



Southern Tasmania
Regional Land Use Strategy
Background Report No.9: Infrastructure
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This document is detailed supporting information for the Regional Land Use Strategy for Southern Tasmania.

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1. Water

1.1 Background

With over 96,000 connections 3100km pipes and 18 treatment plants, Southern Water operates across more than 50 catchment areas, some which extend into areas within northern corporation jurisdiction (Cradle Mountain Water and Ben Lomond Water).

Two significant modes of operation exist across the region. The major mode is via a centralised linear network based around the Bryn Estyn treatment plant adjacent the Derwent River, west of New Norfolk. It serves most of the greater Hobart sector (Hobart, Kingborough, Glenorchy, Brighton) with three major trunk extensions - through Southern Midlands 30km north to Kempton and east to Campania; east to Derwent Valley (Boyer and New Norfolk) and; through Clarence some 30km eastwards to Sorell and Penna. The balance of the serviced region is distributed through some 37 localities utilising 17 treatment plants.

The greater Derwent centralised system has ample source allocations. Once water is lifted from the River, capacity constraints begin through the treatment plant which reaches (or exceeds) its operating limits during high demand periods.

Greater Derwent schemes consume approximately 88% of their Priority 1 allocation, and some 12,000ML of Priority 5 water remains unused annually.

Other systems are supplied from more than 30 watercourses. Additional allocations were recently obtained to support the Huon Valley systems. Analyses of work programs and affordability now need to be finalised prior to rolling out a broader sub-regional scheme. The greatest challenge facing this area is potential industrial growth - projected population growth to 2030 is negligible.

Regional systems experience arguably more severe source issues, including:-

- Derwent Valley, Glamorgan Spring Bay, Central Highlands and Huon Valley schemes consume more than their Priority 1 allocation
- Central Highlands demand exceeds the total allocation
- Prosser supplies have at times depleted to 1 months supply (for Orford & Triabunna)
- Bicheno and Swansea also have source issues, with the Swansea project well underway
- Colebrook has recently experienced an extended period of water cartage due to failed supply
- Tunbridge relies on an off-stream storage during drier months – capacity is 50-80 days
- Hamilton, Gretna, Wayatinah and Ouse can all be affected by maintenance practices for Hydro dams

The centralised network relies heavily upon the trunk mains, with on ground storage subsequently reduced in many areas. Several weaknesses exist in the distribution system, including:-

- Kingborough presents demands beyond capacity during hot summers as the treatment plant and transfer mains have insufficient capacity to maintain water levels in Ridgeway Dam
- Margate requires an additional transfer main to boost capacity, with potential then to expand supplies through Kettering and Coningham

- Lake Fenton pipeline has limited capacity, presenting restriction to areas like Chigwell
- Granton and Chigwell areas have insufficient on ground storage

Low pressure and potential fire protection issues exist in elevated areas like South Hobart, upper Sandy Bay, Lenah Valley, Tolmans Hill, Ridgeway/Fern Tree and Porters Hill and fringe areas of Clarence on the Eastern Shore.

- The trunk line from Berriedale to Elwick limits supply balancing to Hobart and the Eastern Shore and requires duplication to meet growth demands
- Tea Tree and Richmond supplies become stretched if irrigation demands increase on that distribution line
- Treatment and distribution issues affecting regional systems include:-
- Bothwell, Gretna & Ellendale might all require additional storage, and Ellendale demand can exceed supply capacity
- Oatlands treatment plant is at/near capacity
- Mangalore through Dysart trunk reticulation is aged and cannot sustain increasing pressures necessary to meet demand

1.2 Source Management

Even in Tasmania with its' abundance of water, the importance of water to sustainable planning and development is being increasingly highlighted. Without reliable and sufficient water sources of appropriate quality, efficient and sustainable service provision is increasingly difficult.

Strategic management of sources, treatment and reticulation systems cannot be optimised if undertaken in isolation, and if not aligned to development and consumption patterns – past, present and future. Poor development decisions can divest communities of the benefits of consistent and efficient service and strategic infrastructure planning.

1.2.1 Surface Water

Most Southern Water allocations are based on average consumption from 1995-2000. Some granted allocations are potentially in excess of the capacity or yield of the natural systems. Of the 110GL, about 50% is surety level 1 [expected to be available at greater than 95% reliability] and 20% surety level 5 [expected to be available at about 80% reliability].

Growth from 1996 to 2006 has been approximately 4.5%, and growth over the next 20 years might range from 14 to 24%. The Priority 1 water allocation, which itself might not be (fully) available 1 year in 20, will be exceeded and town supplies will be reliant on Priority 5 allocations which are one-quarter as reliable.

Should climate effects reduce catchment yields, then the reliability of the allocations will be adversely impacted. Similarly, any loss of quality due to salinity, sea level rise, or runoff quality may reduce service levels and/or increase treatment costs.

Variations to Hydro dam operations might impact on water reliability in those affected sources, as may increased irrigation extractions. River off take structures might require alteration if water levels rise or decrease significantly, even if for intermittent or short periods.

Construction of small dams on rural properties can impact on catchment yields. In Tasmania dams less than 1ML are not regulated provided they are not located within a watercourse.

Source quality may be impacted by increases in sea levels that may push saline transition zones upstream into extraction zones. Changing or intensified land uses within catchments might give rise to increased sediment, chemical residues or nutrients and other contaminants in source waters – including groundwater. Some Southern Water catchments extend into areas served by Ben Lomond and Cradle Mountain Water, or the Northern regions for planning reforms and resource management (NRM).

1.2.2 Groundwater

Most parts of Tasmania have low rates of groundwater extraction, and as such no direct issues arise. During extended dry periods however, saltwater intrusion may take effect, rendering groundwater sources unsuitable.

Whilst extraction for urban purposes is quite low (~2% of total extraction), the issue must be considered and monitored. It is not unusual to become more reliant on groundwater sources as rains decrease and/or source demands increase for irrigation or other uses. Source management and planning must therefore integrate the demands of all affected users, and all the available sources.

As an example, if developments and land use are established based on groundwater sources, and those sources fail, surface water substitution is required from currently utilised sources. Given these scenarios typically occur in extreme events like extended dry periods, the surface sources might also be significantly depleted, exacerbating the issue. Where properties rely on bores or spears and have no reserve storage, they are susceptible to quality, groundwater level and power reliability in combination.

The Bruny Island bore currently provides up to 400kL per month to service domestic water tanks across the island. It may become impacted if surrounding land uses and impacts are not strategically managed. Contamination by infiltration or seepage of septic, industry wastes, salinity of catchment soils, stormwater runoff from developed areas, well inundation are all issues which can affect groundwater quality.

1.3 Growth

Infrastructure demand is driven on several fronts – population, consumption, occupancy and land use (more specifically commercial/industrial). In an environment with increasing rates of change incorporating a higher number of variables, a thorough model for growth forecasting is critical to good planning.

The changing environment must be clearly understood in light of historical trends so that a clear appreciation of future effects is established for planning assumptions and scenarios.

1.3.1 Population

There can be significant variation between permanent and virtual/holiday populations in many areas. There are many communities across the Region with low permanent populations which swell 2-3 times during holiday periods. These increases can range from a few days up to 3 or 4 months, and often occur around holiday seasons. The number of persons per dwelling can also be significantly higher during these periods.

By not fully understanding the effect of these population variations, and properly assessing appropriate technology and costs thereof, over-commitment of resources becomes far more likely.

1.3.2 Occupancy & Density

Reductions in dwelling occupancy (of 15-18%) are likely across most or all the Region in the next 20 years (see Regional Profile report). This could reduce demand per dwelling and increase the number of houses, which might also increase asset outlay (reticulation lengths) if lot densities do not increase. For systems highly sensitive to “sales volume”, these effects might significantly impact household servicing costs – keeping in mind the high proportion of fixed costs in water provision.

The occupancy rates and their predicted rate of change vary significantly across the region, showing the importance of using localised data, not State or Regional averages. The East coast areas average 2.3 persons per dwelling, potentially reducing to 1.9 by 2026. Clarence currently has 2.6 persons per dwelling and Brighton is of the order of 2.8 persons per dwelling. Trends are downward in the range 12-21%.

Across the Greater Hobart area, typical densities are at 7-15 dwellings/ ha with some areas, because of lifestyle reasons, typically having much lower levels of density (such as 1 dwelling/ha). As residential densities increase, so do efficiencies in the provision of infrastructure services, both in terms of water and sewage infrastructure but also Transport infrastructure. These efficiencies in service provision also have an impact on costs of providing the service where dwelling densities are lower.

1.3.3 Consumption

Consumption per premises also varies significantly across the region, the range by council area being 180-580kL/annum (inclusive of non-domestic use). Individual scheme figures within municipal boundaries vary even more, and should be checked against service limitations (eg low use might be a result of non-supply, or restrictions) and user profiles (eg large industrials in small towns).

Rural residential lots may present higher use, or spin-off to higher use enterprises (eg hydroponics, farm garden). An example might be large lot rural residential development which uses an average 15% more per connection, for yard water use only, than total use across a broader urban scheme. Across the region there are many examples of these lots with alternate enterprises demanding water.

Integrated water solutions, such as rainwater tanks and water reuse, can reduce demands to the reticulation significantly.

Large non-domestic consumers can significantly impact every aspect of water services. Some large processing entities can represent up to 60% of system consumption. Annual variations of 10-15% might typically apply, with higher levels of volatility possible. There also exists risk of large users significantly expanding or downsizing their businesses quite quickly as economic/market opportunities align.

A proposed aquaculture facility in the Huon Valley may increase consumption in that system by 25%. Conversely, partial closure of the McCain facility in the north-west might see a 20-60% demand reduction in that system.

1.4 Sustainability

The foundation of sustainable communities and regions is arguably water. Without reliable water sources, industries will constrict, agriculture declines and community amenity is reduced.

1.4.1 Land Zoning and Use

Future zoning of land means a longer term infrastructure focus is achievable, and improved solutions can be planned and implemented consistently over a long timeframe. Resources can be efficiently directed to strategically planned projects and extensions without the distraction of random infrastructure demands. Networks which expand indefinitely, particularly those without adequate cross linkages, diminish in service integrity resulting in increased customer service demands.

Land owners, investors, utilities and other stakeholders all have time to wind up or down their business plans in accordance with a consistent plan. A consistent strategic plan also means that robust financial planning can be undertaken to improve or optimise equity.

1.4.2 Finances

An initial matter worthy of resolution is the cost of work as used by various stakeholders in determining policy, planning issues and the like. This is typically an area of significant variation, often leading to misunderstanding and discrepancy between planning, funding and implementation studies, analyses and policy. There is significant gain in having a common data bank for such information so that understanding of cost structures improves, and all aspects of planning (short term through to strategic) become better aligned. Meanwhile, it is imperative that all financial assumptions be ground-truthed before making policy, pricing or economic rulings.

Fixed costs to the corporation - including operations, maintenance, administration and financing - are largely fixed between 75 and 85%, so regulations must carefully balance the reform agenda - water demand management and user pays - against sustainability of the corporations. Higher use charges aimed at controlling consumption can significantly diminish revenue streams, or increase cross subsidies between user groups. There are several examples where revenues have plummeted as customers responded severely to high use charges.

Southern Water faces a large capital works program ahead – initial indications are \$186M new works or \$400M total over 10 years - including an array of legacy issues bound up by the reform objectives (which are not necessarily included or accurately costed in those predictions). Aside from the pressures of financing and constructing the works, the ongoing operation maintenance and ownership costs present a significant impact to forward budgets. It is important to therefore closely match demand and growth to investment and expansion in order to protect the long-term interests of customers.

As an example, the proposed Huon regional water scheme will invest some \$25M to address increased demands and potential future growth. DCAC¹ suggests that limited medium to long term growth will occur in the Huon area, despite the trends of recent years. Hence, a dichotomy of infrastructure planning – large monies may be expended and demand trends are highly varied.

A final point worthy of notation at this stage is the funding methodologies of the public sector. Whilst some sectors of government are moving towards preventative programs, more flexible thinking is needed to move some reform agendas.

¹ Demographic Change Advisory Council, Tasmanian Government

1.4.3 Developer Charges

A useful mechanism for bridging the problem of growth and associated infrastructure costs may be developer charges. They can be used as a tool to focus development to areas where costs are lower, or services more readily achievable – the default mechanism is that high cost, low yield extensions will incur higher developer charges than more efficient infrastructure.

To determine the charges, infrastructure investment is determined, preferably using fit-for-purpose service levels. Infrastructure projects are then scheduled by matching them to corresponding growth predictions, generally limited to 20 or 30 years. By using a common measure of development – in the case of Southern Water, this is an equivalent tenement (ET)² – it is relatively simple and efficient to apply a proportional charge to all developments within the planned service areas.

Eight Councils across the region applied developer charges prior to 1 July 2009. The quantum in current dollars ranges from \$270-\$2,100 per lot. All in subdivision infrastructure is to be provided by the developer at the developer's cost and passed to the Corporation. All external infrastructure solely required to service the development is to be provided at the developers cost.

Charges adopted by Council's prior to 1 July 2009 will continue to be applied. Intent is to determine and apply appropriate and cost reflective charges, which are applied on a case by case basis to all relevant development.

1.4.4 High Volume Customers

In any situation where significant source volumes, or sales volumes are tied to single users or an industry group, it will be essential to monitor those relationships and fully assess their impact on the corporation.

Large industries are often seen as saviours of small or declining communities, and they might be. If however they decline or leave, the impacts can be devastating. Many of these industries present very significant imposts on utility infrastructure. If they significantly decline, then affordable methods for downsizing infrastructure and operating costs are vital to the affordability for the communities that remain.

1.4.5 Fire planning

Densification of activities, regardless of land use or zoning may present significant challenges to reticulation networks. In particular, higher demands and increased fire fighting requirements might not be readily achievable if capacity does not exist within the networks. Worst case scenarios include sub-regional commercial precincts where no real fire fighting capacity exists due to poor land use planning and/or inadequate trunk networks feeding the expanding development corridors.

Protection of critical assets with vegetation and development buffers will become more important particularly if fires are more prevalent in future. Maintaining the quality characteristics of catchments and open storages will also become topical should climate variations increase fire frequency, spread or intensity.

² Equivalent tenement is a typical residential dwelling, based on average occupancy and consumption.

1.5 Efficient Infrastructure

The proposed strategic and integrated planning approach aims to establish focal areas for development and growth over the next 10 years, and will encompass guiding principles and overlays extending 20-30 years forward. There is significant merit to aligning infrastructure strategies to this approach as opposed to arbitrarily enabling land or communities for service expansion.

Time has proven that expanding settlements around their perimeter, or along spurs or corridors does not result in efficient infrastructure, unless appropriately planned and implemented. One can find countless examples of overcapitalisation made ahead of, or in pursuit of proposed developments. Many other situations now exist where service levels are marginal due to inappropriate expansion trends.

Historically, as the efficient areas for development are filled and become less affordable, all facets of the development industry leap away to new areas often leaving land 'gaps'. Generally, these trends have resulted in extended linear arrays of reticulation rather than optimised, linked networks.

1.5.1 Asset optimisation

The Southern region has 30 connected properties per kilometre – compared to 38 in the northwest and 28 in the north. Regional councils had service densities or yields in the order of 25 for water connections, with smaller relatively efficient schemes (some 500-600 connections) yielding 20 connections per kilometre. The rural council areas in the south serve only 14-18 properties per kilometre.

Rural living proposals could yield as few as 4-5 connections per kilometre. Unless reduced service standards are adopted, the linear asset outlay is equivalent to an urban situation yielding more than 60 connections per kilometre. Putting aside infrastructure costs, recurrent costs are often comparably high for small communities and developments pursuing rural amenity.

A longer term focus should identify opportunities through amalgamating schemes or facilities or sharing their capacity over larger service areas. Infill is likely to be possible across many urban areas, but will require verification of asset capacity. Without adequate storage within sub-regional networks, conversion to higher densities along trunk mains can reduce serviceability at the ends of linear distribution networks (eg. New Norfolk to Glenorchy to Hobart to Kingborough). Planned pump, store and boost networks can efficiently service growth along these trunk main routes.

