was as simple as copying what someone else in NSW has done it there would be a burgeoning industry here already. Subsequently in effect, the process is being pushed for and to date has been wholly funded by Tenterfield Shire Council and Regional Development Australia – Northern Inland. (Although since commencing the project Moree Plains Shire Council, Goulburn Mulwaree Council and Whitsunday Regional Council have joined.)

Entities which have indicated full financial support are as follows:

- Regional Development Australia – Northern Inland (NSW): \$20,000 (\$10,000 cash, \$10,000 in-kind support);
- Whitsunday Regional Council (QLD): \$15,000;
- Tenterfield Shire Council (NSW) - \$15,000 (plus quite a considerable in-kind commitment).
- Goulburn Mulwaree Council (NSW) - \$15,000
- Moree Plains Shire Council (NSW) - \$ 25,000

Partly committed:

- Inverell Shire Council (NSW). Dependant on ARENA's agreement they will 'consider' a \$15,000 contribution;
- Glen Innes Severn Shire Council (NSW): In support of completing the study, but didn't commit themselves. Instead requested the New England Joint Organisation fund all member council's contributions of \$15,000 each, totalling \$105,000, from the seed funding the NSW Government paid to set up Joint Organisations (which was \$300,000.)
- New England Joint Organisation (NSW). 'Energy' is included in the draft strategic plan, but the budget is yet to be determined. It has been mooted previously by members that the NEJO fund \$105,000 towards the project.

Recently requested:

On 5 October the Northern Rivers Joint Organisation (NRJO) was provided a brief *precis* on the Project. NRJO will discuss at their next scheduled meeting.

Riverina and Murray JOC wrote to Tenterfield Shire Council fully supporting the project and Tenterfield Shire understands that RAMJO intend taking it to their board in November to consider joining with other councils to help finance the project.

The Shire's of Hay, Bourke and Forbes have expressed an interest and have recently been forwarded details.

Byron Shire Council have been approached to contribute (after seeking assistance from Tenterfield Shire as they were about to embark on the same journey).

Tenterfield Shire Council has been invited to present on the Waste to Energy at a Local Scale Feasibility Project on 12 October by the North East Regional Waste Managers (north coast of NSW: Ballina Shire, Bryon Shire, Clarence Valley, Lismore City, Kyogle, Richmond Valley and Tweed Shire).

The total assured sum currently stands at \$ \$90,000. If ARENA provide a dollar-for-dollar grant of \$90,000, this would raise only \$ 180,000. Obtaining dollar for dollar funding from ARENA is NOT assured. It would be far better for the study to stand alone, such that the process can remain in the control of local government.

Whilst raising \$90,000 is commendable, it is not anywhere near likely to provide enough resources to thoroughly answer all questions.

Keeping in consideration that there are always a considerable number of detractors whenever Waste to Energy is mentioned, any effort that delivers only half of the required answers will open the doors for criticism and hence ensure the project's failure from the start. Alternatively, if the whole process is not viable, having a process not inform local government from the beginning would be just as disastrous.

Tenterfield Shire Council is therefore seeking enough financial contributions to ensure a robust process occurs. This is anticipated to be at least \$540,000.

7. Political Support

Tenterfield Shire Council, in collaboration with the New England Joint Organisation (NEJO), has received strong support from local representatives, and even more pleasingly, others from further afield:

- The Hon. Barnaby Joyce MP, Member for New England (Federal)
- The Hon. Thomas George MP, Member for Lismore (State)
- The Hon. Adam Marshall MP, Member for the Northern Tablelands (State)

Once the local political climate was understood to be positive, Tenterfield Shire Council commenced the process of seeking wider support via others, including the NSW Country Mayors Association and departmental representatives (State & Federal).

On 3 August Tenterfield Shire Council presented to the NSW Country Mayors Association.

In attendance was Mr. Ken Gillespie, Regional Infrastructure Coordinator, NSW Premier & Cabinet, and staff from the Office of the Regional Infrastructure Coordinator.

NSW Country Mayors adopted as follows:

RESOLVED That the Country Mayors Association provide a letter of support to Tenterfield Shire Council and the New England Joint Organisation to seek seed funding from governments to undertake a feasibility study and the Premier be advised of this support (Yass Valley Council/Glen Innes Severn Council)

RESOLVED That the Country Mayors Association invite other Joint Organisations to support the initiatives of Tenterfield Shire Council and the New England Joint Organisation to make Waste to Energy a reality (Leeton Shire Council/ Tenterfield Shire Council)

RESOLVED That the Country Mayors Association request Mr Ken Gillespie, Regional Infrastructure Coordinator to facilitate a meeting of State Government leaders including OEH, EPA and DPC with local government representatives to discuss the issues that could be faced making Waste to Energy a reality (Orange City Council/ Yass Valley Council)

During the meeting of 3 August, the Chair of the NSW Country Mayors Association, Mayor Katrina Humphries of Moree Plains Shire Council, took the opportunity to speak to the Hon. Gladys Berejiklian MP, NSW Premier, about the project.

