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COMMITTEE ON THE NORTHERN TERRITORY ENERGY FUTURE

Demand and Supply-Side Management Strategies and Off Grid Power Generation for Commercial and Remote Communities

Tersum Energy Pty Ltd

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Committee on the Northern Territory Energy Future

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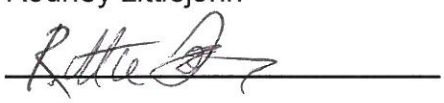
Signature: 

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1. Executive Summary

The Northern Territory is about to undergo a rapid period of economic expansion. This will be driven mostly by the development of the large LNG facilities + their associated infrastructure, as well as the ongoing expansion of both Australian and US military forces. These unrelated activities meet in their need for the stable supply of energy + water. An already stressed power network will incur even greater and longer periods of fluctuations bringing with them economic loss for industry and social challenges as lifestyles are impacted.

Being 'remote' from a large proportion of the Australian population during these times should be viewed as an opportunity, which should not be taken lightly nor lost by taking the path of least resistance. The introduction of the strategies included in this report are sustainable energy options which will position the Northern Territory to be in control of its energy mix and needs in the medium to long term. They will generate new employment through direct engagement + attract new and diversified industry and finally provide energy security and maximise economic efficiency by best use of all resources available.

The challenge is through considered planning and execution to develop a broader energy generation mix and sustainable energy solution through the introduction of:

Supply Side Management Strategies

- smart grids into new suburbs and industrial areas

Demand Side Management Strategies

- smart meters and other demand side enablers

Fringe or Off-Grid Generation Options

- a blend of base load generation, using commercially proven energy-from-waste technologies and large scale solar generation to compliment demand peaks.

2. Supply Side Management Strategies

2.1. Smart Grids

The design of networks in Australia are reflective of days past, whereby in the 1950's- 60's energy was the domain of state monopolies and the mantra was 'economies of scale' where the most efficient design was large central generation facilities and a 'spider web' of transmission assets to allow the electricity to be pushed to users of vast distances.

Effective for their time, these network designs are now becoming the largest costs in the energy supply chain, as they are either reached or have reached the end of their useful life's and now need to be replaced.

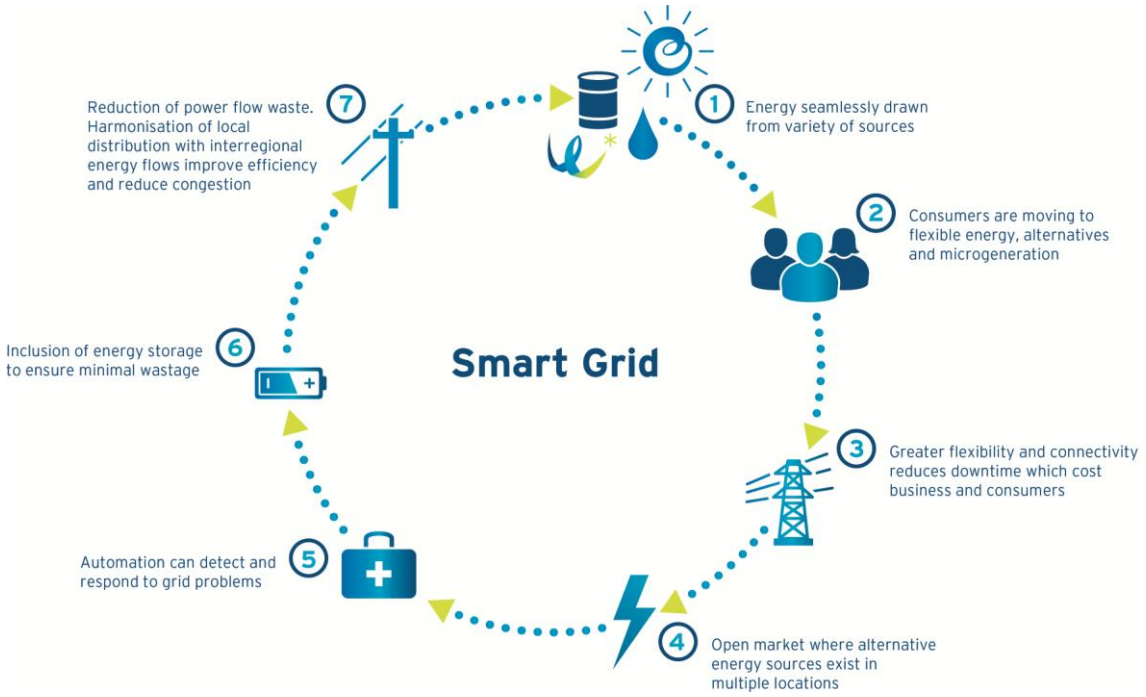
A smart grid is a modernised electrical grid that uses information and communications technology to gather and act on information, such as the behaviours of suppliers and consumers, in an automated fashion, to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

