Prepared for

Auckland Regional Council

Issues Paper for an ARC Role in Energy Management

By

East Harbour Management Services

November 2005

Executive Summary

Energy supply in the Auckland Region is likely to become critical within the decade. Electricity supply in particular will become constrained at peak winter times. The periods of constraint will increase each year unless new supply is provided by transmission line upgrading from the south, local electricity generation capacity is installed, encouragement of distributed energy initiatives, or electricity demand is reduced, particularly at peak times.

The level of security of supply of energy into the Auckland region should be a matter of concern for the regional community. At present there is little community input into decision making as there is no community advocate. Decisions are made on mainly commercial lines by major energy supply parties.

The security of electricity supply can be met by a portfolio of opportunities and responses including; transmission into the region from the national electricity supply system; local electricity generation; and improved energy management within the region. Many of the opportunities are only likely to be achieved if there is improved knowledge, facilitation, and demonstration by a community based organisation such as the Regional Council.

The security of supply of energy and the cost of energy into the future will have a significant bearing on social and economic wellbeing of the Auckland community.

The Regional Council has a statutory role which can be shaped by the issues particular to the energy requirements of the Auckland region. The issues can be grouped into areas of:

- Economic growth
- Planning and regulatory (including community decision making on an appropriate level of security of supply)
- Facilitation of distributed energy initiatives through provision of information and demonstration
- Contingency preparedness

The region can respond to the need for leadership on regional energy matters, coordination of responses, and shared pursuit of opportunities by developing a regional energy strategy and establishing a stronger regional energy advocacy role.

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1 Introduction

This report provides an overview of the Auckland regional energy demand and supply situation and identifies issues and opportunities of relevance to the Auckland Regional Council (ARC). The report also summarises the ability of the ARC to take a role and identifies what other Councils are doing.

The report provides information to assist with answering the question of "Is there a role for ARC, and if so, what should that role be?"

2 Background

In March 2005 a report was presented to the ARC's Strategy and Planning Committee outlining Transpower proposals to upgrade the high voltage electricity transmission network into and around the Auckland Region. A further report was requested on the ARC's potential role in energy issues. The resulting report to the May meeting provided an initial assessment of the appropriateness of an enhanced ARC role in energy issues. It identified the need for an issues and options paper to further explore this potential and also identified matters requiring further consideration.

The key requirement for development of energy policies is an understanding of the likely future demands for energy. This is in terms of regional distribution of demand, demographic drivers and the link to economic growth of business. Energy demand can also be affected by how energy is used and the technologies utilised for energy management.

Today there are also a variety of potential supply side energy technologies under development that may be of relevance to the Auckland region. These include:

- Marine (wave, tidal)
- fuel cells
- photovoltaics
- compressed natural gas (CNG) tanker transport
- transport biofuels (biodiesel, ethanol)
- superconducting transmission and storage (electric)
- pyrolysis oil
- vanadium redox batteries
- micro turbines (gas)
- energy supply quality improvements through storage and power quality
- pebble bed reactors (nuclear)
- integrated gasification combined cycle (coal)

and many others. Technologies such as these may be of great interest to investors and policymakers, not only because of their likely importance in Auckland's energy future, but also because of the potential role they could have in a sustainable energy future for the region.

It is essential that information is obtained to incorporate significant emerging supply side energy technologies with demand side scenarios. "Supply side" here refers to any technology designed to produce fuel, heat or electricity, whether located in central plants, at distributed sites, or on customer premises. It would also include improved energy transport or transmission technologies. "Demand side" technologies are designed to improve the efficiency of fuel, heat or electricity utilization, or eliminate the need for fuel or electricity altogether (such as solar water heaters).

The region is a significant importer of energy with the result that regional possibilities will be strongly dependent on external energy supply factors. This will be incorporated in scenarios for 2025 and 2050.

Because the report covers the next 50 years it provides only a picture through scenarios of what could happen. It is too long a time frame for forecasts but scenarios give the picture appropriate for policy setting, and indicate the roles that ARC could take.

The level of detail presented is only to the level necessary for Council to be confident in its decision making. Where appropriate, greater detail will be produced after consideration of work done to date.

The report is based on information available to the public in a range of reports.

3 Current Energy Supply

3.1 Electricity

3.1.1 Infrastructure

The majority of electricity consumed in the ARC region is generated elsewhere in New Zealand and supply is dependent on the Transpower National Grid bringing this energy from the south.

Electricity Generation

The only significant generation within the region is:

- Southdown is a 122 MW natural gas-fuelled, co-generation station capable of producing 1000 GWh of electricity a year and up to 24 tonnes per hour of industrial use steam. It is owned and operated by Mighty River Power.
- Otahuhu A gas turbine power station has an installed capacity of 85 MW. Because of age and low thermal efficiency the plant is now only ever operated for emergency reasons.
- Otahuhu B was commissioned in January 2000. This 380 megawatt combined cycle power station is the presently largest of its kind in New Zealand. Both Otahuhu stations are owned and operated by Contact Energy.
- A small contribution is made by the burning of methane gas recovered from landfill areas. Greenmount (5.5 MW capacity) and Rosedale (2.7 MW) are the two largest methane gas generation stations in the country and are operated by Mighty River Power.

- Glenbrook is a co-generating station operated by NZ Steel Ltd and generally injects between 30 and 60 MW into the Grid. The burning of coal to support the steel making process allows waste heat to be used to produce steam to drive a generator. This plant is the most significant user of coal in the region.
- The Watercare Services 620 kW generator at Mangatangi Dam is connected to the network via a 415V/22kV transformer and is the only embedded generation within the Counties Power service area.

Should all these plants be operating at full rated capacity they would provide just over 600 MW of electricity. Allowing for operating efficiencies and transmission losses generation plant within the ARC region could not provide any more than 25% of recent peak loads.

There are also a number of privately owned electricity generation plants in the region which are used to provide electricity for on-site use. Such plant is often used only as standby plant. As little, or no, electricity is exported into the grid from this plant they are not considered as contributing to either generation capacity or as a component of the regional peak loads. Such plant is normally included within the energy demand calculations.

Local Electricity Distribution

The ARC region is serviced by two electricity line distribution companies. Auckland City and the Northern Sectors are serviced by Vector operating as Vector or United Networks. The north boundary is almost identical for ARC and Vector. The Southern Sector occupies approximately half of the area serviced by Counties Power. Refer Figure 1

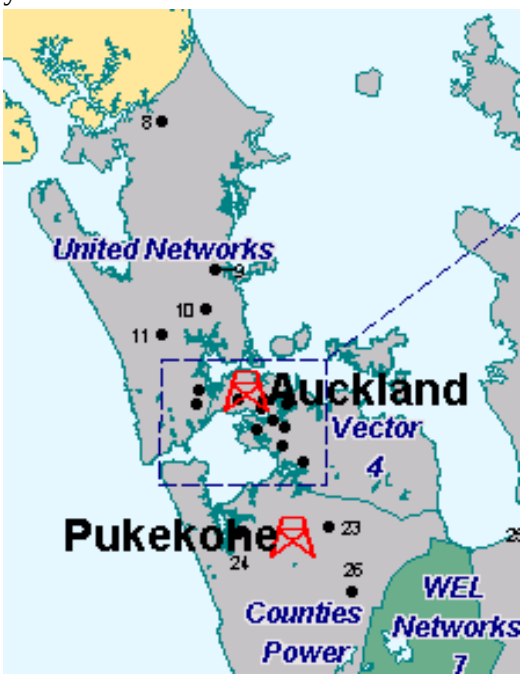


Figure 1 Electricity Distribution Companies in ARC Region

The Northern Region covers the North Shore City, Waitakere City, and Rodney District. It supplies residential (both rural and suburban), commercial and industrial developments. Most of the commercial and industrial developments are centred around the Albany Basin, Takapuna, Glenfield, Henderson and Te Atatu areas. Apart from scattered small townships the areas north of the Whangaparaoa Peninsula and west of Henderson are predominantly rural residential. In total the Northern Region accommodates a population of about 400,000.

The scale of the Vector Auckland network can be gauged by the fact that it incorporates 21,000 kilometres of cables and lines.

The total Counties Power network comprises 3,400km of lines and cables, 9 major substations. An area of 2,220 km2 is served and the geographic distribution of customers within this rural area contributes to voltage constraints and high losses.

Electricity Transmission to Auckland

As well as the transmission networks owned by the local companies, parts of the Transpower national grid also pass through the region.

The main transmission grid feeds into Otahuhu at 110 kV or 220kV and electricity is then distributed to the Grid Exit Points (GXPs) at 110kV

The Auckland region is supplied mainly over a number of 220 kV and 110 kV lines from the Waikato region to the south, including:

- the double circuit 220 kV Stratford-Taumarunui-Huntly-Otahuhu line,
- the double circuit 220 kV Whakamaru-Otahuhu C line, and
- the single circuit 220 kV Whakamaru-Otahuhu A&B lines.
- the double circuit 110 kV Arapuni-Hamilton-Bombay-Otahuhu line, and
- the double circuit 110 kV Arapuni-Pakuranga line

The North Isthmus region is supplied from Otahuhu via the following 220 kV circuits:

- the double circuit 220 kV Otahuhu-Henderson line (with one circuit passing through Southdown)
- the double circuit 220 kV Henderson-Marsden A line
- the double circuit 110 kV Henderson-Maungatapere A line

Figure 2 shows the main transmission lines and the Grid Exit Point locations. Figure 3 gives more local detail.

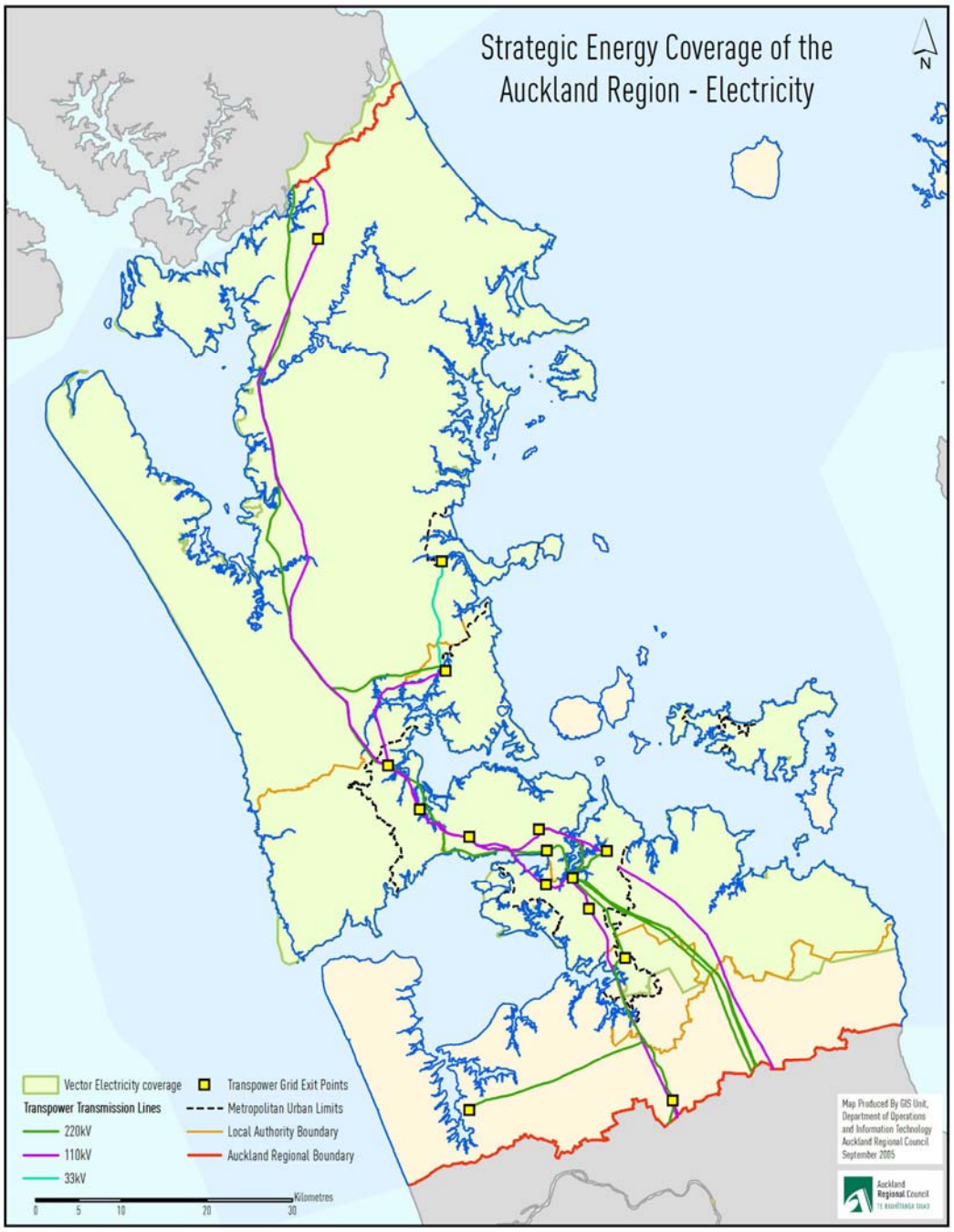


Figure 2 Strategic Energy Coverage - Electricity (Source ARC)

The Transpower grid supplies electricity to Grid Exit Points (GXPs) in the region. These are at; Wellsford, Silverdale, Albany, Henderson, Penrose, Mt Roskill, Hepburn Road, Pakuranga, Southdown, Otahuhu, Mangere, Wiri, Takanini, Bombay and Glenbrook. The GXP locations are shown in Figures 2 and 3.

Figure 3 Grid Exit Point Locations

Counties Power area is supplied through the Glenbrook and Bombay GXPs. Substations at each GXP reduce the supply voltage to suit the needs of the consumers. Local distribution lines and cables owned by Vector and Counties Power are a combination of overhead and underground installations.

Current Upgrade Plan

Due to forecast increasing demand, the lines companies have ongoing plans for the replacement and upgrading of their lines and equipment. Short term plans are outlined in their published Asset Management Plans and some details of these are given in Appendix A of this report.

3.2 Gas

3.2.1 Infrastructure

The majority of gas consumed is natural gas transported from Taranaki through two transmission pipelines to the Auckland region. The map in Figure 4 shows the high pressure transmission pipelines.

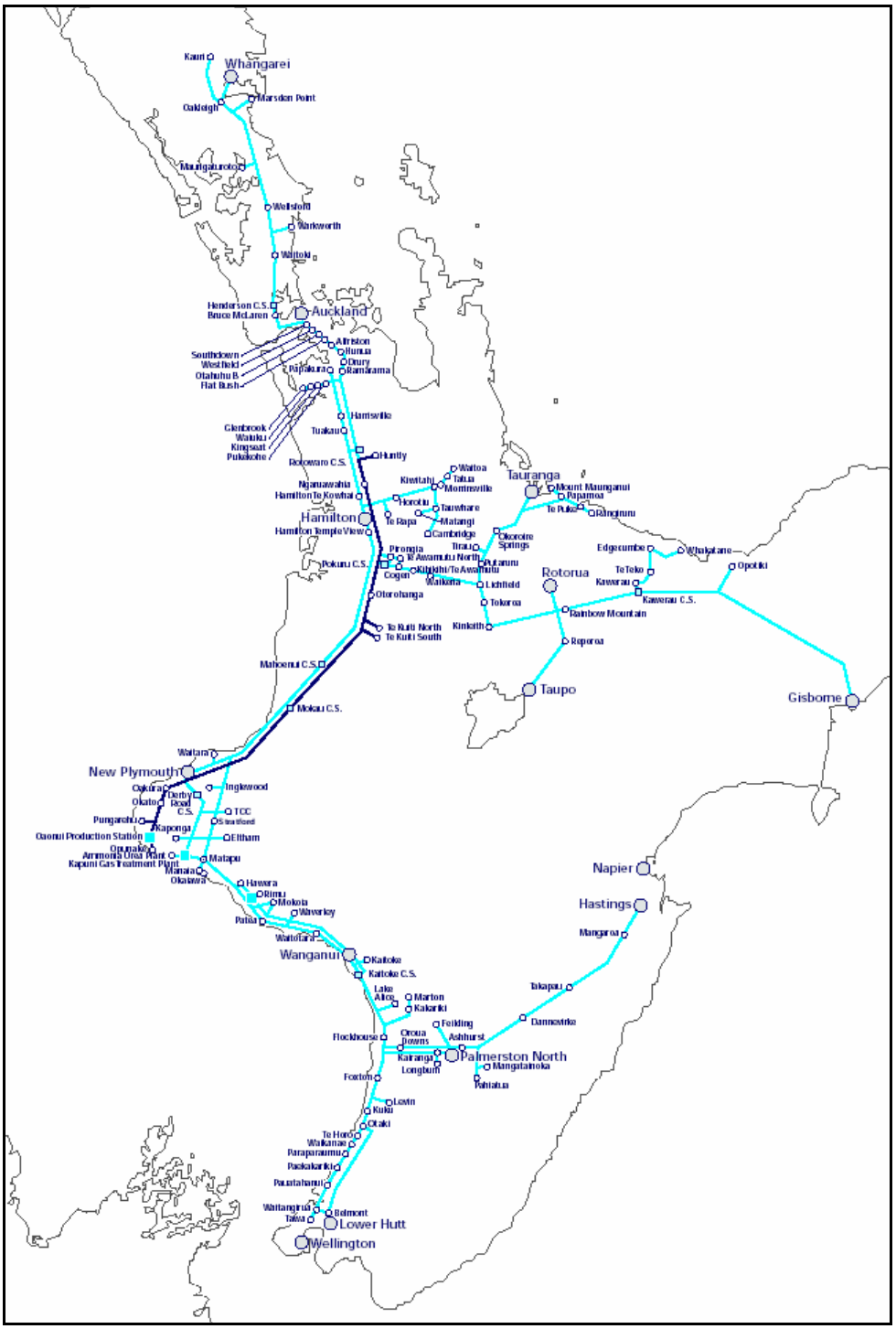


Figure 4 New Zealand Gas Distribution Network

There is an extensive local gas distribution network, over 4900 km long with 11 gate stations and 144 regulating stations.

Figure 5 shows the extent of the network in the ARC region.

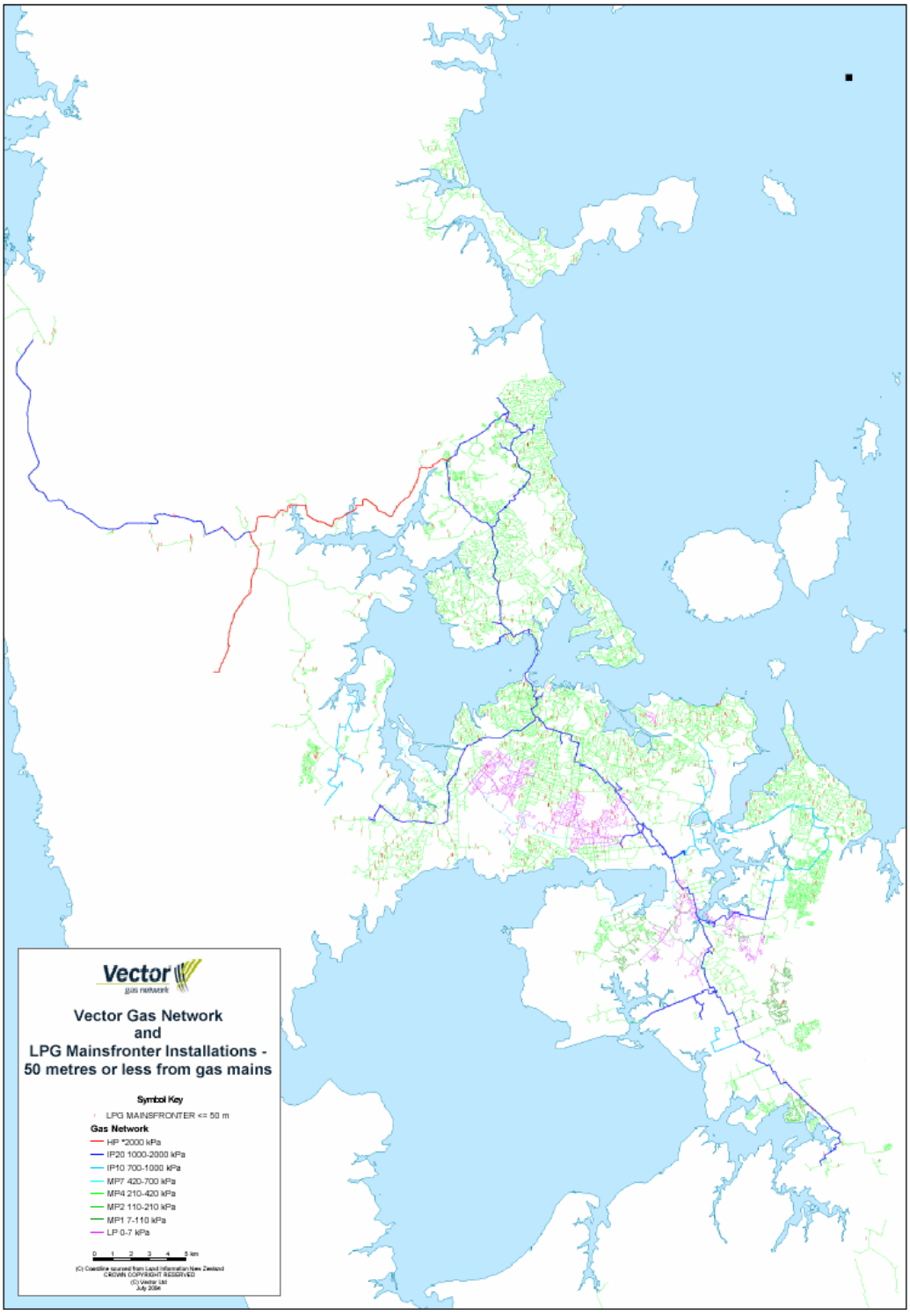
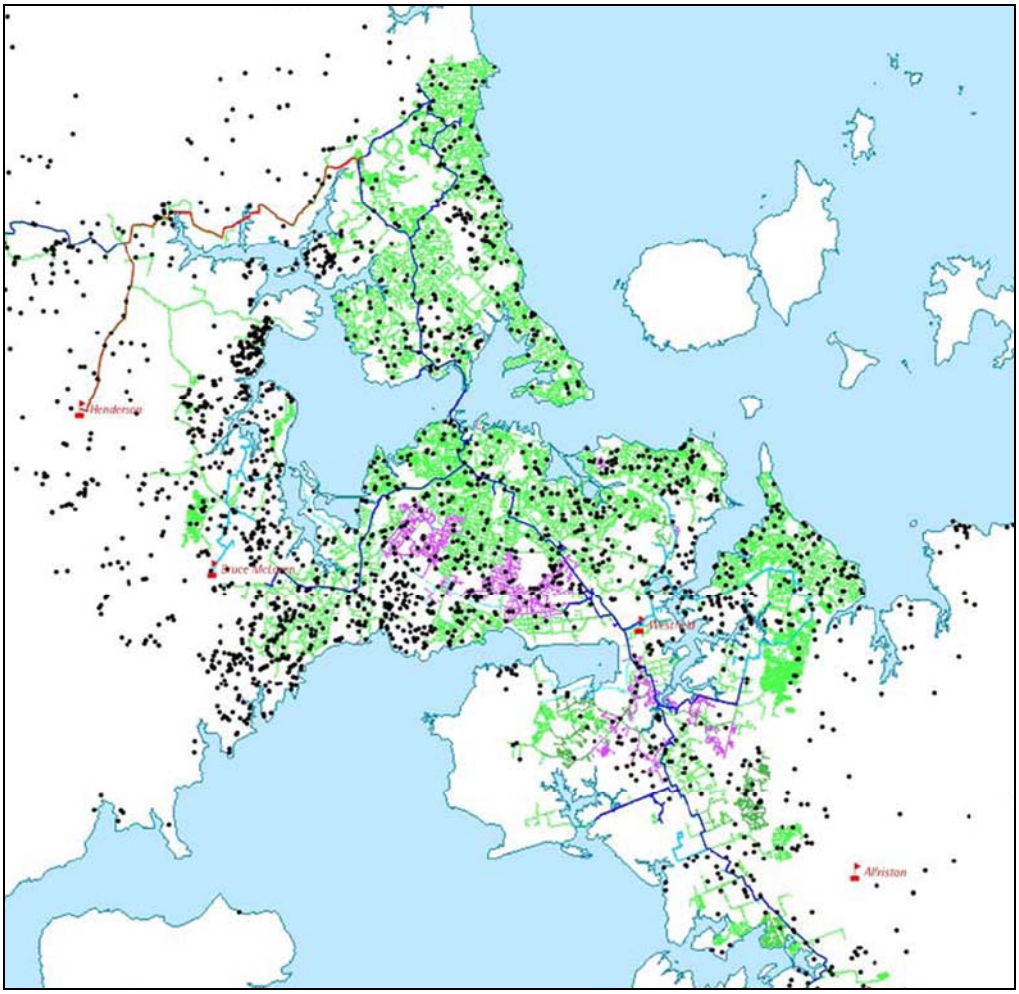


Figure 5 Vector Piped Gas Network

& ARC **Figure 6** shows the certified LPG installations within the Greater Auckland Region. These are installations that are larger than 9 kg bottles of LPG, many of these will be 45kg or larger. There are 2500 installations of this size covering the period 1997 to

2001 in the whole Vector network region. It should be noted that these installations do not include gas barbeque, patio heaters, portable heaters or homes with hobs using 9 kg gas bottles.