Where appropriate provisions (by Zoning) are not available within Planning Schemes, approvals for infrastructure proposals can face substantially lengthened timeframes and be exposed to greater public scrutiny. Forward planning will also ensure that utility functions and facilities are appropriately located and supported by relevant buffers or transitional land uses.

It is therefore important that appropriate corridors and land parcels be identified and appropriately protected for future development of utility provisions.

Affordable housing is tending to areas where land is cheaper, but often presents challenges and higher costs to service. Infill may be a positive solution as marginal cost of infrastructure decreases. This particular market offers substantial opportunities to develop integrated solutions to water servicing, if appropriately integrated into communities and innovatively engineered.

The desire for higher quality of life pushes improved views and higher amenity - often resulting in higher service costs. If these effects were to be discounted to improve affordability, then mechanisms like developer charges become unattractive and any true service cost indicator to the market is lost.

1.5.2 Integration of water solutions

Stormwater provision and services have remained with local governments. Opportunities to integrate WSUD³ principles may therefore be reduced, so strategic initiatives of Corporations might be best integrated into Local Government Planning Schemes.

In a similar manner to the MRET⁴ system for energy, sustainability reforms might be achieved by adopting service targets such as net demand on services, or a mandated proportion of sustainable water sources in a particular development.

Existing on-site water tanks might deliver an average 40-60% of annual water demand for an average household. Incorporating tanks into any future water scheme therefore has the potential to reduce demands, and subsequent costs, significantly. Depending on cost drivers, the downside may be that variable portions of revenue streams will be impacted by reductions in sales volume, and more critically, when rainfall sources are inadequate, the reticulated scheme will be demanded for full supply volumes.

1.5.3 Co-location, proximity

Most of the southern region relies on a centralised distribution network extending almost 100km to serve the varying communities. Energy consumption increases significantly with distance from the water source, therefore locating large users a significant distance from the source will increase transfer costs and expand infrastructure costs. Pipes need to be larger and longer to meet the service demands of transferring large volumes of water. These effects are exacerbated where reservoir storage is insufficient to optimise trunk main operation.

Close power supplies of relevant capacity, connectivity and redundancy are essential to effective water services and improved reliability.

Distribution networks for electricity within some areas may need augmentation to support significant increases in energy demands, whether site specific or for broader development demands. This could introduce flow-on delays from rolling out infrastructure support services. Increased demands to some of these areas might disproportionately impact carbon footprints or related environmental indicators, particularly as distances from generation sources escalate.

Maintenance of buffers around critical infrastructure is vital to ensuring amenity and avoiding future amelioration costs. Whilst this is generally less critical for water infrastructure, it remains an important consideration – particularly around storages, river inlets, etc. If for example it became necessary to establish an off-stream raw water storage, adequate land is necessary, and contaminant risks need to be sufficiently remote.

If consideration were made towards relocating commercial or retail areas, the urban reticulation networks might face an increased demand and require alteration or augmentation – larger network might be required in through the proposed more intense use area.

Varying land uses can present differing base and peak demands – night consumption for industry versus morning and evening peaks for domestic. If these effects are considered, even briefly at planning stages, then a balanced demand on water systems might be achievable.

³ Water sensitive urban design

⁴ Mandated renewable energy target

Uses such as rural land irrigation may increase need for labour in sub-regional areas, so sustainable centres should be appropriately planned and serviced.

1.5.4 Small community servicing

As a result of increased development activity and changing demographics, demands and/or expectations for centralised infrastructure to resolve health, environmental or service issues have risen substantially. Many rural towns are becoming attractive to residents accustomed to urban services. The desire to maintain lifestyle characteristics of some settlements will often conflict with the outcomes associated with service expansion.

Onsite costs may be comparable to reticulated services in many situations, albeit individuals will have substantially less control with reticulated systems. Development without proper controls however, may impact adversely on amenity and environment thus invoking significant pressure to reticulate.

Due to their smaller scale, these systems typically invoke higher unit capital costs to construct and produce significant annual costs. A capital outlay multiplier for settlements less than 1000 person potentially ranges from 1.5 to 5 for water as size reduces to 100 persons – the multiplier is generally 1 for populations 5-10,000. Similarly, operations and maintenance cost multipliers may increase to 2.5 over the same population range – generally 1 for populations greater than 7000.

Fringe and/or remote areas around the region typically show decreased income levels, likely to represent a reduced affordability to pay (higher) service charges. Rate levels in such areas are often 25+% higher than urban areas.

Conversely, higher income buyers are often attracted to unique development opportunities and/or properties which might be beyond normal service limits. This is an acceptable situation, provided those developers and investors are willing to meet the capital and recurrent costs of the increased service demands, and not burden the wider community.

An intent of reform was to promote cost recovery and fair/equitable attribution of costs. Generally, smaller communities will not be serviceable within similar cost structures to the larger urban schemes, so charges will be significantly higher or cross subsidies will be necessary.

It is very difficult to service these developments efficiently, and generally treatment and pumping systems operate far from optimum conditions when the loads or demands on the infrastructure vary significantly for short or medium periods.

1.6 Climatic Variation

The key impacts of climate that will impact water services are sea level rise or inundation, shifts in rainfall pattern, and weather severity.

Sea level rise impacts from climate change may cause inundation of land suitable for infrastructure, or may invoke an infrastructure relocation program for existing assets. As previously discussed, they might also cause increased salinity or outright displacement of some sources.

Increases in adverse weather may reduce reliability of overhead electricity networks. These effects may be manageable using backup power systems which are becoming more affordable, even for smaller installations. Longer response times to non-urban schemes might also increase the need for backup provisions, increasing service costs.

Large storm events could increase the prevalence and frequency of poor raw water quality, giving rise to treatment difficulties and ultimately significant capital outlays to upgrade treatment processes. Heavy rainfall might also create conditions for landslips at higher frequency or in extended locations, possibly dislocating infrastructure.

Warm weather and reduced rainfall and runoff and stream-flows has potential to increase impacts of algal blooms and other similar problems. Those same effects might see a reduction in the quality and amenity of open spaces and/or playing fields unless alternative, more sustainable and less expensive supplies are available to water them appropriately.

Such situations could give rise to a dichotomy between the amenity and social issues related to open space and recreation, and the resource and economic issues evolving around water sources.

In worst cases, the various effects of climate may alter the available uses of various water sources, and certainly alter how they might be allocated. These water shortages might also invoke intensive agricultural pursuits in order to produce more efficiently. Such innovation can often give rise to new issues – for example, desalination requires disposal methods for the brine by-wash.

1.7 Planning Implications

The various patterns of development characterised in Tasmania have varying impacts for service provision. Australian's love of quarter acre lots produces considerable urban sprawl which can often lead to inefficient service provision. Furthermore, in a place such as Tasmania where people are embracing rural-residential living, there is increasing pressure on service providers to provide a level of infrastructure not sustainable for that level of density. Historically the costs in providing these services have not been adequately passed on to the community that is making that lifestyle choice.

With the establishment of regional bodies and projects in both service provision, and also in Land Use Planning, an opportunity exists to embrace discussion regarding sustainable development across the Region. It is essential that regular dialogue is held between the variety of Infrastructure providers and land use planners, not only at the broader regional level but also at the Council level. As discussed future planning of growth areas provides an organisation such as Southern Water with an opportunity to plan for infrastructure demand and assess capacity in existing networks. In turn, in any land use planning decisions, a complete knowledge of infrastructure restrictions is essential in good decision making.

At a more micro level, regular dialogue must be maintained between Southern Water and local Council's in the assessment of development applications. This ensures appropriate conditions are applied to developments, enables Southern Water to track where developments occurring, and gives Southern Water an opportunity to request developer contributions where appropriate.

2. Wastewater

2.1 Background

With over 89,000 connections and 2200km of pipes, Southern Water operates 52 treatment plants. Twenty of those are Level 1⁵ and licensed by Councils. Of the 32 larger (Level 2) plants, there are 11 discharging to the Derwent River system, 7 to estuarine environments or oceans outfalls and 4 to creeks or other rivers. A further 3 plants discharge into 'sensitive' environments (the Pittwater Lagoon or a Wildlife Park).

Compliance of Level 2 treatment plants is of concern to the Regulator (EPA), with plants across the State meeting only 50% of all licensed parameters. Regardless, receiving environments are in good condition. An extensive review of licences (EPNs) is underway since most the treatment plants operate under considerably old and arguably extraneous permit conditions.

Reuse is undertaken to varying levels in at least 17 of the larger (Level 2) plants across 8 Council areas and accounts for approximately 42% of effluent production, including several smaller plants. The Coal Valley Recycled Water Scheme represents the largest component at 1700ML/yr and increasing.

More than 180 pump stations are required to overcome the geographic constraints of the various networks to ensure sewage effectively reaches the treatment plants.

Outside the major serviced centres, there are 33 townships or localities with reticulated systems.

The general preference is towards larger centralised schemes which are more cost effective and sustainable. Technology and integrated planning reviews may change this over time, provided economic measures can be met.

Capacity issues exist in many forms across greater Hobart, including:-

- Trunk mains required from Granton and Austin's Ferry to cater for demand
- Treatment plants are at or near licence capacity at - Prince of Wales Bay, East Risdon, Rosny, Margate, Blackmans Bay
- Macquarie Point plant is operating significantly below capacity. The facility is on a lease from TasPorts
- Taroona treatment plant is overloaded, and investigations are required to determine viable options for expansion or diversion
- East Risdon and Margate treatment plants currently exceed their licensed flow limits which is likely to invoke a licence amendment by negotiation with EPA
- Some industrial land remains along Jackson St Glenorchy where trunk sewers are at/near capacity
- Lack of stormwater systems across much of the city create problems with overflows during wet weather, or reliance on sewer systems
- Many pump stations have no redundancy, and are proximate the River or other sensitive environments

⁵ A level 1 plant discharges up to 100kL/day (approximately 400 equivalent permanent population)

Regionally:-

- Ellendale and Bushy Park onsite sewage systems may be intermittently below optimum performance
- Many plants in small centres or tourism focussed villages would desirably be relocated to more suitable land
- Geeveston is facing capacity exceedance due to approved subdivisions
- Treatment plants are at or near licence capacity at - Woodbridge, Triabunna, Tarooma
- Bagdad, and most likely other small centres with lagoon systems, experiences sewer odour problems on a seasonal basis
- The lagoon system at Bagdad is constrained in area, and has increasing demands from subdivision activity
- Some common septic systems exist across the region which need to be renewed or augmented to improve performance and cost efficiency (eg. East Bagdad, South Arm)
- Reuse schemes in smaller council areas operate in highly variable efficacy – Orford scheme is inoperable
- Many areas have failing onsite systems and prevail on reticulated sewerage for a solution regardless of efficiency.

To date it has been preferable to extend reuse into the Coal Valley as opposed to upgrading treatment facilities in the Clarence area to Tertiary level. This is a pattern reflected across the region, and most of the country generally – it is typically less expensive to develop reuse opportunities than higher technology and treatment quality.

2.2 Source Management

In sewage terms, source management relates to the contributing flows and loads to the system. These range from typical domestic discharges through to stormwater inflows, infiltration and industrial effluents. There are significant links between water supply management and sewage issues, and the two must be considered in tandem to optimise the overall costs of the water services cycle.

Generally, Tasmania has small sewage systems and resilient environments in which to operate. Most systems have relatively consistent and low strength discharges. Industrial and commercial dischargers generally offer relatively low levels of pre-treatment compared to most mainland situations.

The major source components to consider are domestic flows, trade waste and inflow/infiltration.

2.2.1 Domestic sources

Water reduction fixtures have effects on flow cleansing, and the strength of sewage is increased through less dilution. The latter effect has positive implications for newer treatment technologies.

Longer systems lead to septicity and related odour problems. Development which does not extend down lengthy corridors alleviates this problem.

Planning sewer systems faces similar difficulties as for water systems. It is probably even more beneficial to match growth and flows to design to avoid blockages, sediment deposition and septic issues in pump

stations. Oversized pump stations are difficult to manage should proposed growth not occur – aside from the misallocated capital expenditure.

2.2.2 Trade Waste

For the purpose of this discussion, trade waste is any discharge to sewerage from any non-domestic premises.

Many planning provisions contain use descriptions enabling widely varied system demands within a development. This makes it difficult to plan and to determine appropriate planning conditions to cover the multitude of scenarios that might be established “as right” with any Permit.

Particularly for larger volume or strength discharges, it is important the characteristics of the operation be well understood. Reticulation systems are designed mostly based on peak loads and assumed diurnal load patterns. It is therefore possible in some instances for trade wastes to be utilised during low demand periods to improve the efficacy of the reticulation networks.

Poor management of trade wastes can result in effluents and biosolids being far less suited to beneficial product development due to contaminants.

2.2.3 Inflow and Infiltration

Inflow relates to stormwater which enters the sewer system via various means – open pits, flooding of manholes and pump stations, illegally connected stormwater pipes, etc. Infiltration typically represents water (often groundwater seepage) which ‘leaks’ into the sewer system, either through pipe joints, or gaps in other infrastructure.

Optimised infrastructure reduces both components by minimising the length of sewer installed.

Poor development decisions can exacerbate the problem if all relevant infrastructure issues are not properly addressed (sewer, water, stormwater, seepage).

The problems can be increased where development is not properly planned and sewer systems extend through ‘marginal’ areas – across swampy areas, below watercourses or artificial water storages forming part of a development proposal.

2.3 Growth

In general terms, the growth of sewage systems is linked closely to water issues. Where no water reticulation exists, there are usually lower demands on the sewer system since water consumption is less. Issues related to population and development density are covered previously under Water.

2.3.1 Production

Sewage production per premises has historically been of the order of 50% of water consumption. Data available shows this has varied over time, and the proportion of premises sewage generation varies significantly across the region - the range by council area being 180-350kL/annum. Figures from the State of the Industry report show sewage discharge across the Southern council areas was up to 87% of average consumption, with the lower value being 43%.

Higher density development generally produces a higher proportion of water discharged to sewer, since there is a significantly reduced external use of water.

Large non-domestic consumers can significantly impact every aspect of sewage services. Some large processing entities can represent up to 80% of system loading. Annual variations of 10-15% might typically apply, with higher levels of volatility possible. There also exists risk of large users significantly expanding or downsizing their businesses quite quickly as economic/market opportunities align.

2.4 Efficient Infrastructure

The path to sewerage infrastructure efficiency is heavily influenced by environmental regulation. As populations continue moving towards major urban centres, typically located in coastal or riverine environs, impacts on environments are perceived to increase.

In Tasmania, many plants that do not meet the current Tasmanian Accepted Modern Technology Guidelines may be required by the Environment Division to upgrade to this Tertiary treatment standard. For larger plants like Macquarie Point, Prince of Wales Bay, Blackmans Bay and Cameron Bay, this capital cost would be many tens of million dollars per plant, along with ongoing additional operational costs once constructed.

There could also be spatial limitations for an AMT plant at a site such as Macquarie Point, (especially given the existing treatment plants must remain operational throughout the construction of the new plant) which would require relocation of the plant and building of transfer pump stations and pipelines, further adding to capital and operational costs.

Further to treatment plant issues, the common perception that real costs of infrastructure will dramatically change land demand considerations might be true, however it might not necessarily be cheaper to undertake infill development. This will particularly depend upon whether existing systems through developed areas have sufficient capacity to accommodate that proposed infill.

2.4.1 Asset optimisation

The Southern region has the highest service density for sewerage with an average 57 connected properties per kilometre of main – ranging from 30 to almost 60 across Council areas. Regional councils had service densities or yields in the order of 30-45 for sewerage, with the larger urban centres (representing the vast majority of serviced area) serving 50-60 dwellings per main kilometre.

Sewerage reticulation has generally been provided with higher yields, however due to municipal boundaries, there are several examples of treatment facilities which might be best rationalised. The two plants in the Sorell area might be best merged as growth presents the driver for augmentation of at least one facility.