Growing concerns over environmental damage from fossil-fired power stations has led to a desire to use large amounts of renewable energy.

Power from photovoltaic cells (and to a lesser extent wind turbines), despite being highly variable, has also, significantly, called into question the imperative for large, centralised power stations.

The rapidly falling costs point to a major change from the centralised grid design to one that is highly distributed, with power being both generated and consumed right at the limits of the grid.

2.2. Features of the Smart Grid



The planned rollout of the NBN (in either FTTP or FTTN) provides the opportunity to introduce smart grid enabling technology. The rollout in either format has consistency in that there is a priority given to new community and industry subdivisions + essential services.

3. Demand Side Management Strategies

The introduction of demand-side tools such as smart meters has proved to be quite challenging in some of the large cities on the eastern seaboard, however the technology is not the challenge, rather the marketing strategies employed. Taking the lessons learnt from these implementations and identifying successful implementation strategies from Europe and/or North America will allow for a considered approach to be constructed and implemented.

3.1 Smart meters and the associated information technology

Smart meters usually refer to as interval or time-of-use meters, involving real-time or near real-time sensors, power outage notification, and power quality monitoring. Interval and time-of-use meters historically have been installed to measure commercial and industrial customers, but may not have automatic reading. Often people confuse smart meters with energy monitors. Smart meters may be part of a smart grid, but alone, they do not constitute a smart grid.

3.2 Purpose

The rollout of smart meters is one strategy for energy savings. The introduction allows both consumers and generators to better understand consumption patterns and develop efficiencies. For household consumers smart metering can allow them to adapt their electricity usage so that regular high usage activities (washing machines) can be set to run when energy prices are lower. Large consumers can incorporate technology that can monitor energy prices, weather and usage patterns. Running advanced algorithms the technology can inform to allow for decisions to be made to alter usage or buy electricity in intervals when costs are predicted to be lower.

With the inception of electricity deregulation and market-driven pricing throughout the world, utilities have been looking for a means to match consumption with generation. Traditional electrical and gas meters only measure total consumption, and so provide no information of when the energy was consumed at each metered site

3.3 Benefits

Smart metering offers benefits to householders and utilities. From a consumer perspective these include,

a. an end to estimated bills, which are a major source of complaints for many customers
b. a tool to help consumers better manage their energy use reducing their energy bills and carbon emissions. Data from usage in Europe and North America suggests average consumption reduced by 3-5%.

Smart metering offers potential benefits to utility companies and regulators include

a. matching of demand and generation, will allow for ‘right sizing’ of generation assets and reduce the amount of idle spinning capacity freeing capital and
b. allow for the introduction of a broader mix of generation options, in locations on the grid that can deliver maximum value and efficiency to grid performance.

A study in 2011, by The American Council for an Energy-Efficient Economy reviewed more than 36 different residential smart metering and feedback programmes internationally. The conclusion was to realise potential feedback-induced savings, smart meters must be used in conjunction with well-designed programmes that successfully inform, engage, empower and motivate people.

Both supply side and demand side management strategies are enhanced through the introduction of smart grids however there are generation options available today that whilst enhanced within the construct of smart grids are available today that can bring both flexibility and energy security to the Northern Territory.

4. Fringe or Off-Grid Generation Options

The full introduction of smart grid capability, which will undoubtedly drive a more efficient outcome, will however take significant time to develop. The introduction of smart meters and, more importantly, the broadening of the generation base through a blend of Energy-from-Waste and Large Scale Solar can be achieved in the near term (3-5 years) through collaboration between industry, government and communities.

The starting point in designing fringe or off-grid solutions is to identify the assets or resources available. In many cases again we choose the path of least resistance by adopting the use of fossil fuel sources, such as diesel, rather than seeking to deploy new, but commercially proven and operating alternatives.