Source: Vector & ARC

Figure 6 LPG Usage Locations within Greater Auckland

3.3 Transport energy

3.3.1 Infrastructure

Nearly 100% of the Auckland demand for transport fuels is met by the 170 km pipeline from the refinery at Marsden Point to the storage and distribution facilities in Wiri in South Auckland. There are no other supply points for petrol or jet fuel in the Auckland area. Wynyard Wharf does supply a very small amount of diesel into Auckland, but that would be far less than 5%.This constitutes about half of the total refinery output, although this percentage varies significantly across individual products. For instance more than 90% of the jet fuel production at NZRC is used in Auckland. The remainder of the refinery output is transported around the country by road and coastal tanker. The pipeline was upgraded early in 2005 to increase its capacity by around 20 % from around 2 million tonnes per year to 2.4 million tonnes per year. The upgrade involved the construction of a new pumping station

near Huapai, northwest of Auckland City, and expanding an existing pumping station near Wellsford. The maximum capacity is expected to be reached in 2008-2010. Typical fuel storage in the Auckland region is given in Table 1. Note that these figures do not give the maximum possible storage capacity in Auckland but reflect volumes typically held.

Table 1 - Fuel Storage

Product	Terminal Storage kt
Petrol	19
Jet fuel	25
Diesel	16
Fuel Oil	7

Source: Covec, Hale & Twomey

4 Current Energy Demand

4.1 Electricity

4.1.1 Infrastructure

The capacity of the network required to carry electricity from generator to the consumer is dependent on the largest peak load rather than the overall amount of electricity used. Study of the load profiles is therefore important as these shows when the loads occur. It is the growth in peak demand which drives the need for continual upgrading of the lines and support equipment.

4.1.2 Demand

In order to assess the electricity demand, the quantity of electricity supplied through the GXP points is a suitable indication of growth. There will be some local transmission losses but these are too small to be considered in the scope of this report. Total quantities for 2004 are listed in Table 2.

Table 2 – Grid Exit Points in ARC Region

Grid Exit Points (GXP) in ARC Region			kWh	kWh
Wellsford	WEL	Vector	133,657,344	
Silverdale	SVL	Vector	225,415,008	
Albany 110kv	ALB1101	Vector	671,299,632	
Albany 33kv	ALB331	Vector	515,998,512	
Henderson	HEN	Vector	439,059,456	

Penrose 110kv	PEN1101	Vector	403,115,328	
Penrose 22kv	PEN221	Vector	332,887,248	
Penrose 33kv A	PEN33A	Vector	317,981	
Penrose 33kv B	PEN332	Vector	1,265,045,328	
Mt Roskill	ROS	Vector	783,972,000	
Hepburn - Auckland	HEPW	Vector	511,035,552	
Hepburn - Waitemata	HEPA	Vector	436,538,448	
Pakuranga	PAK	Vector	582,256,224	
Southdown	SWN	Vector	259,128	
Otahuhu A	OTA	Vector	198,966,384	
Mangere	MNG	Vector	479,237,472	
Wiri	WIR	Vector	354,109,392	
Takanini	TAK	Vector	486,264,672	
Vector TOTAL				**7,819,435,109**
Bombay	BOB0331	CP	208,426,752	
Bombay	BOB1101	CP	117,547,488	
Glenbrook	GLN0332	CP	138,151,182	
Counties Power TOTAL			**464,125,422**	**464,125,422**

Source: Electricity Commission Centralised Database

4.1.3 Recent Peaks

On 22 June 2005 the demand for electricity in the upper North Island (the region from Huntly north) reached a record level. The demand of 1980 MW compares with the previous record of 1947 MW in August 2004. An industry working party had expected demand could peak at around 1990 MW. With all equipment available, the maximum supply that could be met is 2130 MW. This means that the recorded peak was over 90% of the maximum capacity with all plant operational.

4.1.4 Load Profiles

Two distinct load profiles have been identified for the Auckland region. Load in summer and winter vary with the winter peaks being the higher driven by domestic cooking and heating requirements during the evenings. Reports from the Electricity Commission, Transpower and Vector all provide similar figures for the load.

Peak demands do not occur simultaneously. Residential loads tend to peak in the evening, with a peak lasting two to three hours from 17:00 hours. Commercial loads tend to peak during the day with a peak lasting five or six hours. Peak demands are seasonal and area specific, with some areas peaking in winter and others in summer. The underlying trend for peak demands is moving towards a summer peak, particularly in commercial areas, and the network will have to be designed and operated to ensure performance is maintained under changing customer usage patterns.

Figure 7 and 8, from Energy Market Services[1] show the annual load profiles for the Auckland Regions.

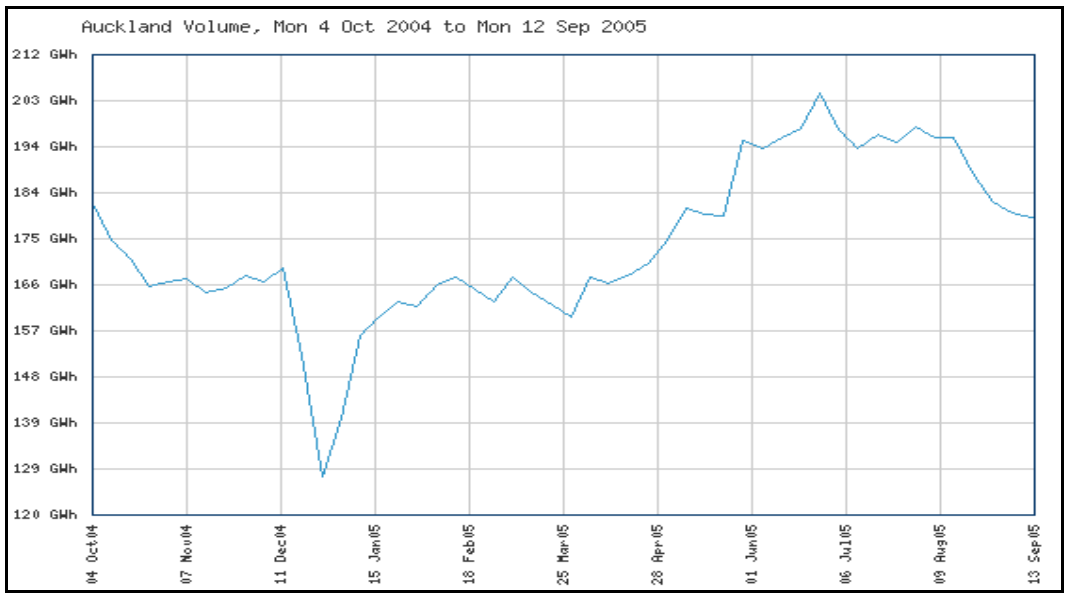


Figure 7 – Annual Electricity Consumption Profile

The impact of summer holiday shutdowns on consumption is dramatically shown in Figure 7. The growth trend over the period since 1999 can be seen in Figure 8.

[1] The EMS 'Auckland Region reflected in these charts roughly follows the ARC boundaries

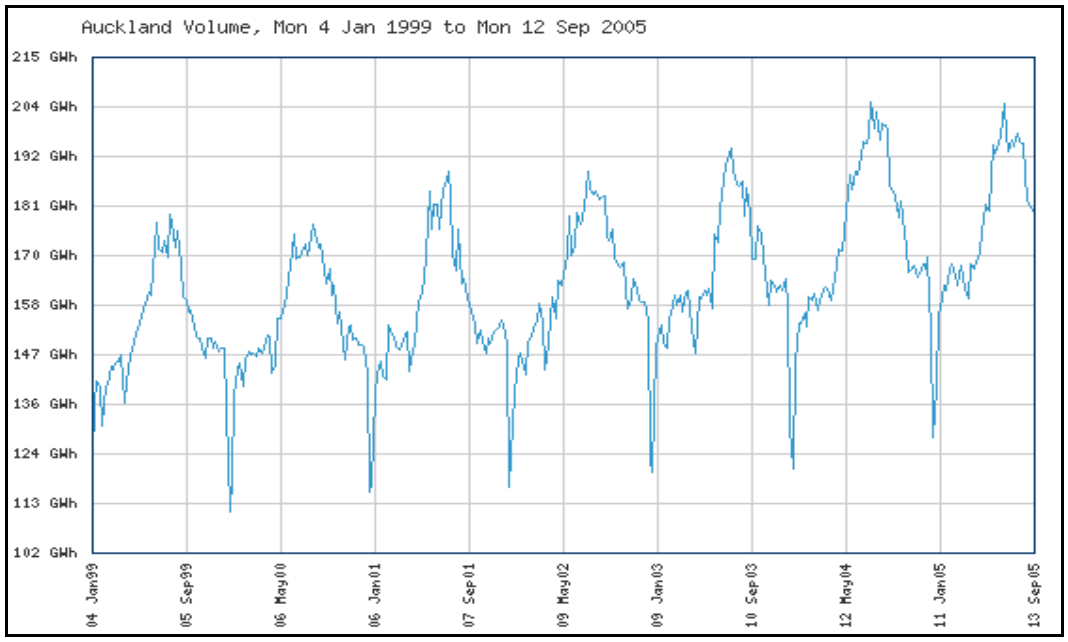


Figure 8 – Seven Year Electricity Consumption Profile

Figures 9 and 10 represent the seasonal load profiles in more detail, the evening peaks can be seen in both but is more pronounced in winter.[2] The maximum peak for the Auckland/North Isthmus is shown at about 1800 MW, as mentioned above, this peak has already been exceeded by more than 10%. While the peaks occur for relatively short periods, the transmission network and support equipment must be able to handle these loads.

The increased affordability of domestic air conditioning units together with warmer temperatures is causing an increase in electricity use and is expected to change the shape of the summer load profile. In the short term, the largest peaks as likely to continue to be in winter.

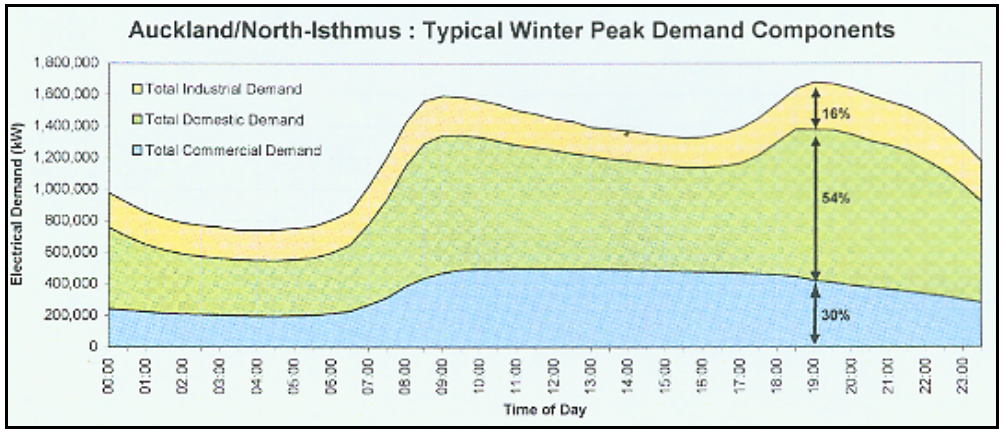


Figure 9 Winter Load Profile

[2] 'Auckland's Electrical Demand Characteristics and Applicability of Demand Management', Sinclair Knight Merz, June 2005 for The Electricity Commission.

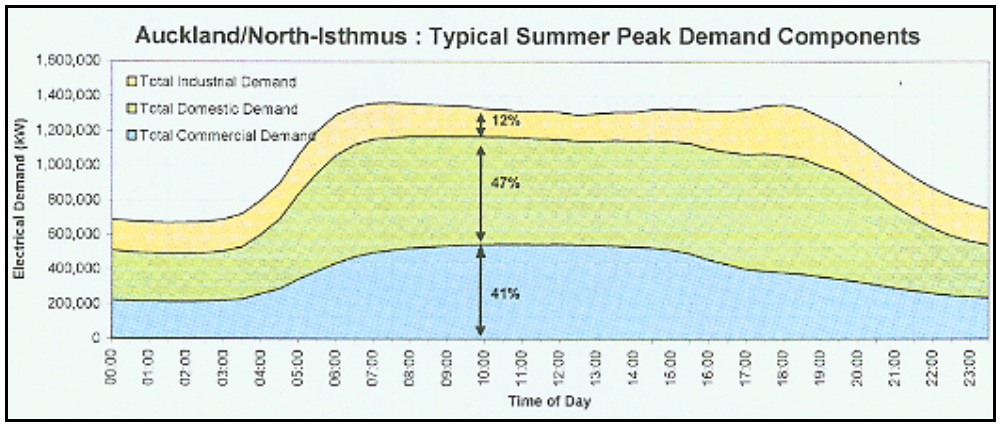


Figure 10 Summer Load Profile

4.1.5 Recent Growth

Past growth in electricity demand in this region in the period since 1993 has averaged 2%. Some areas of the region have grown at a much faster rate than others with the Bush Road substation experiencing an average growth of over 10%. Rate of growth is driven by new residential developments with some of the established areas showing a reduced demand in this period.

4.2 Gas

4.2.1 Infrastructure

The Vector gas network is over 4,900 kilometres long covering the region from Orewa in the north to Tuakau in the south. For the purpose of this study it has been assumed that all of this network falls within the ARC region as that part of the network in the Franklin District outside of the ARC will have relatively low gas use.

4.2.2 Demand

Current gas demand through the gas distribution network was almost 12 PJ in 2004. The Otahuhu power station is supplied directly from the transmission system and is not included in this total but could use up to 20 PJ of gas annually.

Residential and commercial gas usage is highly seasonal, with relatively low per customer usage. Peak monthly use is estimated around 1.3 PJ.

Current LPG annual usage in New Zealand is over 160,000 tonnes (7.5PJ). Of this about 90,000 tonnes (4.45 PJ) is used by industrial and commercial enterprises, 35,000 tonnes (1.73 PJ) in the domestic market and the remainder, 1.24 PJ for automotive use.

Location of the gas exit stations are shown in Figure 11

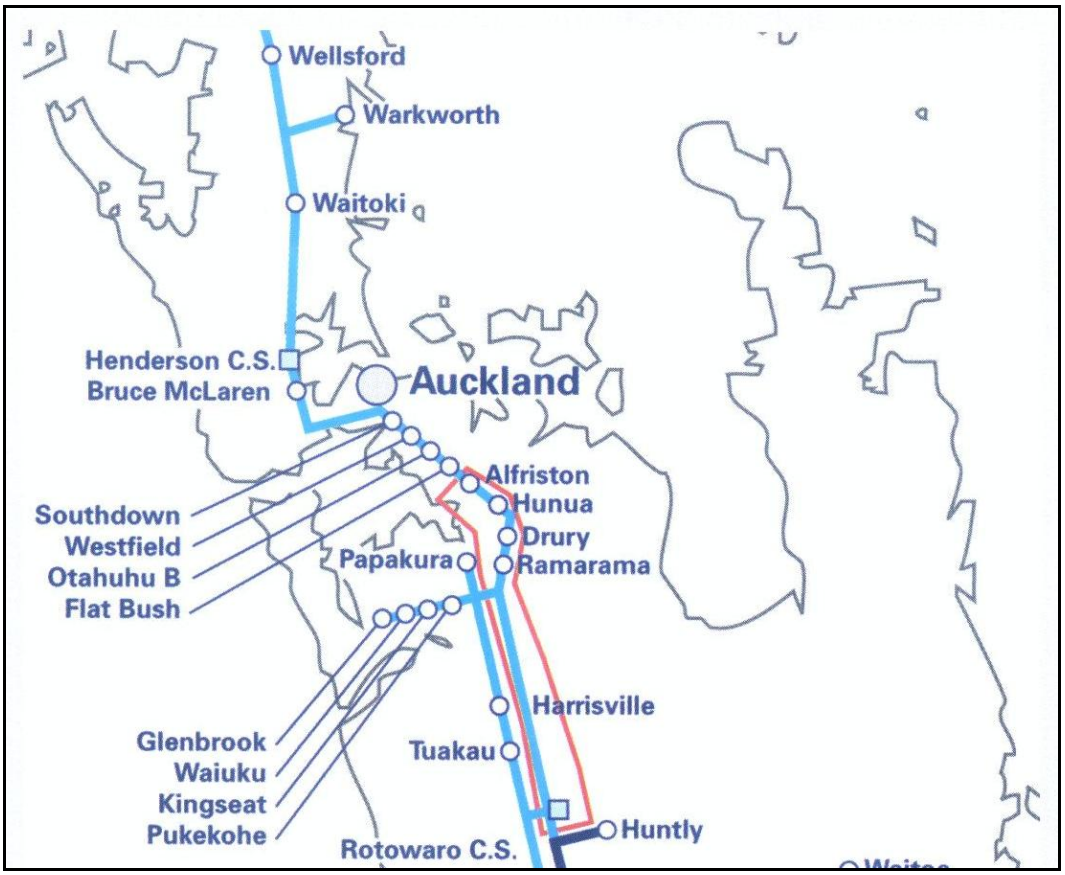


Figure 11 Gas Supply Infrastructure

4.3 Transport energy

4.3.1 Infrastructure

The current regional transport infrastructure is shown in.

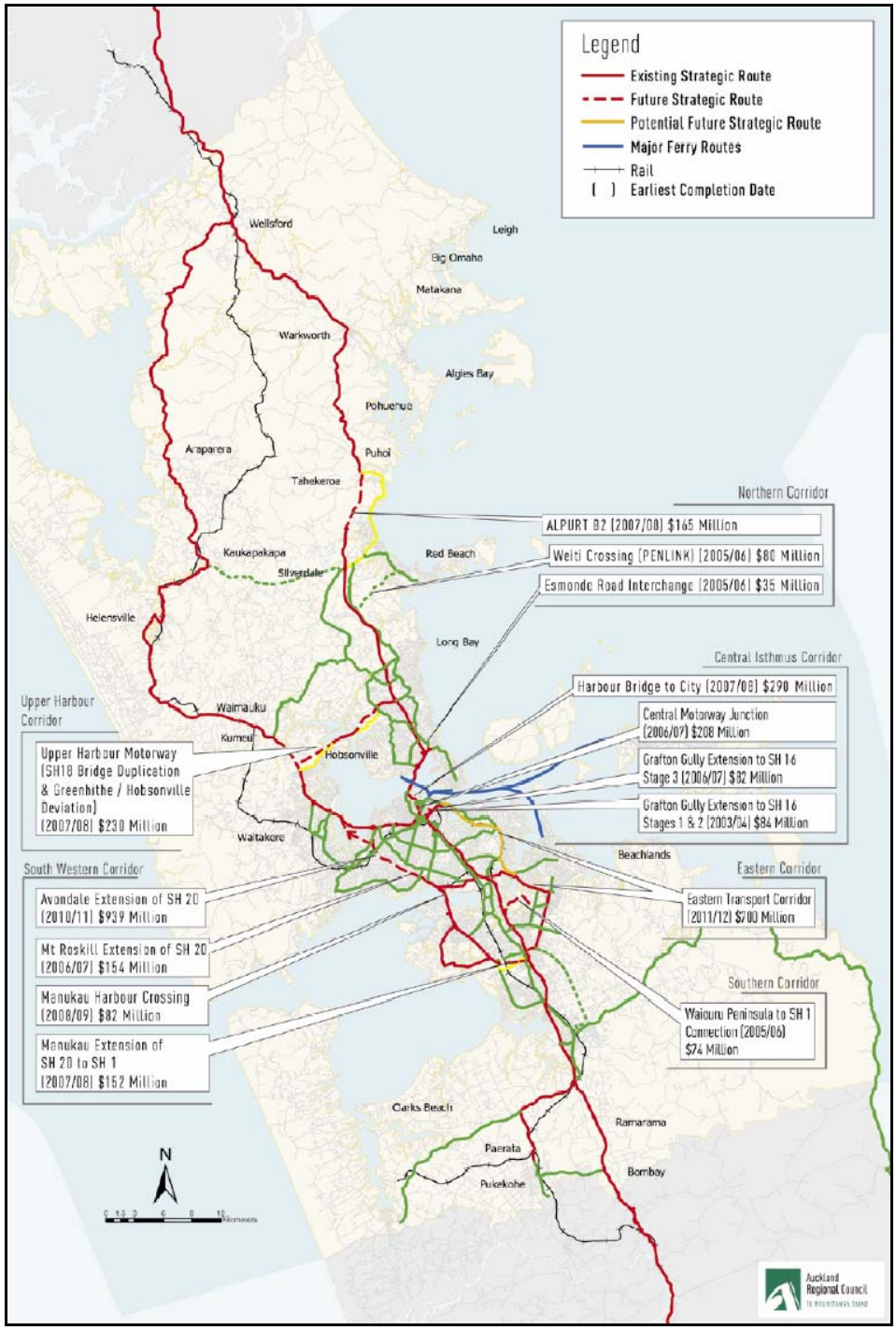


Figure 12 Present Transport Infrastructure

4.3.2 Demand

Annual fuel use per person is slowly rising as shown in Figure 13.

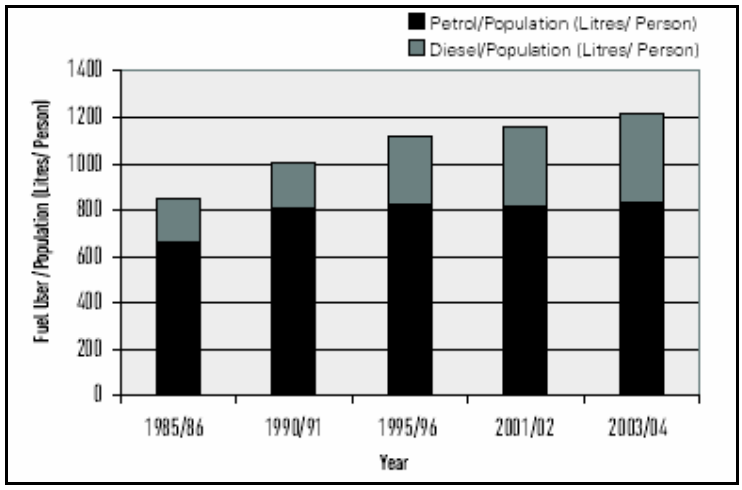


Figure 13 Annual Transport Fuels Use per Person

Annual petrol and diesel demand for the region is approximately 1.6 billion litres with petrol contributing 1.08 billion litres.

Aviation fuel annual demand is over 1 billion litres with the fuel delivered by pipeline from Wiri storage facilities to storage at the airport.

5 Energy Demand in the region to 2050

5.1 Regional Growth Strategy

The growth strategy for the ARC region has been outlined in a number of reports and publications produced by ARC and the Territorial Authorities. Details from these reports have been used to provide input to Table 3 but have not been otherwise been repeated in this report.

5.2 Growth Assumptions – Demographics

The population growth predictions outlined in the three sector agreements between ARC and the Territorial Authorities have been used as the basis for predicting areas of growth in the region. These predictions are shown in Table 3.[3]

[3] Sources: A Vision for Managing Growth in the Auckland Region, ARC, Nov 1999
The Central Sector Agreement, ARC, October 2003
Northern & Western Sectors Agreement, ARC, October 2001
Southern Sector Agreement, ARC, March 2001

There is provision in Table 3 to include which electricity and gas supply points are relevant for each residential node once this information is identified.

Table 3 Predicted Population Growth in ARC Region

Sector	Council	1996	Growth 1996 to 2021	%	Growth to 2050	% Growth to 2050	Residential nodes	Growth to 2021	Growth to 2050	GXP	Gas Station
Northern & Western	North Shore City Council	172,000	77,000	45	120,000	70%	Albany	37,000			
							Birkenhead / Northcote	8,000			
							Devonport	2,500			
							East Coast Bays	8,500			
							Glenfield	2,500			
							Takapuna	6,500			
	Waitakere City Council	156,000	75,000	48	147,000	94%	New Lynn	9,000			
							Henderson	6,000			
							Glen Eden	2,700			
							Ranui	1,900			
							Lincoln Road	1,000			
							Hobsonville Corridor	12,000			
							Massey North - Westgate	1,330			
							Redhills	8,840			
							Babich	2,000			
							Penihana	1,600			
							Sunnyvale/ Sturges	2,100			
	Rodney District Council	66,000	74,000	11	111,000	168%	Whangaparaoa	14,000			
							Orewa/Silverdale	10,400			
							Helensville	8,000			

Central	Auckland City Council	346,000	142,000	41	237,000	68%	Central City	142,000	237,000
Southern	Manakau City Council	254,000	89,000	35	178,000	70%	Flat Bush	41,000	43,000
							Manakau City		8,000
							Manurewa		5,000
							Hunters Corner		2,000
							Papatoetoe		5,000
							Middlemore		2,000
							Mangere Bridge		2,000
							Mangere Town		3,500
							Pakuranga		3,500
							Howick		1,500
							Te Mahia		1,500
	Papakura District Council	40,000			54,000	135	Takanini	11,000	22,000
							Hingaia	5,000	10,000
							Papakura		6,500
	Franklin District Council	32,000			43,000	135%	Greenfield		

Specific areas of concentrated growth have been highlighted by ARC and are shown in Figure 14.

Employment and Energy Use

Areas where employment is likely to grow significantly are the CBD, airport, East Tamaki, Albany basin and Onehunga-Panmure.