The Brighton area (including Mangalore to the north) could be diverted to the Green Point facility, and flows to the Tarooma facility - which requires augmentation and is subject to landslip - could potentially be directed to Macquarie Point. Similarly, there could be many pump stations which could potentially be optimised through gravity diversions or other changes to reticulation networks within and across municipal boundaries.

Optimising reticulations and treatment facilities for major trade waste generators might require a joint approach. Pre-treatment and/or onsite storage might present opportunities for significant cost savings and offset of major infrastructure augmentations. Large flows might be reduced by buffered storages and off-peak discharge, and high strength effluents could be reduced to levels more suited to existing

treatment plants. Industrial trade wastes can be several hundred times stronger than domestic sewage, thus having a substantial impact, even in low volumes.

Growth without a long term strategy often results in several small pump stations or mains becoming overloaded and 'built in'. When demand necessitates an augmentation of the infrastructure, there is little or no room to do so. This is particularly the case where infrastructure is situated within road reserves.

2.4.2 Integration of water solutions

Stormwater ingress to sewers is an issue most local authorities have addressed at some time. In an era of sustainability, stormwater and sewer harvesting may be an attractive venture. Such initiative could significantly boost yields from reuse schemes. In some instances, operational difficulties can also be solved through these mechanisms.

Given the long lead times and multitude of funding, agreements, licences and other issues, it is important that a consistent policy and planning framework be developed over a medium to long term. Otherwise, resources will be misappropriated by way of a changing strategic direction.

In a similar manner to the MRET system for energy, sustainability reforms might be achieved by adopting service targets such as net demand on services, or a mandated proportion of sustainable water sources in a particular development.

2.4.3 Co-location, proximity

As for water, close power supplies of relevant capacity, connectivity and redundancy are essential to effective water services and improved reliability.

Distribution networks for electricity within some areas may need augmentation to support significant increases in energy demands, whether site specific or for broader development demands. Opportunities do exist with larger treatment facilities to undertake co-generation and provide energy to the NEM or distribution grid. Cases exist where backup generators are utilised in the same manner.

Maintenance of buffers around critical infrastructure is vital to ensuring amenity and avoiding future amelioration costs. It is desirable longer term to co-locate grease and septic waste disposal with a biosolids facility. To do this may require significant odour control equipment and/or buffering from neighbouring uses.

As sustainability and carbon footprinting become more important to business outcomes, it might even become more desirable to situate biosolids facilities and effluent discharges closer to industrial or agricultural facilities which can utilise those products.

An issue to consider for future planning is the proximity of treatment facilities or pump stations to significant areas, town entrances and the like. Many existing treatment plants are situated in prime locations, and are not necessarily low lying (eg. Hamilton, Rosny, Macquarie Point).

2.4.4 Small community servicing

As awareness of sustainable living principles increases, there are more and more towns, villages and shack areas seeking improved sewage management systems. These settlements range from 10 or twenty dwellings up to several hundred in size and often rely on a variety of septic configurations which

over time have become less reliable or appropriate. Many of these situations are a legacy of piecemeal development, or a lack of infrastructure planning.

Current situations exist at Boomer Bay, Southern Beaches, Southport and other shack settlements around the region. Failing onsite systems combined in some instances with ongoing population growth are presenting an increased risk to public health and adjacent environments.

Due to their smaller scale, targeted centralised systems typically invoke higher unit capital costs to construct and produce significant annual costs. A capital outlay multiplier for settlements less than 1000 person potentially ranges from 1.1 to 3 for sewerage as size reduces to 100 persons with the multiplier being generally 1 for populations 5-10,000. Similarly, operations and maintenance cost multipliers may increase to 1.4 respectively over the same population range but are generally 1 for populations greater than 7000.

2.5 Sustainability

The foundation of sustainable communities and regions is arguably water. Without reliable water sources, industries will constrict, agriculture declines and community amenity is reduced. In order for those activities to achieve health and environmental outcomes, it is often critical that effective sewerage systems exist.

Essential to that outcome are appropriate regulations and licence conditions, economically achievable infrastructure objectives, suitable receiving environments and viable destinations for the remaining process outputs.

2.5.1 Receiving Environments

Many treatment plants have been located adjacent watercourses or estuarine environments. As awareness of the significance of such areas has increased, so has the perceived need for ecological studies to determine effluent impacts, and the viability of plant upgrades.

Whilst this position has some merit, it often fails to appropriately acknowledge the costs related to monitoring such environments to determine the targeted impacts, and the ongoing management thereof.

To improve the efficacy of this issue, there is merit in determining environmental issues and sensitive environments, and then preparing a process aligned to Development Control Plans so ongoing development can be accommodated efficiently and consistently.

Determination of water quality objectives for receiving waters is often left to the water service provider. This can create ambiguity and inconsistency over critical values of the particular environment, what is a high priority for the water authority might be a low priority to another body.

2.5.2 Land Zoning and Use

Forward zoning of land means a longer term infrastructure focus is achievable, and improved solutions can be planned and implemented consistently over a long timeframe. This is arguably more important for sewerage since there are often more issues to be considered, or at least typically a higher level of scrutiny and proofing.

All that work can be severely impacted if long term planning does not provide and maintain adequate buffers around critical infrastructure, and appropriate corridors for trunk infrastructure and discharge or disposal mechanisms.

Adequate provisions must be included in Planning Schemes to ensure that protected areas and species, reserves, RAMSAR wetlands and the like are appropriately administered and development impacts assessed. This typically requires specialist input from proficient engineers and scientists to ensure that technical issues are properly identified and addressed. This is another area where various land uses and zones might be dealt with similarly, since all have impacts on these matters.

2.5.3 Developer Charges

A useful mechanism for bridging the problem of growth and associated infrastructure costs may be developer charges. They can be used as a tool to focus development to areas where costs are lower, or services more readily achievable – the default mechanism is that high cost, low yield extensions will incur higher developer charges than more efficient infrastructure (eg Warrane, Risdon, etc).

To determine the charges, infrastructure investment is determined, preferably using fit-for-purpose service levels. Infrastructure projects are then scheduled by matching to corresponding growth predictions, generally limited to 20 or 30 years. By using a common measure of development – in the case of Southern Water, this is an equivalent tenement (ET)⁶ – it is relatively simple and efficient to apply a proportional charge to all developments within the planned service areas.

Eight Councils across the region applied developer charges prior to 1 July 2009. The quantum in current dollars ranges from \$570-6,200 per lot. All in subdivision infrastructure is to be provided by the developer at the developer's cost and passed to the Corporation. All external infrastructure solely required to service the development is to be provided at the developers cost.

Charges adopted by Council's prior to 1 July 2009 will continue to be applied. The intent is to determine and apply appropriate and cost reflective charges, which are applied on a case by case basis to all relevant development.

2.6 Climatic Variation

Sea level rise impacts from climate change may cause inundation of land suitable for infrastructure, or may reduce the effectiveness of land based disposal mechanisms. The same mechanisms may invoke an infrastructure improvement or relocation program for existing assets.

Serious implications exist from sewerage areas like Cremorne, Seven Mile Beach and even to a lesser extent Lauderdale. If sea level rise predictions are correct, then sewer designs must ensure they do not become ingress points for ocean waters, or flood waters. Saline inflows are adverse to most treatment plant processes, and can also render effluents unusable in reuse schemes.

Conversely, sewerage these areas extends the period to retreat – failing on site systems are replaced by a reliable sewer system, which if properly constructed, could resist saline inflows despite rising water levels.

Increasing weather severity can cause system flooding, power failure, and exposure or damage to infrastructure due to erosion and storm surges. By their nature, most sewage systems have extensive

⁶ Equivalent tenement is a typical residential dwelling, based on average occupancy and consumption.

infrastructure networks along coastal and other low lying areas which might be susceptible to tidal surges and wave actions.

New treatment technologies to meet more stringent effluent quality limits are becoming more energy intensive, albeit with a reduced land footprint.

Increases in adverse weather may reduce reliability of overhead electricity networks. These effects may be manageable using backup power systems which are becoming more affordable, even for smaller installations. Longer response times to non-urban schemes might also increase the need for backup provisions, increasing service costs.

Warm weather and reduced rainfall and runoff and stream-flows has potential to increase impacts of algal blooms, of particular concern in reuse schemes. Any changes in habitats could also be linked to sewage operations if adequate monitoring and studies are not available to prove otherwise. Warmer waters may also invoke changes to the micro-biology of treatment plant process chains.

2.7 Planning Implications

The planning implications for wastewater management are not dissimilar to those for water management. Many of the historic constraints have come about from inappropriate piecemeal development where there has been limited consideration of the impacts on infrastructure both on a local and regional basis. Unserved areas have been allowed to develop and expand as people's lifestyle choices see them choosing to live further out of town. For a regional corporation such as Southern Water, this leaves them with a challenging legacy as communities now expect better quality service provision, as well as controls placed on them through environmental regulations.

With the establishment of regional bodies and projects in both service provision, and also in Land Use Planning, an opportunity exists to embrace discussion regarding sustainable development across the Region. It is essential that regular dialogue is held between the variety of Infrastructure providers and land use planners, not only at the broader regional level but also at the Council level. As discussed future planning of growth areas provides an organisation such as Southern Water with an opportunity to plan for infrastructure demand and assess capacity in existing networks. In turn, in any land use planning decisions, a complete knowledge of infrastructure restrictions is essential in good decision making.

At a more micro level, regular dialogue must be maintained between Southern Water and local Council's in the assessment of development applications. This ensures appropriate conditions are applied to developments, enables Southern Water to track where developments occurring, and gives Southern Water an opportunity to request developer contributions where appropriate.

3. Stormwater

3.1 Background

Stormwater is both a potential hazard to life and property, but also a significant resource when appropriately managed. Poor quality stormwater can pollute receiving waters such as watercourses, lakes and coastal marine ecosystems. Well managed stormwater can provide a water resource for parks and gardens and provide a means of recharging aquatic ecosystems.

Whilst the impacts of poor stormwater management are less noticeable at a regional level, they are never the less significant with regard to their long term impact on Tasmania's waterways through increased flooding and pollution. This has an impact not only in the way those natural systems operate, but also in the manner in which we utilise them for recreation or economic benefit (2009, DEPHA). These impacts are well documented and include:

- Increased stormwater run-off reducing the level of soil-moisture and groundwater replenishment.
- Increased flood peaks which in turn increase erosive, degrading flows on natural drainage channels and waterways, placing further stress on downstream infrastructure and increased contaminant carrying capacity. (2009 DEPHA)
- Potential increased pollutant generation and conveyance to receiving waters.

The impact of urbanisation is to reduce the water quality of the runoff waters as compared to 'undeveloped' land (such as bushland). In addition the manner in which the water flows into receiving waters is different for urban areas. Due to impervious surfaces, the water is rapidly delivered to receiving waters, without meaningful filtration by soils which not only increases the opportunity for flooding, but also leads to a far greater transfer of pollution to receiving waters. This is one of the most significant impacts of urbanisation on water catchments.

The majority of the Greater Hobart area is serviced with stormwater, although the effectiveness of these systems is not always clear. Stormwater is delivered to the Derwent Estuary catchment through a series of 13 major rivulets and 270 pipes (2010, Derwent Estuary Program). There are varying levels of data available regarding stormwater systems and there is evidence that some stormwater ends up in the sewage system, having adverse flow on effects to the operation of wastewater treatment systems. In addition, the topography of the broader Hobart catchment means that the municipalities of Glenorchy, Hobart and Kingborough utilise natural water courses from Mount Wellington as stormwater systems, as opposed to a more structured system.

Fundamentally all urbanised areas should have stormwater systems in place to ensure appropriate management of runoff. As this is the responsibility of each Local Government area, implementing consistent stormwater management is challenging. There are best practice guidelines, produced both nationally and locally. Further to that there has been a push in recent years to encourage water sensitive urban design in developments ranging in size from large scale subdivisions to simple house extensions. Ideally the use of water sensitive urban design practices reduces the amount of runoff entering stormwater systems, and thus reducing the amount of pollutants and litter, and captures it for a more productive use.

3.1.1 Water Sensitive Urban Design

Water sensitive urban design (WSUD) promotes a more de-centralised approach whereby greater emphasis is placed upon on-site collection, treatment and use of stormwater. WSUD principles can be applied in addition to, or in place of, a traditional stormwater system. WSUD has the potential to reduce future infrastructure needs by making better use of rainfall within residential development (eg. garden irrigation) and reconfiguring the stormwater system to better cope with peak flows resulting from storm events. Deliberate application of WSUD principles may mitigate some of the current and future capacity constraints faced by the stormwater system by intercepting or delaying entry of stormwater to the network.

The Derwent Estuary Program states that : “Water Sensitive Urban Design (WSUD) is the design of urban water infrastructure that aims to minimise impacts of urbanisation on ecosystems whilst maximising efficient water use through the following :

- protecting the water quality of surface and ground waters
- maintaining the natural hydrologic behaviour of catchments
- protecting natural features and ecological processes
- minimising demand on potable water supply systems e.g. through the installation of rain water tanks for gardens
- integrating water into the landscape (e.g. wetlands) to enhance visual and ecological values
- collecting, treating and/or reusing runoff, including roof water and other stormwater
- reusing treated effluent and minimising wastewater generation
- increasing social amenity in urban areas through multi-purpose green space and landscaping”

Examples of WSUD principles can be the integration of rainwater tanks on a domestic property, through to the inclusion of compact gardens within carparks and roads to capture water runoff. One of the benefits of WSUD principles is that the design can be incorporated at the beginning of a development such as a subdivision, or alternatively can be retrofitted to an existing situation.

3.1.2 Soil and Water Management for Building and Construction

One of the major potential contaminants to stormwater is runoff associated with building and construction works. A single building block can lose four truckloads of soil in one storm, with most of the sediment that moves off site entering stormwater drains (2010, Derwent Estuary Program).

The building and construction industry is responsible for soil and water management throughout all phases of development. To comply with their responsibilities all sectors of the building and construction industry are required to have a practical understanding of the accepted guidelines for soil and management produced by the Australian and Tasmanian governments, NRM South and the Derwent Estuary Program.

Fact sheets have been produced to help mitigate the impacts of building and construction site activities on soils, landforms and receiving waters by focusing on erosion and sediment control measures. Developers and builders have a legal obligation to take all reasonable care to reduce soil erosion and prevent sediment loss from building and construction sites. Soil erosion on building and construction sites can be a major contributor of sediment pollution into waterways. Excessive sediment that enters the

waterways can kill fish and aquatic plants, silt up streams and block stormwater pipes which can lead to increased flooding events.

In order to address this problem, the Soil and Water Management on Building and Construction Sites Guidelines provide guidance on how to prepare soil and water management plans. It is standard practice to submit these to Council prior to the issue of a Building Permit. The accepted planning approach is to condition planning permits to provide a Soil and Management Plan prior to the issue of a Building Permit. Soil and water management plans are specific site plans or drawings that detail sediment and erosion control measures on building and construction sites. Subdivisions or activities that create greater than 250m² of ground disturbance typically require the submission of a soil and water management plan prior to any site disturbance. The Soil and water Management Plan will show the type, location, design, installation and maintenance schedule for all these measures and should be considered as the blueprint for controlling anticipated erosion and for preventing sediment leaving a site. The plan may incorporate measures such as sand bagging of excavated areas, and minimising vegetation removal where possible.

3.2 Legislative Context

Stormwater management, despite the Tasmanian Water and Sewerage reform in 2009, is the responsibility of each Local Government entity, with the broader governance of water resources the responsibility of the State Government. Tasmania is a signatory to the National Water Initiative program, which was an initiative of the Federal Government. Under the agreement Tasmania, as have the other states and territories, has committed to conduct water reform, and integrated management of water for environmental and public benefit. As part of the endorsement of this reform, the State is to encourage water sensitive urban design (WSUD) as a best management practice for the long-term management of urban runoff quality.

The objectives for water quality management for the state are set down in the *Tasmanian State Policy on Water Quality Management 1997 (SPWQM)*. This legislation is closely linked to the Resource Management and Planning System (RMPS), with an important means of implementing the policy through local planning schemes. From this, there is a draft State Stormwater Strategy which provides a means of fulfilling a number of provisions within the State Policy including runoff from land disturbance –for both the construction phase and operational phase; and urban runoff

The draft State Stormwater Strategy provides a number of tools for designing and assessing developments in terms of their impacts on Stormwater quality, but also tools for use in the management of existing infrastructure.