Immediately after the meeting Tenterfield's Chief Executive Officer was approached by four (4) mayors, outside of the New England area, asking if he would be prepared to present to their respective councils (and/or JO).

Since then the Riverina and Murray Joint Organisation have not only sent a letter of support to Tenterfield Shire Council, they have adopted energy (including W2E) as their second highest strategic objective (only second to water security).

The Hon. Adam Marshall MP and the Hon. Thomas George MP advocated the worthiness of the project on behalf of Tenterfield Shire Council and the New England Joint Organisation to the Hon. Gabrielle Upton MP, Minister for the Environment, Minister for Local Government, and Minister for Heritage.

Consequently, on 3 August, Tenterfield Shire Council was given a hearing with representatives from the Minister's Office, including Mr. Kevin Wilde, Chief of Staff. The meeting was very positive, suggesting Council was on the right track and indicating grant streams available to assist (EPA) with

the project. Mr. Wilde commented that although there has been interest in very large Waste to Energy (W2E) applications that Tenterfield Shire Council was the only entity looking at how to scale W2E to suit local conditions.

Mayors Peter Petty and Michael Pearce, Tenterfield and Uralla Shire Councils, and the CEO of Tenterfield Shire Council, met with Mr. Cosimo Thawley, Senior Advisor, Office of the Hon. Josh Frydenburg MP; Minister for the Environment and Energy, in June. This was to seek clarification at a Federal level as to the worthiness and validity of the project. A similar comment was made regarding reduction of scale to suit local circumstances, versus what has been occurring to date - with larger scale proposals.

On 22 October, at the Local Government New South Wales Annual Conference, the delegates representing all councils in NSW unanimously adopted an amendment to the initial resolution (Resolution 42) regarding waste management to include Waste to Energy as follows (extract):

*Development of regional and region specific solutions for sustainable waste management (e.g. **waste to energy**, soft plastic recycling facilities, green waste).*

*Funding a wider range of sustainability initiatives, such as; **waste to energy**, marketing and strategies that provide and support a circular economy.*

Since the LGNSW Conference the NSW Country Mayors has, for the second time in as many meetings, discussed the Waste to Energy at a Local Scale Feasibility Study Project and resolved to write to all regional councils seeking \$15,000 to go towards the project. Further, they resolved to seek audience with the EPA to review the Waste to Energy Policy.

8. Conclusions

Waste to Energy is an underutilised additional resource available to assist the Australian energy market while at the same time dealing with an increasingly intractable problem of landfill disposal.

As a government (at least in NSW) it seems we have been hesitant in the past to release energy from waste because it isn't 'green', "it's too hard", or we're constrained as the Policy has too many constraints, yet almost daily governments of all persuasions are being castigated over energy prices and waste landfill sites, with the public mostly heralding renewables as the answer.

It is somewhat ironic that as a country we're effectively burying energy, in the form of 'waste', but on the other hand we're digging up coal to produce electricity – and will continue for a very long time.

With financial assistance Tenterfield Shire Council and our partners will demystify the current situation regards Waste to Energy at scales that align to smaller applications and obtain a true answer.

In doing so we'll discover:

- Is it feasible?
- If so, what does the feasible solution look like? – Feedstock, technology, environmental controls, locations, transport, financial performance, financing, ownership, governance etc.
- If it is not feasible, what needs to change to make it so?
- Next steps for implementation (if feasible) or towards feasibility (if not yet feasible).

9. Request

Tenterfield Shire Council and our partners need strong financial support to thoroughly and professionally investigate the current status and to determine what scales can be applied.

Whilst we have received an amazing amount of support from a great many areas, but most councils and JO's we've approached so far are:

- Willing to watch someone else take the risk and responsibility; or,
- Quite understandably, are slow to make decisions because their strategic plans haven't incorporated W2E (something that in effect has only just become a conversation point); or,
- Are concerned that the Regulator will continue make the process difficult if not impossible.

- Are confused because of the often biased views (both pro and anti-waste to energy)
- Have spent an enormous amount of money on excavating and preparing landfills and don't see the need.

At a political level there are no grand openings providing photo opportunities. Funding feasibility studies is therefore quite unpopular, the saying 'shovel ready' reverberating through the hallways of local governments right across the country.

The funding we have received to date, even if matched dollar for dollar by ARENA, is not sufficient to do a thoroughly robust feasibility study.

Tenterfield Shire Council, with our project partners, Moree Plains Shire Council and Regional Development Australia – Northern Inland, need to raise at least \$540,000.

We are confident that if enough of the right quality people, with the right motivation and non-biased ethics, are able to answer the last 13 pages of questions we'll be in a better situation.

10. Sources

Australian National Waste Report (2016), Prepared for Department of the Environment and Energy, Blue Environment Pty Ltd.

Transgrid (2018), Transgrid identifies top six energy zones in NSW and ACT to meet future need in the National Electricity Market, available at <https://www.transgrid.com.au/news-views/blog/Lists/Posts/Post.aspx?ID=205>