Sub-regions with relatively few employment opportunities compared to their population are Papakura/Franklin, Waitakere, Hibiscus Coast and the Howick/Pakuranga peninsula (including Botany Downs). Regional growth up until 2021 is not expected to significantly increase employment opportunities in the sub-regions – Papakura and Waitakere in particular.[4]

Currently manufacturing employs approximately 14% of those employed in the Auckland region while the remainder are employed in what can be loosely described as commercial. Manufacturing as an employer has been declining for some time. In 1986 it employed 29% of the workforce, and in 2002, 17%.[5]

Business and financial sectors are expanding. Small businesses dominate the total workforce. This will result in businesses being spread more evenly through the growth areas and not concentrated in industrial zones.

[4] Draft Regional Land Transport Strategy Chapter 3
[5] Growing Auckland, Auckland Regional Economic Development Strategy 2002 – 2022.

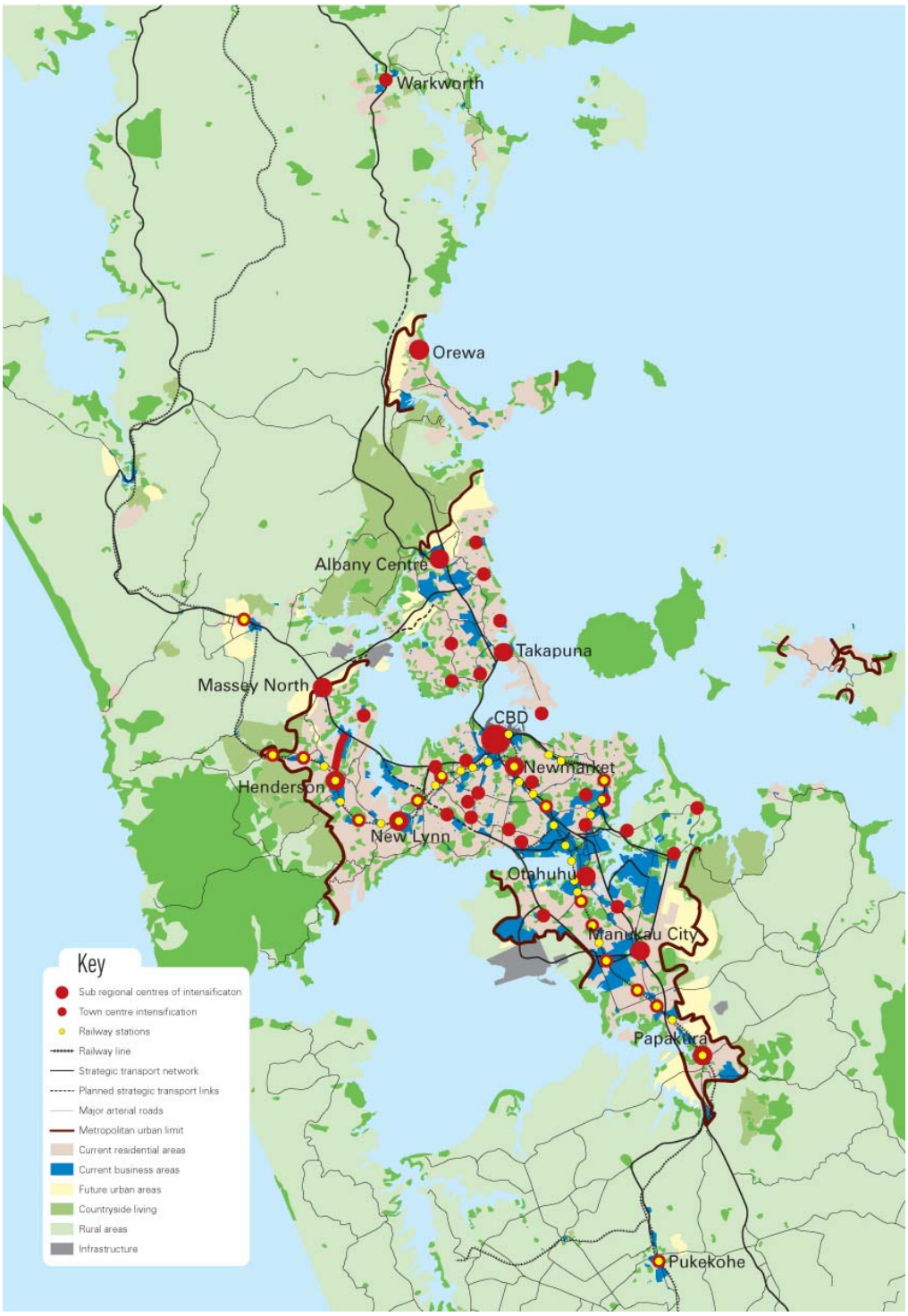


Figure 14 Proposed Distribution of Intensification Areas, as specified in the Regional Policy Statement update 2005

5.3 Growth Assumptions - Electricity

A number of bodies have considered the likely growth in energy consumption in the future. Growth assumptions have generally been made looking at two different factors. One consideration is the quantity of electricity used over a period, specified in gigawatt hours (GWh) which is a measure of consumption over a one hour period. The other is the maximum peak load which needs to be carried by the supply infrastructure, specified in megawatts (MW) or megavolt amps (MVA).[6]

The electricity growth predictions of Vector, Counties Power, the Electricity Commission and Transpower are outlined in Appendix B. Growth is driven mainly by increased population. By New Zealand standards the load growth in the region is relatively high (at around 2% per annum).

There is general agreement that there will be a growth in energy demand of about 40% in the next 20 years and about 100% within 50 years. Growth in Auckland City will be restricted by lack of additional space and by a limit on the level of population density. Some predictions for growth in the city appear to be unattainable due to the physical limitations. Growth in population nodes in other parts of the region will be a combination of new greenfield sites and expansion of existing locations.

The highest load growth in the Northern part of the region is expected to occur around the Albany Basin with the development of industrial and retail businesses. With the opening of the new motorway from North Shore to Orewa (which is planned to be extended to Puhoi), it is expected that significant residential developments will take place in areas north of Silverdale. Electricity demand in established areas such as Northcote and Devonport is expected to remain relatively static.

In the southern part of the region Manakau City is predicted to grow by over 60% by 2050 with much of this growth in new greenfield areas such as Flat Bush The main growth in the Papakura District will be concentrated in Takanini and Hingaia. The Franklin District Council plans that growth in their region be spread across the district rather than concentrated in a few locations.

[6] For the purpose of this report the values in MW and MVA can be regarded as similar.

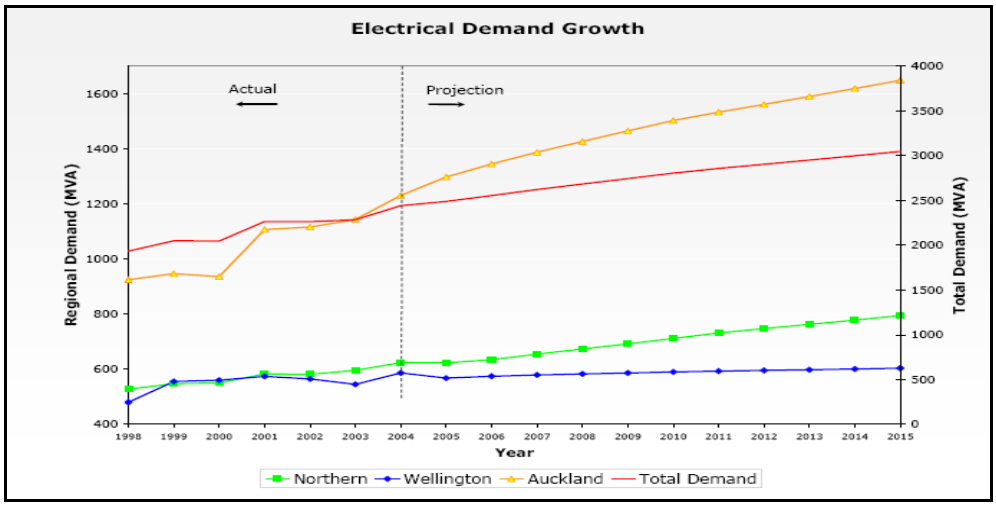


Figure 15 Past and Projected Electrical Demand for Vector Networks

Figure 15 from Vector[7] shows predicted growth in overall demand.

Predictions of disruptions to supply of electricity in the Auckland region as early as 2007 are being made by a number of parties. As this is a very short time frame accurate urgent work is required to prepare for possible disruptions.

5.4 Gas

5.4.1 Infrastructure

The increase in gas demand will require upgrading of gas pipelines into Auckland. Imported gas could be shipped directly into the Auckland Region but it is unlikely to occur. Gas is more likely to be delivered to Marsden and piped to Auckland. If this were to occur a new pipeline would be required from Marsden to Auckland. Otherwise there will be incremental additions to the network to meet demand.

If gas is peak constrained then gas storage could occur.

5.4.2 Demand

LPG and reticulated natural gas can substitute for each other and LPG may grow at the expense of reticulated gas.

Growth Assumptions

Auckland's gas network has lower penetration levels than most other reticulated urban areas. Only 16% of residential dwellings are connected to the gas network. Less than 11% of all businesses are gas customers. Other areas in New Zealand have much more mature networks, with penetration of gas well above 30%. Less

[7] 2005 Asset Management Plan, Vector, P42

than 30% of Auckland residential consumers connected to gas use reticulated natural gas for space heating.

Auckland has experienced significant growth in apartment dwellings. Many apartments are non-owner occupied. It is unlikely that many of these will connect to the gas network. Developer contributions to gas reticulation of subdivisions are around 10% of the level of contribution they make to electricity reticulation. 80% of Vector's gas business growth is attributable to new developments/subdivisions.

In the Vector network, around 12% of its gas customers are manufacturing based, consuming approximately 54% of total non-residential natural gas in the region.

Reticulated gas growth is expected to be low but could be stimulated if the price margin between gas and electricity widens.

5.4.3 LPG

There are few large LPG tank installations – they are commonly located at service stations as re-fuel sites, or used for energy intensive commercial applications (including potentially in areas where reticulated natural gas networks exist), or to reticulate subdivisions.

At present current New Zealand use is just over 160,000 tonnes per annum. Figure 16 produced by Shell, suggests demand will be greater under the high oil price scenario. Extrapolating the high oil price scenario of an annual increase of 5000 tonnes to 2021 would give an annual consumption of 240,000 tonnes (11.9 PJ). Actual growth appears to be higher at around 7500 tonnes annually. Extrapolating this out to 2021 would give an annual consumption of 280,000 tonnes (17.8 PJ).

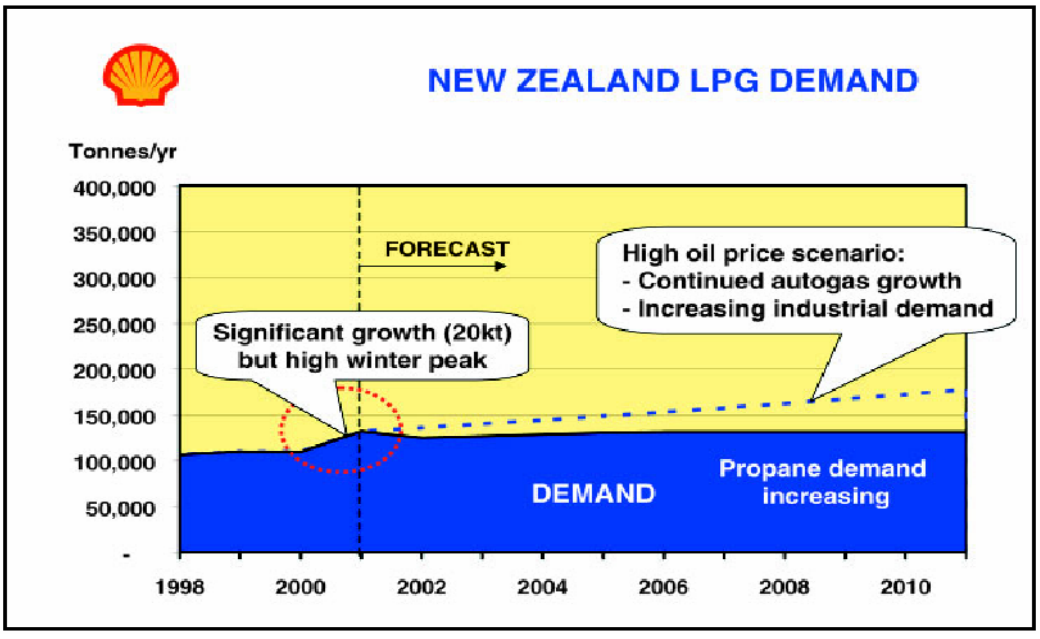


Figure 16 Past and Projected New Zealand LPG Demand

Source Mulvena, NZ Petroleum Conference 2002

5.5 Transport energy

5.5.1 Demand

The number of cars is expected to increase from the current 652,000 to 830,000 in 2016 as shown in Figure 17 with a resulting fuel demand expected to increase by 26% to over 2 billion litres per year.

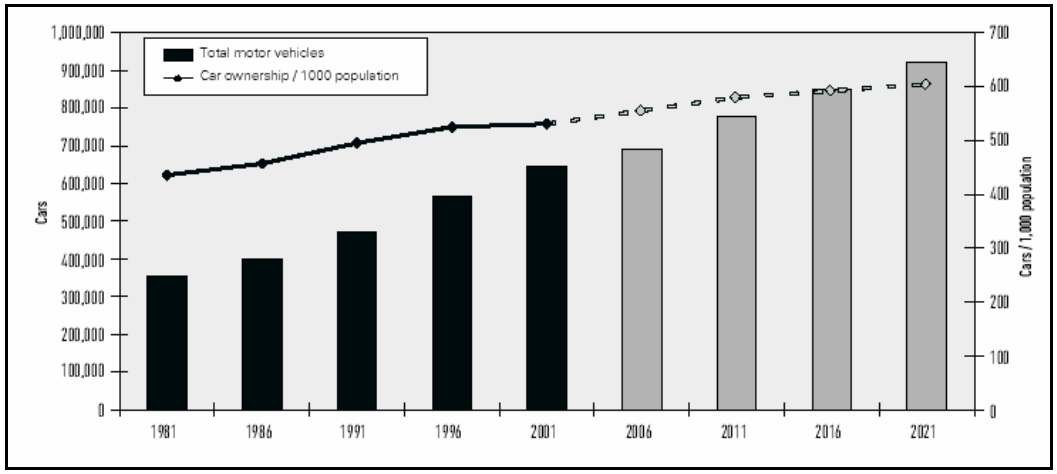


Figure 17 - Number of Cars
Source: Draft Regional Land Transport Strategy

6 Possible energy supply to 2025

6.1 Electricity

6.1.1 Generation

The increased demand for electricity throughout the country will require significant growth in generating capacity over the next two decades. This growth is likely to be spread over the whole country but there is likely to be a focus on increasing generation capacity as near as possible to the main consumption area of Auckland City and the Northern Isthmus. Already plans have been announced for generation plants within the ARC territory. The government has a policy that a large proportion of new generation be from renewable resources however much of the proposed alternatives would use fossil fuels.

Resource Consent has been granted for an 18 MW wind farm on the Awhitu Peninsula near the southern ARC boundary. This development is being undertaken by Genesis Energy and a wind farm of this size would generate enough electricity for 8,000 houses.

It is likely that over the next twenty years advantage will be taken of the high wind resources on the exposed west coast and many more wind farms will be developed in the region.

Contact Energy has resource consent for an additional Otahuhu Combined Cycle Gas Turbine (CCGT) station. The station capacity is proposed to be up to 400MW. The earliest the Otahuhu station could be operational is 2010 even with a guaranteed gas supply. The project is in doubt until a guaranteed gas supply is identified.

Genesis Energy has recently announced that it is investigating building a 385MW gas-fired power station near Helensville and Silverdale, north of Auckland. Genesis has stated that it cannot provide certainty that resource consents, fuel supply, and financial arrangements will be in place by 2010. For these reasons, Genesis states that it should not be considered as an alternative to the proposed 400kV line.

Todd Energy proposes a modular 200MW Open Cycle Gas Turbine (OCGT) generating plant, suggesting that the use of multiple-turbines would increase reliability over a lower-cost single-shaft option. Its initial studies indicate that such a proposal would require additional funding to be viable.

It is possible that future gas fired generation would be dependent on using imported gas as feedstock if significant discoveries of new gas resources are not made in New Zealand. Doubts over long-term supplies of gas are likely to restrict development of generation plants of this type.

Should imported Liquefied Natural Gas (LNG) become a feedstock for new generating plant it is possible that new receiving, storage and transmission infrastructure will be required in the ARC region. A more likely scenario is that gas will be landed at Marsden with a new pipeline required to transport it to Auckland.

All proposals for new generating plant are likely to be subjected to significant objection from local residents using the RMA and local planning guidelines to support their cases. It is important that the ARC and other regional territorial authorities consider the need to include planning guidelines for electricity generation and transmission in their long-term plans.

6.1.2 Infrastructure

The predictions of electricity growth in the ARC region to 2025 suggest increases in consumption of between 75 and 100% of present demand. It is expected that this will require large investment in expanding the supply infrastructure by Transpower and local lines companies. The physical impact of installing new supply lines, substations and other supporting infrastructure will be considerable and will provoke strong opinions from the public both in support and objection to such plans. There are likely to many appeals which could significantly delay or even stop such proposed expansions triggering supply restrictions in coming years.

The present controversy over Transpower's plans to install new transmission lines to the Auckland region is an example of what can be expected if provisions are not made now in regional planning to make allowances for further expansion of the energy infrastructure.

Short Term Plans

Figure 18 Proposed Transpower Grid Upgrade Route

Transpower has announced their preferred route (Figure 18) for a main supply link to Auckland. While the last 9 kilometres at the Otahuhu end from Ormiston Road will be underground the rest will be carried overhead by large pylons. The need for such an upgrade is presently being considered by the Electricity Commission with a decision to be announced in 2006. Transpower plan to have the new lines in service in 2010 if approval is given.

Although there is considerable variation in options as to how the increased electricity demands of the upper North Island are to be met there is general acceptance that, although the timing could be delayed by construction of alternatives, an upgrade of the National Grid will be required. Should Transpower not obtain approval for their plans alternative sources of power will need to be established very quickly. This matter is covered in more detail in the 'Security of Supply' section of this report.

The Transpower upgrade proposals are to increase the voltage at which the electricity is carried from 220 kV to 400kV as this will increase the capacity and reduce the level of transmission losses. Present peak capacity of 2190 MW would be increased.

A number of committed tactical transmission upgrade projects are being undertaken by Transpower in the Auckland region to extend the operational capacity of the existing system and these will be commissioned in the period prior to 2010. Details are given in Appendix B.

The Electricity Commission (EC) has called for suggestions of alternatives to the building of a new 400kV transmission line. These submissions have been reviewed and been classified into those considered to be worth further investigation. While many of the suggestions are unlikely to proceed they do give an indication of projects which ARC may need to consider in the future. The favoured options are tabulated in Appendix C.

6.2 Gas

6.2.1 Infrastructure

It is assumed that gas for domestic and commercial gas consumers will be readily available, but this may not be the case for large industrial customers. The latter is likely to be the case if no new major gas fields are discovered.

Any shortfalls in indigenous LPG supply will be met by imports.

6.3 Transport energy

6.3.1 Infrastructure

The increased demand for transport energy, along with proposed closure of existing storage facilities, will necessitate an identification of new storage capacity for transport fuels.

The proposed blending of ethanol into petrol, and biodiesel into diesel, will require additional storage if blended fuels are to become established alongside conventional fuel types. There may also be the need for a blending facility in the region.

The maximum capacity of the Marsden/Wiri petroleum pipeline is expected to be reached around 2008-2010 necessitating the construction of a new supply infrastructure, which may be an additional pipeline or new direct import facilities. While the construction of a new pipeline from NZRC is part of a solution to Auckland's future fuel supply, it does not address structure production limits at the refinery. If the pipeline capacity were the only constraint, construction of a new pipeline could be delayed for a number of years beyond that point (say 5 years?) through incremental road transport from the next supply points of Marsden Point and Tauranga. However, the pipeline constraint is not the only issue that needs to be considered in that decision.

The possible introduction of new technologies such as hydrogen fuel cell powered vehicles may require a complete rethink of how transport fuels are handled.

7 Security of Electricity Supply

Traditionally because New Zealand has a hydro based electricity supply system the security of electricity supply has been related to meeting demand in a dry year, or in the event of a major electricity supply contingency such as a transmission line or power station failure[8].

The Electricity Commission is responsible for managing the electricity sector so that electricity demand can be met in a 1-in-60 dry year, without the need for

[8] As the security of supply of electricity to the ARC region is of major concern, we repeat some comments made by Vector in July 2005, in their submission to the Electricity Commission commenting on transmission alternatives.

emergency conservation campaigns. Prior to the establishment of the Electricity Commission lack of confidence in electricity supply has lead to extreme price volatility in the electricity spot market and the need for power savings campaigns in 2001 and 2003.

The security of supply may be in terms of the availability of electricity supply to meet demand, or in the quality of that supply in terms of meeting frequency or voltage requirements.

The Electricity Commission[9] analysis indicates that there will be an inability to meet electricity demand in the Auckland area from around 2010.

Vector[10] however considers the threat to Auckland's security of supply is more imminent than that presented by the Electricity Commission. Vector's analysis suggests that a security of supply "crunch" may occur as soon as 2007.

Supply of electricity within Auckland is by imports from outside the region through Transpower transmission lines, by generation within the region from the Otahuhu and Southdown power stations and from some distributed generation at industrial sites such as the Glenbrook steel works.

Secure supply of electricity will be affected by national supply, particularly hydro and generation from the Huntly power station and the operation of Otahuhu and Southdown power stations. If Otahuhu and Southdown power stations were unavailable for generation at the same time the system would reach transmission constraint at 1,440MW of demand. This double contingency can easily occur and illustrates the system capacity with Southdown not dispatched[11] (due to economics) and Otahuhu tripping[11] (as is generally expected of such plant 6 times a year). Even with all other generation on-line, the system cannot provide a secure supply to meet the region's peak summer demand without Otahuhu B. It is logical to assume that Southdown would be dispatched in the event of a prolonged Otahuhu B outage. With Otahuhu B out and Southdown on the system still cannot meet peak demand in a secure state, albeit the shortfall is reduced. The ramp rate[11] for the needs to be considered in assessing the system's ability to meet load following a plant outage, typically several hours before maximum output can be achieved). This type of plant is not suitable for contingency supply as it is not able to respond quickly to need.

An approximation of the region's load duration curve (this is a smoothed line curve using 10 data points) is recorded in Figure 19.

[9] Electricity Commission "Statement of Opportunities"
[10] Vector submission to Electricity Commission on "Alternatives to Transmission"
[11] Refer Glossary

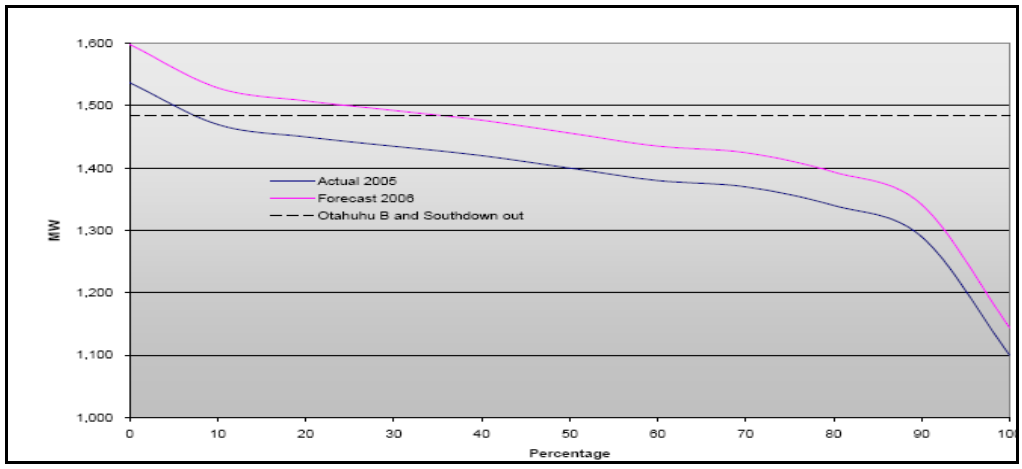


Figure 19- Load Demand Curve

This suggests that, with Otahuhu B offline, load will need to be shed for more than 30% of the time to maintain a secure (N-1)[12] system during summer 2006. That is rolling blackouts across the region throughout the afternoon and early evening. This dependence on a single plant (Otahuhu B) is clearly a high risk policy which makes the security of electricity supply into the Auckland region vulnerable to treat from a single incident.

Figure 20 suggests that, with the currently installed generation plant and transmission capacity, there is minimal spare capacity available by 2007 (with all generators available). This chart does not take account of new builds (e.g. e3P).