3.3 Planning Implications

Some of the challenges facing the management of stormwater in the Greater Hobart area come about from the lack of data regarding existing infrastructure and services. In urban areas formal stormwater infrastructure should be in place to capture the majority of run off. Some Council's have accurate information on whether that infrastructure is adequate, or where it needs upgrading. However many do not and without a thorough audit it is not clear whether there are gaps in infrastructure provision, or instances where stormwater is hooked into sewerage systems. In the situation where sewerage systems are accommodating stormwater, this gives an incorrect picture of the potential available capacity of that system with flow on impacts to infrastructure provision and strategic planning.

This is particularly important in instances where there is expansion of older suburbs and infill development increasing the density of suburbs. When many of these inner suburbs were developing stormwater infrastructure was put in place for a certain capacity. As Hobart's urban sprawl has continued, the stormwater has continued to be hooked into these systems, whether they have the capacity or otherwise. This, coupled with limited information on capacity, has the potential to apply further pressure to a system already at maximum load leading to overflows, flooding and associated problems.

Inclusion of stormwater management principles in Planning Schemes is important, not only to give Council's the ability to request information on specific applications when required, but also to raise awareness of the importance of stormwater management in the overall health of a water catchment. In addition considerations of water quality should be an underlying principle for strategic planning decision making. With an awareness of the impacts of certain development types on the quality of runoff, more strategic decisions can be made on appropriate locations for development (i.e. adequate buffers from significant wetlands such as Orierton Lagoon).

As discussed following the Water and Sewerage Reforms in 2009, Councils have been left with ownership of Stormwater infrastructure. Whilst this is a vital service, it is not a service that Council's can charge for, outside of their general rating base. This raises the important issue of who pays for such infrastructure, particularly now that the financial gains from water and sewerage no longer exist. Councils must find a way of funding such infrastructure – and particularly funding any upgrades to existing infrastructure. Whether this remains the sole responsibility of Council's, or in partnership with the State Government is not clear.

4. Energy Resources & Electricity

4.1 The Tasmanian Power System

The Tasmanian power system comprises:

- power stations and wind farms that generate electricity;
- a transmission system⁷ that transmits electricity from generators to the distribution system, major industrial customers and Basslink;
- a distribution system⁸ that supplies industrial, commercial and residential electricity consumers; and
- retailers that provide energy services to customers.

The generation sector in Tasmania currently features three main market participants: Aurora Energy Tamar Valley, Hydro Tasmania and Roaring 40s Pty Ltd. Mainland generators are also connected to the Tasmanian transmission system via Basslink. A number of other small generators that are directly connected to the distribution system are also licensed to operate in Tasmania. In Tasmania Transend Networks Pty Ltd is sole Transmission Network Service Provider (TSNP) and Aurora Energy Pty Ltd (Aurora) is the sole Distribution Network Service Provider (DNSP). At present, four companies are licensed to retail electricity in Tasmania: Aurora, Country Energy, TRUenergy and ERM Power Retail Pty Ltd.

In 2008–09, 11,031 GWh of energy was transmitted, which is 2.6 per cent less than the amount transmitted in 2007–08. This reduction reflects the fact that a major industrial customer was operating at reduced load for a significant portion of the year.

Despite the increase in diversity of the generation mix over recent years, hydro generation remains the predominant source of generation to meet Tasmanian load, and is expected to remain so for the foreseeable future.

Maximum demand in Tasmania was 1874 MW in 2008–09, which is 53 MW higher than the previous peak that was recorded in 2006–07. Total maximum demand (Tasmania plus export via Basslink) was 2236 MW, which is 96 MW less than the maximum demand recorded in 2007–08.

Transend's transmission system has been shaped largely by the nature of Tasmania's generation system. The supply of electrical energy in Tasmania is dominated by Hydro Tasmania's hydro generators. Hydro Tasmania's generators are usually energy constrained rather than capacity constrained. This means that even with sufficient installed capacity to meet peak demand, the present Tasmanian power system might not be able to meet future energy needs due to water unavailability.

⁷ The Transmission System operates at extra high voltage, which is 88,000 volts (88kV) and above – typically 110,000 volts (110kV) or 220,000 volts (220kV).

⁸ The distribution system operates at high voltage which is 1,000 volts (1kV) or above but less than 88,000 volts (88kV) and low voltage which is less than 1,000 volts (1kV).

Power systems that are heavily reliant on hydro generation create a set of operating conditions for transmission systems that differ from those of thermal based generation. Features that have a substantial influence on the configuration and operating conditions of Transend's transmission system are:

- the geographic dispersion of hydro generation (determined by the location of suitable water catchment sites);
- the large number of relatively low capacity generators;
- seasonal variations and climatic factors affecting generator availability and utilisation;
- transmission constraints created by the variability of load flows; and
- increased planning uncertainty due to varying climatic conditions.

The impact of these features is that more investment and maintenance effort is needed in Tasmania to connect generation and load than is the case in the rest of Australia. In addition, a number of generators located at remote sites require extensive transmission infrastructure that traverses difficult terrain and environmentally sensitive areas (including world heritage). The sensitivity of performing maintenance activities in these areas due to the nature of terrain, access limitations and modified work practices, contributes to increased operating costs.

4.2 Energy Generation

Tasmania has a long history of harnessing its natural resources for energy production. Hydro electric power is the State's most significant energy resource with the industry comprising electricity generators, separate transmission and distribution network which is integrated with the mainland through Basslink and competing electricity retailers. Much of Tasmania's electricity generation infrastructure originates from the Tasmanian Government's programme of hydro industrialisation in the period between 1914 and 1990 which was designed to support electrification of State growth of energy intensive mineral processing operations (Hydro Tasmania 2010). It commenced with the acquisition in 1914 of the hydro-electric system in the Central Highlands being constructed to provide electricity to the Electrolytic Zinc Company of Australasia, the Australian Commonwealth Carbide Company and the City of Hobart. Expansion of the electricity grid throughout Tasmania and the establishment of several mining ventures and pulp and paper industries saw strong growth in demand in the 1930's. The 1960's saw rapid investment in generation capacity to attract large energy intensive industries through access to reliable and competitive electricity supplies. More recently, new generation supply has been dominated by a single gas project, wind and mainland imports via the Basslink interconnector.

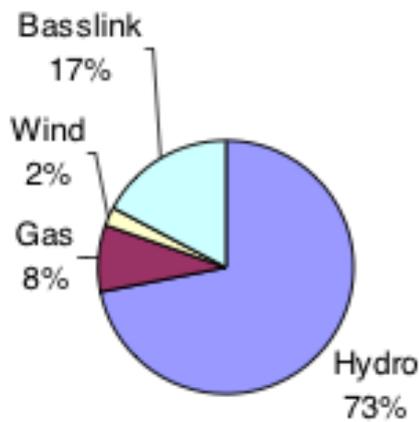


Figure 1: Proportion of energy supply from each generation source in Tasmania (Source: Transend)

Hydro Tasmania dominates the generation sector in Tasmania. Electricity production by major generation sources in Tasmanian during 2007-2008 was approximately 11, 049GWh, made up of hydro-electricity (7,100GWh), Basslink net imports (2,293GWh), gas (1,200GWh), wind (429GWh), and landfill gas (274GWh) (Hydro Tasmania, 2009). Hydro Tasmania generates electricity principally from an integrated hydro-power scheme located in high rainfall areas in Tasmania. Hydro generation capacity is provided by 29 power stations using water storages in its six major catchments including the South- Esk Great Lake, Mersey-Forth, Derwent, Pieman- Anthony, King and Gordon. The system comprises two major storage areas including the Lake Gordon/Lake Pedder and Great Lakes. There are also numerous other storage lakes and over 50 large dams.

In terms of electricity generation, the catchments serving the southern region include the Gordon, Upper Derwent and Lower Derwent Catchments, and Great Lake and Arthurs Lake. The Gordon River Scheme has created the largest water storage in Australia. Water from Lake Gordon and Lake Pedder is used underground in the Gordon Power Station situated near the Gordon Dam.

The harnessing of the hydro-electric potential of the Derwent River catchment area began in 1934 and the last power station was commissioned in 1968. It involved a series of separate developments and included the construction of 16 dams, 10 power stations and a large number of weirs (small dams), flumes, canals, tunnel and pipelines. The Upper Derwent catchment includes the Tarraleah Power Development, which was approved by the Tasmanian Parliament in 1934. The Lower Derwent Catchment area comprises six power stations in progressively lower parts of the Derwent and forms a relatively simple step-like series. They have tributaries of the Derwent as well as the flow from Tungatinah and Tarraleah Power Stations.

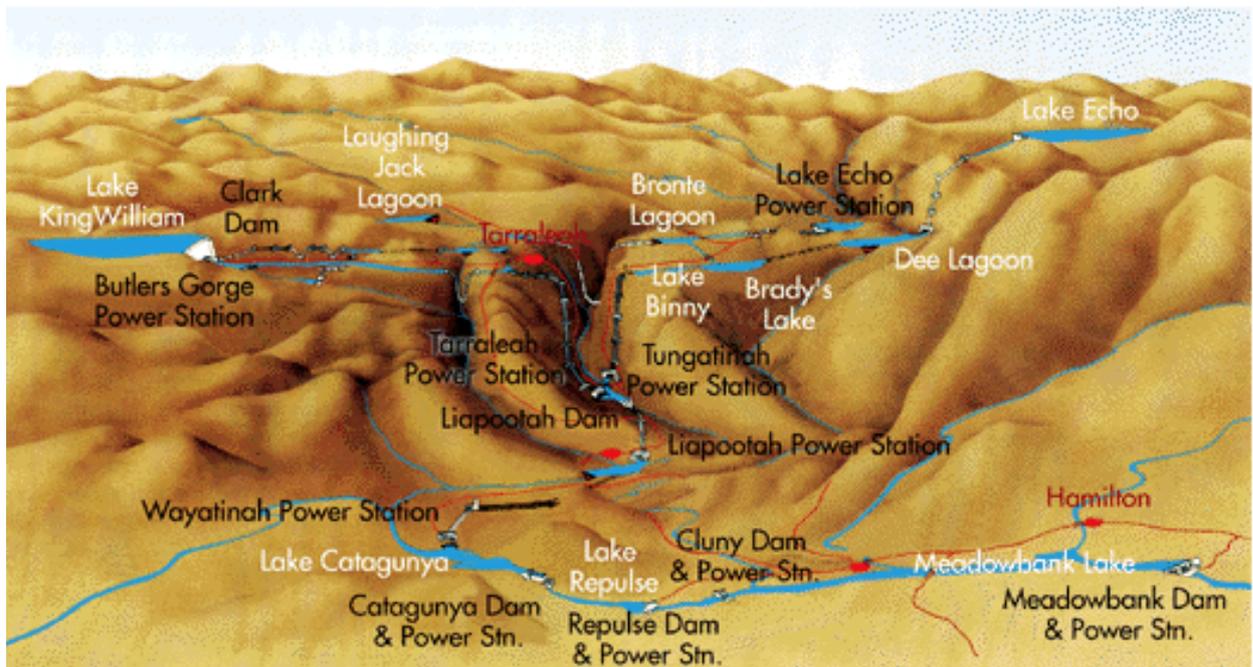


Figure 2: Overview of power production in the Derwent Catchment (Source: Hydro Tasmania)

Also of interest is the potential for geothermal energy from underground granite formations – particularly those on the East Coast - that is currently being investigated for its viability. Tasmania is also uniquely placed to capture tidal and wave energy

4.3 Generation Infrastructure.

As identified earlier in this report, Hydro Tasmania is the primary supplier and generator of electricity in Tasmania delivering in excess of 11,000GWh of electricity into the Tasmanian market per annum. In the Southern Region, the major source of electricity generation is hydro-electric power and includes three major catchments and associated infrastructure: Derwent, Gordon – Pedder, and Great Lake – South Esk.

The physical infrastructure associated with the generation of electricity primarily includes dams, power stations, and switchyards, but also consists of a complex network of assets, including weirs, spillways, siphons, canals, tunnels, flumes, helipads, water gauging stations, roads, powerlines, bridges, pump stations, and communication towers.

As identified above, there are currently three major catchments located within the Southern Region; the Derwent Catchment, Gordon-Pedder Catchment, and Great Lake – South Esk (partially located within the Southern Region).

4.3.1 Derwent Catchment

The harnessing of the hydro-electric potential of the catchment area began in 1934 and the last power station was commissioned in 1968. It involved a series of separate developments and included the construction of 16 dams, 10 power stations and a large number of weirs (small dams), flumes, canals, tunnel and pipelines. See Figure 3 below:

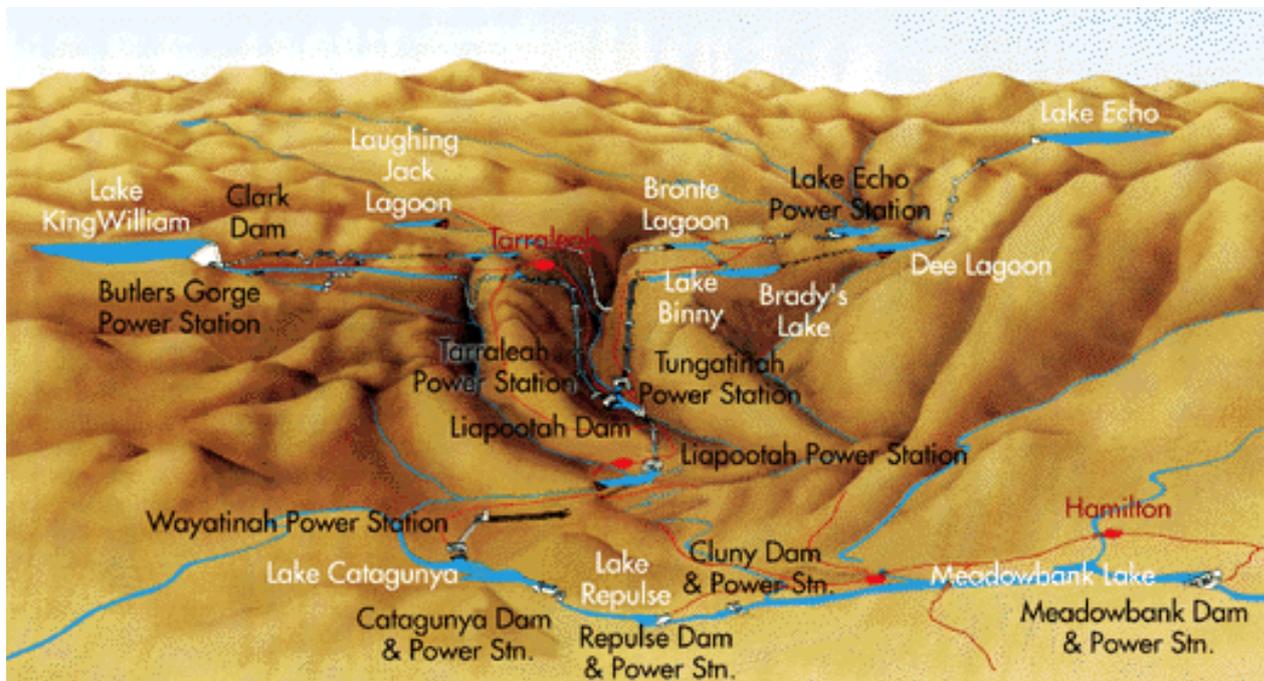


Figure 3: A schematic representation of the Derwent Catchment (Source: Hydro Tasmania)

4.3.2 Gordon- Pedder

Lake Pedder was created by the construction of a large rockfill dam on the upper reaches of the Huon River at Scotts Peak and another on the Serpentine River above its junction with the Gordon. A small dam was also constructed across a low marshy area at Lake Edgar near Scotts Peak. Lake Gordon was created by the building of a 140 metre high concrete arch dam across the Gordon River above its junction with the Serpentine River. Water from the two lakes is used in the underground Gordon Power Station situated near the Gordon Dam.