The Northern Territory, like many other places in Australia is currently stockpiling, but wasting a valuable asset that can a long way to be used to generate reliable base-load power generation namely Rubbish.

The *'Shoal Bay Landfill'* currently receives in excess of 165,000 tonnes of waste annually (data 2010), and whilst some of the potential energy is captured by way of methane capture, the bulk is lost. The introduction of Energy-From-Waste as a base-load substitute to both diesel and natural gas will provide a secure energy source, whilst having the additional environmental benefit of eliminating landfill.

4.1. Energy-from-Waste Overview

Gasification is a chemical process that converts carbonaceous materials, like biomass & MSW into useful gaseous fuels or chemical feedstocks. Pyrolysis is a related process. Traditional incineration (more correctly referred to as Combustion) also converts carbonaceous materials into product gases, but there are some important differences. For example, combustion product gas does not have useful heating value, but product gas from gasification does. Gasification takes place in reducing (oxygen-deficient) environments requiring heat; combustion takes place in an oxidizing environment giving off heat.

Gasification is a well-established technology and different technologies have been commercially applied for more than a century for the production of both fuels and chemicals. Many of these technologies have the potential to produce more electric power from the same amount of fuel than would be possible by direct combustion (incineration).

A Gasification-based Energy-from-Waste (EfW) facility has essentially six stages:

1. Waste receipting and separation
2. Waste conversion (or gasification)
3. Gas cleaning
4. Energy Recovery & Production
5. Residual Product handling
6. Waste Disposal

4.2 Benefits of Energy-from-Waste (Gasification)

Attractive features of technology include:

- The ability to produce a consistent product that can be used for the generation of electricity or as primary building blocks for manufacturers of chemicals and transportation fuels.
- The ability to process a wide range of feedstocks including MSW, coal, heavy oils, petroleum coke, heavy refinery residuals, refinery wastes, hydrocarbon contaminated soils, biomass, and agricultural wastes.
- The ability to remove contaminants in the feedstock and to produce a clean syngas product.
- The ability to convert wastes or low-value products to higher value products.
- The ability to minimise the amount of solid waste requiring landfill disposal. Solid by-products have a market value can be used as fuel or construction material, and are generally non-hazardous.

From a ‘typical’ tonne of municipal waste the following saleable products are derived

The combining of Energy-from-Waste facilities with Large Scale Solar can enhance these saleable products. Large Scale Solar can be used to eliminate the ‘parasitic power’ or power for the facilities own use, resulting in more ‘base-load’ power being available consumers. In addition through community engagement large scale solar can be developed in a manner that increases the uptake of solar, whilst minimising network disruption.

4.2. Large Scale Solar

The benefits of large-scale solar are widely known and the flexibility of combining Energy from Waste facilities with solar is ideal. The two forms of technology complement one another perfectly.

In general the demand profile of residential usage matches the capacity profile of Solar, with the exception of the early evening. By developing hybrid (Solar/EfW) power generation facilities there can be delivery of the required base load power needed throughout a 24-hour cycle, with the solar providing peak demand requirements.

4.3. Summary of Tersum Proposal

Tersum was provided with the 'Industrial and Commercial Waste Management Review (released in Jan 2012), a very thorough document on the Territory's waste strategy, including future recommendations. Tersum's potential project, using technology which can address all of these recommendations and provide significant cost reductions by processing the waste at the coal face and negating the need to transport hazardous material interstate. Tersum would address/negate the requirement for a Clinical/Pharmaceutical and quarantine waste facility to be built as our high temperature Gasification technology can process such material.

Additional benefits can be gained within the Department of Defence whereby classified/sensitive documentation can be destroyed in a strictly controlled environment locally without the security risk of transportation south.

In the event of a natural disaster, such as a cyclone, the associated clean up would become a positive as the debris would be converted through our plant into electricity, and not impact Darwin's landfill.

Tersum is locally represented in the Territory by Bevan Wall. Bevan is a long term resident of the NT (31 Years) and has built a sound reputation in both Defence & Industry and is in touch with the future growth of all facets of industry in the Northern Territory.

Our management team would welcome an opportunity to discuss our proposal with a full overview of the benefits of renewable energy and sustainable energy strategies to the region.