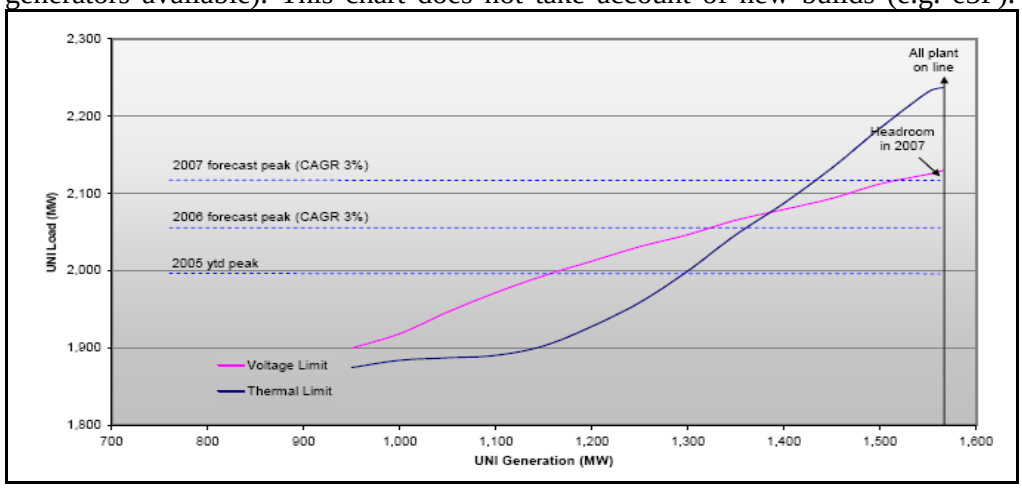


Figure 20 – Forecast Peaks

Transpower reported an upper NI winter system peak demand of 1,980MW in June 2005. The upper North Island region's winter peak is typically recorded in July. Of immediate concern, the system can only deliver 1,930MW of secure supply with Otahuhu B unavailable. This means that, today, the loss of a single plant (Otahuhu B) over the system's winter peak will require load to be shed to enable the system to be brought back to a secure state (N-1).

[12] Refer Glossary

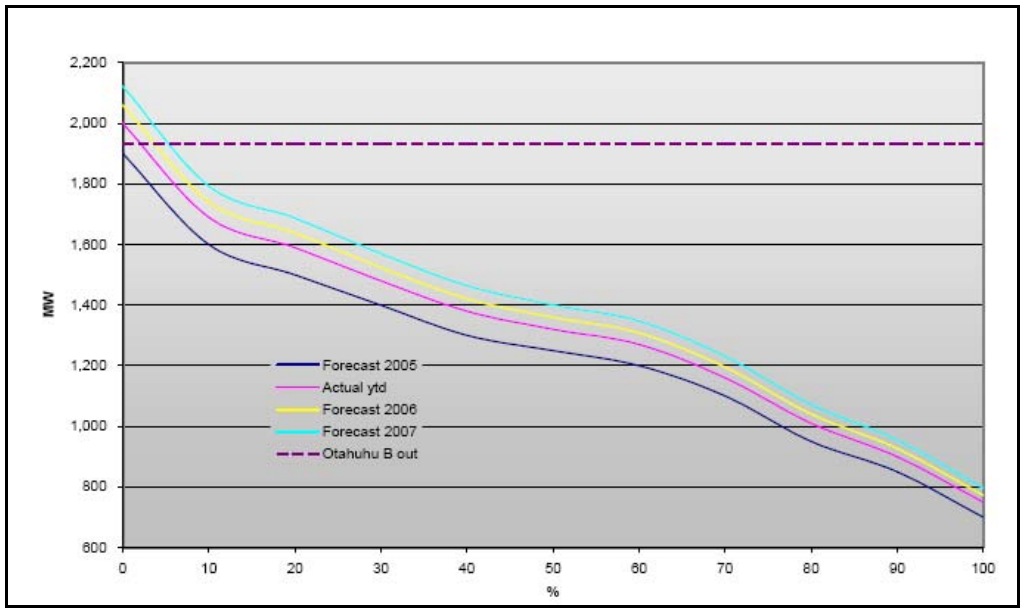


Figure 21 – Duration of Peak Loads

Figure 21 shows that to maintain a secure (N-1) system, with the forecast peak demand of 3% and an upper NI thermal limit of 1,930MW, load will need to be shed approximately 5% of the time. That is whole distribution feeders (thousands of customers) would be taken out for approximately one hour each evening. This reinforces the view that dependence on a single plant (Otahuhu B) is clearly risky.

Vector[13] is becoming increasingly concerned about the risk to security of supply into Auckland, as well as transmission capability across the Auckland isthmus. This stems from the physical risks to supply and has been communicated to the Electricity Commission.

The fragility of the system was shown last June when the demand for electricity north of Huntly reached an all-time high (twice in short succession). At that time it is understood that, for the system to be held at a secure state (N-1), loss of a single plant (Otahuhu B) would result in blackouts for many upper North Island customers. There is a real risk of such events occurring.

The region's focus must be on issues of overarching importance to ensuring security of supply into Auckland is quickly addressed, and in a way consistent with sound long-term decision-making for New Zealand. The issues in need for expeditious resolution are:

• grid reliability standards – these must be clear, must form specific requirements on Transpower and must be enforceable. For Auckland, given the size of its load, the standard must be approaching N-2[14] like most other large cities globally; and

[13] Vector submission to Electricity Commission on "Alternatives to Transmission"
[14] Refer Glossary

• resolving transmission pricing and counterparty arrangements in such a way that signals regional constraints and, therefore, provides incentives for efficient location of generation investment.

Vector added the comment that "*It is not surprising that generation has not been installed in the Northern region given significant uncertainty around these issues, as well as market uncertainties such as the price of gas and transmission capacity. The regulatory matters need to be concluded before any commercial party would likely consider further investment in the region. For this reason, Vector considers that the basic building blocks need to be in place and the system brought to a secure state (approaching N-2 for Auckland) before transmission alternatives are considered or implemented, particularly if some form of central funding is deemed necessary.*

8 Risk to Electricity Supply

In addition to considering the overall security of supply which mainly considers loss of generation or transmission, there is a need to consider what local risks may be present which could isolate areas within the ARC region. United Networks has carried out detailed study of risks in the northern part of the region and these can be applied across the whole region. Excerpts from United Networks risk analysis are repeated below.

8.1 Credible risks

Credible risks comprise those failures due to aging processes, overloading, material deterioration, human error, poor workmanship, lightning, fire, earthquake, flood etc. Risks which could be deemed fanciful are not considered (i.e. aircraft crashing into substations where these substations are not near airfields or on recognised approach paths to airports).

Practices in network design and operation tend to seek to avoid loss. As a result, events with high consequence are usually associated with low probability of occurrence. Conversely risks with high probability invariably associate with minor consequence (i.e. service fuse failure). This conceptual relationship between consequence and likelihood is illustrated below which shows where different types of risk can be placed on the 'risk continuum'.

Failure to supply is a major risk. Costs of failure to supply fall onto distributors, retailers and consumers. In a connected network, failure to supply may originate at many levels with differing consequences. Failure to supply has dimensions of magnitude of loss, how the costs fall and the ability to control risks. Failure of generation or bulk transmission is also involved.

Responsibility to supply may be excused where circumstances outside the control of companies frustrate the delivery of the network service. Earthquake or volcanic actions are examples of force majeure. However the boundary of force majeure is not always clear. For example, an overhead line failing in a windstorm may be force majeure but may also be imprudent design and/or maintenance.

Significant network risks are high consequence events arising from single or multiple failures of the network itself, (i.e. insulation failure within a zone transformer as opposed to an earthquake toppling a zone transformer.) Significant network risks could arise where parallel or consecutive failures of circuits occur due to common failure modes (lack of true independence) or lack of spatial diversity (i.e. multiple sub-transmission cable circuits in a common trench).

8.2 Identified Risk

One identified risk is the possibility of loss of the 110kV overhead line running from the Transpower Albany substation to United Networks Wairau Road substation. This is a double circuit overhead line run on a single set of wooden poles. Loss of this line during peak network loading conditions would result in loss of supply to 30% of lower North Shore customers. This risk is mitigated by the short repair time associated with overhead construction.

A number of zone substations are supplied via multiple cables that are run in the same trench. This leads to the possibility of a multiple failure from a single contingency event. The risk is mitigated through the availability of significant transfer capacity from adjacent substations. The Hobsonville and Browns Bay substations constitute the major risks in this category. At both locations multiple cable supplies run in the same trench over significant distances.

Takapuna, Devonport, Milford, Northcote and Glenfield representing about l5% of the Northern Region's distribution network, are situated within the Auckland Volcanic Field. This field is still considered active, although there is no basis on which to predict the time or approximate location of a future eruption.

Historic eruptions have displaced approximately three cubic kilometres of material per eruption. Most hazards would be confined to 1-4km from the vent and conceivably destroy all assets within 1-2km of the vent. Ash and lava flows may cause problems further afield and the corrosive effect of acidic products could spread over a wide area reducing the economic life of network assets that may otherwise appear undamaged.

A one in 10,000 year likelihood is estimated for an eruption on this field with resultant material damage of $70-80 million.

Distribution assets tend to fare reasonably well in flood events, especially if water velocities are low, (<0.5ms).

Recorded flood events affecting the Auckland areas (including the Northern Region's network) have generally been localised in nature with rarely more than one major catchment experiencing appreciable flood damage at any one time.

Occasional high wind and even small tornadoes can be expected.

Rural line assets are more at risk of damage during high winds than urban line assets. Even so, they are designed to withstand high winds and most would be expected to fare reasonably well in extreme storm events. l-2% damage to rural pole mounted assets in 500 year storm events as a result of unfavourable topographical features (accelerating local wind speeds) is assumed. Even in

maximum credible wind storms, wind forces would vary widely. A loss of 3-5% of poles and pole mounted assets in rural areas is assumed in a maximum credible wind storm. Electricity disruption to most rural consumers would probably be reinstated within one to four weeks depending on accessibility and availability of repair resources.

The Sunset Road, Birkdale, East Coast Road and Wairau Road zone substations are identified as more at risk from vandalism due to the socio-economic factors in those areas.

Following the failure of the sub-transmission cables to the Auckland CBD in 1998, a re-assessment of the 33kV and 11kV cable ratings was undertaken particularly in regard to the measured thermal resistivity of cable bedding and back-fill material.

Temperature sensors have been placed in cable trenches where cables group at route exits from a select number of zone substation servicing the Takapuna central business district.

The region has mostly concrete poles and wood rot of poles is not a significant issue.

Fire/explosion as a material damage risk is limited to key assets which include the network control centres, regional offices and zone substations.

The Takapuna network control centre has a very high standard of fire protection installed.

9 Supply Opportunities

9.1 Large Electricity Facilities

Gas fired electricity generating power stations have been the main form of new major electricity generation facility built in recent years because of the availability of gas, reliability of operation, and consentability. If adequate gas supplies can be obtained in the future either from domestic production or import then this form of power station can be expected to be continued to be built.

Gas fired power stations can be built for quick start peaking operation of base load operation. The use will determine the facility design. Having some peaking generation in the Auckland region would assist overcome the peak time electricity supply constraint. However peaking plant is generally not economic unless the standby reserve generation role is paid for by the Electricity Commission.

Diesel fired plant similar to that recently built at Whirinaki to provide reserve generation could also be built in the region.

Nuclear or coal fired facilities could be built in the region to meet appropriate environmental standards but community views on such plant would have to be addressed.

Any thermal generation plant would have to work within the air quality guidelines which would be a significant constraint for plant to be located within the metropolitan area.

The Albany area is where the earth crust is reasonably thin and deep geothermal extraction of heat for electricity generation is possible in the future. International experience on this technology is increasing and it could be viable before 2050.

The extraction of energy from marine energy sources such a wave or tidal flows or currents is fast becoming economic and could be expected to be viable before 2025. Tidal sites are technically possible at the entrances to the Kaipara and Manakau Harbours. Wave sites are possible in some areas with proximity to the electricity network a consideration on feasibility.

Wind sourced electricity generation is occurring throughout New Zealand locations within the Auckland region particularly on the West Coast can be expected to be pursued. As an uncontrolled energy source wind energy is ideally embedded into a large population where fluctuations in output can be absorbed by the overall demand.

The municipal waste produced in the region could be used as a source of fuel for a waste-to-energy plant generating electricity. While technically viable, the lack of constancy of supply of waste means that there is a lack of certainty of fuel for a plant with an economic life of 30 years.

9.2 Electricity Transmission

The upgrading of transmission lines could occur by upgrading existing lines or by building new routes. Each of these will produce specific regional effects that require addressing in a regional way.

Transmission can be by overhead line or by underground cable. There is a significant cost difference between these options, however the effects on local communities from each is quite different. The region will need to address this trade off of increased cost against environmental effect. This will be wider than just for the current proposed upgrading of the transmission lines from the south into Auckland. Other lines within the region can be expected to require upgrading with the resulting issues needing to be addressed.

Construction of transmission lines has a long lead time because of the need to cross many properties and planning for electricity transmission has tended to be reactive rather than proactive as in the manner undertaken for transport infrastructure. Preparation of long term energy infrastructure plans will allow the community to influence ahead of need where transmission lines should be located.

Transmission upgrade decisions are integrally linked to new generation and other opportunities which could occur. The transmission network provides the backbone and structure for the generation and supply of electricity. With a sound transmission network the options available to the region are kept wide e.g. there can be greater wind energy uptake if the transmission network has the capacity to moderate fluctuations in generation.

9.3 Energy Storage

When energy supply becomes constrained storage becomes a viable option so that energy delivered in off-peak times can be stored for peak use.

Intermittent energy supply such as from wind often has little value because it can not be guaranteed. The introduction of storage can improve the controllability of the supply. The gas and electricity transmission systems to some extend provide a level of storage and remove fluctuations.

9.4 Industrial and Business Energy End-use

Modern industrial equipment requires a high level of quality of electricity supply so that computers and other electronic controls do not trip off. The cost of loss of production from a poor energy supply can be high but nearly completely eliminated with good control systems.

The cost of energy to industry can be minimised with good energy management techniques and equipment. However the cost of introducing such practices to small business players can be reduced if collective action is taken and costs of training, evaluation and implementation are shared between businesses. Such coordination requires someone to take the lead.

Investment in energy efficient equipment is very capital intensive and is therefore often deferred. If the region can assist reduce the capital costs or lobby government for assistance to small business such as through tax relief more investment may occur.

Most small/medium sized business lack the training and information that would assist them improve energy use for economic growth. Regional programmes to provide collective training and information would assist decision making and often the way energy is used.

The use of industrial process waste for energy production is a largely ignored topic. There is no encouragement and regional and district plans often but barriers in the way rather than provide encouragement. A regional waste-to-energy programme would change attitudes to waste, increase energy supply and reduce energy disposal costs.

A number of businesses have already installed small scale electricity generation plant in the form of standby or embedded generation. Most of this is currently diesel gensets but over time and as technology is developed may include fuel cells, Stirling engines, photovoltaic, small wind and micro-hydro. Encouragement of this distributed generation and integration of it into the total supply network can provide significant regional benefits. In Christchurch this has provided about 23MW of semi-controllable generation which the network company uses for peak electricity load management.

Industrial heat and cooling users are often able to shift the time of energy use away from peak periods. If there is a market ability for them to gain an economic benefit

from such load shifting then here is a significant amount of peak energy use that can be avoided.

9.5 Residential

There are a number of products that could be incorporated into residential buildings that would reduce energy costs. Some can also be used to reduce peak demand for energy. Such products include solar water heating, double glazing, space heating, heat pumps etc. Many of these products are relatively unknown to the public and regional programmes could increase uptake significantly.

Some of these products require Building Consents which can often be a significant cost of the installation. Councils can assist uptake if the cost of consents are minimised to cover only the relevant effect e.g. consents for water heating systems are often the same cost regardless of the design and whether there is a storage tank on the roof or just a collector.

Space heating is a significant cost for some people and the efficiency of the energy source can be determined by the heater type. Community programmes providing information on alterative heater types could make a contribution to regional energy demand.

The use of smart time-of-use meters can provide information on energy use and allow optimisation of energy consumption so as to minimise energy costs. Such technologies would require promotion through community programmes to sell the advantages of their use.

The residential user is generally indifferent as they have only a single tariff so controlling their electricity use at different times has no effect on their electricity bill. Tariffs would need to be chosen to make it worth while to shift consumption away from peak times. See 11.8.

Direct use of gas for cooking and heating can provide efficiencies for total energy supply.

9.6 Small scale Electricity

In rural areas there are a number of opportunities for small scale electricity generation which include small wind, solar pumping, micro hydro, and photovoltaic technologies. Programmes to assist the uptake of these technologies are needed as there is no incentive for energy supply companies to invest in such plant, nor to encourage others to do so.

Portable diesel generators are a valuable standby source of electricity in the event of a loss of electricity supply. Planning provision for their operation may be needed if their use is to be effective.

The region has a number of water supply lines in which micro-hydro plant could be installed. Some is already installed but further installations may be feasible.

Woody biomass from wood processing activities is often used on-site for heat production. Over time the heat could also become economic for the generation of electricity. The constraint will be on the availability of wood waste as a source of fuel.

Very wet organic waste can be processed in a digester to make biogas. Such technology requires a continuity and consistency of feedstock to keep the digester going. While difficult to achieve community collection of organic waste could support such plant.

9.7 Transport Fuels

A number of transport fuels alternative to current petrol and diesel are starting to become economic internationally. Over the next forty five years many of these will come to fruition. These many include ethanol/petrol blend, diesel/biodiesel blend, hydrogen, LPG, electricity. The form of the vehicles associated with each of these fuels may also change resulting in changes in the infrastructure requirements.

It can be expected that most of the transport fuels are likely to be imported into the region rather than produced locally. This may have implications for investment in infrastructure.

10 Energy related activities currently or recently undertaken by ARC

The ARC has made a commitment towards becoming an organisation, which promotes sustainable development practices both within its own organisation, and in the regional community. These commitments are founded in key policy documents such as the Regional Policy Statement (1999), and in the most recent Annual Plan (2005/06)/Long-Term Council Community Plan (2005/14).

The Auckland Regional Council (ARC) became a founder member of the EnergyWise Councils partnership programme in 1997.

Energy is included in the RM Act definition of “natural and physical resources”. A mandate is therefore given to promote the sustainable management of the energy resource and to have particular regard to the efficient use and development of the energy resource.

The ARC’s fulfils this mandate in several key areas including land and transport policy and planning, operational performance, climate change and social marketing through the ‘Big Clean Up’ campaign.

IN-HOUSE ENERGY EFFICIENCY

In October 2002, ARC made a commitment to provide leadership in relation to how a council can ‘walk the talk’ by fully integrating social, environmental, economic and cultural sustainability into all aspects of its internal operations.

The ARC’s corporate sustainability strategy incorporates objectives, targets and KPIs to ensure continuous improvement in the efficient management and use of energy and resources. These are outlined in Table 4 below:

Figures 22 – 25 show the outcomes achieved to date.

Table 4, ARC In-house Energy Initiatives and Outcomes

Target Achieved **Positive trend** **Target not achieved**				
Objectives	2004/2005 Target	2004/2005 Actual	Target Achieved	Trend
Efficiently using energy and resources.	A 10% reduction in electricity use	↑5.6%	☹	See chart below.
	During 2003/04 a series of energy efficiency audits were commissioned through Energy Efficiency Conservation Authority's (EECA) Energy Audit Incentive Grant Scheme. Subsequent implementation of energy saving measures at Head Office the ARC achieved an 11% reduction in electricity use at its head office equating to coat savings of $21,755 during 2003/2004, During 2004/05 electricity use at Head Office increased by 17% (5.6% per fte). This equated to increased costs of approximately $29,000.			
	A 10% reduction in paper use.	↓8.9%	😐	See chart below.
Minimising emissions, effluent and waste.	A 5% reduction in greenhouse gas emissions (CO_2 per fte)	↓12.5%	☺	See chart below.
	To reduce average vehicle fleet fuel consumption per 100km by 5%.	↑2%	☹	See chart below.

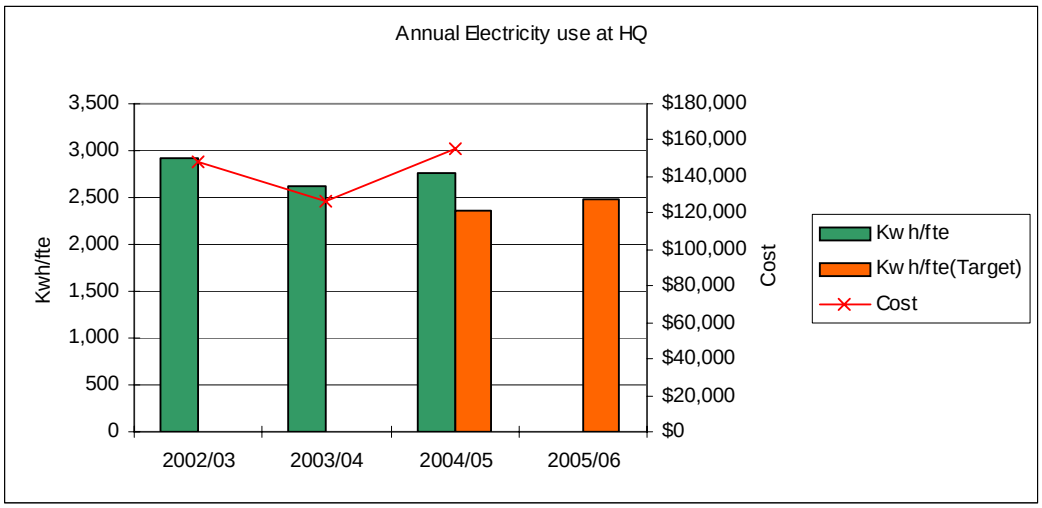


Figure 22 Annual Electricity Use

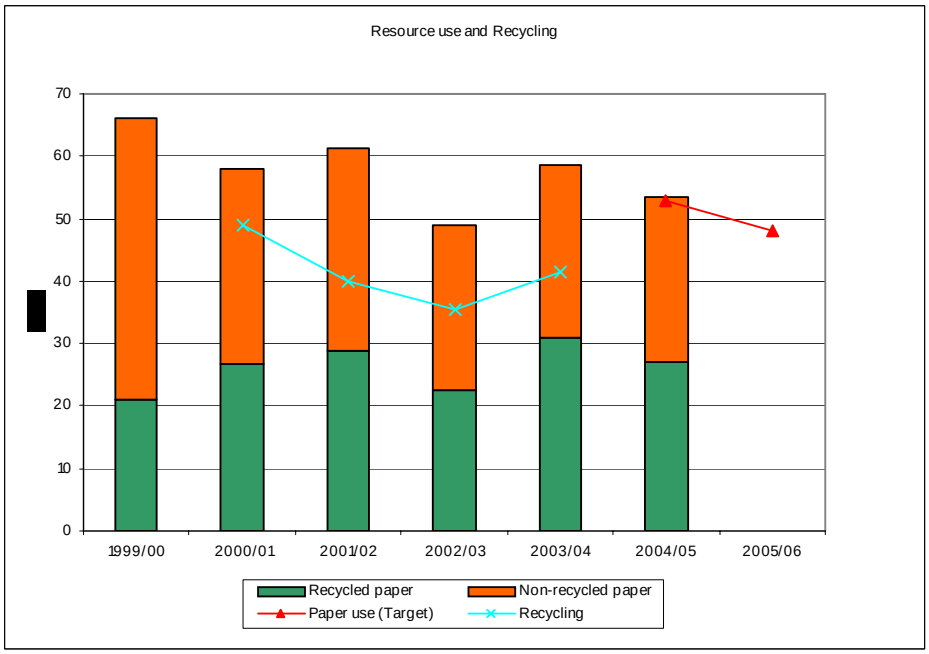


Figure 23 Resource Use and Recycling

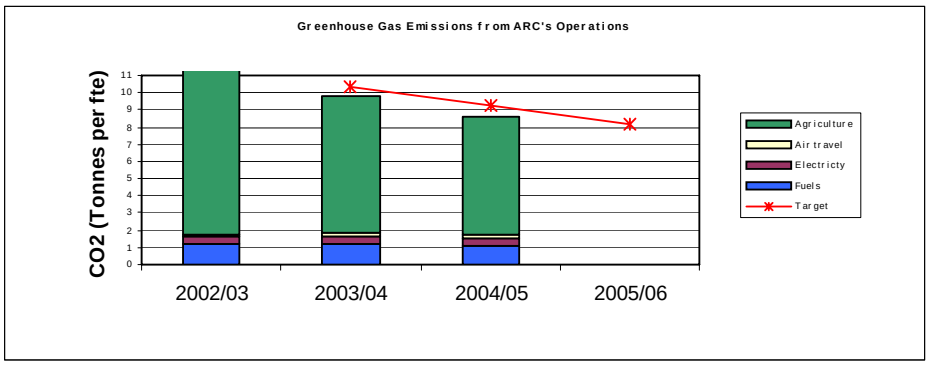


Figure 24 Greenhouse Gas Emissions

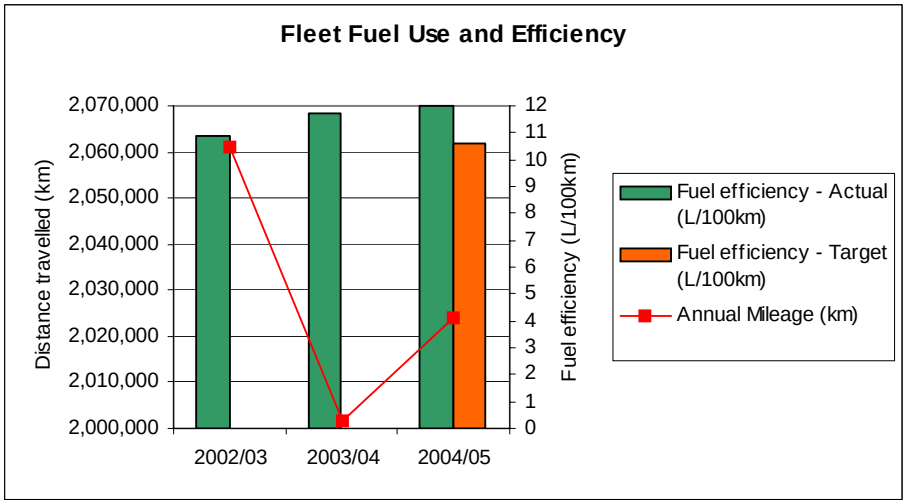


Figure 25 Fuel Use and Efficiency

10.1.1 Initiatives

The ARC Group has implemented energy efficiency initiatives in a range of key policy areas. These include:

- A review of both the Regional Policy Statement and Regional Land Transport Strategy is currently being undertaken, a key aim of which is to improve alignment with government and regional policy objectives, including energy efficiency and transport policy. The changes will better implement the Auckland Regional Growth Strategy which encourages more intensive development in town centres and around passenger transport and seeks to limit urban sprawl.
- Promotion of Travel Demand Management initiatives (e.g., business travel plans, development of a Regional Cycling and Walking Strategy) through the Regional Land Transport Strategy. During 2004/05 this included the development and Implementation of:
  - 137 Walking school bus routes.
  - School travel plans with 60 schools.