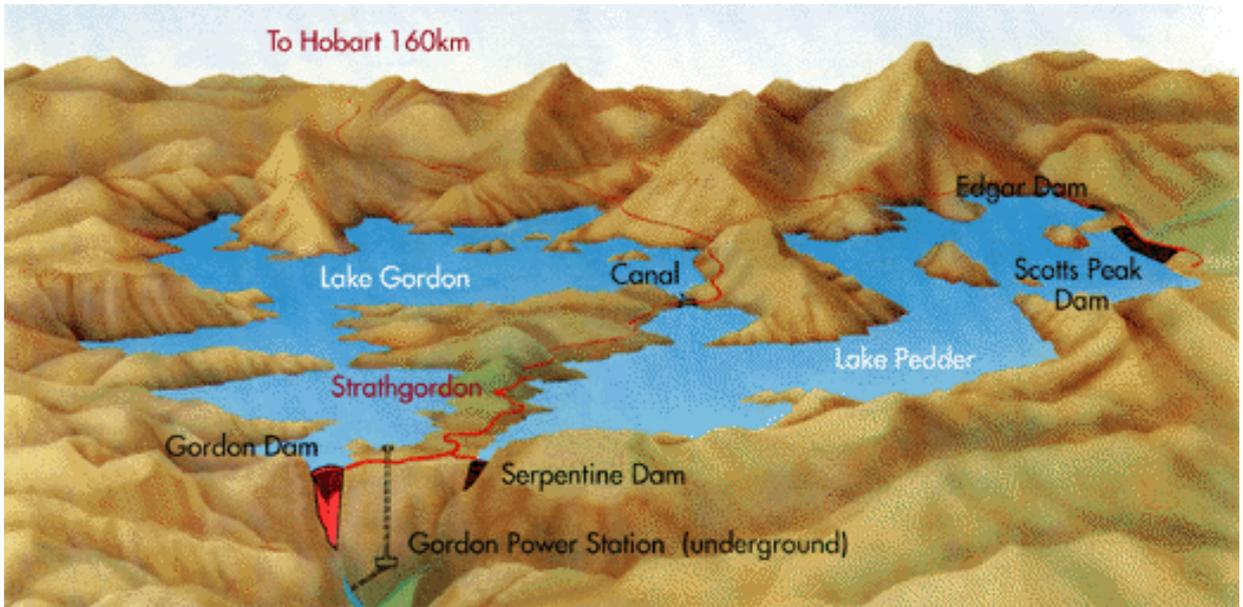


Figure 4: A schematic representation of the Gordon – Pedder Catchment (Source: Hydro Tasmania)

4.3.3 Great Lake – South Esk

A six kilometre tunnel was drilled under a ridge to the northern edge of the Great Western Tiers. From here the water flows down a large, high-pressure steel penstock and vertical shaft into Tasmania's first underground power station at Poatina.

The Poatina Power Station is a huge underground excavation, as wide as a city street, as long as a city block and as high as a seven storey building. It houses six, 50MW generators and is the State's second largest power station.

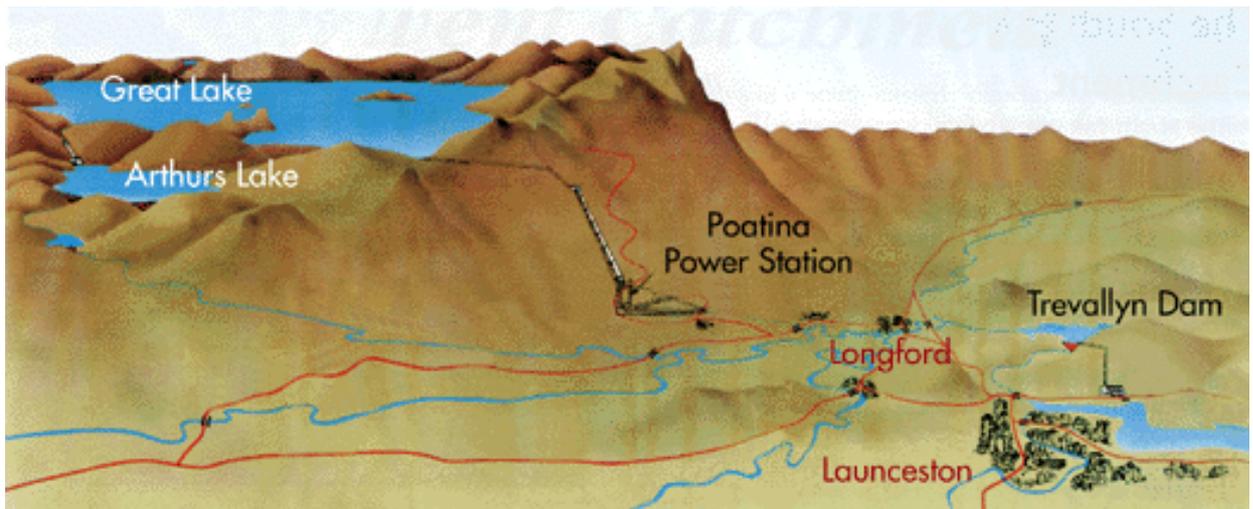


Figure 5: A schematic representation of the Gordon – Great Lake Catchment. (Source: Hydro Tasmania)

4.3.4 Wind Energy

Wind energy is also a growing form of electricity generation in Tasmania, although the establishment of wind based energy generation facilities has been affected by the Commonwealth Government's decision to cease renewable energy credits. Current grid connected wind generators in Tasmania include Woolnorth on the far northwest coast, which is owned and operated by Roaring 40s. Another small wind farm operates on King Island at Huxley Hill by Hydro Tasmania. This wind farm is not connected to the grid. The wind resources in Southern Tasmania are not as recognised as those on the North & West coasts, which capture winds from the Roaring 40s. Notwithstanding this certain locations across the region would have sufficient wind occurrence and intensity to generate electricity. In particular the Central Highlands is already being investigated as a suitable location for a wind farm. Detailed information on suitable locations for wind farms based upon their wind resource is difficult to obtain, as investigations are held as commercial in confidence. However the Commonwealth Government has developed a series of tools considering wind resources which can be found at www.environment.gov.au/settlements/renewable/atlas/index.html

The growth of renewable energy generation through wind power sites is leading to other issues. The scale of these wind generators varies from small residential scale roof-mounted generators to large stand alone installations. The structures can have significant streetscape implications depending on their locations and there are negative community perceptions regarding them. Conversely there are significant benefits from the creation of on site power and easing the pressure on public infrastructure. Planning Authorities must have guidelines that adequately address the assessment of wind generation turbines of varying scales.

Also of interest is the potential for geothermal energy from underground granite formations – particularly those on the East Coast - that is currently being investigated for its viability. Tasmania is also uniquely placed to capture tidal and wave energy.

4.3.5 Legislative Context

The *Land Use Planning and Approvals Act 1993 (LUPAA)* is the principal development approval legislation in Tasmania and is relevant for all approvals associated with development, maintenance and repair of non-dam electricity infrastructure. Aside from this, there are a number of exemptions under the *Electricity Supply Industry Act 1995* and the associated *Electricity Supply Industry Regulations 2008* regarding construction, installation, modification, maintenance, demolition or replacement of electricity infrastructure. These exemptions enable certain developments and land uses undertaken by electricity entities to continue and are defined by the regulations as 'works of minor environmental impact'.

Hydro Tasmania still has obligations under a raft of other legislation including the *Environmental Management and Pollution Control Act 1994*, *Historic Cultural Heritage Act 1995*, *Threatened Species Protection Act 2002*, *Forest Practices Act 1985*, *Aboriginal Relics Act 1975*, *Crown Land Act 1976*, *Environment Protection and Biodiversity Conservation Act 1999* and the Tasmanian Wilderness World Heritage Area Management Plan.

Applications for dam works are assessed under the *Water Management Act 1999* by the Assessment Committee for Dam Construction, however LUPAA is the primary development approval legislation in Tasmania (In Tasmania dams less than 1ML are not regulated provided they are not located within a watercourse, obviously the vast majority of works undertaken by Hydro would not fall into this category). There are several exemptions established under the *Electricity Supply Industry Act 1999*. The intent of

these exemptions is to enable certain developments and land use activities undertaken by electricity entities on a regular basis to continue. These are typically referred to as being of 'minor environmental impact' and are defined in the *Electricity Supply Industry Regulations 2008*.

In addition to the above processes, for projects that meet the criteria for 'major infrastructure' or 'projects of state significance' they can be assessed under the *Major Infrastructure Development Approvals Act 1999* and the *State Policies and Projects Act 1993* with projects of Regional Significance being assessed under Division 2A of the *LUPAA*.

The *LUPAA* and *EMPCA* are also relevant in the assessment of developments associated with the utilisation of wind resources.

In addition to the relevant Planning Legislation, there is a raft of legislation specifically related to the Electricity industry that is of relevance to the organisation.

4.4 Tasmanian Electricity Transmission System

Transend Networks Pty Ltd (Transend) plays a vital role in the Tasmanian power system, as the owner and operator of the electricity transmission system in Tasmania. The Tasmanian transmission system is characterised by a 220 kV and a 110 kV transmission network that connects generators to the distribution system, major industrial customers and Basslink.

Transend transmits electricity from power stations to the local distribution company (Aurora Energy) and to major industrial customers throughout the State.

Loads are concentrated in the north and south-east of the state. Main load centres are connected to the 220 kV transmission system at Burnie, Chapel Street (Hobart), George Town, and Hadspen (Launceston) substations. Other load centres are connected via the 110 kV peripheral transmission system. Transend's transmission system has been shaped largely by the nature of Tasmania's generation system. The supply of electrical energy in Tasmania is dominated by Hydro Tasmania's hydro generators. This creates a set of operating conditions that are different to thermal based generators. These include the geographic dispersion of hydro generation; the large number of relatively low capacity generators; seasonal variations and climatic factors affecting generator availability and utilisation; transmission constraints created by the variability of load flows; and increased planning uncertainty due to varying climatic conditions. These features influence the investment and maintenance costs involved in connecting energy in Tasmania, making it more expensive than elsewhere in Australia.

In 2000, the Tasmanian Government entered into an agreement with the National Grid Australia for the construction of an interconnector between Tasmania and Victoria known as Basslink. The Basslink interconnector is a high voltage direct current link via a sub-sea underground and overhead cables and into the convertor stations, where it is converted to alternating current so that it can be connected to the state grids. The Basslink undersea cable began operating in 2006-07 and provides Tasmania with the potential to import and export electricity via a network of power stations on the eastern Australian seaboard.

Being part of the national electricity grid does provide Tasmania with greater security in supply and protects against the risk of energy shortages caused by prolonged droughts over catchment areas, due to our high reliance upon hydro schemes for energy production.

Transend transmit electricity from power stations owned and operated by Hydro Tasmania to substations around the State and own 3650 circuit kilometres of transmission lines, 47 substations and

nine switching stations. The bulk transmission network is a state based network, meaning that electricity produced from various power stations (either hydro or gas powered) is connected into a state wide grid and distributed across the State. Electricity from the mainland is also connected into the state grid via Basslink. This means that if one particular region or city produces greater demand (load centres), electricity produced in another region can be transferred across the grid to meet that particular demand.

Large parts of the north-west, north-east and southwest of the state are not strongly linked to the backbone transmission system, as it has not been economic to strengthen the transmission network in these areas.

The Tasmanian transmission system is comprised of:

- A 220 kV bulk transmission network which, with supporting 110 kV transmission circuits, provides corridors for transferring power from several major generation centres to major load centres and facilities transfer between those major load centres;
- A peripheral 110 kV transmission network, and connection assets, which is largely radial and connects load centres or generators to the bulk transmission network;
- 9 switching stations, 2 transition stations, a telecommunications system and control centres; and
- 47 connection points (substations) made up of 44, 33, 22, 11 and 6.6 kV assets (A transmission network normally operates at voltages greater than 66 kV).

It is important to note that the future adequacy of the bulk transmission network depends mainly on the order of dispatch of generation, whereas the adequacy of the peripheral transmission network is determined by future demand for electricity delivered through the distribution system and to major customers.

Figure 6 below shows a schematic configuration of the bulk transmission network in Tasmania as of the 30 June 2009.

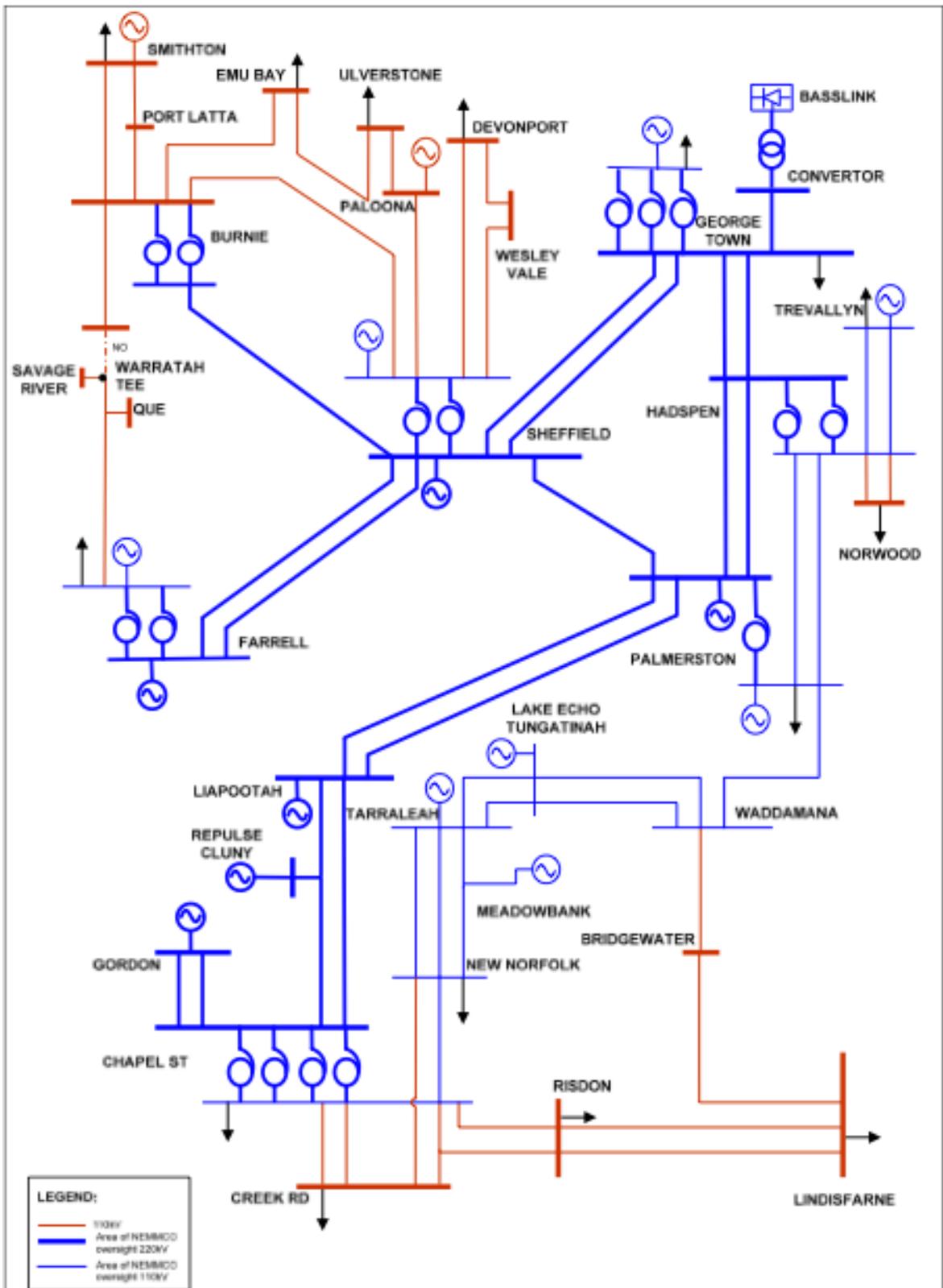


Figure 6: Bulk Transmission Network (Source: Transend 2009)

4.4.1 National and Tasmanian Regulatory Arrangements

Transend is a participant in Australia's National Electricity Market (NEM) and is required to develop, operate and maintain the transmission system in accordance with the National Electricity Rules (NER). The NEM operates on an interconnected power system that extends from Queensland to South Australia. Tasmania is connected to the NEM via Basslink, a direct current link across Bass Strait.

