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NEW ZEALAND
Area (sq km): 268,680
Population (X1000, 2007): 4,193
Capital: Wellington
Other cities: Auckland, Christchurch
Language: English
Currency: New Zealand Dollar
Exchange rate (per $US, 2007): 1.361
GDP ($million, 2007): 130,429
Frequency (Hz): 50
Voltage: 240
Electricity consumption (kWh per capita, 2007): 10,370

New Zealand is located in the South Pacific Ocean about 2,000km east-southeast of Australia. The country has two main islands – North Island and South Island – as well as many smaller islands. New Zealand also administers the island territories of the Cook Islands, Niue, and Tokelau. Much of North Island is mountainous country and it has numerous rivers, including the Waikato River, New Zealand's longest, which flows northwest from Lake Taupo to the Tasman Sea. North Island's active volcanic area has many geysers and hot springs and there are occasional heavy earthquakes. South Island has even more spectacular scenery with the Southern Alps rising to over 3,700m atop Mount Cook. The Clutha is the longest of South Island's many rivers.

Much of New Zealand has a pleasant temperate to subtropical climate with plentiful precipitation, fertile soils, and rich coastal waters. In the first half of the 20th Century, this led to an economy based on farming, livestock rearing, fishing, and timber production with exports largely consisting of raw and processed foods, wood, and wool. New Zealand also has a wide variety of mineral deposits including coal, gold, limestone, dolomite, and magnesite along with natural gas. Due to its size, climate, and isolated location, New Zealand has one of the world's great assemblages of indigenous species of plants and birds. Ecotourism is of growing importance.

Historians have concluded that New Zealand was uninhabited by humans as late as 1100 AD when Maori sailors first began to colonize North Island from their home islands in Polynesia. The Dutch explorer Abel Janszoon Tasman visited about 1640 and Captain James Cook took possession of New Zealand for Britain around 1770. Whalers and missionaries began to expand their settlements, movements strongly opposed by the Maoris. The Treaty of Waitangi was signed in 1840 between the United Kingdom and a council of Maori chiefs and, in the next year, the UK made New Zealand a separate crown colony. Today, New Zealand is a stable parliamentary democracy with 12 local government regions and four urban authorities. In 1984, the election of the Labour Party in New Zealand initiated fundamental changes in what had been essentially a statist system. Over the next 25yrs, the New Zealand government fostered a free-market economic outlook and privatized many state-owned enterprises (SOE).

As a large island economy, albeit mostly self-sufficient, New Zealand has struggled with inflation. Robust consumer spending helped make for steady growth from 2000-2005, but increases in central bank interest rates led to larger capital inflows and a stronger NZ dollar, and a growing current account deficit. The economy entered recession before many other OECD countries and contracted for over a year during 2008/09. Real GDP dropped 1.6% in 2009, although the economy started to expand late in the year. Inflation is now running at 2-4% with unemployment at about 6%. Services account for nearly three-quarters of economic activity, although New Zealand has maintained its agrarian nature in may locales.

New Zealand has between 112mn and 171mn barrels of remaining recoverable oil reserves. Thus far, a third of total production has come from the Maui oil and gas field – the country's largest – located off the southwestern coast of Taranaki, North Island. Mean 2009 national oil production was 54,000 bbls/day (bpd), much of it of high quality crude, most of which was exported.[1] The lead production company is **Shell Todd Oil Services Ltd (STOS)**, a 50:50 joint venture of **Shell** and **Todd Energy**, which produces 85% of New Zealand's natural gas and an appreciable amount of the country's oil.

New Zealand Refining Co Ltd (NZ Refining) owns and operates New Zealand's only oil refinery at Marsden Point in Northland. The refinery was commissioned in 1964 and supplies most of the country's refined oil, gasoline, diesel, and jet fuel requirements. The refinery was expanded in 1985 and upgraded in 2009: it is now capable of processing 120,000 bpd. The refinery company is jointly owned by **BP**, **Caltex**, **Exxon Mobil**, and **Shell** (85% in total), and public shareholders (13%).

Natural gas has been a major energy resource for New Zealand since the onshore Kapuni field in South Taranaki began producing gas for distribution to North Island in 1971. Some years later, the offshore Maui field came on-stream along with five smaller onshore fields in the Taranaki basin. In September 2006, first commercial gas flowed from the Pohokura field located off the Northern Taranaki : this is now New Zealand's largest gas resource. It owned by **Shell**, **Todd Petroleum**, and Austria's **OMV**. Natural gas production in 2009 was 164bn ft^3 (bcf), up about 3% from the previous year. New Zealand's remaining natural gas reserves are estimated to be 1.2-1.9tn ft^3 (tcf).