  - Pilot Business travel Plans with universities, business and local government in the Auckland region.
- Tendering of passenger transport contracts.
- Commitment to begin ARC/ARTA Travel plan in 2004/05 which aims:
    - To improve travel choices/options for staff.
    - To reduce the travel impact of ARC's activities.
    - To reduce unnecessary travel.
    - To promote the use of more fuel efficient and environmentally–friendly vehicles
- *During 2004/05 a fleet audit programme commenced.* Data collection and management systems have been refined to include vehicle kilometres travelled, emissions and fuel efficiency. This will enable analysis of current and future results and trends in terms of the efficiency, effectiveness and utilisation of the vehicle fleet.
- In March 2004, ARC took ownership of its first Hybrid vehicle. The ARC has since expanded its hybrid fleet to three. These ultra-low emissions vehicles (ULEV), combine a petrol engine with an electric motor to create a hybrid system that boosts fuel economy and substantially reduces emissions, as well as reduced whole life costs.
- The ARC's v*ehicle Fleet Use and Management Guidelines* contain policies, procedures and standards for the purchase, maintenance, use, replacement and disposal of all council vehicles. The guidelines include sustainability criteria in relation to the purchase of council fleet and are aligned to the council's environmental policy. The criteria have recently been expanded to incorporate vehicle emissions, whole life costing and the corporate sustainability commitments and performance of tenderers. The cost benefit analysis for the hybrid vehicles highlighted the importance of incorporating whole life costing into decision-making. As a result, whole life costing will be integrated into *Fleet Use and Management Guidelines.*
- The ARC has become a signatory to the NZ Urban Design Protocol which was launched in March 2005. The ARC will provide input to the review of the New Zealand Building Code, which has been commenced by the Department of Building and Housing, on a range of sustainability issues and in particular, the quality of intensive housing.

11 Issues in Energy Management

11.1 Demand for New Electricity Supply

The Auckland regional electricity peak demand is growing at around 1.5% per annum. By 2025 it may have reached 3000 MW, and by 2050 it could have doubled from present levels. Alternatively peak demand could be reduced or spread by investment within the region of controllable energy efficiency initiatives.

Total electricity demand is likely to increase in parallel with the peaks. Total energy demand can be met by investment in a full portfolio of energy supply sources and substitution between energy forms is possible.

Current peak electricity demand occurs in winter but summer peaks are increasing largely as a result of increased air conditioner use, particularly for residential purposes. Analysis by Vector indicates that the system may be unable to serve the upper NI region's peak demand as early as summer 2007.

11.2 Security of Electricity Supply

Auckland energy supply is peak constrained rather than energy constrained. In the short term electricity supply constraints will occur at occasional winter peak times and general constraint may start occurring from around 2007 - 2010. Over time the peak constraint will become more severe and unless action is taken social and economic wellbeing will suffer.

Security of electricity supply will most be affected by the level of security required to avoid possible contingent events such as the loss of a major transmission line, or loss of electricity generation from the Southdown or Otahuhu power stations. If any of these facilities were out of service for extended periods then significant action would need to be taken to avoid social and business disruption. Regional councils representing energy users in general should be aware of such risk and work with relevant energy companies to have contingency plans.

Other (non-generation) alternatives for electricity supply are possible (e.g. direct use of gas and greater levels of investment into interruptible load). However, such initiatives which rely on market stimulus and incentives also have an element of uncertainty about them;[15]

- it may be difficult to hold alternative providers accountable for delivery of transmission avoidance benefits over time;
- probabilities of reliability and security of alternative projects are unlikely to be known with certainty, including complexity and uncertainty associated with calculating the overall probability across a portfolio of alternative projects;

Central to whether alternative options eventuate is the issue of who carries the risk associated with their provision. This risk is not just related to an alternative project itself, but the much broader risk of security of supply (which an alternative project could engender). The level of 'risk' to be taken by the community is not well understood and requires regional determination.

11.3 Appropriate level of security of supply

Normal electricity supply is on the basis of an N-1 level of security. i.e. there is adequate backup to cover at least one major contingent event.

The community should have a view on the level of security of supply appropriate for the region or parts of the region. Councils representing regional energy users must focus on issues of overarching importance to ensuring security of supply into

[15] Section 7 discusses specific details relating to security of electricity supply to Auckland.

Auckland is quickly addressed, and in a way consistent with sound long-term decision-making for the region. The issues in need for decision are:

- grid reliability standards – these must be clear, must form specific requirements on Transpower and the local electricity distribution companies, and must be enforceable. For Auckland, given the size of its load and the economic implications from a significant contingent event, the standard should be approaching N-2 for some parts of the region as is occurring for some cities globally;
- the cost of the security of supply should be at a level acceptable to the region.
- the portfolio of supply options that best optimise risk of non supply to the region needs to be identified and monitored,
- the responsibilities for such decision making should be proactively pursued.

If the region were to adopt an N-2 level of security for critical areas then the community should be involved in such a decision because of the cost implications both of providing for that level of security, and of disruption if that level of security is not provided and two major contingent events occur at once.

11.4 Gas supply into Auckland

There is some capacity limitation on the installed natural gas transmission system north of Rotowaro in the Waikato into Auckland. This has obvious implications for recent announcements regarding gas-fired generation in or north of Auckland. Therefore, until capacity limitations are addressed (which is likely to require additional gas infrastructure to be built), any new large-scale generator in the region will have to run on distillate (or other fuels), which may make the plants uneconomic in the current environment. Alternatively provision needs to be made for imported gas to be made available probably via a new pipeline from Marsden to the Auckland network south of Henderson.

NGC has received initial consents from Auckland local authorities for a pipeline route designation for a new transmission pipeline from the Rotowato compressor station near Huntly to East Tamaki in South Auckland. The initial consents are subject to six objections and NGC is currently seeking a negotiated resolution with the appellants.

The consents carry a number of conditions. The designation is being sought to enable construction within a period of 10 years.

Direct use of gas is likely to increase as electricity prices increase for residential and commercial customers. If gas were available this would lead to expansion of the local distribution networks.

Increased use of gas for commercial and local electricity generation activities would require strengthening of parts of the gas distribution network.

Figure 26, Oil and Gas Supply Infrastructure – ARC Region

Little information is publicly available on the nature of the gas supply constraint. If gas supply via pipelines into the region is peak constrained then local storage should be pursued so that off peak supply can be stored for use in peak times.

Little attention is paid to gas supply yet it is a premium energy resource and a significant component of regional energy. A gas supply plan should be developed for the region so that regional views on use of this energy source can be included in supply decision making rather than just leaving it to gas supply companies to determine what is best for the region.

11.5 Petroleum supply into Auckland

Figure 26 shows the present gas and petroleum supply pipe lines. The capacity of the Marsden Auckland petroleum line is expected to reach capacity around 2008-2010. This has implications for the supply of fuel to Auckland, particularly for jet fuel which is reliant on the line for supply to Auckland International Airport. The line also supplies most of Auckland's petrol and diesel requirements so alternative ways of meeting the demand for these fuels will need to be considered in the near future. Alternatives to the pipeline are increased use of road tankers which will add to road congestion or coastal shipping. These options need to be considered in the context of security of supply issues.

Petroleum storage is an issue. Any loss of petroleum product storage capacity in the area will compound the problem of delivery of oil fuels to the Auckland market. IEA oil storage obligations may also need to be considered.

11.6 Fragmented market

The energy market is fragmented with a large number of players varying in size from large corporate companies down to the individual home owners. All have opportunities for investment, or at least, their energy related decisions can affect energy market supply capability. Coordinated decision making in such a fragmented market is difficult particularly when some players have substantial resources compared to the small players who usually have few resources and little knowledge of options.

Sound energy solutions may also be a mix of supply, transmission and energy end-use management. Coordination to find an optimal mix is usually very difficult because vested interests will be pushing their own solution.

The establishment of the Electricity Commission to provide coordination and to ensure market failures are addressed will go a long way to overcome a number of aspects arising from fragmentation. EECA also has a role to facilitate initiatives for the increased uptake of renewable energy and efficient energy use. However there are still substantial areas where there are still gaps or lack of ability of small business or residential energy users to address. These are areas where a coordinated regional response to energy matters can produce rewards for the economic and social wellbeing of the region.

The regional collective benefits of energy programmes can be significantly greater than the sum of individual benefits e.g. one solar hot water system provides a home owner direct hot water heating cost benefits, but a solar water heater on every home would also provide large regional energy supply benefits.

11.7 Energy Related Information

The region's biggest constraint on opportunities to improve energy use and to improve the security of supply at the lowest cost probably arises from the lack of information available to the public and in particular to small and medium sized businesses.

Many people have little knowledge of the options for improved energy use that are available to them. They also have little knowledge of how to obtain such information.

While EECA and the Electricity Commission provide some information there is little regionally related information. There is little incentive for energy companies to provide information as they can not capture the benefits of improved energy use.

The access to information is closely related to the presence of role models and reference applications. Councils are in a good position to provide such models and leadership. They can also be a conduit to the public for information distribution.

A constraint will be the access to funding for the preparation of information and its distribution.

11.8 Time of Use of Energy

The lack of information on the time-of-use of energy is a significant barrier to good energy use decision making. Energy often has a different cost according to when and how it is used. Where time-of-use information is available energy users are able to optimise their total cost of energy.

Residential energy users are generally on a fixed tariff so they pay the same price whatever time they use the energy. Energy usually costs more to produce at peak times so load shifting to when energy costs are less should be reflected in reduced costs to the user.

There is little incentive for energy companies to encourage time-of-use meters and the cost for replacing existing ones is high. Progress could be made if new buildings were required to install time-of-use meters. This could be part of broader energy use improvement programmes.

11.9 Air Quality

The regional airshed is at capacity in the metropolitan area[16] which means that any new electricity generation facilities built in that area could only proceed if air discharge emissions were reduced commensurately to offset emissions from the new facilities. Alternatively the fuel for such a facility would have to be clean burning such as from gas.

Locating power stations in the Auckland area has been promoted by some parties as an alternative to upgrading electricity transmission lines into the region from the south. The choice of power station and its location would have to take into account the airshed capacity.

[16] Refer Section 14.8 for more detail.

11.10 Infrastructure consenting

Many energy infrastructure consenting activities cross several territorial authority boundaries or involve both territorial and regional council responsibilities. It is expeditious that joint hearings be held for such activity applications.

A regional energy strategy document would facilitate such application consideration. A strategy document would also assist infrastructure owners prepare applications.

11.11 Coordinated Energy Planning and Activity Implementation

Many energy activities are at a level of development where they could be actioned, but because they are poorly understood by the public, are not being pursued. For example solar water heating systems are a proven technology which could be installed on a large number of buildings, however because there is no coordinated action to promote such systems, growth of uptake is slower than it could be.

There is no natural leader for development of energy efficiency programmes because there is little ability of such a party to capture the benefits of their effort. Councils are the natural party that could provide the leadership and secure regional benefits.

11.12 The Built Environment

Territorial authorities can influence the uptake of energy efficiency options in new buildings through promotion and the building consent process. The new Building Act and the review of the Building Code provide an opportunity for councils to encourage sound energy initiatives in new buildings. Auckland councils should work with Department of Building and Housing to identify what the region would like to see in the Building Code.

Many energy efficiency investments that residential homeowners could make are currently not reflected in the valve of the property. Overseas it is now common to have a home energy rating scheme so that the cost of energy efficiency improvements in a building are reflected in the value of the property and realisable on sale.

Territorial authorities are in the position of being able to provide good information to property owners on energy efficiency products. The information can be provided along with other information provided from time to time by councils. The respectability that councils can give by their involvement can provide strong leadership and encouragement.

The recognition of skilled energy efficiency product installers in the issuing of Building Consents can reduce consent costs. Many efficiency improvements such as installation of a solar water heating system can incur consent costs up to around 10% of the cost of the product. Such costs can be yet another barrier to homeowners investing in energy efficiency.

11.13 Energy Use Database

There is a lack of information on how and where energy is used in the region. The lack of such information means that users have little basis for making changes to energy use behaviour, energy using equipment is not optimised to reduce energy demand, and alternative technologies are usually not considered when making investment decisions.

The Building Research Association (BRANZ) has been undertaking a government funded project into residential energy use through the Household Energy End-use Project (HEEP). This project has collected seven years of data from houses throughout New Zealand but has now come to an end. Continuation of this project for Auckland, but with a focus on information useful for the region would produce valuable information on household energy use. Continuation would require the region to push for continued funding.

There is little information collected and made publicly available on commercial or business use of energy. EECA produced some information in 2000[17] but this is based on 1980-1998 information that is now very old and often relates to equipment and technologies that are now superseded. The region should work with EECA to update this information and obtain data relevant to the region.

There are a number of products available to home owners which are reputed to be effective in reducing energy demand and costs. Often this is based only on manufacturer's trade literature and there is little actual performance information. The region should establish a database of reference applications to which potential owners can refer.

11.14 Commercial and Industrial Energy Costs

Energy can be a significant cost for many businesses, yet the business may not have staff with experience and knowledge on energy matters. Energy is often just a matter of receiving the monthly invoice. Simple energy management training, such as how to negotiate an energy contract, could improve energy use and reduce energy costs.

There is also energy efficient manufacturing equipment that could be installed which would reduce energy consumption and costs. Such equipment may not be installed while old less efficient equipment is still serviceable. Improved information and assistance to encourage early replacement could have an effect on economic competitiveness. Regional programmes to assist with capital purchase of new equipment may have a positive cumulative effect on regional energy demand.

Industry is also often in the situation where they can shift the time of use of energy away from high cost peak periods. Encouragement to do this often is required

[17] The Dynamics of energy Efficiency Trends in New Zealand: A compendium of Energy End-Use Analysis and Statistics, EECA, 2000 Edition.

despite the inherent economic benefits to industry. Regional education programmes and reference projects can provide the encouragement necessary.

11.15 Planned New Power Stations

There has been several press reports of planned new generation plant within the Auckland region. While any incremental increase in generation within the region will alleviate the security issues identified in this report the expected construction dates if they were to go ahead is generally beyond the period when electricity supply into the region becomes critical. Such large projects also require long lead times for consenting and construction with no certainty of outcome throughout the process.

Construction of new power stations within and north of the region would improve security of electricity supply. The assistance that the region can give for these projects to proceed quickly and easily (While maintaining appropriate environmental standards) will encourage the proposed projects to proceed. Regional attitudes will affect the confidence investors would have in coming to the region and improving security of supply.

11.16 Electricity Network Load Management

The electricity network company has the ability to manage peak loads so as to ensure reliability of supply and to reduce electricity transmission costs. Electricity load management can be undertaken in a number of ways.

11.16.1 Ripple Control

The most common electricity load management tool is the use of ripple control. With ripple control hot water systems in residential dwellings can be turned off by the network company. Ripple control can be a measure to temporarily reduce peak electricity demand, or to cover contingency events such as major and unexpected plant or transmission line outages.

The degree of availability and use of ripple control is not generally publicly known except during hot water heating conservation campaigns. There are also issues relating to ownership of equipment and operation because ownership is split between network companies and electricity retailers, however in most cases ownership is in the hands of the network companies.

Vector has contracted the ability to control some load (hot water heating). In winter the transmission pricing methodology provides a signal to do so, however Vector advise that because the signal is GXP based rather than regionally based it is therefore not optimal. The same capability is available in summer however the economic incentives to do so are muted and therefore load is generally only controlled in emergency situations. In summer, the capability is available and is offered into the ancillary services market and to third parties (e.g. gentailers).

There are significant issues which limit the use of ripple control as an electricity load management tool. The community generally is not a party to its use and so can not ensure that regional benefits are optimised rather than just energy company

benefits. Water heating control should be part of a solution to enhance security of supply.

11.16.2 Distributed Generation

There already exists a significant amount of emergency or stand by electricity generating plant which could be contracted to provide a measure for local generation in the event of electricity supply contingency, or for electricity load management.

The regional benefits from distributed generation could possibly be improved but there needs to be a push from the regional community for this to occur.

11.16.3 Electricity Demand Trading

Electricity load can also be managed by parties with fixed electricity contracts trading with others requiring additional energy or less expensive electricity. The transaction costs of such an arrangement can be high so regional facilitation may assist increase uptake of this mechanism.

11.17 Contingency Energy Supply

Contingencies affecting the supply of energy may arise from within the system (generation or transmission line failure) or externally from extreme weather events. Short term contingencies, such as those which happen during extreme weather, are generally well managed by the electricity network companies. Significant events of a greater magnitude are however unlikely to be so well planned and practiced. (The 1998 Auckland City electricity supply failure being an example.)

It can be expected that such a major contingency could occur at anytime.

ARC and territorial authorities must work with the energy industry to plan for such an event. There are a number of scenarios that can be planned for including;

- Use of mobile electricity generating plant such as containerised diesel gensets.
- Larger ship mounted electricity generation plant that can be moored and connected to the local electricity network.
- Temporary transmission lines.
- Energy use reduction campaigns
- Emergency fuel supplies including gas or transport fuels
- Availability of trained personnel

In each of these options the regional and territorial authorities have a strong role to play, particularly with regard to ensuring planning provision and infrastructure support. For example if ship mounted electricity generation plant were to be used it would be of little value if there was no location where the ship could moor for long periods and connect directly into the electricity network supply system. There may be little incentive for the Electricity Network companies or any other party to make provision for such a contingency response and the region may have to be involved so that it occurred in the regional interest.

11.18 Regional Economic Growth

Energy is a significant input into regional economic activity. Many of the initiatives that could be undertaken to reduce energy costs and improve economic wellbeing are however diffuse, relatively small, costly, and with few incentives on an individual basis. Collectively however the effects can be significant. The sum of collective benefits is greater than the sum of the individual benefits.

Linking energy to economic growth through the Auckland Regional Economic Development Strategy may be an efficient way of ensuring that energy issues are pursued in the interest of the region.

11.19 Regional Energy Forum

There appears to be no single party with responsibility to facilitate a coordinated community response to energy matters. The Regional Energy Forum involving councils, industry and community representatives may provide such avenue.

Linking the community input with the economic growth objectives will assist ensure that the regions interests with regard to energy are maximised.

11.20 Transport Energy

Regional decisions on alternative transport strategies require transport energy use to be taken into account so that long term sustainable options are chosen. While transport energy costs may, in the short term, only have a relatively minor user effect, longer term the costs can affect the economic wellbeing on the community, particularly with cartage of commercial goods.

In the long term there will be changes in energy type and transport mode. While in the medium term the fuels may change to variants of current fuels e.g. ethanol or diesel blends, the longer term changes will be more significant, but yet unknown.

The changes may affect energy supply infrastructure and the ability to transport and store new energy types will necessitate planning provision because of the hazardous nature of some transport energy types.

The region does not appear to have opportunities for sourcing new transport fuels. It is likely to be an importer of transport fuels. However its policies can influence uptake to assist the achievement of other objectives such as air quality.

ARC has an opportunity to be a leader of new fuel use through its own vehicle fleet. With a regional energy strategy this could also encompass territorial authorities. Change in energy use can be highly influenced through modelling by high profile parties such as Councils.

12 Energy Roles in Central Government

In recent years the Government has expanded the role it plays in the energy market. This is a reversal of its attitude towards energy during the decade from 1984 when it had a hands-off role and left decisions to "market forces".

The Officials Committee on Energy Policy (OCEP) was replaced in 2003 by the Officials Committee on Sustainable Energy (OCSE), demonstrating the new focus on sustainable energy. This committee advises the Minister of Energy on matters of energy supply, and demand (use).

OCSE is chaired by the Ministry for Economic Development (MED) which takes a lead role in formulating energy advice. Other agencies on the committee include the Ministry for the Environment (MfE), the Energy Efficiency and Conservation Authority (EECA), the Ministry of Transport, the Ministry of Research Science and Technology, the Department of Prime Minister and Cabinet and the Treasury.

"The government's aim is to move progressively to a more sustainable energy future, keeping open as many options as possible."[18]

12.1 Ministry of Economic Development

The Ministry of Economic Development leads the production and co-ordination of policy advice related to economic, regional and industrial development. Sustainable Energy is one component of this.

The Ministry of Economic Development is also the Government's primary advisor on the operation and regulation of specific markets and industries, including energy.

12.2 Ministry for the Environment

The Ministry for the Environment is the lead department advising the Minister of Energy on the development of Government policy advice on energy efficiency, conservation and the use of renewable sources of energy. It works with the Energy Efficiency and Conservation Authority (EECA) and also monitors their performance under the Public Finance Act.

The Ministry for the Environment is the lead department developing the Government's climate change programme, focusing on building partnerships with business, community, Maori and local government groups as well as working closely with other government departments and Crown agencies.

[18] Sustainable Energy 2004

12.3 The Energy Efficiency and Conservation Authority

EECA was established as a Crown entity under the Energy Efficiency and Conservation Act 2000. Its purpose is to promote, in New Zealand, energy efficiency, energy conservation, and the use of renewable sources of energy in a sustainable manner. EECA's functions are to assist and advise the Minister in all the above responsibilities, and any other functions conferred on it by other Statutes.

12.4 The Electricity Commission

The Electricity Commission regulates the operation of the electricity industry and markets (wholesale and retail) in accordance with the Electricity Act and government energy policy.

The Commission's principal objective, is to ensure that electricity is produced and delivered to all classes of consumers in an efficient, fair, reliable and environmentally sustainable manner. The Commission is also required to promote and facilitate the efficient use of electricity.

The Commission was established in 2003 following concerns from the government that the existing industry arrangements did not provide for the effective management of the sector and that the existing governance arrangements did not ensure security of supply in dry years.

12.5 Research, Science and Technology

Various government organisations are involved in undertaking and commissioning energy research including: The Foundation for Research Science and Technology, Crown Research Institutes and Universities. Often the researchers develop the scope of the research. The research outcomes could be significantly improved if the researchers' efforts can be focused on issues relevant to regional councils and communities. Regional councils could have a role directing research activity to focus on issues and problems in their region.

13 Local Government Activities Relating to Energy

In general region councils throughout New Zealand appear to take a more active role in strategic energy issues than territorial authorities[19]. Commitment to EECA's EnergyWise Councils Partnership's is one measure which demonstrates this: with 6 of the 14 regional and unitary councils represented (43%); while only

[19] Readily available sources of information have been used to determine current activities of local government relating to energy. Several council officials have also been contacted to enhance the publicly available information. A selection of the most relevant Long Term Council Community Plans or Regional Policy Statements have also been reviewed.

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19 or the 74 territorial authorities are represented (25%). This difference is expected and can be explained by the different roles of regional councils and territorial authorities and the limited resources of some territorial authorities. Generally territorial authorities focus on managing internal energy use.

13.1 Activities of Regional Councils

Current activities of regional councils and unitary authorities relating to energy, have been determined for 14 regional and unitary councils and are summarised in Table 5.[20]

Membership of EECA's EnergyWise councils partnership is used as an indication of commitment or interest in energy issues. For the purposes of this report a "Regional Energy Survey" is defined as a study of energy use within the region, whereas a "Regional Energy Strategy" is a more comprehensive study in which potential energy supply and demand management opportunities are quantified.

Table 5 - Energy Activities of Regional Councils

Regional/Unitary Councils	EnergyWise Councils Partner	Regional Energy Survey Completed	Regional Energy Strategy Completed
Northland Regional Council	No	No	Planned (by 2007)
Auckland Regional Council	Yes (1997)	In progress.	No
Environment Waikato	Yes (2002)	Yes (2003)	Planned (draft scope of works has been completed)
Environment Bay of Plenty	Yes (2005)	No	No
Gisborne	Yes	Yes (2005) Tairawhiti (includes Wairoa)	Yes (2005) Tairawhiti (includes Wairoa)
Hawkes Bay	No	No	No
Horizons (Manawatu-Wanganui)	No	No	No

[20] Council officials at Northland Regional Council and Environment Waikato have also been contacted to expand on this information.