Within the NEM, the Australian Energy Market Operator (AEMO) is responsible for managing the security of the national power system and operating the wholesale electricity market. The AEMO requires Transend to continually monitor power system security in some parts of the Tasmanian transmission system. Transend is also obligated to retain the capability to manage power system security for the entire Tasmanian transmission system in the event that the AEMO is unable to fulfil its system security obligations in Tasmania.

The Australian Energy Regulator (AER) is responsible for the regulation of electricity transmission services in the NEM. This includes responsibility for determining the maximum allowable revenue for regulated electricity network service providers. Transend's maximum allowable revenue is set for five year regulatory periods.

Transend is also obligated to ensure that the transmission system meets the technical performance criteria set out in the NER and the Electricity Supply Industry (Network Performance Requirements) Regulations 2007 and local jurisdictional requirements under the terms of its licence issued by the Tasmanian Economic Regulator under the *Tasmanian Electricity Supply Industry Act 1995*. Transend is subject to a number of industry-specific Tasmanian Acts and Regulations including (without limitation):

- *Electricity Supply Industry Act 1995;*
- *Electricity Supply Industry Regulations 2008;*
- *Electricity Industry Safety and Administration Act 1997;*
- *Electricity Companies Act 1997;*
- *Electricity Wayleaves and Easements Act 2000;*
- *Electricity Ombudsman Act 1998; and*
- *Electricity Supply Industry (Network Performance Requirements) Regulations 2007.*

All of the factors described above, together with performance obligations prescribed in connection agreements with customers connected to the bulk transmission network, influence the manner in which Transend operates, maintains and develops the transmission system, and have a direct impact on Transend's performance, operational decisions and costs. Transend is therefore interested in pursuing the least cost, most technically acceptable solution when looking into capital projects.

4.4.2 Transmission System Development

Transend's transmission system development program predominantly comprises augmentation projects that enlarge or increase the capacity of the transmission system, or connection projects that provide new or modified connection points.

Transend's planning and capital investment activities are strongly influenced by external agencies including National Energy Rules (NER) requirements established by the Australian Energy Market

Commission (AEMC) and requirements from the Australian Energy Regulator (AER), Office of the Tasmanian Economic Regulator (OTTER) and customers.

Transend conducts system planning studies on an annual basis to determine the expected future operation of the transmission system in detail over a 15 year period. The outputs of the transmission network planning process are documented in the area development plans. From the area development plans, the projects that are required to meet Tasmanian and national electricity supply requirements for the forthcoming five year period are published in Transend's Annual Planning Report (APR). The APR is issued in compliance with clauses 5.6.2 (a) and (b) of the NER. It also satisfies a licence obligation to publish a Tasmanian Annual Planning Statement (TAPS).

The key inputs that drive the need to develop the transmission system:

1. National Electricity Rules mandate Transend's obligations to ensure that the transmission system meets technical performance criteria such as power system reliability and security;
2. Electricity Supply Industry (Network Performance Requirements) Regulations 2007 set the minimum network performance requirements that a planned power system of a TNSP in Tasmania must meet in order to satisfy the reliability limb of the regulatory test in the NER;
3. Strategic Grid Vision presenting a long term view of the operation and potential design of the transmission system with a nominal planning period of 15-30 years influencing the development of solutions to short-term network constraints, and also highlighting future strategic land and easement requirements;
4. Area Development Plans detail network development needs over the next 5 year period that are required to ensure continued compliance with Transend's licence requirements. This information forms the basis of Transend's 5 yearly revenue application, which sets the capital program for that period.
5. Customer connection needs including generators, market network service providers, distributors, and major industrials; and
6. Load forecasts.

The planning process also integrates future transmission system development and asset renewal needs to ensure that the optimum development strategy is identified.

4.4.3 Climate Change

Continuing uncertainty over the policy response to climate change and its effect on the electricity industry makes development planning more complicated. In particular, promotion of renewable generation and the impact on transmission has potential to significantly affect Transend.

The response to climate change policies is likely to require electricity transmission businesses to extend their networks to often remote and high environmental or cultural value areas where renewable generation can be sourced, and to provide increased interconnector capacity. It is likely that significantly more investment in the transmission grid will be required as Tasmania transitions to a lower emissions future.

It is also anticipated that the impending overhaul of the Commonwealth government's tradable Renewable Energy Certificate (REC) market will make such developments considerably more financially

viable. This is mainly attributable to the fact that the market will be split into large-scale and small-scale divisions in order to prevent the dramatic fall of the current REC market price due to the increasing popularity of such smaller infrastructure items such as rooftop solar panels and solar hot water systems. This has led to many larger projects stalling due to concerns over the capital investment and projected returns. The introduction of Scale Efficient Network Extension (SENE) legislation will further enhance the prospects for renewable energy generation by offering financial incentives for constructing infrastructure such as transmission lines to areas where multiple generators may connect to the transmission system.

4.4.4 Legislative Context for Approvals

The *Land Use Planning and Approvals Act 1993 (LUPAA)* is the primary development approval legislation in Tasmania. There are several exemptions established under the *Electricity Supply Industry Act 1995 (ESIA)* and associated *Electricity Supply Industry Regulations 2008* relating to construction, installation, modification, maintenance, demolition or replacement of electricity infrastructure. The intent of these exemptions is to enable certain developments and land use activities undertaken by electricity entities on a regular basis to continue. These exemptions are for works defined by the regulations as 'work of minor environmental impact'.

Notwithstanding these exemptions, Transend still has obligations under a raft of other legislation including but not restricted to *Environmental Management and Pollution Control Act 1994*, *Historic Cultural Heritage Act 1995*, *Threatened Species Protection Act 1995*, *Nature Conservation Act 2002*, *National Parks and Reserves Management Act 2002*, *Forest Practices Act 1985*, *Aboriginal Relics Act 1975*, *Crown Lands Act 1976*, the *Tasmanian Wilderness World Heritage Area Management Plan* and *Environment Protection and Biodiversity Conservation Act 1999*.

For projects that meet the criteria for 'major infrastructure' or 'projects of state significance' assessment processes are available under the *Major Infrastructure Development Approvals Act 1999 (MIDAA)* and the *State Policies and Projects Act 1993*. Projects of Regional Significance (PORS) are assessed under Division 2A of the *LUPAA*. Exemptions are also available for projects from the requirements of the *Environment Management Pollution Control Act 1994* if a development is deemed to be of state significance.

4.4.5 Southern Region

Electricity supply to about 250,000 people in the south of the State, including Hobart, depends on transmission lines from power stations located elsewhere in Tasmania. The southern transmission network is therefore critical to the social and economic well-being of Tasmania.

Southern Tasmania's electricity is supplied via a series of 110 kV transmission lines from the Upper Derwent region and 220 kV transmission lines from Liapootah in the Lower Derwent and Gordon Power Station into Chapel Street Substation. The closest source of electricity to the Hobart region is from the Upper and Lower Derwent power schemes in the north-west and Gordon Power Station in the west. Additional power requirements above the local generation come from Palmerston through the 220 kV Liapootah–Palmerston transmission lines and the 110 kV Waddamana–Palmerston transmission line.

The southern electricity transmission system is shown in Figure 7 below.

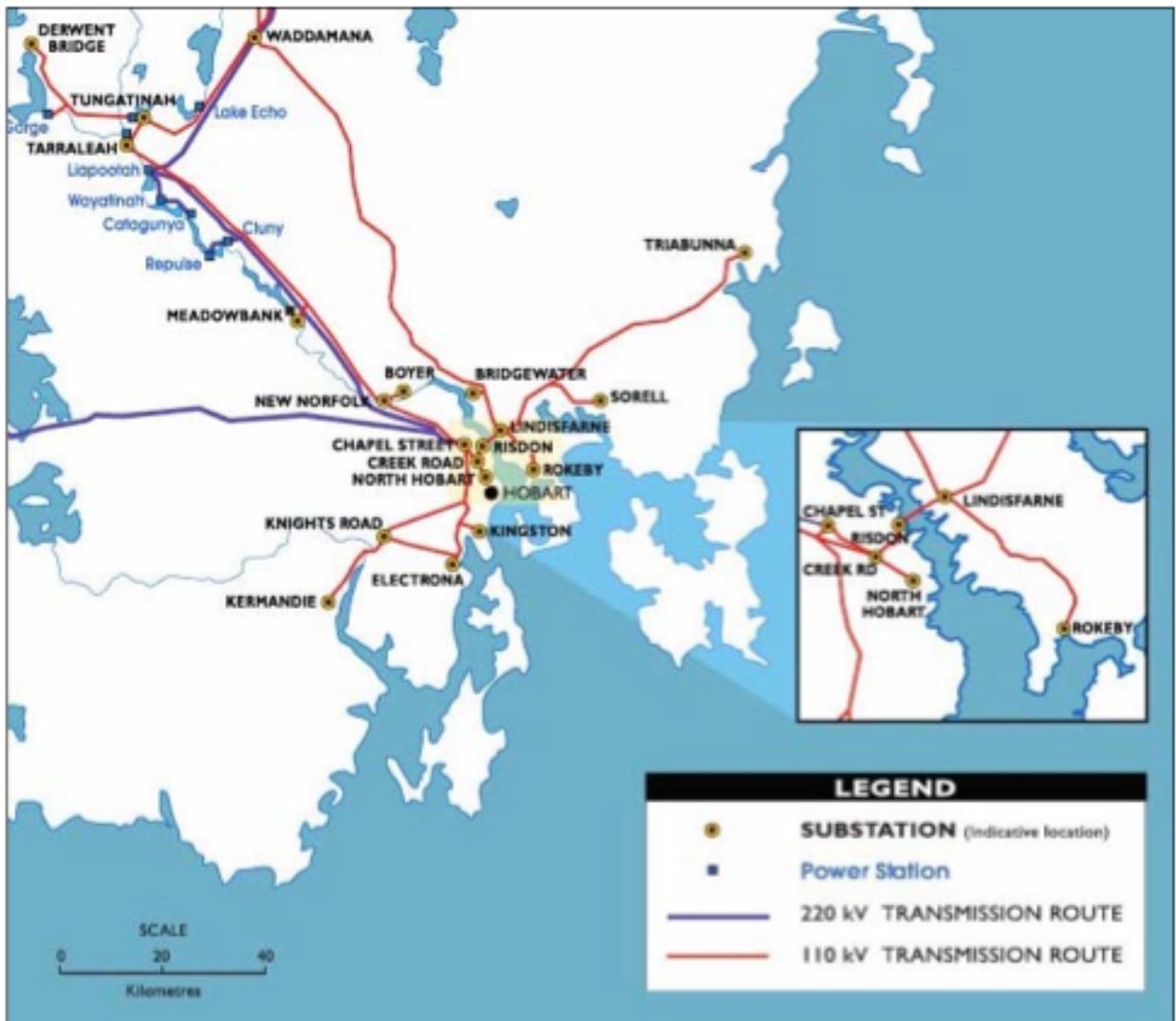


Figure 7: Southern Tasmania Electricity Transmission System (Source: Transend 2007)

The Gordon power station totalling 432 MW also connects into the core 220 kV system at Gordon Substation.

The southern area 110 kV network is divided into sub-areas Derwent, Eastern shore, Hobart and Kingston–Huon.

Derwent sub-area has five power stations totalling 300 MW (Derwent 110 kV). The winter maximum demand is 100 MW the majority of which (85 MW) is consumed at Boyer by the Norske Skog paper mill (direct connect energy intensive customer). The remaining load is divided between New Norfolk, Derwent Bridge, Meadowbank, Tungatinah and Waddamana, which, with the exception of New Norfolk, are less than 5 MW each.

The eastern shore (of the Derwent River) sub-area includes the city of Clarence, surrounding suburbs, towns and districts down to the Tasman peninsular and up to Triabunna.

The load is supplied from the Bridgewater, Lindisfarne, Rokeby, Sorell, and Triabunna substations. The load is mainly residential and rural with no direct connected customers.

The Hobart sub-area includes the cities of Hobart and Glenorchy and surrounding suburbs (on the Western shore of the Derwent River). The load is supplied from Chapel Street, Creek Road, North Hobart and Risdon substations. The load is a mix of residential load and the Nyrstar⁹ zinc smelter (direct connect energy intensive customer) at Risdon.

The Kingston–Huon sub-area includes the city of Kingston and surrounding districts down to Southport. The load is supplied from Kingston, Electrona, Knights Road, Huon River, and Kermandie substations. The load is mainly residential and rural.

4.4.6 Current Transmission Constraints

Under some conditions, demand for electricity in southern Tasmania now exceeds the capacity of the existing transmission network. Transend claims the network can transfer sufficient power into southern Tasmania to supply up to 640 MW of electricity during cold periods. However, the southern system peak demand was 685 MW in 2006, and this is expected to continue to increase (Transend, 2007). Therefore the system is ineffective in delivering enough electricity to meet peak demand in Southern Tasmania without overloading transmission lines or risking voltage collapse. To minimise the likelihood of supply disruption in southern Tasmania, Transend has undertaken the following actions:

1. Set up a network support agreement in place with Hydro Tasmania. This agreement provides a short term solution that alleviates some, but not all, network constraints in southern Tasmania.
2. A significant upgrade of an existing 110KV transmission line with a new 220 kV high voltage line between Waddamana Substation and Lindisfarne Substation (near Risdon Vale). The project also involves the upgrade of existing substation infrastructure. The project is currently under construction and expected to be completed in mid-2011. While the line will be constructed on land corridors that are part of existing easements, Transend undertook negotiations with around 170 landowners to acquire land for substation development and gain consent to widen the existing easements to accommodate the proposed development. While the majority of the existing line will be replaced, for around the final 15km of the 100km line, between Bridgewater and Risdon Vale, a new line will be constructed alongside another existing 110 kV transmission line.

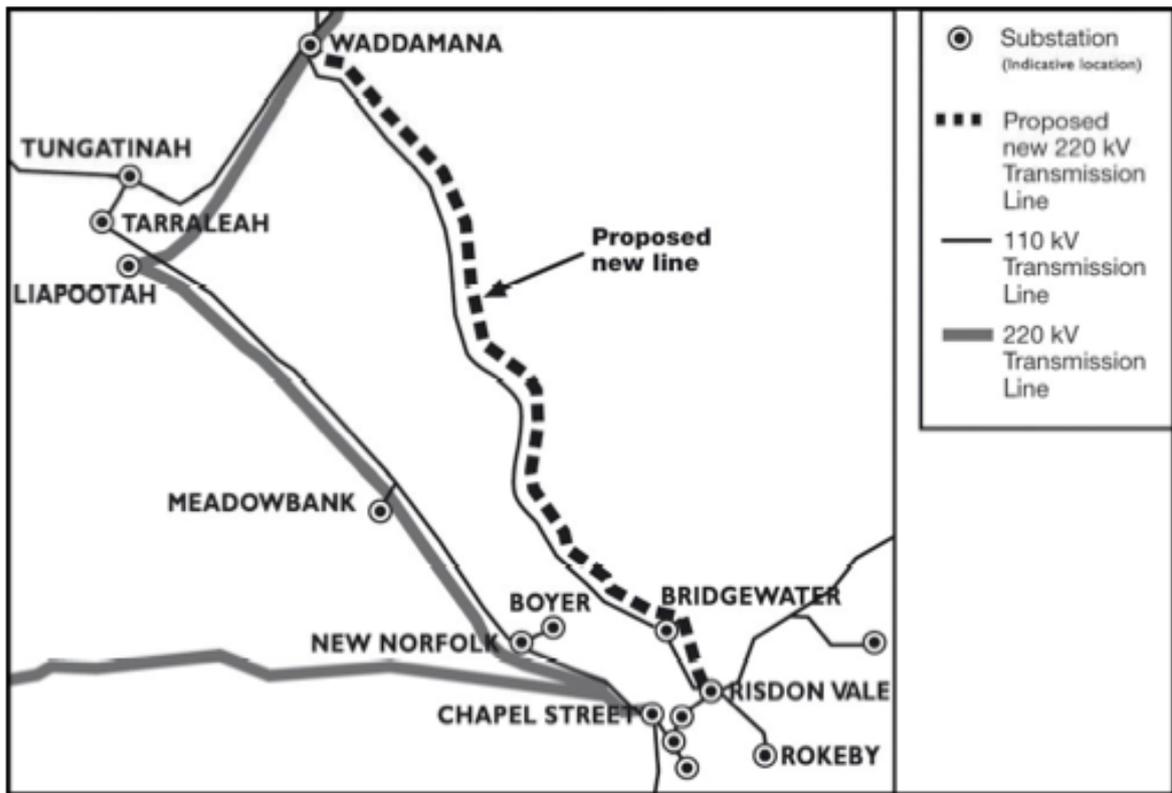


Figure 8: Proposed Waddamana to Lindisfarne 220kV transmission line (Source: Transend 2007)

The Waddamana to Lindisfarne project will:

- Provide a more secure transmission supply to Hobart and Southern Tasmania;
- Reduce the load transferred through the transmission lines that connect to Chapel Street substation;
- Reduce the reliance on Chapel Street substation;
- Reduce the load transferred through the Chapel Street-Risdon 110kV transmission line;
- Reinforce the existing low capacity supply to Hobart's eastern shore; and
- Remove reliance on the availability of the Gordon Power Station.