Regional/Unitary Councils	EnergyWise Councils Partner	Regional Energy Survey Completed	Regional Energy Strategy Completed
Taranaki	No	No	No
Greater Wellington	Yes (2003)	No	No
Tasman	No	No	No
West Coast	No	No	No
Environment Canterbury	Yes (1997)	Yes (1982-2002)	Yes (2004)
Otago	No	No	No
Southland	No	Yes (2003)	Yes (2003)

Northland Regional Council

Northland Regional Council has identified in their long term community plan that "a secure and cost effective electricity supply is required"[21]. They also mention that "Northland Regional Council intends to facilitate the development of a non-statutory Regional Energy Plan for Northland, working with stakeholders such as District Councils, power trusts and key industries. The objectives of such a plan would be to develop a long term, sustainable energy strategy for Northland." The time frame for this work is 2004-2007.

From discussions with Northland regional council, work has not yet commenced on the regional energy strategy. Their main concerns are that the region is a net electricity importer and the potential for electricity supply & transmission problems through Auckland.

A resource consent application for Marsden B is currently being processed by the council. The council wants to avoid any perceived conflict of interest, so will not proceed with a regional energy strategy until this resource consent application is processed. The outcome of this resource consent application could also have a significant impact on the direction and focus of a regional energy strategy.

The idea of the regional council facilitating a non-statutory regional energy strategy has been discussed with Enterprise Northland. When the development of a

[21] Northland Regional Council, Northland Community Plan 2004-2014, Long Term Council Community Plan.

regional energy strategy does proceed it is expected to involve several local stakeholders such as District Councils, power trusts and key industries.

Auckland Regional Council

The Auckland Regional Council became a founder member of the EECA EnergyWise Councils Partnership programme in 1997.

In October 2002, Auckland Regional Council made a commitment to provide leadership in relation to how a Council can 'walk the talk' by fully integrating social, environmental, economic and cultural sustainability into all aspects of its internal operations.

Environment Waikato

Environment Waikato joined EECA's EnergyWise Councils Partnership in 2002 and completed a regional energy survey in 2003. Environment Waikato plans to complete an energy strategy for the Waikato region.[22] A draft scope of works for the regional energy strategy has been completed, but work on the project has been delayed due to other unplanned work on geothermal energy in the region. Completion of an energy strategy for the Waikato region remains an important goal for Environment Waikato.

Environment Waikato's long term council community plan identifies goals to continue to report on Environment Waikato's energy use.[23]

Greater Wellington

Greater Wellington joined the EECA EnergyWise Councils Partnership in 2003. Their Regional Policy Statement has been promoting energy efficiency and conservation as well as renewable energy since becoming operative in 1995.

The long-term council community plan includes a chapter on energy. Key targets are described below:

Energy Targets for Greater Wellington Regional Council

Fewer than 400 million litres of petrol and diesel used for transport purposes per annum (currently 442 million litres)

At least a 500% increase in electricity generated from renewable energy resources in the region (currently 14 GWh)

Greater Wellington Regional Council's carbon footprint reduced by 10% per annum.

[22] More details are available in: EECA's EnergyWise Councils Partnership year 7 report 03/04.
[23] More details are available in: Environment Waikato's Delivering a Sustainable Future, Long Term Council Community Plan 2004-2014.

Environment Canterbury

Environment Canterbury has been a member of the EECA EnergyWise Councils Partnership since this was first formed. As part of this involvement they report annually on internal energy use as a method of tracking progress towards energy reduction targets.

Environment Canterbury has been active in energy issues and associated air quality issues for some time. They have developed and implemented a clean heat project to reduce air pollution in Christchurch. This project involves encouraging, facilitating and supporting energy efficiency improvement in homes within the clean air zone (including insulation improvements and replacing heaters with more efficient cleaner heating technologies).

Environment Canterbury also encourages sustainable transport within the region and published a Regional Energy Strategy in April 2004.[24]

13.2 Activities of Territorial Authorities within the Auckland Region

The following energy activities have been identified as being pursued by the territorial authorities within the Auckland region. The list may not include activities that are less publicly obvious.[25]

13.2.1 Waitakere City Council

- Member of the Communities for Climate Protection (CCP) project (see below)
- Recently undertaken a study of renewable energy potential of the city. Looked at energy efficiency and alternative types of energy generation such as solar, hydro, wind.
- Have achieved Milestone 1 of the CCP project to develop an emission inventory – inventory is both city and corporate focussed. This will enable benchmarking. Inventory largely based on national averages.
- Proposed next step is to develop an energy strategy which will include reduction targets which are required by the Communities for Climate Protection project
- One of Waitakere City Council's Strategic Platforms is Sustainable Energy and Clean Air which provides a strategic mandate for considering sustainable energy within Council business
- Was a contributor to the regional submission on Ministry for Economic Development's (MED) discussion document: Sustainable Energy: Creating a Sustainable Energy System

[24] http://www.ecan.govt.nz/Plans+and+Reports/Energy/Regional+Energy+Strategy+2004.htm

[25] Council websites and direct contact with council officials was used to collect the following information about territorial authority activities (regarding energy) within the Auckland region.

13.2.2 Auckland City Council

- Member of the Communities for Climate Protection project
- Coordinated and contributed to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System
- Are working on Milestone 1 of the CCP project to develop an emission inventory – inventory is both city and corporate focussed
- Following on from the regional submission on MED's discussion document, Auckland City are working on a work programme for engaging with central government as part of the sustainable programme of action

13.2.3 North Shore City Council

- Member of the Communities for Climate Protection project
- Became an "Energy-Wise" Council in 2001 – EECA initiative
- Have set up an energy management team which meets quarterly to discuss progress with achieving corporate-based energy initiatives. Energy efficient methods for computers, light bulbs etc
- Involved in limited community-based work on energy
- Was a contributor to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System
- Have developed a good solutions guide for energy efficiency in building design
- Are investigating subsidising building consent processes for buildings proposing to use solar energy
- Have developed Travel-Wise initiatives which promote energy efficiency e.g. Walking school buses

13.2.4 Rodney District Council

- Member of the Communities for Climate Protection (CCP) project and ICLEI
- Have achieved Milestone 1 of the CCP project to develop an emission inventory – inventory is just corporate focussed
- Was a contributor to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System
- Made a submission on the Electricity Commission's consultation paper, 'Options for Enabling Transmission Alternatives'.
- Make reference to energy matters in Council documents such as the LTCCP, Vision Rodney and A Living Vision for Rodney's Economy
- An Energy Working Group, set up by the Rodney Economic Development Trust earlier this year, are about to commission a study of sustainable energy supply options for the Rodney District. This study will be reported back to the Council in December

13.2.5 Franklin District Council

- Limited work being done in the area of energy, however, view energy as a key strategic issue
- Are in the process of collecting information on the energy sector but it is for specific purposes, so in more of a reactive mode.
- Was a contributor to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System

13.2.6 Papakura District Council

- Member of EECA's EnergyWise Councils Partnership
- Was a contributor to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System
- It is acknowledge that energy is an important issue for Auckland, but it is not currently a priority for this council. They see their role as focusing on managing internal energy use and participating in, but not leading activity in this area.

13.2.7 Manukau City Council

- Member of EECA's EnergyWise Councils Partnership
- Was a contributor to the regional submission on MED's discussion document: Sustainable Energy: Creating a Sustainable Energy System
- It is acknowledged that energy is an important issue for Auckland, but it is not currently a priority for this council.

Table 6 identifies which territorial authorities in the Auckland region are members of EECA's EnergyWise councils partnership and the Communities for Climate Protection New Zealand. These memberships are used as indicators of commitment or interest in energy issues.

Table 6 - : Membership of EnergyWise Councils Partnership and Communities for Climate Protection New Zealand

Territorial Authorities with the Auckland Region	EnergyWise Councils Partner	Communities for Climate Protection New Zealand Programme member
Auckland City Council	Yes (1999)	Yes
Manukau City Council	Yes	No
Northshore City Council	Yes (2002)	Yes
Papakura District Council	Yes (2004)	No

Territorial Authorities with the Auckland Region	EnergyWise Councils Partner	Communities for Climate Protection New Zealand Programme member
Rodney District Council	No	Yes
Waitakere City Council	Yes	Yes

Involvement of 5 out of the 6 territorial authorities in the Auckland Region in EECA's EnergyWise Councils Partnership indicates a strong interest in energy issues. This represents 83% involvement of territorial authorities in the Auckland region compared to a national average of 25%.

Involvement of 4 out of the 6 territorial authorities in the Auckland region in the Communities for Climate Change New Zealand Programme also indicates a strong interest in energy issues. This represents 67% involvement of territorial authorities in the Auckland region compared to a national average of 23%.

These indicators demonstrate that in the Auckland region there is more focus on energy issues than in many other parts of the country.

In general the territorial authorities appear to focus on managing internal energy use and encourage the efficient use of energy, through promotion encouraging and facilitating demand management. The scope for regional councils is wider, they can get more involved in strategic issues facilitating sustainable regional development.

13.3 Economic Development Units

Several regions have organisations or business units focused on economic development. Examples include: Enterprise Northland, Venture Southland, Business Porirua, Positively Wellington Business, Vision Manawatu, Go Wairarapa, Canterbury Development Corporation and Ruapehu Economic Development Unit.[26] In some cases these business focused organisations have taken a lead role in scoping, commissioning and managing regional energy strategies. This demonstrates the strong connection between energy and economic development.

While ARC's economic development unit has more of an implementation/service delivery focussed role rather than a strategy and policy development role, the relationship between energy and economic development is acknowledged and as such energy considerations should be incorporated into economic development initiatives.

[26] http://www.edanz.org.nz

Venture Southland has taken energy further and appointed an energy projects team who co-ordinate regional energy activities and assist with ensuring the region's economic wealth is increased from energy.

14 Legislative and Policy Developments on Energy

14.1 Auckland Regional Policy Statement

The Auckland Regional Policy Statement (ARPS) provides considerable guidance on the role of the ARC in energy policy. However there have been considerable advances since the methods in the ARPS were developed. Some opportunities for greater advocacy have been set out in the report to Council (refer Appendix D).

The ARC also has a range of programmes that may have an energy dimension. It would be useful to have energy considered through the Auckland Regional Economic Development Strategy, for example, in terms of promoting energy efficiency in business, promoting energy efficiency as a business opportunity and advocating for security of supply to businesses. Similarly, it is important to co-ordinate activity with Civil Defence and natural hazard functions, recognising the importance of security of energy supply.

14.2 Long Term Council Community Plans

The Local Government Act 2002 provides a broad mandate for local authorities to involve themselves in economic, social, environmental and cultural issues. The Act is outcome focused and introduces mandatory long term strategic planning in the form of Long Term Council Community Plans (LTCCPs).

LTCCPs are ten-year plans, which must be prepared or revised every three years. They provide a framework for the direction and priorities of each local authority.

14.3 Local Government Act 2002

The Act signals a strong commitment to the principles of sustainable development. Sustainable development has been defined nationally and internationally as: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs"

The Local Government Act 2002 requires local government authorities to be guardians of the economic, social, environmental and cultural present and future well being for their communities. Energy has a significant impact on all of these areas of well being, both now and in the future.

14.4 Land Transport Management Act 2003

The Act requires regional councils to prepare regional land transport strategies. Requirements for consultation are described in the Act.

Requirement in preparing a land transport programme are to take into account any current national land transport strategy, National Energy Efficiency and Conservation Strategy, and relevant regional land transport for the strategies. In effect this means that travel demand management should be considered.[27]

14.5 Resource Management Act 1991

The Resource Management Act 1991 (RMA) is the core of the legislation intended to help achieve sustainability in New Zealand. By bringing together laws governing land, air and water resources and concentrating on the environmental effects of human activities, the Resource Management Act introduced a new approach to environmental management. The Act's purpose is to promote the sustainable management of natural and physical resources.

14.6 Resource Management (Energy and Climate Change) Amendment Act 2004

The Resource Management (Energy and Climate Change) Amendment Act 2004 was passed on 26 February 2004, and came into force on 2 March 2004. This Act recognises the Government's preference for national coordination of controls on greenhouse gas emissions and gives greater emphasis to climate change and energy matters in Resource Management Act planning and decision making.[28]

14.7 Resource Management Amendment Act 2005

The Resource Management Amendment Act 2005 was passed in August and concludes the government's review of the Resource Management Act. The amendments will improve the operation of the Resource Management Act by addressing problems with delays, costs, inconsistencies, uncertainty and national leadership regarding the RMA's processes and in decision making.

The amendments focus on five key areas:

1. Improved national leadership
2. Improved decision making
3. Improved local policy and plan making
4. Improving certainty for consultation and iwi resource planning
5. Improving natural resource allocation.

The key areas relating to the role of regional councils in energy are: improved national leadership; improved local policy and plan making and improved natural resource allocation.

[27] Land Transport Management Act 2003
[28] More details are available at www.mfe.govt.nz/laws/rma/energy-climate.html

Improved national leadership

Key changes related to energy include:

- Intentions to prepare national policy statements on electricity transmission and electricity generation
- Councils will need to ensure that their policy statements and/or plans give effect to a national policy statement
- Where appropriate National Policy Standards will become absolute i.e. councils cannot be more lenient or impose stricter controls through resource consents
- More flexibility to enable central government to have input and meet the needs of decision makers, applicants and communities when resource consent applications or council plans present issues of national significance.29

Improved local policy and plan making

There are three new functions for regional councils related to contaminated land, allocation of natural resources, and the integration of infrastructure and land use. Of theses changes the two which are most significant with relation to energy are allocation of natural resources and the integration of infrastructure and land use.

These changes make regional policy statements more effective and states that plans must now 'give effect to' regional policy statements.

Regional Policy Statements will need to provide clearer and stronger directions on how the environmental issues of the region are to be managed by local authorities.[30]

Improved natural resource allocation

These changes clarify the regional councils role in establishing rules in a regional plan to allocate any of the following natural resources:

- water (other than open coastal water)
- heat and energy from water
- heat and energy from material surrounding geothermal water
- the capacity of air or water to assimilate the discharge of a contaminant.

The key change with regards to energy is the requirement for consent authorities to have regard to the value of existing investment when determining applications for new consents to replace existing consents.[31]

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[29] More detail is available from: The Ministry for the Environment's RMA Information Sheet: Improving national leadership

[30] More detail is available from: The Ministry for the Environment's RMA Information Sheet: Improving local policy and plan making

[31] More detail is available from: The Ministry for the Environment's RMA Information Sheet: Improving natural resource allocation

14.8 National Air Quality Standards

National Air Quality Standards came into force on 1 September 2005. A key standard requires regional councils to reduce pollution from fine particles (i.e. smoke) to a set level by 2013 in towns and cities. The other standards set maximum levels for carbon monoxide, nitrogen dioxide, ozone and sulphur dioxide in outdoor air. The standards are set out in the Table 7.

Table 7 Ambient air quality standards

Pollutant	Standard	Time average	Allowable exceedances per year
Carbon monoxide (CO)	10 mg/m^3	8-hours	1
Nitrogen dioxide (NO_2)	200 µg/m^3	1-hour	9
Ozone (O_3)	150 µg/m^3	1-hour	0
Fine particles (PM_{10})	50 µg/m^3	24-hours	1
Sulphur dioxide (SO_2)	350 µg/m^3 570 µg/m^3	1-hour 1-hour	9 0

These air quality standards apply to the Auckland Region urban airshed (defined by the Metropolitan Urban Limits) shown in red in Figure 27 below.

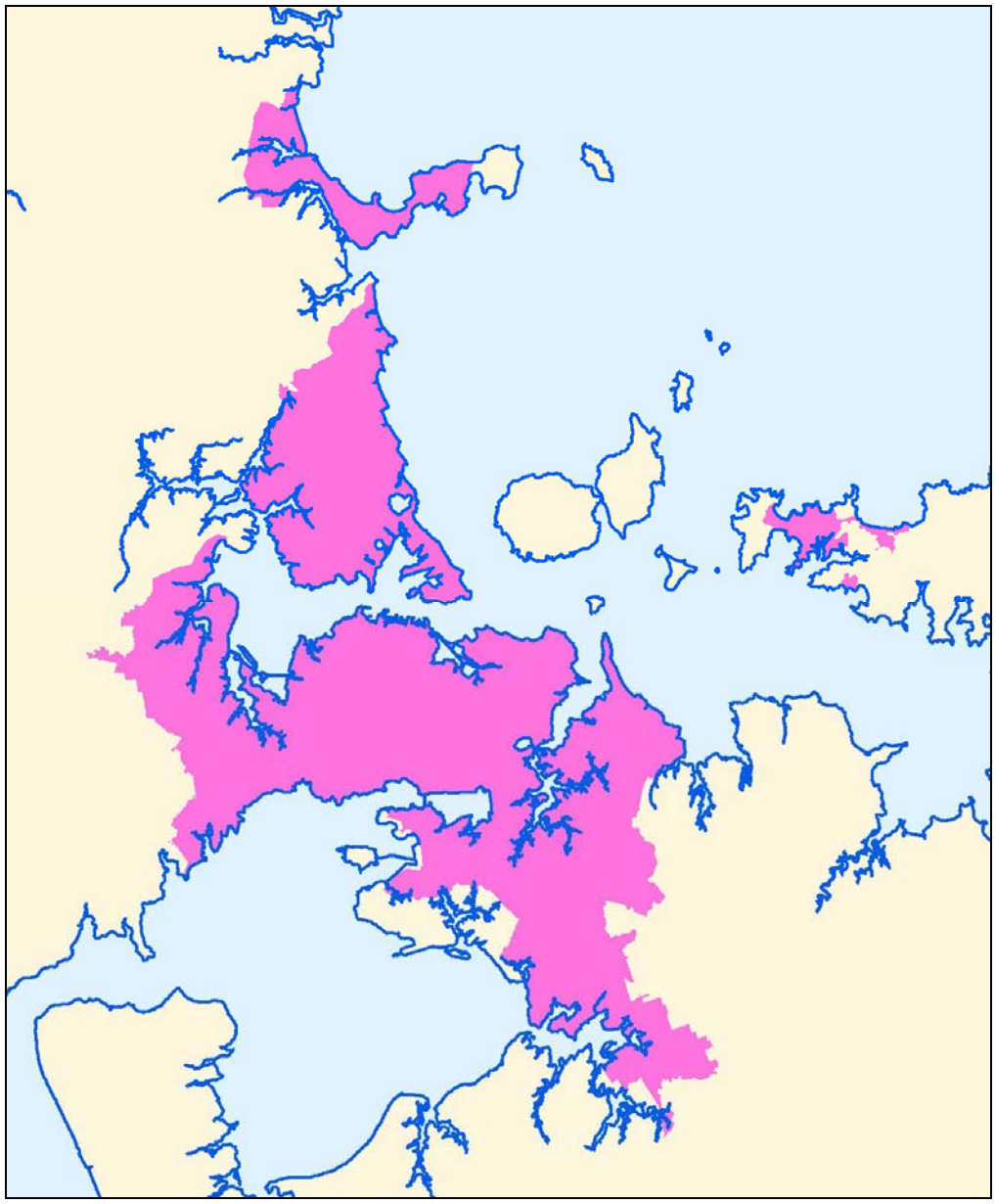
These standards put in place new ambient air quality standards, which are currently exceeded in many cities and towns in New Zealand. These air quality standards are currently exceeded in areas within the Auckland region.

The regulations focus consent authorities to decline applications for resource consents "if the discharge to be permitted by the resource consent is likely to cause, at any time, the concentration of PM_{10} in the airshed to be above the straight line path." The straight line path is a line from 2005 to 2013 representing the extent to which the concentration of PM_{10} in the airshed breaches its ambient air quality standard at 1 September 2005 and a point meeting the air quality standard at 1 September 2013.

In effect new resource consent applications must be declined until an improvement in air quality can be demonstrated. This legislation will impact on resource consent applications for new thermal electricity generating plant in the Auckland region.

The principal environmental concerns associated with gas-fired combined-cycle gas turbines are emissions of nitrogen oxides (NOx) and carbon monoxide (CO). Nitrogen oxide abatement is accomplished by use of "dry low-NOx" combustors and a selective catalytic reduction (SCR) system. Limited quantities of ammonia are released by operation of the NOx SCR system. CO emissions are typically controlled by use of an oxidation catalyst within the plant. No special controls for particulates and sulphur oxides are normally used since only trace amounts are produced when operating on natural gas.

These emissions will need to be considered in any consent hearing for a gas turbine station and how these would impact on the air quality.



Source – ARC

Figure 27, Auckland Metropolitan Urban Limits

14.9 National Energy Efficiency and Conservation Strategy

The National Energy Efficiency and Conservation Strategy (NEECS) released in 2001, sets a 15% improvement target in energy efficiency for local government over five years, to match the commitment of central government. Other key objectives related to central and local government include commitment to adopting

sustainable energy principles and introduction of policies and actions to support economy-wide sustainable energy. The NEECS includes five programmes targeting the government, energy supply, industry, buildings and appliances and transport sectors. The strategy emphasises central and local government partnerships and leading by example.[32]

14.10 Sustainable Development Programme of Action

The government's Sustainable Development Programme of Action, released in January 2003, identified "energy" as one of four key areas which will make a significant contribution to New Zealand's sustainable development, along with water, sustainable cities and child and youth development.

A Sustainable Energy Steering Group was formed to progress this work, led by the Ministry of Economic Development and involving the Energy Efficiency and Conservation Authority, the Ministry for the Environment's Climate Change Office, the Ministry of Transport, the Ministry of Research, Science and Technology, the Department of Prime Minister and Cabinet and the Treasury.

In October 2004, the Minister of Energy released the document Sustainable Energy: Creating a Sustainable Energy System for New Zealand, which established a framework for energy policy moving forward i.e. an energy system that is reliable and resilient, environmentally responsible and fairly and efficiently priced. The document identified the two key challenges the New Zealand energy system will face in the long term as global climate change and the coming peak in global oil production.[33]

14.11 Climate Change Policy

The New Zealand Climate Change Office has developed a programme to assist regional councils and territorial authorities to take into account climate change effects.

The programme aims to develop guidance materials for local authorities to assist them in assessing and managing the risks of climate change in their planning processes. It has been designed to provide underpinning information for the "4 million careful owners" climate change public awareness programme and to provide guidance to councils on climate change effects under the provisions of the RMA (Energy and Climate Change) Amendment Act.[34]

15 Defining the Role for ARC

Auckland Regional Council's role in energy planning is described in the Regional Strategy and Planning Committee report of 26 April 2005 D160-T03,titled: "ARC Role in Energy Planning" included in Appendix D. The report concludes "there is

[32] More details are available at: http://www.eeca.govt.nz/strategy/index.asp
[33] More details are available at: www.med.govt.nz/irdev/econ-dev/sus-dev-prog/index.html
[34] More details are available at: http://www.climatechange.govt.nz

a legislative mandate for an ARC role in energy planning." It goes on to say "This mandate and direction is coupled with a strong practical imperative – the need to ensure that Auckland maintains a secure energy supply."

There have been changes to the Resource Management Act since the regional council report was prepared which strengthen the regional council's legislative mandate regarding energy. The three most significant changes which influence this are the increased importance of regional policy statements, the regional councils new role in the allocation of natural resources, and the role of strategic integration of infrastructure with land-use.

Other regional councils throughout New Zealand are recognising their role in energy. Environment Canterbury is considered to be a leader in this area. Greater Wellington and Environment Waikato have also identified energy as a priority. Regional energy strategies have been completed for three regions; Gisborne (Tairawhiti), Canterbury and Southland. Another two regions; Northland and Waikato have taken steps to initiate regional energy strategies. The ARC could undertake to initiate its own regional energy strategy and this report will provide input into such a process.

15.1 Economic Growth

The regional council clearly has a responsibility in the area of energy to encourage and facilitate sustainable business development. An opportunity to implement this responsibility could be through consideration of an energy dimension in the review of the Auckland Regional Economic Development Strategy.

15.2 Planning

The regional council has a planning role in energy through:

- new responsibilities in the allocation of natural resources
- regional transport planning responsibilities
- the relationship between energy issues and other regulatory issues such as air quality.

A key role for regional councils is to determine the interactions of various central government policies relating to energy i.e. air quality and security of supply issues. These interactions and implementation consequences need to be reported back to central government to influence policy development. This will ensure that central government policies are workable and practical at a regional level.

15.3 Contingencies

The regional council has a responsibility to prepare for, provide and/or facilitate contingencies plans in the event of interruptions to energy supply.

15.4 Facilitation

The regional council has a role to facilitate regional initiatives to manage energy use and promote energy efficiency improvements within the region.

16 Glossary

The text includes some technical terms which are defined here.

Dispatched	When a generation plant is feeding electricity into the supply grid.
Tripping	If a generation plant shuts down for unplanned reasons.
Ramp Rate	The time that a generation plant takes from being started till it reaches a point where it can feed electricity into the supply grid. (This can be several hours before maximum output can be achieved.)
N-1	A level of security of capacity of an electricity supply system which allows it to continue in operation after having suffered the loss of ONE major generating or transmission component.
N-2	A level of security of capacity of an electricity supply system which allows it to continue in operation after having suffered the loss of TWO major generating or transmission components.

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17 References

Most reference sources are shown as footnotes in the report. The following documents have also been referred to during the report or been used to provide guidance with the structure and content.

EHMS-2002 East Harbour Management Services Ltd, "Availabilities and Costs of Renewable Sources of Energy for Generating Electricity and Heat", for Ministry of Economic Development, September 2002.

EHMS-2003 East Harbour Management Services Ltd, "Southland Regional Energy Assessment", Venture Southland, November 2003.