Figure 9 below is a schematic diagram of Southern Tasmania's transmission network after the completion of the Waddamana to Lindisfarne project.

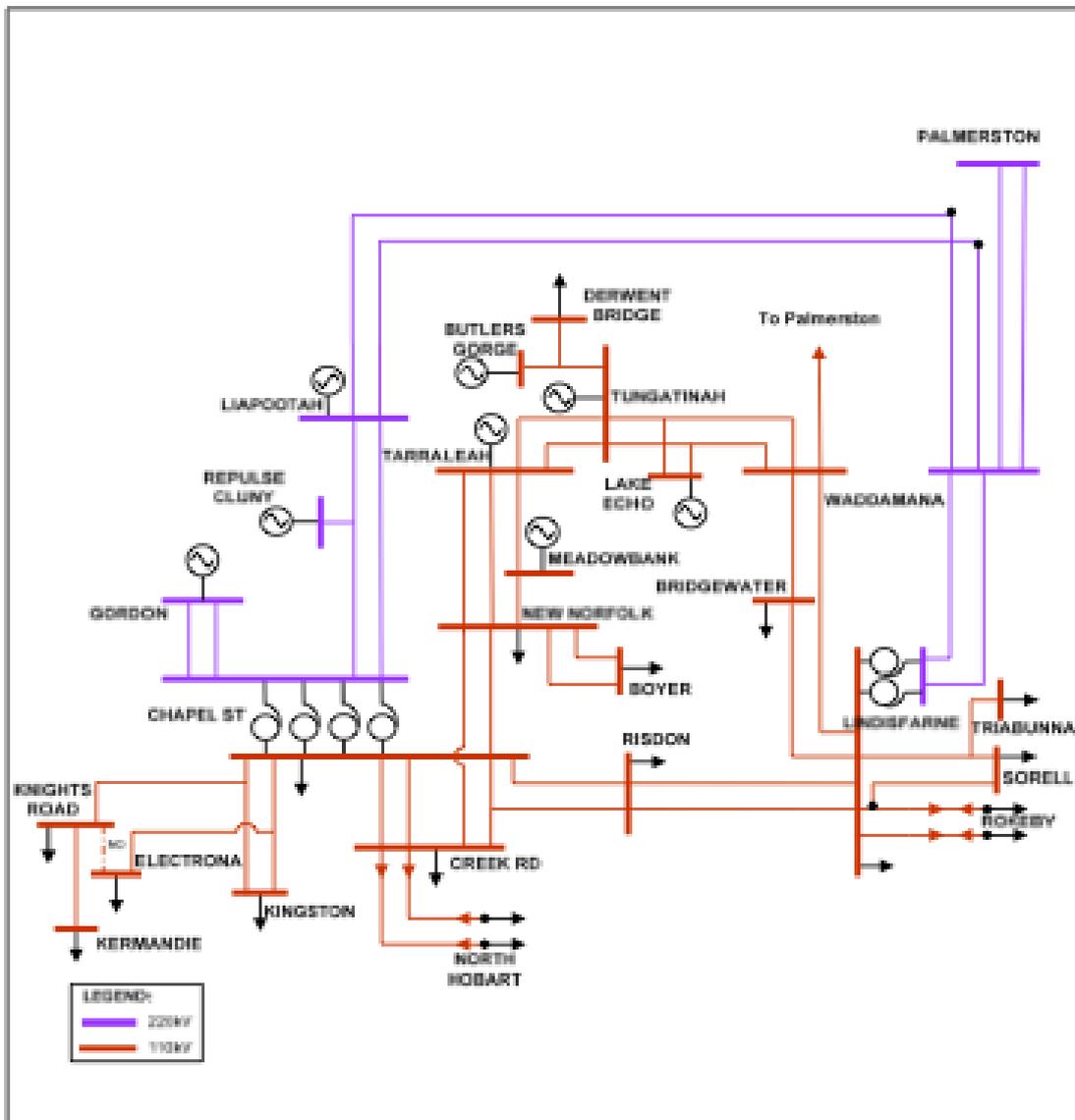


Figure 9: Southern Tasmania area transmission network after the 220kV transmission line installations (Source: Transend 2009)

4.4.7 Energy and Demand Forecasts

In its most recent Annual Planning Report 2009, Transend assessed the ability of the generating system to meet maximum demand in Tasmania. Transend investigations suggest that generation capacity is able to meet projected demand until 2028. From an energy perspective, Hydro Tasmania has developed a projection of the long-term supply and demand balance based on business as usual conditions. This indicates that the combination of current and proposed on island generation, plus Basslink imports provides a significant buffer against hydrological variability in Tasmania. The National Electricity Market provides a robust market driven framework for ensuring the security of supply in participating jurisdictions, including Tasmania.

Tasmania's electricity consumption is heavily influenced by industrial activity and is expected to increase at an average annual rate of 0.69% over the next decade. In the future, additional generation capacity could be provided by biomass, hydro, gas and wind generation. In the longer term, technologies that are at an early stage in innovation are likely to play an important role and these include solar energy, geothermal energy and marine energy.

In addition new demand for electricity could be met by reducing electricity consumption. The reduction in electricity consumption through energy efficiency measures is widely acknowledged as being the least cost measure to reduce greenhouse gas emissions. While numerous studies have highlighted the potential to cost effectively improve energy efficiency in the residential, commercial and industrial sectors, action to date has been limited due to a number of barriers including information failures, misalignment of incentives, capital constraints and behavioural barriers. A 2008 study estimated that energy efficiency potential in the residential sector in Australia could be as high as 73%. This raises issues in the land use planning context in terms of the design and siting of development as well as the construction/installation of small scale energy sources on site (i.e. solar panels or wind turbines on buildings).

4.4.8 Forecast Constraints

Transend has identified a number of constraints in the network forecast to occur for the next five years based upon an assessment of the systems performance in terms of:

- Thermal overloading;
- Voltage performance;
- Security and reliability; and
- Good electricity industry practice.

In Southern Tasmania there are a number of existing and forecast constraints in the transmission system. The constraints relating to loading have implications in terms of the growth and development of areas. In particular the Kingston, Lindisfarne, Rokeby and Sorell substations are forecast to have the capacity exceeded, however Transend is in the process of addressing these capacity issues through augmentation projects. In the medium term, Transend has already identified a capacity issue for the North Hobart substation which will need to be addressed.

4.4.9 Planning Implications for Transmission of Electricity

There are a number of challenges relevant to the transmission of electricity and land use planning.. These are summarised and discussed below:

Inconsistency between planning schemes

Generally, there is little conformity between local authority planning schemes in Tasmania. This can lead to project uncertainty and delay as there are often inconsistencies in planning use classes, criteria and key definitions. For example, the Electricity Supply Industry Act 1995 has certain definitions for voltage classes which are not accurately reflected in many planning schemes.

Lack of a State Planning Policy directly relating to electricity infrastructure use and development

The lack of state planning policies for energy exacerbates uncertainty and has resulted in inconsistent planning approaches being developed from the 'bottom up' in Tasmania. There would be benefits in developing a more robust policy framework and a consistent approach to transmission infrastructure development by implementing a standardised schedule, definitions and zone requirements into all of Tasmania's 32 planning schemes.

Lack of co-ordination between approval authorities

Transend is often required to go through multiple approval processes by various regulatory authorities, which can lack co-ordination and lead to inconsistent decision making and time delays. Developing more efficient and effective approval processes is of significant importance to the energy sector as it faces a substantial development challenge over the coming decade to reconfigure but also to replace assets that are reaching the end of their economic/technical lives.

Transend faces considerable expense and time complying with the various legislative requirements, particularly where there are seasonal impact studies required. Transend acknowledges the important role these studies play in determining the best development option for a project and would like to see more flexibility in development approvals to address such time and cost constraints, whilst ensuring such survey works are undertaken and the values identified protected.

Under resourced regulators

Government regulatory authorities in the state are under resourced which may lead to delays and poor decisions and lack of strategic direction within which developers can develop their projects.

Major Project Approvals

The benefits of undertaking such processes for Transend across multiple jurisdictions is that Transend only have to deal with a single authority, a single set of development criteria and resulting permit conditions as opposed to multiple local government authorities, inconsistent planning schemes, and potentially conflicting permit conditions. Transend's Waddamana to Lindisfarne 220 kV Transmission Line Project was assessed under MIDAA and the above benefits did flow to this project. This process also provided related benefit as a notified corridor was registered on all titles affected by the project, providing affected landowners with notification of the project, even when titles changed hands across the course of the project. This helped to facilitate the related process of land and easement acquisition and allowed for greater flexibility and options during development of the project.

However, providing already existing planning authorities with the ability to establish their own distinct development criteria has the potential to create significant challenges and uncertainty for Transend as:

1. there are currently no state planning policies that apply for energy infrastructure and therefore there is insufficient guidance to establish appropriate technical or design parameters to assess electricity infrastructure development;
2. there are few precedents upon which to base the assessment criteria for electricity infrastructure developments. The development of unique assessment criteria for each project perpetuates the existing challenges of inconsistency between planning schemes that Transend already faces when dealing with projects that span planning scheme areas;

3. Transend undertakes extensive options analysis when developing a preferred project option. This process becomes much less certain when the assessment criteria for a project are unknown prior to entering the statutory planning processes of a major project.
4. The development of unique assessment criteria also continues uncertainty around a planning authority's tolerance for later design refinements when developing options for a project.
5. These processes do not provide for any streamlining for the acquisition of secondary permits.
6. Potential increased cost borne by the developer of assessment processes such as those under PORS and MIDAA.

There are also a number of options available to solve some of the issues faced by Transend in maintaining and developing the transmission system. Transend is keen to discuss these with approval authorities at all levels to facilitate an appropriate and smoother assessment process for our infrastructure. These are summarised and discussed below:

Protection of electricity infrastructure sites and corridors

There are obvious issues when transmission assets need to be located within urban, semi-urban or even developed rural areas primarily due to the significant scale of these assets. Overhead extra high voltage transmission lines require a safety corridor of some 50 metres for 110,000 volt (110kV) lines and 60 metres for 220,000 volt (220kV) lines. This is primarily to ensure that no danger is posed by conductor movement¹⁰, Electro-Magnetic Fields (EMF) and electrical induction. Underground extra high voltage transmission cables require a safety corridor of some 10 metres. These safety corridors are generally embodied by registered easements, statutory easements or unregistered wayleave agreements in favour of Transend. Critically, the standard easement terms will allow for work to be undertaken on the infrastructure, vegetation to be cleared and a restrictive covenant which will preclude any permanent structures from being built inside the easement.

There is a need to protect vital electricity infrastructure sites and corridors. While transmission lines can be protected by easements, as evident in many existing residential areas, these dissect subdivisions creating difficult and unusual lots, as well as constraining those corridors. Appropriate zoning and/or overlays could be a mechanism for protecting Way leave corridors. One of the underlying issues with such a notion is attempting to avoid direct conflict between Transend and all other external stakeholders affected by such use or development. Should it be possible to avoid such situations and clearly identify strategic infrastructure development corridors well in advance then community and landowner expectations would be managed in a better fashion, and the cost and time associated with undertaking comprehensive options analysis to determine transmission line and substation sites would be considerably less. The cost and time associated with acquiring easements and gaining land use planning, environmental and cultural heritage approvals and permits would also be reduced.

Recognition for future development

Future growth areas should be planned in a manner that puts the least pressure on the system and the need to augment or extend the system with capital expenditure. If development is planned in an area that will require augmentation or extension of the system then this should be done in an orderly manner, with issues such as that experienced in the development of Cambridge Park avoided as far as practicable. It

¹⁰ The weight of the transmission lines (conductors) causes significant sag therefore conductors are prone to swing in the wind.

has already been identified that further development in the Northern and Eastern corridors of Greater Hobart will over time require significant investment in electrical infrastructure.

Co-locating with other infrastructure

Co-locating transmission infrastructure is difficult given the uncertainties in planning transmission infrastructure on the same timeframes as other infrastructure providers such as transport, water and sewage etc. It would be beneficial to have greater co-ordination in this area with opportunities to share resources and reduce costs.

Flexibility

For transmission line development in particular it is important for the planning permit to allow for a degree of flexibility in the final location design of the asset. This allows for changes that might arise, for example from the need to respond to an unforeseen landowner or environmental issue. However, the increasing trend for planning authorities to seek more and more 'definitive' information on the location of particular assets at early stages in the planning process can lead to lengthy and costly project delays. Such an approach reduces the envelope in which changes can be made and increases the risk of triggering the need to apply for minor amendments to the consent and opening the issue for potential delay.

Legislative changes to allow for whole of network management

As discussed earlier, Transend's infrastructure serves all of Tasmania and as such is affected by many legislative instruments. In some of these instruments, there is the ability to gain approval for a whole of network management regime in relation to particular issues and this then eliminates the need for approval each time an asset is modified. Transend sees opportunity for enhancement in this area to enable more holistic protection and strengthening of values affected by use and development of the transmission system.

4.5 Energy Distribution

In Tasmania there are four companies that are licensed to retail electricity. Aurora Energy Pty Ltd is the largest organisation responsible for the distribution of electricity infrastructure. The organisation works very closely with Transend, with both organisations heavily regulated with all infrastructure paid for by consumers. This regulation specifies performance targets to which Aurora must operate in (such as the System Average Interruption Duration Index).

Aurora has been referred to as the poles and wires end of the network, where the electricity makes its way to its customers. Aurora has approximately 267,000 customers in a supply area of 68,000 with the vast majority being residential. The organisation manages an asset base comprising 15,500 km high and 7500km low voltage overhead powerlines, 2050km underground cables, 30,000 ground and pole mounted substations, 46,000 street lights and 220,000 poles worth over \$1 billion.

The bulk of the electricity utilised by Aurora is from Hydro Tasmania, which has been supplemented by imports over Basslink in recent years. There are also smaller private owned generation units connected directly to the distribution network.

4.5.1 Constraints and Planned Activities.

Aurora has identified a load growth of about 2% per annum state wide. This requires approximately an additional 20MW growth pa which is equivalent to a major substation every year. In the Southern Region

the load growth is varied across Greater Hobart. The eastern side of the Derwent typically sees a growth of 2%pa, the western side, 2.5%, northern side (Glenorchy to Brighton) 3%, and the Southern area (Kingston to Electrona) 3 – 4%. Despite the increasing popularity of non network solutions such as solar and gas, at present they do not seem to be able to produce enough electricity to defer projects.

There has also been specific growth from the wood-heater buyback programs, particularly in the north of the state which impact on long-term growth projections. These programs are ongoing.

Tasmania is a winter peak load which is dominated by residential customer use. Therefore the load profile follows domestic use which includes strong peaks in the morning and evening in winter with loads being at about 40 -60% for other periods.

In the Southern region there are approximately 25 major substations owned by Transend and Aurora, 11 of these are forecast to approach or exceed their transformer ratings over the next 5 years. Most of these are located in the urban areas of Hobart, Glenorchy, Brighton, Clarence and Kingborough. In addition across the region there are a number of localised issues of security and capacity, specific to each supply network. These are summarised below:

Table 1: Hobart City Constraints and Proposed Activities

Substations	Issues	Proposed Activities
Creek Rd (West Hobart Zone)	5 feeders over the planning rating	Reinforce a number of feeders with two new feeders to be constructed into the western end of the Hobart CBD.
East Hobart Zone	None	Reinforce Salamanca and wharf area from this zone as well as the West Hobart zone.
North Hobart	2 feeders over the planning rating, impacts on security of the network to CBD, RHH and Calvary hospital	Re-arrange the RHH emergency supply to the East Hobart Zone, reconfigure the network to Calvary at North Hobart.
Risdon	None	None
Sandy Bay	2 feeders over the planning rating, localised overloading	None

Table 2: Hobart East Constraints and Proposed Activities

Substations	Issues	Proposed Activities
Bellerive Zone	Two feeders exceeding planning rating, with a further 3 feeders likely to exceed rating within 5 yrs. Zone is non-firm during winter months.	New switching station to be installed to mitigate against loading constraints initially at Lindisfarne and later Mornington. With the new Cambridge zone one of the feeders is now unconstrained, with the establishment of the Howrah Zone the second overload situation will also become unconstrained.
Lindisfarne 33kV	None	Likely to be a new zone north of Lindisfarne to meet capacity and security needs of the suburbs of Old Beach and Risdon Vale.
Geilston Bay Zone	Three feeders exceeding planning rating, likely to be an additional 3 feeders exceeding the rating within 5 years. Zone is non-firm during winter months	One new 11kV feeder has been completed which will bring two of the overloaded feeders within the planning rating. A second feeder will be established by the reconfiguration of the Geilston Bay Zone following the Rosny Zone establishment.
Rokeby	Six feeders exceeding planning rating.	None
Richmond Zone	None	Being considered for upgrading from 2010 onwards for load and security reasons.
General.	None	Cambridge Zone commissioned in April 2009, reducing the loads for Bellerive and Rokeby Zones. Two new zone substations to be developed – Howrah and Rosny, reducing the load on Rokeby, Bellerive and Geilston Bay Zones. To be established before winter 2010. From 2015 it is likely a new Lauderdale Zone substation will be constructed

Table 3: Hobart North Constraints and Proposed Activities.

Substations	Issues	Proposed Activities
Bridgewater	Two feeders exceeding planning rating, a further two feeders likely to exceed the limit in 5 years on projected growth. Likely increase in growth with the initiated Clyde irrigation project.	Some of the overloading will be accommodated at Brighton and Austin's Ferry.
Derwent Park Zone	None	None
Chapel Street	Strong Growth. Three feeders exceeding the planning rating. Further an additional two feeders will exceed the planning limit in 5 years based on projected growth.	Install a new substation at Transend's Creek Rd site thereby reducing loading issues for Chapel St and North Hobart. Work on the three overloaded feeders through two projects.
Claremont Zone	Strong Growth. Security on two feeders are concerning – supply Cadbury Chocolate factory.	None
New Town Zone	One feeder exceeds the planning rating.	None
Other	Brighton Transport Hub will see strong development that will need to be accommodated.	Significant investment is needed for the Brighton Transport Hub – likely to see a new substation at Brighton. In the short term a range of upgrading works will be necessary. Additional zone substations likely to be required at Austin's Ferry.

Table 4: South Area Constraints and Proposed Activities

Substation	Issues	Proposed Activities
Electrona	Two feeders beyond the planning rating over the next 5 years based on projected growth.	Distribution projects are to be constructed which will alleviate load constraints.
Kermandie	None	None
Kingston	Five feeders that exceed the planning rating. Further there will be an additional 3 feeders exceeding planning rating over the next 5 years based on projected growth.	None
Knights Road	Two feeders exceeding planning rating over the next 5 years based on projected growth. A number of large customers are upgrading their supplies which will cause transfer and security issues at the 11kV feeder level.	Additional feeder from Knights Road on the cards.
Other.	None	New Zone substations at Brown's Road, Blackmans Bay, near Margate and near Mt Nelson over a period of time from 2012 to 2025.

Table 5: Sorell/Peninsula Area Constraints and Proposed Activities

Substation	Issues	Proposed Activities
Sorell	Issues of Transfer capacity in Sorell, Midway Point and Richmond. Localised load growth, and load and reliability on one feeder supplying Richmond Town and Zone.	<p>Reliability Programs for Lewisham, Dodges Ferry, Primrose Sands, Forestier Peninsula.</p> <p>Additional voltage support for the peninsula feeders and loop automation on sections within the Tasman and Forestier Peninsulas will be implemented.</p> <p>Connection of a new feeder for Lewisham.</p> <p>Consideration of whether the Richmond Zone should be supplied for Lindisfarne</p> <p>Further stage addressing low voltage and transformer loading issues in Primrose Sands.</p>

4.5.2 Legislative Context

Much of the development works are exempt from planning approval under LUPAA. There are several exemptions established under S56 and S57 of the Electricity Supply Industry Act 1995 (ESIA) and associated Electricity Supply Industry Regulations 2008 relating to construction, installation, modification, maintenance, demolition or replacement of electricity infrastructure. The intent of these exemptions is to enable certain developments and land use activities undertaken by electricity entities on a regular basis to continue. These exemptions are for works defined by the regulations as ‘work of minor environmental impact’.

4.5.3 Planning Implications

There are similar issues and challenges facing Aurora as those facing Transend and Hydro. Whilst they have less involvement with local planning schemes, and accordingly the lack of consistency does not influence them to the same extent, they are by nature a reactive organisation which is very demand driven.

The growth of certain areas has significant impacts on Aurora’s infrastructure and capacity to deliver service in accordance with their regulatory requirements. This leads to considerable future investment being necessary in key locations, or increasing risk of not meeting their regulatory requirements. The increasing popularity in local sustainable energy production through solar and wind sources has not had a significant impact on the operation of the organisation to date. However further sustainability initiatives such as the introduction of the electric car, could have significant implications in terms of load profiles and peak demands.

5. Gas

5.1 Background

A transmission pipeline to bring gas to Tasmania was completed in early 2003 by Duke Energy under a development agreement with State government. The 753km subsea and underground pipeline, costing over \$400 million, was commissioned in 2002. It is delivering gas from the state of Victoria to Northern Tasmania, Southern Tasmania and Tasmania's North West via a trunk main (now owned by Alinta).

Powerco Ltd is currently building 700km of distribution networks throughout Tasmania, a project with an estimated value of \$100 million. The construction of the gas distribution network was divided into two major stages. The first stage of the project, which was completed in July 2005, involved the laying of 100k m of gas pipe in the urban areas of Hobart, Launceston and other northern towns. The second stage, completed in April 2007, involved further laying of gas pipe in Hobart, Launceston, Burnie and Devonport.

Overall the network comprises:

- Strategic main – steel pipe with current pressure of 1000kPa and capacity of 5000kPa.
- Secondary main – Polyethylene pipe (PE) – running up to 1000kPa.
- Local reticulation – PE pipes at 500kPa.

The north-south trunk pipeline terminates at Bridgewater.

5.2 Legislative & Governance Context

The *Gas Pipelines Act 2000* applies to the steel trunk main pipeline. Part 3, Division 4 of the *Gas Act 2000* has implications for permits issued under the *Land Use Planning and Approvals Act 1993*, in that if a gas pipeline corridor has been declared, notification of the pipeline licensee of any planning application is required. The pipeline licensee is then afforded appeal rights.

In addition the Gas Infrastructure (Planning Permit Exemption) Regulations 2003 excludes a 'pipeline', 'supply pipeline' or 'transmission pipeline' from development as defined under the *Land Use Planning and Approvals Act 1993*.

5.3 Planning Implications

As with all infrastructure there are two key land use planning considerations: the protection of the infrastructure and secondly the integration of infrastructure with land use planning.

Gas lines are pressurised. As a result, damage to the main may not only result in an interruption of supply, it may have significant safety implications. There is merit in considering the clear identification of the gas main in planning scheme maps. Powerco is concerned to see that its strategic network is protected and are keen to see all development or maintenance proposals within 50m of the strategic mains.

In terms of integration with land use planning, Powerco is under no obligation to connect gas to any new residential subdivisions for which roads were formed after April 2007. Thus, extension of the gas

network to new areas is a matter of commercial assessment by Powerco and agreement between individual developers and the company.

Gas infrastructure therefore has minimal implications in terms of the Regional Land Use Strategy and the associated settlement strategies.

6. Communications

6.1 Background

A Tasmanian National Broadband Network company has been established by the Commonwealth with the support of the State Government. The company is known as the Tasmania National Broadband Network Company (NBN Tasmania). Aurora Energy is supporting the venture using the value of its telecommunications physical assets. Aurora's Cambridge data centre will be the nerve centre for NBN Tasmania. NBN Tasmania is the first stage of the Commonwealth Government's ambitious multi-billion dollar national broadband network. Tasmania was selected to lead this national initiative because of the extensive work we have done in developing and testing the concept of fibre-to-the-premises.

The project specifically entails the following:

- Aurora has developed an extensive optical fibre network to meet the communications needs of the Tasmanian electricity supply industry, and also to supply high speed communications capability to selected public and private organisations including those in the health and education sectors.
- The Tasmanian Government decided in late 2007 to select Aurora Energy as its strategic partner to commercialise the TasGovNet optical fibre backbone, which was laid in conjunction with the gas pipeline development (from George Town through Launceston to Hobart, and along the north-west coast to Port Latta).
- Aurora Energy and Basslink Pty Ltd entered an agreement in 2008 to commercialise the optical fibre link from northern Tasmania to Melbourne, providing for the first time a communications alternative to the existing Telstra links.

The existing Tasmanian optical fibre network will be extended over a period of five years to pass approximately 200,000 homes and businesses throughout the state. The first stage of this work, due for completion in the second quarter of 2010, involves extension of the fibre backbone:

- from Cambridge via Midway Point to Triabunna
- from Port Latta to Smithton
- from George Town via Scottsdale to St Helens.

The first three towns to receive the rollout are Midway Point, Smithton and Scottsdale.

Initial National Broadband Network Rollout

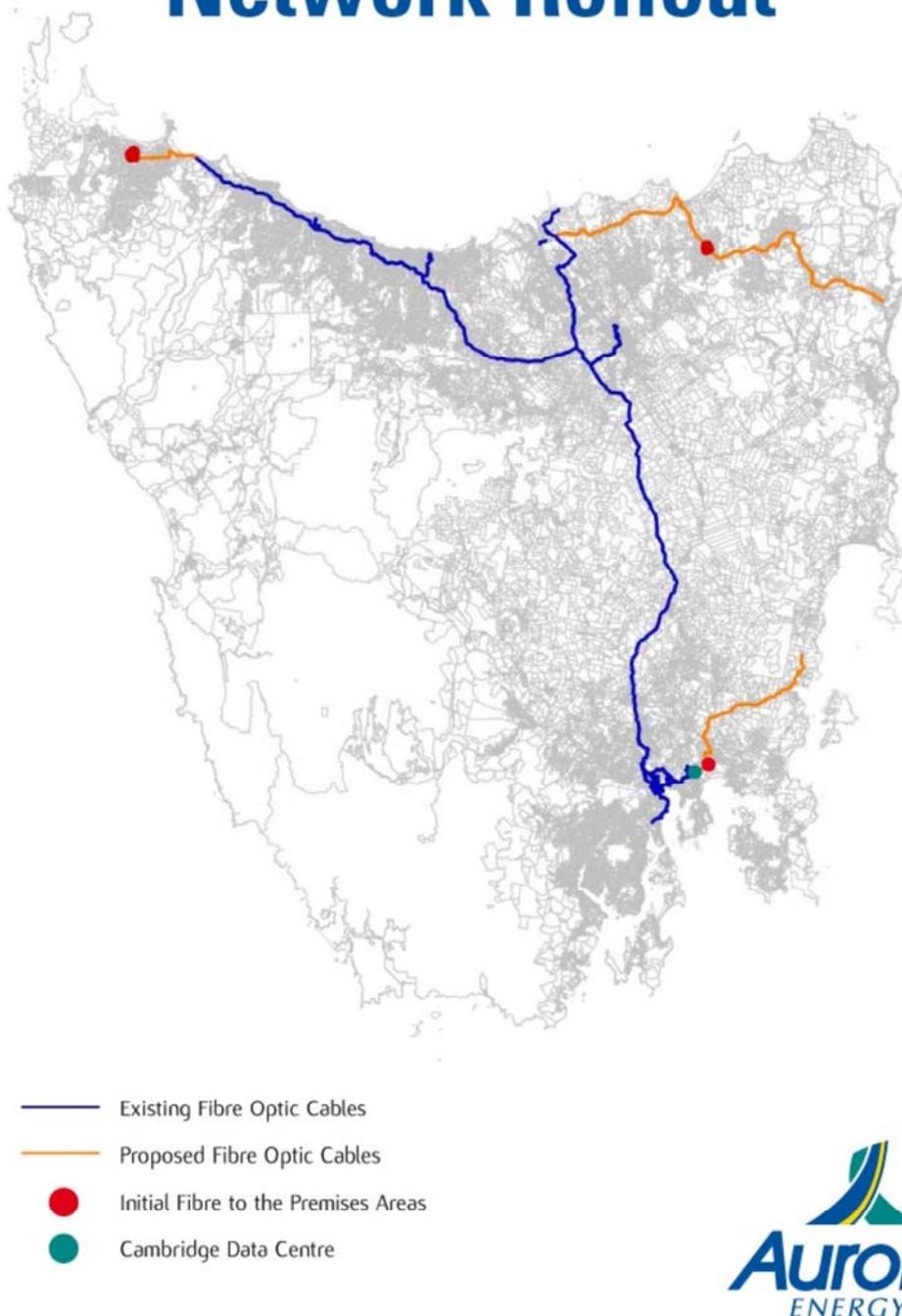


Figure 10: Initial National Broadband Network rollout map for Tasmania (Source Digital Tasmania 2010)

6.2 Planning Implications

Planning Directive No. 2 Underground and Minor Aboveground Infrastructure aims to give underground and minor aboveground infrastructure an exempt use and development status in all planning schemes. A permit will not be required for certain telecommunications facilities under the draft Planning Directive. This is consistent with the Telecommunications Schedule already in each planning scheme. The definition of a 'telecommunication facilities' includes broadband. Broadband is a term used to express the speed and capacity at which a telecommunication service is delivered. The following works would be exempt under clause 2.2(b) from the requirement for planning approval:

- Works involved in the inspection of land to identify suitability for NBN infrastructure; and
- The connection of a line forming part of NBN network to a building, caravan or mobile house; and
- Low impact facility as defined under the Telecommunications (Low-impact Facilities) Determination 1997 – which would include some underground cabling.

The following NBN infrastructure would fall outside the scope of the draft Planning Directive and would therefore require planning approval:

- Aerial cables; and,
- Facilities not categorized as low impact facilities.

The proposed National Broadband Network rollout does not meet the definition of 'low impact facility' as defined under Part 2 of Schedule 3 of the *Telecommunications (Low impact facilities) Determination Act 1997*. This means the rollout will require planning approval.

Once the rollout has been conducted, it is likely that each newly subdivided lot will require some form of connection. The onus will be on Council to impose conditions ensuring that connections are made to take advantage of the telecommunications infrastructure. This can be done through requiring electrical and telecommunication reticulation to be installed underground.

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Southern Tasmania
REGIONAL PLANNING PROJECT

The Southern Tasmania Regional Planning Project
is a joint initiative of the State of Tasmania, the Southern Tasmanian Councils Authority,
the 12 Southern Councils and the Sullivans Cove Waterfront Authority