EHMS-2004 East Harbour Management Services Ltd, "Tairawhiti Regional Energy Assessment", Tairawhiti Development Taskforce, January 2004.

EHMS-2005 East Harbour Management Services Ltd, Renewable Energy – Industry Status Report (Second Edition), Energy Efficiency and Conservation Authority, 2005.

Appendix A - Short Term Electricity Infrastructure Upgrades

The electricity distribution lines companies produce an annual 'Asset Maintenance Plan' (AMP) which review the stare of their assets and outlines short term maintenance and expansion plans. Maintenance requirements are normally driven by the age of the equipment while growth drives the on-going upgrade and expansion of the systems. It can be seen that the cost of this work is considerable with many individual jobs costing over $3 million. Extracts from the plans are summarised below. More detail is given in the AMPs.

Counties Power[35]

An important part of long-term development plans is the reconstruction and upgrade of the sub-transmission networks to the north east (Opaheke) and south east (Tuakau). Details of this work include; (completion dates in brackets)

South East Sub-transmission
Construct Pukekohe to Tuakau sub-transmission line and operate at 22kV (2009).
Purchase land and construct 110kV Tuakau substation (2016).

North East Sub-transmission
Major sub-transmission works; Bombay – Opaheke 110kV (2007).

Waiuku zone substation development (2016).

Upgrade of the 11kV distribution network to 22kV.[36] Programmed between 2005 and 2014.

[35] Asset Management Plan June 2005
[36] A voltage constrained feeder has four times the capacity at 22kV than at 11kV, and in the vent of current constraints it would have twice the capacity.

There are a number of projects associated with shifting customers in urban areas off rural feeders. To be carried out between 2005 and 2014.

Purchase land and construct 110kV Opaheke substation (2007).

Other Areas

Pinnacle Hill 110/220kV substation (2018).

Vector[37]

	Project	*Driver*	*Timescale*	*Estimated capital*	
Manukau Area	*Reinforcement at Manukau*	*Growth*	2005	*$1 -3 million*	Manukau substation will be upgraded with a third transformer
Auckland CBD 22kV Distribution Network	*22kV distribution*	*Growth*	2005	*>$3 million*	A 22kV backbone distribution network will be established
Pacific Steel	*Backup supply cable*	*Security*	2005	*<$1 million*	Extend a 33kV cable from Hans substation to provide a backup supply to the Pacific Steel site
Freemans Bay Area	*22kV cable replacement*	*Replacement*	*2006*	*$1-3 million*	The 22kV cables supplying Freemans Bay are 36 year old
Hobson/ Quay Interconnector	*22kV cable replacement*	*Replacement*	*2006*	*$1-3 million*	The 22kV cables connecting Hobson and Quay will become the primary supply to Quay,
Ellerslie, Penrose Area	*McNab 11kV switchboard replacement*	*Replacement*	*2006*	*$1-3 million*	11kV switchgear at McNab substation is 52 years old
Auckland CBD 22kVDistribution Network	CBD 22kV Distribution	*Timescale*	2006	*>$3 million*	Stage 3 and 4 will be established in 2006 to supply new load

Sylvia Park Substation	*New zone substation*	*Growth*	2006	*>$3 million*	A major development is occurring at Sylvia
Highbrook Development	*New subdivision*	*Growth*	2006	*>$3 million*	Being reticulated at 22kV from Otahuhu GXP
Ponsonby Area	*Replace 22kV cables*	*Replacement*	2007	*>$3 million*	Cables are 55 and 39 years old
Hobson Substation	*New 110kV switchgear and transformer*	Growth	2007	*>$3 million*	Additional 22kV capacity is required at Hobson by 2007
Penrose Area	*McNab 33kV cable replacement*	*Replacement*	*2007*	*>$1 million*	Replacement of the cables required for reasons of equipment rating.
Ponsonby and Chevalier Area	*Uprating Ponsonby & Chevalier substations to 11kV*	*Growth*	*2007*	*>$3 million*	Are the last remaining substations operating at 6.6kv
Hillsborough Zone Substation	*Establish Hilisborough zone substation*	*Growth*	2007	*>$3 million*	A new zone substation at Hillsborough area. A site has been purchased by vector.
Mahuru Substation	*Establish Mahuru substation*	*Growth*	2007	*>$3 million*	Expected growth from commercial developments in the Newmarket area

Chevalier Area	*Replace 22kV cables*	*Replacement*	2008	*>$3 million*	Cables are 72 and 23 years old
Kingsland Area	*Replace Kin gsland 22kV switch gear*	*Performance*	2008	*$1-3 million*	This switchgear is 38 years
Penrose Area	*New substation*	*Growth*	2008	*$1 -3 million*	A large customer in the Penrose area is planning to increase its load requirements
Flat Bush Substation	*Establishment of new Zone substation*	*Growth*	2008	*>3 million*	To supply residential development in the Ormiston Road Flat Bush area. Land will be purchased for Flat Bush substation.
Hans Substation	*Third Transformer*	*Growth*	2008	*$1 -3 million*	To supply the Savill Drive industrial subdivision
Otahuhu Area	*New Equipment*	*Growth*	2008	*$1 -3 million*	A large customer in the Otahuhu area is planning to expand production
St Johns Substation	*Establish zone substation*	*Growth*	2008	*>$3 million*	Development around Winstone Quarry site and the Auckland University Glen Innes Campus
North-Western Auckland CBD 22kV Distribution Network	*North-western 22kV distribution network*	*Growth*	2009	*>$3 million*	Long-term development at Auckland city's north-western area around the tank farm

Mangere South Substation	*New zone substation*	*Growth*	2009	*>$3 million*	The AIAL (Auckland International Airport Limited) owns land north of the airport commercial and industrial development purposes
Maraetai Area	*11kV switch gear replacement*	*Replacement*	2009	*<$1 million*	11kV switchgear at Maraetai substation is 46 years old
Takanini Area	*Substation reinforcement*	*Growth*	2009	*<$1 million*	There is strong growth in the Takanini area with a prediction of around 3,000 houses per annum to be built over the next few years.
Liverpool Substation	*New 110/22kV transformers*	*Replacement*	2009	*<$1.5 million*	110/22kV transformers, two of which are 28 years old
Onehunga/Te Papapa Area	*Onehunga substation uprating to 33kV*	*Growth*	2010	*>$3 million*	The Onehunga substation is 41 years old and reaching its design capacity
Hobson West Substation	*New switching station*	*Growth*	2012	*>$3 million*	Land for Hobson West substation has been purchased
Parnell Substation	*22kV cable replacement*	*Replacement*	2012	*>$3 million*	The 22kV cables supplying Parnell substation are 77 years old
Liverpool/Quay Interconnector	*22kV cable replacement*	*Replacement*	2013	*>$3 million*	The existing gas pressure cable is 37 years old

22kV Switchboard at Victoria Substation	*22kV switchboard at Victoria substation*	*Growth*	2011	*>$3 million*	To accommodate the load growth at 22kV in the Auckland CBD
33kV Cable at St Johns	*33kV new cable at St Johns*	*Growth*	2013	*>$3 million*	Load growth in the St Johns area requires reinforcement of the 33kV
CBD 110kV Reinforcement	*Additional 110kV capacity into CBD*	*Growth*	2015	*>$3 million*	Required to the Auckland CBD to maintain the security of supply.
Hobson 22kV	*110/22kV transformer-Hobson*	*Growth*	2015	*>$3 million*	Due to the growth in the CBD and the progressive retirement of the existing 11kV network
NORTHERN CUSTOMER AREA					
Northern Area	*Uprate various 33kV circuits*	*Growth*	2005-2011	*>$3 million*	Due to load growth in the area, the existing conductor on nine 33kV circuits is constraining capacity.
Albany Basin Area	*Establish a 33kV bus at Bush Road substation*	*Growth*	2005	*>$3 million*	Security will be enhanced by installing a new 33kV feeder from Albany to Bush Road substation and on to Sunset Road substation.
Orewa Area	*New transformers at Orewa substation*	*Regulatory*	2005	*$1-3 million*	The existing transformers at Orewa exceed the noise requirements for the area

Warkworth Area	*Increase transformer capacity at Warkworth*	*Growth*	2005	*>$1 million*	Capacity constraints exist at Warkworth substation.
Henderson Area	*Reconfigure the Henderson area 33kV network*	*Growth*	2005	*>$1 million*	The presence of a number of tee off and spur line arrangements on the 33kV network in the area has resulted in performance issues
Silverdale Area	*Establish Red Beach zone substation*	*Growth*	2005	*>$3 million*	With the extension of the Northern motorway towards the Silverdale/Orewa area, demand is expected to grow steadily
Gulf Harbour Area	*Lay 33kV cable to Gulf Harbour*	*Growth*	2006	*>$3 million*	Growth in Gulf Harbour. Load forecasts indicate that the area will eventually require a zone substation to supply the load.
Coatesville Area	*Install second transformer at Coatesvile zone substation*	*Growth*	2006	*$1 -3 million*	The load on Coatesville substation continues to grow and the transformer is loaded to around 90% during peak times.
Glen Eden Area	*Establish a new zone substation at Oratia*	*Growth*	2006	*$1 -3 million*	The load on Waikaukau substation continues to increase.
Albany Basin	*Install additional 11kV switch gear at McKinnon zone substation*	*Growth*	2006	*<$1 million*	The development in the Albany Basin requires additional 11kV feeders to be connected into McKinnon substation.
Triangle Road Area	*Reinforce Triangle Road zone substation*	*Growth*	2007	*$1 -3 million*	The load on Triangle Road substation is increasing

North Shore Area	*33kV cable to Forest Hill substation*	*Growth*	2008	*>$3 million*	Installation of a 33kV cable from Sunset Road to Forest Hill
Kaukapakapa Area	*Establish a new zone substation at Kaukapakapa*	*Growth*	2008	*$1 -3 million*	The load on the Kaukapakapa 11kV feeder continues to increase
New Lynn Area	*Reinforce 33kV capacity at New Lynn substation*	*Growth*	2008	*$1 -3 million*	Demand around the New Lynn area increases
North Titirangi Area	*Install new transformers at Atkinson Road zone substation*	*Growth*	2009	*$1 -3 million*	The load on Atkinson Road substation has increased
Greenhithe Area	*Establish a new zone substation at Greenhithe*	*Growth*	2009	*>$3 million*	Demand in the Greenhithe area increases through residential development
Westgate/Whenuapai Area	*Establish a new zone substation at Whenuapai*	*Growth*	2009	*>$3 million*	Demand in the Westgate area increases through large commercial development
Whangaparaoa Area	*Establish Gulf Harbour substation*	*Growth*	2009	*>$3 million*	Demand on the Whangaparaoa Peninsula has been growing steadily
Swanson Area	*Install second transformer at Swanson zone substation*	*Growth*	2010	*<$1 million*	The load on Swanson substation continues to increase.

Henderson Area	*Install second transformer at Keeling Road zone substation*	*Growth*	2010	*$1 -3 million*	The load on Keeling Road substation continues to increase with commercial development in the Henderson area
Henderson Area	*Keeling Road substation to Woodford substation 33kV tie*	*Growth*	2010	*$1 -3 million*	Load growth around the Henderson Valley area
Albany Basin Area	*Install second transformer at McKinnon substation*	*Growth*	2010	*<$1 million*	Demand around the Albany Basin industrial area increases
East Coast Bays	*Install second transformer at Forest Hill zone substation*	*Growth*	2010	*<$1 million*	The load on Forrest Hill substation continues to increase
North Shore Area	*Highbury substation second transformer*	*Growth*	2011	*<$1 million*	Steady load growth in the Highbury/Northcote area
Albany Basin Area	*Rosedale Road new zone substation*	*Growth*	2011	*$1 -3 million*	Demand in the Albany Basin/Browns Bay area increases
Whangaparaoa Area	*33kV cable to Manly substation*	*Growth*	2012	*>$3 million*	Demand in the Whangaparaoa Peninsula continues to grow
Silverdale Area	*Wainui Road new zone substation*	*Growth*	2012	*>$3 million*	Load on Silverdale is expected to continue to grow rapidly with residential and commercial developments in the area

TRANSPOWER

Hepburn Grid Exit Point *Timescale 2006*
A proposal to install an additional new 110/33kV 120MVA transformer at Hepburn has been agreed with Vector to be commissioned before winter 2006..

Silverdale Grid Exit Point *Timescale 2007*
Silverdale GXP was commissioned in 2003. A single 220/33kV 12OMVA transformer was installed. Load flow analysis shows that the 33kV network backup capacity will be exceeded in 2007. It is proposed to install a second 220/33kV 120MVA transformer at Silverdale to improve the security of supply.

Albany Grid Exit Point *Timescale 2006*
A proposal to install a third 220/33kV 12OMVA transformer at Albany, to be commissioned before winter 2006.

Transmission upgrade projects being undertaken by Transpower in the Auckland region to extend the operational capacity of the existing system include:

• Increasing the thermal operating limits of the Otahuhu-Henderson 220 kV circuits 1 and 2 from 765/695 MVA to 984/938 MVA, winter and summer ratings respectively.

• Increasing the thermal operating limits of the Huntly-Otahuhu 220 kV circuit 1 from 493/404 MVA to 670/614 MVA winter and summer ratings respectively.

• Install additional capacitor banks to improve the voltage stability. To be commissioned prior to 2010.

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[37] 2005 Asset Management Plan

Appendix B - Electricity Growth Predictions

Electricity growth predictions by several electricity market participants are summarised below.

17.1.1 Vector[38]

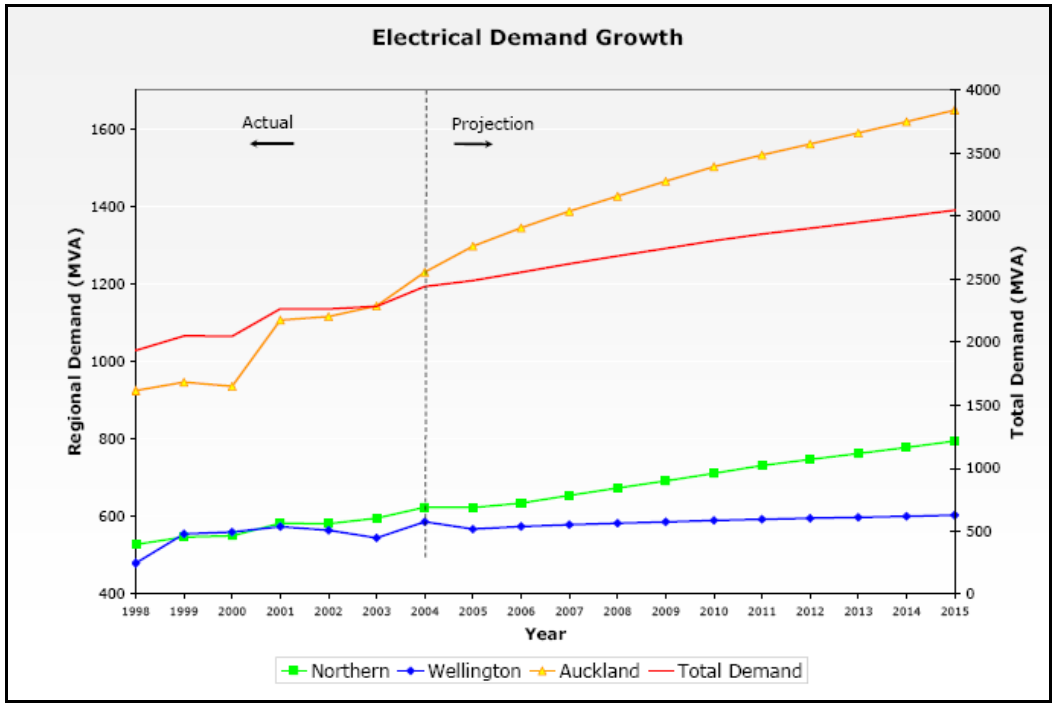

Figure 28 - Past and Predicted Electrical Demand in Vector Networks

This graph shows past demand and their long-term forecast out to 2015; this shows an average growth rate of 1.4% per annum for both of the Northern and Auckland networks serviced by Vector which lie within the ARC zone. The forecast is for a "normal" climate year. Peak demand is then forecast for the next 15 years. An underlying basic growth factor is applied, reflecting the expected impact of economic growth, population growth, available land for development, district plan changes etc. Individual commercial developments are accounted for where known. The forecast is adjusted to include block load transfers between zone substations, which are planned as a capital expenditure deferral strategy, but also deliver improved asset utilisation as well.

It is interesting to note the much greater rate of expected increase in demand in the northern region compared with Wellington city.

Short-term maximum demand in Vector's network is mainly influenced by climate, particularly the severity of winter. Medium-term demand is mainly driven by population.

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[38] 2005 Asset Management Plan, Vector

The load on Vector's network is primarily an urban load, consisting of:

- Residential load
- Small commercial loads, such as dairies and single or small blocks of shops
- Large commercial loads, including shopping malls and light factories
- Large industrial loads, ranging from large factories to steel mills

Growing demand for air conditioning, especially for residential use, is increasing overall electricity consumption and increasing the peak demand in summer. This is putting strain on existing electricity infrastructure.

A study of the influence air conditioning load will have on Vector's 11kV electrical network indicates an 11% increase in 11kV feeder reinforcement over the next 15 years due to additional air conditioning load.

In their Northern Region, Vector expects the highest growth to occur around the Albany Basin with the development of industrial and retail businesses. With the opening of the new motorway from the North Shore to Orewa and then to Puhoi, it is expected that significant residential development will take place in areas north of Silverdale. Established areas such as Devonport and Northcote are expected to have relatively static demand.

17.1.2 The Electricity Commission [39]

The Electricity Commission (EC) has also made predictions for growth in electricity. They have prepared a prediction of national demand up to 2045. This has been based on assumptions of an increase in GDP of 96.5% from $111,563m in 2005 to $219,178m in 2045. A 32% increase in the number of residences from 1,579,700 in 2005 to 2,080,800 in 2045 together with an 18% increase in population from 4,077,600 in 2005 to 4,814,300 in 2025.

Based on these assumptions, the Commission has modelled three levels of increase low, mean and high. The predicted levels of electricity use for all of New Zealand are given in Table 8;

Table 8 – Electricity Commission Predictions for Growth in New Zealand Consumption

GWh	Low	Mean	High
2005	36,892	37,371	37,792
2015	44,386	47,097	49,825
Increase from 2005	20.3%	26.0%	31.8%
2025	58,555	71,564	84,871
Increase from 2005	58.8%	91.5%	124.6%

[39] Statement of Opportunities, The Electricity Commission, 2005

The Electricity Commission has commissioned a regional demand projections review but the outcomes are not yet available. It is expected that growth in the ARC region will be greater than the New Zealand average and the 34% growth predicted by Vector up to 2015 is very much in line with the EC figures for this period.

In addition to the predictions for total electricity use in Gigawatt hours (GWh), the EC has projected growth in the peak demand in regions. The ARC area is included in the 'Auckland' and 'Northern Isthmus' regions. Their predictions are shown in tabular and graphical forms in Table 9 and Figure 25;

Table 9 – Electricity Commission Predictions for Growth in Auckland Peak Demand

MW	**Low**	**Mean**	**High**
Northern Isthmus			
2005	707	726	741
2015	933	1,015	1,095
Increase from 2005	32%	40%	48%
2025	1,120	1,290	1,463
Increase from 2005	58.5%	78%	97.5%
Auckland			
2005	1,186	1,215	1,237
2015	1,566	1,693	1,818
Increase from 2005	32%	39.5%	47%
2025	1,899	2,172	2,449
Increase from 2005	60%	79%	98%

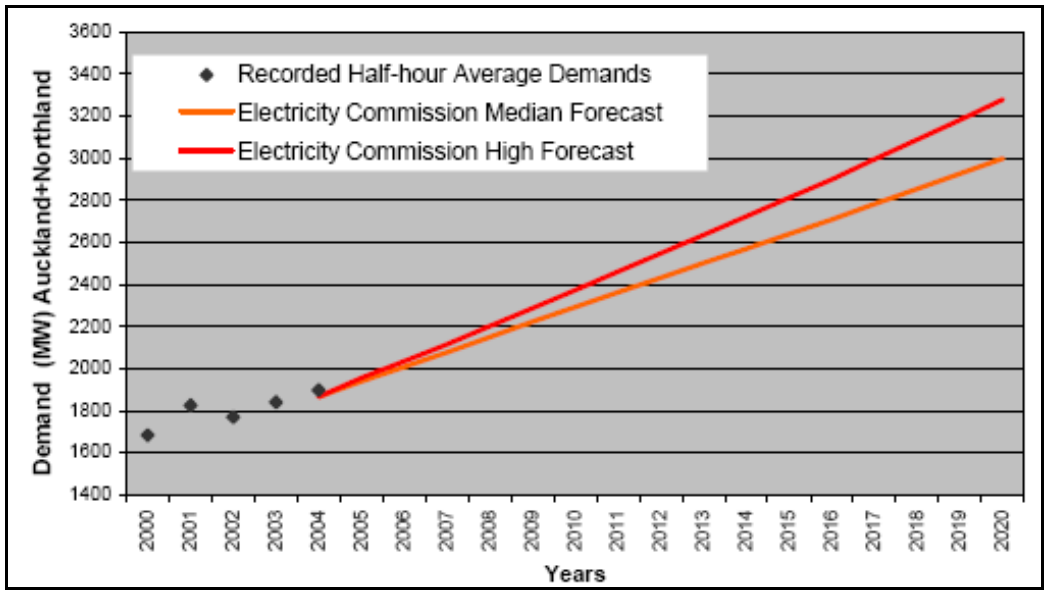

Figure 29 – Growth in Demand, Auckland and Northland

17.1.3 Counties Power [40]

In the southern region increase of peak demand is forecast of 20.5 % from 83 MW in 2005 to approximately 100 MW in 2015. Franklin District is one of the fastest growing authorities in New Zealand with economic growth over the next decade forecast to be between 3 and 3.5% per annum with population growth of 1.5 to 2% per annum. It is expected that many businesses will move south as property values increase and there is more pressure on land use further north.

Between 2001 and 2004 the volume of electricity supplied by Counties Power increased by 13.5%.

17.1.4 Transpower[41]

In their submissions to justify upgrades to the main grid feeding the Auckland region, Transpower has assumed an annual growth in peak demand of 2.5%.

Load Profile

Transpower have predicted that the future winter load profiles will increase as shown in Figure 26.

[40] Asset Management Plan June 2005, Counties Power
[41] Transpower, 2005

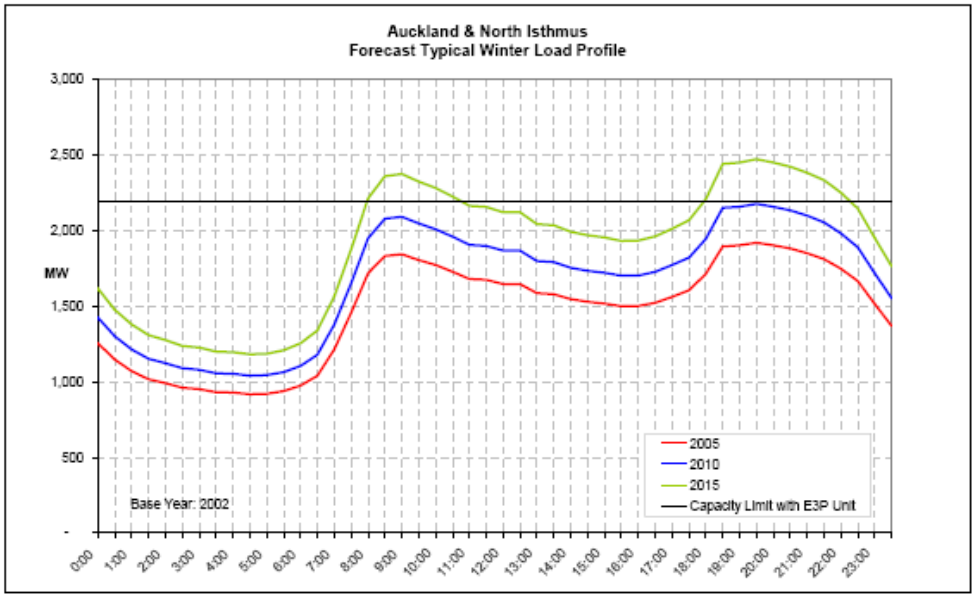

Figure 30, Forecast Winter Load Profile

17.1.5 Ministry of Economic Development

The MED produces a report on "Energy Outlooks" which looks at New Zealand's likely energy needs in the future. They base their forecasts on the following assumptions.

- 2.5% per annum (pa) GDP growth from 2007 (2002 Budget forecast prior to 2007);
- Oil prices rising from US$20/bbl in 2004 to US$25/bbl by 2020 and constant thereafter;
- Constant exchange rate of NZ$1.00 = US$0.50 out to 2025;
- Pohokura gas available from 2007[2] and Kupe from 2008;
- New gas available from discoveries averaging 35PJ pa for 2011-2013 and 60PJ pa from 2014 onwards;
- North Island delivered coal prices at $3.50/GJ in 2004 and at $4.00/GJ from 2013 onward, and South Island delivered coal prices about $3.00/GJ;
- As a result of the National Energy Efficiency and Conservation Strategy (NEECS), additional energy efficiency uptake above the normal rate, of 0.5% pa for 2002-2005, 1.0% pa for 2006-2015, and 0.5% pa again for 2016-2025;
- Carbon charges at $15/t$CO_2$ from 2008;

- Forest industry growth, with the harvest rate increasing from 19Mm³ in 2001 to 33Mm³ in 2025, and the total amount processed increasing from 13Mm³ in 2001 to 19Mm³ in 2025.

Based on these assumptions MED produced this graph of national growth. The step down in industrial and commercial demand starting post-2003 is attributable to the wind-down of Methanex. Note that Figure 31 includes all forms of energy used by general consumers.

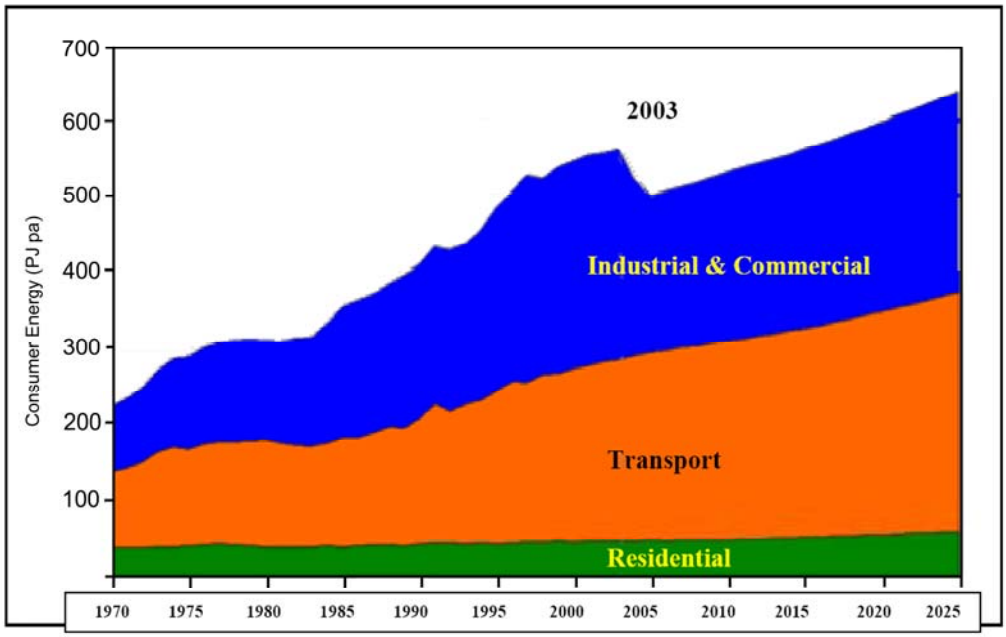

Figure 31 – Ministry of Economic Development - Consumer Energy Growth Predictions

Appendix C - Alternatives to New 400 kV Electricity Grid Upgrade

The Electricity Commission has called for alternatives to Transpower's proposed grid upgrade. The have been reviewed and classified. Those considered to warrant additional investigation are listed below.

Category A1: Will consider further in relation to a 5 year timeframe. These could feasibly be in place by 2010.

Category A2: Will consider further in relation to a 10 year timeframe. These could feasibly be in place by 2015.

Table 1: Category A1 alternatives

Transmission
400kV options include: ▪ Partial under grounding of the 400kV line from Otahuhu and Whakamaru along a number of alternate routes, namely; i. Otahuhu to Hunua (approximately 30 km). ii. Otahuhu to mid-Hunua Valley.
Voltage increase options include: ▪ Convert the existing Whakamaru – Otahuhu 220kV A, B and/or C circuits to 330kV. ▪ Use the Transpower proposed 400kV line route from Whakamaru to Otahuhu to install double circuit 220kV.
HVDC options include: ▪ Use the Transpower proposed 400kV line route from Whakamaru to Otahuhu to install HVDC overhead Monopole or Bipole. ▪ Install underground HVDC VSC_6 from Huntly to Otahuhu.
Miscellaneous augmentation options include: ▪ Re-conductoring the existing Whakamaru – Otahuhu 220kV A and B circuits. ▪ Connect the Whakamaru – Otahuhu 220kV circuits at Huntly. ▪ Connect the Whakamaru – Otahuhu 220kV circuits at Hamilton. ▪ Install series capacitors on 220kV circuits. ▪ Install phase shifting transformers. ▪ Install shunt compensation at 220kV busbars. ▪ Thermally upgrade existing circuits.

Generation
▪ 400MW CCGT[7] generator at Otahuhu. ▪ 385MW CCGT generator at Rodney. ▪ 320MW coal fired generator at Marsden. ▪ Install additional cooling towers at Huntly. ▪ 200MW OCGT[8] generator in Auckland. ▪ Reciprocating engines to manage peak in Auckland. ▪ Move Whirinaki to Auckland. ▪ 20MW waste-to-energy plant in Auckland.
Demand
▪ Interruptible load in Auckland.

Table 2: Category A2 alternatives

Transmission
400kV options include: ▪ Full under grounding of the 400kV line; ▪ Partial under grounding of the 400kV line from Otahuhu and Whakamaru along a number of alternate routes, namely; i. Underground along Waikato River. ii. Install an underground tunnel along the Main Trunk railway line to install lines/ cables to supply Auckland. iii. Route through Hunua Ranges to avoid urban areas. iv. Through all urban areas.

HVDC options include:

- Conventional HVDC Monopole or Bipole extension from Haywards to Otahuhu utilising the existing 220kV corridor.
- Conventional HVDC Monopole or Bipole underground from Whakamaru to Otahuhu.
- HVDC VSC underground from Whakamaru to Otahuhu
- Conventional HVDC Monopole or Bipole from Whakamaru to Otahuhu utilising the existing 220kV corridor.
- Install HVDC along one side of the existing Stratford – Huntly 220kV circuit by replacing one of the 220kV circuits.
- Fully replace Stratford – Huntly 220kV double circuit with HVDC.

Voltage increase options include:

- Convert the existing Arapuni – Hamilton – Bombay – Wiri 110kV circuit to double circuit 220kV and extend this to Whakamaru by overhead line and to Otahuhu by cable.
- Install a new 220kV double circuit from Whakamaru to a new tee on the existing Stratford – Huntly 220kV double circuit line north of Taumarunui.
- Replace an existing 220kV line from Whakamaru – Otahuhu with 400kV overhead line.

Miscellaneous augmentation options include:

- Use ACCC[9] conductor to upgrade existing AC lines

Generation

- Cogeneration plant at Marsden.
- Wind generation.
- IGCC[10] coal based generation.

Appendix D - ARC ROLE IN ENERGY PLANNING

D160-T03

Craig Shearer, Director, Policy and Planning
Duane Burtt, Strategic Policy Analyst: 26 April 2005

17.1.6 Introduction

The purpose of this report is to set out a process for considering the ARC role in energy planning.

17.1.7 Background

The context of national and regional energy policy was set out in a report to the March meeting of this Committee. That report also described Transpower proposals to upgrade the national electricity transmission grid and their implications for the Auckland Region. The Committee resolved:

"That the officers report back to the next meeting on the ARC's role on this issue."

This report responds to that resolution – outlining the ARC's current role in relation to energy policy and outlining a process for developing a greater role. Note also that the latest developments in relation to the Whakamaru-Otahuhu electricity transmission upgrade are reported in the Director's Report.

17.1.8 Roles of other organisations

In considering appropriate roles for the ARC in energy planning it is useful first of all to understand the framework of governance in the energy sector.

At the central government policy level, three organisations play a significant role. The Ministry of Economic Development (MED) is the lead agency for energy policy generally and maintains energy information databases. The Ministry for the Environment is the lead agency on Resource Management Act (RMA) administration and climate change policy. The Energy Efficiency and Conservation Authority have an input to energy policy and also actively promote energy efficiency 'on the ground.'

The Electricity Commission was set up by the government in 2003 to oversee the governance, operations and development of New Zealand's electricity market. One of its primary responsibilities is in approving major new investments within the transmission grid, which is managed by another state owned enterprise – Transpower. The remainder of the electricity industry is made up of electricity generating companies and electricity distribution companies (sometimes referred to as lines companies) which sell power to the end consumer. Some of these companies are privatised, some are state owned and some are owned by consumer trusts, but they all tend to operate as private companies rather than being subject to political direction.

17.1.9 Potential ARC role – legislative direction

The ARC's role in relation to Transpower transmission projects was discussed in the paper to the March Committee. However there is some potential for the ARC to take a broader role in energy planning.

The LGA 2002 defines the purpose of local government as being:

(i) "To enable democratic local decision-making and action on and behalf of communities; and

(ii) *To promote the sustainable social, economic, environmental and cultural wellbeing of the regional community. "*

In fulfilling this purpose, local government is required to 'take a sustainable development approach'. This involves, taking into account:

(i) "the social, economic, and cultural well-being of people and communities; and

(ii) the need to maintain and enhance the quality of the environment; and

(iii) the reasonably foreseeable needs of future generations".

Energy is a fundamental background factor in many social, economic and environmental issues. A number of commentators have reached the conclusion that energy is a logical issue to be addressed by Councils in response to their broader mandate:

"Under the Local Government Act 2002, issues relating to energy should be an integral part of policies and programmes developed to promote sustainable development within every local authority, driven by the overarching direction provided by the Long Term Council Community Plan (LTCCP)." [42]

There is a particular imperative for regional leadership to be displayed in Auckland, given that the urban area encompasses a number of territorial authorities and concerns that the supply of electricity to Auckland may not be secure, even in the short-medium term.[43]

The important role of local government in contributing to the development of a sustainable energy system is recognised in the MED discussion document on Sustainable Energy[44], particularly the potential of local government to:

"influence energy use and production through shaping urban development and infrastructure, as well as participation in central government partnerships such as the Energy Wise Partnership and Communities for Climate Protection."

In reinforcing this viewpoint, the regional submission to the MED discussion document (reported to the April committee) provides a collective perspective from Auckland local authorities on our role:

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[42] Schofield, Robert (Boffa Miskell Ltd), and Mark Ashby (Connell Wagner), Quality Planning, Guidance Note, Renewable Energy.
[43] 'Crises, What Crises?', Metro, May 2005.
[44] Ministry of Economic Development, Sustainable Energy: Creating a Sustainable Energy System.

"The Councils of the Auckland Region consider there is a significant and important role for local government to play in moving to a sustainable energy system."[45]

The Resource Management Act also indicates that energy is a significant issue for local authorities in exercising their resource management functions. Under the Resource Management (Energy and Climate Change) Amendment Act 2004, three new matters were inserted into section 7 of the Act, so that local authorities must now *"have particular regard to":*

"(ba) – 'The efficiency of the end use of energy'

(i) – 'The effects of climate change'

(j) – 'The benefits to be derived from the use and development of renewable energy."

Unlike territorial authorities, however, the RMA does not give regional councils a general power to control land use. Regional councils can control the use of land for specified purposes only and energy is not one of those. Therefore if the Council wished to ensure that energy efficient design was considered in new development, for example, this would need to be implemented either through district plans or through the Building Act.

17.1.10 Potential ARC role – NATIONAL POLICY direction

Action Plan: Central and Local Government Programme

The Energy Efficiency and Conservation Authority (EECA), in association with the Ministry for the Environment (MFE), have developed the Action Plan: Central and Local Government Programme in order to implement the National Energy Efficiency and Conservation Strategy. The Action Plan identifies a number of measures to be taken and the lead agencies and support agencies who will implement them. The lead agencies are all from central government but there are a number of measures where local authorities are identified either as support agencies or parties to be engaged with:

- Energy-Wise Councils – the Local Government Energy Efficiency Leadership Programme, where local authorities voluntarily commit to improving energy efficiency in their operations by 15 percent over five years. The ARC was a founding member of this programme.

- Regional Energy Accounting – with the objective of communities being able to 'see' the significance of energy resources, use, and costs in their regions. The intention is that regional councils will use the existing MfE methodology to undertake studies to account for energy 'stocks', 'inflows' and 'outflows' from their regions where this has not already been done.

[45] Auckland local authorities, joint submission to MED discussion document, section 4.6.

- Sustainable Urban Form – designed to promote sustainable urban form and design, through actions such as the New Urbanism conference and the Urban Design Protocol. The ARC has been extensively involved in these issues.

- Energy Efficiency and Renewable Energy Under the RMA – designed to ensure energy issues are effectively addressed in RMA processes and documents. MFE (in association with EECA and LGNZ) have undertaken to provide guidance to local authorities on how to address energy issues. Possibilities include a National Policy Statement, model plan provisions and non-statutory guidelines. This guidance does not seem to be available at the present time.

- Facilitation of Community Energy Efficiency Programmes – designed to provide help to community driven energy efficiency initiatives.

National Policy Statement for Electricity Transmission

The Government have established an Electricity Transmission Reference Group to consider the possible scope of a National Policy Statement (NPS) on electricity transmission. The Reference Group has identified four areas for attention:

- Policies directed at explaining how electricity transmission should be regarded within the purpose, principles and terminology of the Act.

- Policies directed at the adverse environmental effects of electricity transmission.

- Policies directed at the effects on the transmission network.

- Policies that address matters of process.

The Reference Group is required to develop and report on the possible scope and potential benefit of an NPS in the first half of 2005. This will involve a public consultation round – offering an opportunity for the ARC to present its view. The government will consider that report and make a decision on whether to proceed with the actual drafting of an NPS later in the year.

Building Regulations

Building regulations are the simplest and most effective way to ensure minimum levels of energy efficiency in new commercial and residential buildings. EECA works alongside the building regulator to progress ongoing changes to the New Zealand Building Code and compliance documents to promote more energy efficient buildings. This work is designed to implement the National Energy Efficiency and Conservation Strategy (NEECS) target to achieve best practice energy performance in new residential and commercial buildings, so that by 2016:

- New homes are able to maintain an internal temperature of not less than 18°C and not more than 25°C at reasonable cost and without resorting to significant external use of heating or cooling energy.

- New commercial buildings achieve a mean energy performance of less than 100 kWh/m².[46]

It is understood that the Building Code will soon be reviewed and this will represent an opportunity to support EECA's advocacy in this area.

17.1.11 Regional policy

Chapter 5 of the ARPS provides considerable guidance on the role of the ARC in energy policy. Methods under section 5.4.2 include:

"1. The ARC will support the role of the Energy Efficiency and Conservation Authority (EECA) in providing to all sectors of the community advice and information on the benefits of energy efficiency and conservation practices, the availability of energy efficient products, and the use of renewable energy sources.

…

3. The ARC will serve as a role model by implementing energy efficiency and conservation practices in its management programmes.

4. The ARC will advocate energy conservation and the adoption of energy efficient practices.

…

6. Provision should be made in district plans requiring consideration of energy efficiency where that is relevant to consideration of the effects of activities in the consent granting process.

…

10. The ARC will advocate that central government considers all the above points and introduces a comprehensive and consistent range of measures to promote energy conservation and efficiency, and the development of sustainable forms of energy, and formalise these in the preparation of a National Policy Statement on Energy in accordance with the powers and processes provided by Part V of the RM Act.

11. The ARC will establish a regional energy forum to bring together energy interest groups of the Region in order to advocate relevant energy matters on behalf of the Region, including the need for a National Policy Statement on Energy."

There have been considerable advances since these methods were developed, but they remain fundamentally sound and relevant. Some opportunities for greater advocacy have been set out in the previous section.

[46] EECA website - http://www.eeca.govt.nz/programmes/building.asp

The purposes of a regional energy forum could perhaps be served by raising energy as an issue to be considered through the Regional Growth Forum.

The ARC also has other programmes that may have an energy dimension. It would be useful to have energy considered through the Auckland Regional Economic Development Strategy, for example, in terms of promoting energy efficiency in business, promoting energy efficiency as a business opportunity and advocating for security of supply to businesses. Similarly, it is important to co-ordinate activity with Civil Defence and natural hazard functions, recognising the importance of security of energy supply.

17.1.12 Actions by other regional councils

Some regional councils appear to have advanced their thinking considerably on energy issues. The Canterbury Regional Council (ECan) has, for example, recently developed a non-regulatory Regional Energy Strategy to address:

- Potential threats to energy supply.
- Increasing demand for energy, particularly from fossil fuels.
- Environmental impact.
- Lack of guidance at national level.

As part of their commitment to renewable energy, ECan have directly contracted to source power from a wind generator.

The Wellington Regional Council has set a number of energy targets for 2013 in their 2003-2013 LTCCP:

- *"Fewer than 400 million litres of petrol and diesel used for transport purposes per annum (currently 442 million litres).*
- *At least a 500% increase in electrical energy produced from renewable energy produced from renewable energy resources in the region (currently 14 Gwh).*
- *Greater Wellington Regional Council's 'carbon footprint' reduced by 10% per annum."*

Most notably, Northland Regional Council is developing a non-statutory energy plan for an issue which has significant cross-boundary implications with Auckland:

"In Northland, there is a very small hydro-electric power station on the Wairua River and a geothermal power plant at Ngawha. The vast majority of Northland's power needs are generated from outside the region and transmitted via the national grid through Auckland. Potential exists for expansion of other electricity generation options to meet the region's foreseeable needs. These alternatives need to be investigated further. The Northland Regional Council intends to facilitate the development of a non-statutory Regional Energy Plan for Northland, working with stakeholders such as District Councils, power trusts and key industries. The objective of such a plan would be to develop a long term, sustainable energy strategy for Northland." [47]

Clearly there are opportunities to consider the experience of other Regional Councils and to work with the Waikato and particularly Northland Regional Council to ensure a coordinated approach.

17.1.13 Issues and options

If the Council choose to take a greater role in energy policy and planning, a sound information base will be essential. It is proposed that officers prepare an issues and options paper with the following purposes:

- Inform councillors on the range of energy issues facing the region.
- Provide an information base for consideration of the issues.
- Enable prioritisation of issues for further action.

Options to be explored by the paper could include:

a) Preparation of a forecast energy demand analysis for Auckland (and to the extent that it is relevant, Northland) in the short, medium and long terms, with energy efficiency uptake scenarios factored into projections. This project could draw on ARTA work programmes to the extent that they deal with transport energy matters.

b) An analysis of energy supply potential in Auckland and Northland in the short and medium term.

c) Preparation of a regional plan or strategy for energy, with the initial presumption that it will be on a non-statutory basis. An energy strategy could potentially involve direct expenditure on energy outcomes (subsidies for solar water heating for example). However it is anticipated that any strategy would be directed to focus on advocacy and regulatory methods in order to avoid significant expenditure.

[47] Northland Regional Council LTCCP 2004-2014, p35

d) Further implementation of the roles for local authorities set out in the Energy Efficiency and Conservation Authority's Action Plan: Central and Local Government Programme.

e) Advocacy in the process for developing a National Policy Statement for electricity transmission.

f) Advocacy for increased consideration of energy efficiency in the review of the Building Code.

g) Liaison with Auckland territorial authorities to develop a process for regional co-ordination on energy issues.

h) The potential to host a conference or seminar for discussion of the respective roles of the ARC and territorial authorities in energy planning, particularly in response to the RMA amendments. This would also help us to answer questions such as:

- How should energy issues be addressed in the ARC's consent functions?
- Should the ARC advocate for energy efficiency at a local level through its policy implementation work and if so, how?

i) Consideration of energy issues is through other regional processes (such as AREDS).

j) Working with the Northland and Waikato Regional Councils to address security of electricity supply and related energy issues in the top of the North Island.

It is anticipated that the first two projects (a and b) would partially utilise existing work, such as the EECA programme on renewable energy potential and the report to the Electricity Commission on alternatives to transmission upgrade. Obviously close liaison with the Northland Regional Council would also be important.

Potential steps in a strategic process for addressing renewable energy have been set out in MfE's Quality Planning website and the relevant suggestions are attached to this report. While this paper is focused on renewable energy generation the process steps are considered generally applicable to a broader strategy for energy management.

Once the issues and options paper was completed, a workshop could be held with councillors to discuss the paper and an appropriate way forward.

17.1.14 Budgetary implications

A work programme with the elements discussed in this report is extensive and would require significant allocation of resources. These resources are not available in the current financial year and work of this scale is not provided for

in the 2005/06 year. It is likely to require re-prioritisation of work programmes or additional resources.

It may be possible to secure external funding for some of the proposed work. For example EECA's EnergyWise Grants and Loan Scheme provide incentives to encourage organisations to undertake energy audits of their facilities and implement the subsequent audit recommendations. The Scheme encourages public agencies to make investments in energy efficient technologies or projects.[48]

17.1.15 Conclusion

There is a legislative mandate for an ARC role in energy planning. The Energy Efficiency and Conservation Authority's Action Plan for Central and Local Government Programme and the Auckland Regional Policy Statement elaborate on what this role should be. This mandate and direction is coupled with a strong practical imperative – the need to ensure that Auckland maintains a secure energy supply.

If the Council wishes to explore the wider issues around its role in planning for energy, this will require a detailed assessment via an issues and options paper, which would inform councillors before a workshop to discuss any new initiatives.

ATTACHMENT

Excerpt From Quality Planning Guidance Note On Renewable Energy.

RECOMMENDATIONS

a) That the report be received.

b) That consideration be given to officers commissioning an issues and options paper for the ARC's role in energy planning.

[48] Hood, Tania, EECA, Changing the way we think about energy - the role of planners in achieving a sustainable energy future? Paper to NZ Planning Institute conference, May 2003.

ATTACHMENT 1: EXCERPT FROM QUALITY PLANNING GUIDANCE NOTE ON RENEWABLE ENERGY

Strategic Responses

The effectiveness of the responses to recognising the benefits of renewable energy is enhanced if RMA policies are dovetailed and integrated with local authorities' wider strategic initiatives.
Under the Local Government Act 2002, issues relating to energy should be an integral part of policies and programmes developed to promote sustainable development within every local authority, driven by the overarching direction provided by the Long Term Council Community Plan (LTCCP).

Even when energy may not be an explicit issue identified by the community, it will nevertheless be an integral factor in many other issues. The importance of the benefits of renewable energy should therefore be on the agenda during consultation and in public information exercises to ensure it is fully understood and discussed.

Consider whether to take a proactive approach to address issues concerning renewable energy, working in partnership with key stakeholders to identify areas in which actions could be taken. Such partnership may occur through high-level interaction (for example, at CEO level) and/or between Council staff and appropriate representatives from key stakeholder such as energy suppliers and the building sector. It is useful to have an in-house 'energy advocate' lead the process.

As an initial stage to developing strategic response, a scoping exercise should be undertaken about the state of renewable resources in the district/region, to develop a good understanding about the existing level of energy production based on renewable energy sources, the potential for future development, and the consequential environmental effects (for example, refer to Renewable Energy Resources in Canterbury: Potential, Barriers and Options, June 2002). This exercise should identify areas in which a proactive approach may be needed to address issues, and how best such responses are best pursued (for example, through District Plan controls, cooperative initiatives under the Local Government Act, or educative programmes).

Local authorities' broader strategic policies and initiatives on renewable energy, particularly in terms of promoting proactive responses, should be integrated with policies on renewable energy in RMA plans. Preferably, changes to RMA plans and policy statements should only be made once the broader strategic direction and initiatives have been established to ensure an effective dovetailing of policies.

Strategic initiatives that fall outside the RMA should include developing appropriate partnerships with other parties and interests to encourage energy efficiency and exploring means by which renewable energy can be promoted, both within a region or district/city and beyond.

Working with other local authorities is also beneficial, particularly in terms of benchmarking - looking for new approaches taken by other organisations. Established in 1997, the Energywise Councils Partnership programme is now more relevant than ever as a forum for councils to address these strategic issues, as well as developing initiatives and programmes. The partnership is a good forum for working with the Energy Efficiency and Conservation Authority in terms of identifying issues and areas in which further guidance and information can assist councils in developing and implementing effective programmes and policies (Refer

to page on the Partnership; further details can be found at the Energywise website).

RMA Policy-making

While local authorities may not respond immediately to the new matter in terms of developing specific proactive policies on the benefits of renewable energy, at the least, councils should begin to integrate considerations relating to the benefits of renewable energy within their policy-making processes.

In General

Wherever possible, **reviews of RMA policies and plans** should be integrated with wider and more strategic initiatives under the Local Government Act: i.e., RMA policies should be one integral component of an overall energy strategy.

There should be adequate integration of renewable energy considerations into all Councils' RMA policy development programmes, from specific matters to broader issues regarding urban form, land use densities and transportation networks.

A critical consideration will be to **distinguish between domestic and commercial scale renewable energy production.** While the scale of commercial energy proposals is often best addressed through the resource consent process, many small-scale renewable energy projects such as domestic wind turbines could be provided for as permitted activities possibly subject to standards, or through a low level consent process, depending on the scale of effects (i.e., controlled or restricted discretionary activity).

Regional Policy Statements

Currently, **regional policy statements** usually contain policies on energy issues, including renewable energy. If not, such matters may need to be brought into consideration.

It may be appropriate to develop **policies on promoting the benefits of renewable energy,** in partnership with the constituent local authorities and other key stakeholders. For example, such policies could address the management of renewable energy projects such as wind and hydro energy generation within the region, as well as broader issues such as sustainable urban growth and development.

Regional policy statements should **identify the coordinative approaches** that are required to enable the benefits of renewable energy to be more effectively realised within the region.

Regional Plans

Some renewable energy projects, such as geothermal energy production, large wind farms, and hydro-electricity schemes, involve earthworks and water permits under regional plans. Where relevant, regional plans ought to be reviewed in terms of how they address the benefits of renewable energy in the consideration of such consent applications.