New Zealand's natural gas industry is largely in private hands. In 1967, **Natural Gas Corp (NGC)** was established by the New Zealand government as a state-owned company to buy, process, transport and wholesale Kapuni natural gas. In 1978, **NGC** became a subsidiary of **Petrocorp**, which in turn was sold by the government in 1988, at which time **Petrocorp** became a subsidiary of now-defunct **Fletcher Challenge**, at that time an industrial holding company that was the largest firm in New Zealand. In 1992, **Fletcher Challenge** sold two thirds of **NGC** and the new parent company, **NGC Holdings Ltd** was listed on the New Zealand Stock Exchange. Later, **Australia Gas Light Co (AGL)** became the majority owner of **NGC**, but today, its assets are controlled

[1] The **Ministry of Economic Development** maintains New Zealand's energy statistics.

by **Vector Ltd**, an energy company 75.1%-owned by the **Auckland Energy Consumer Trust (AECT)**. **Vector** is thereby principal owner and operator of the country's natural gas pipeline system – 3,400km of high-pressure pipeline and 2,600km of distribution pipeline on North Island -- as well as a major wholesaler and retailer of natural gas. The company also owns and operates a gas processing plant at Kapuni and has other energy interests.

In March 2010, New Zealand's Prime Minister officially opened the NZ$1.3bn Kupe Gas Project almost 25yrs after the Kupe gas field was discovered in 1986 south-southeast of Maui field. The development is owned by Australia's **Origin Energy** (50%), local electricity company **Genesis Power Ltd** (31%), **New Zealand Oil and Gas** (15%), and Japan's **Mitsui and Co** (4%). It is expected to supply about 15% of New Zealand's natural gas demand and 50% of the country's liquefied petroleum gas (LPG) demand.

New Zeland's indigenous natural gas resource base is gradually being consumed and the country's heavy gas users have examined other supply options. In October 2006, for example, **Genesis Energy** and fellow power company **Contact Energy Ltd**, operating as a new joint venture called **Gasbridge**, said they were selecting a site at Port Taranaki to evaluate for construction of a liquified natural gas (LNG) terminal. In July 2009, the partners said they would not proceed with consent applications, but planned to hold the site as a backstop option for possible future use.

In addition to gas and oil, New Zealand also has substantial coal reserves and coal has been an important energy source since the late nineteenth century. Total economically recoverable reserves are estimated to be 9bn tons and production in 2009 was 4.6mn tons, of which about half is exported (mostly metallurgical coal). New Zealand has 22 active coal mines, four underground and the remaining opencast. In 1901, the Coal Mines Amendment Act allowed the government to open and work coal mines and **State Coal Mines (SCM)** ran as a government trading enterprise until 1987. That year, **Coal Corp of New Zealand** was incorporated as a private company and purchased a large part of the **SCM** business. In 1996, **Coalcorp** was rebranded **Solid Energy New Zealand Ltd**. The company is responsible for about 80% of New Zealand's coal production and is also responsible for the rehabilitation of a number of former mine sites across the country.

The country's coal resources are well described and include workable seams in the Northland, Waikato and Taranaki regions of the North Island, and in the Nelson, West Coast, Canterbury, Otago and Southland regions of the South Island. Most of the recoverable resource is in the South Island, mainly in large lignite deposits in Southland. The North Island resource is almost entirely subbituminous coal. In 2008, 60% of production came from opencast mines at Rotowaro and Stockton. The 1,000-MW Huntly power station in Waikato consumes about 40% of New Zealand's annual domestic coal production.

New Zealand does not have many heavy industrial developments. **New Zealand**

Aluminium Smelters Ltd (NZAS) owns and operates New Zealand's only aluminum smelter at Tiwai Point, near Bluff. It is a joint venture company owned by **Comalco New Zealand Ltd** (in turn owned by of **Rio Tinto Alcan**) and **Sumitomo Chemical Co**.

Methanex New Zealand Ltd owns and operates large-scale methanol plants at Motunui and Waitara Valley in Taranaki on the west coast of the North Island.

Electric Power Overview

During a decade of extensive restructuring activities beginning in the late 1980s, New Zealand's electricity sector was completely reorganized. In 1987, a state-owned utility system known as the **Electricity Corp of New Zealand Ltd (ECNZ)**, was formed from what had been a government department for more than 80yrs. **ECNZ** took control of most of the country's generating capacity and the transmission system. It was the country's largest business and produced about 95% of all electricity with the balance produced by local electric power boards running small power plants in addition to their distribution business.

As part of a general makeover of the economy, restructuring of the electricity sector had a high priority and even though the reformist Labour government was put out of office at the end of 1990, the new government kept the effort moving forward. The first major step was in July 1990 when **ECNZ** started the spin-off its transmission group into an entity called **TransPower Ltd**, a process finally completed in July 1994. State-owned **TransPower** continues as the country's transmission system operator (TSO).

Over the next decade, a complicated shuffling of electricity assets ensued along with the evolution of a complex wholesale electricity market structure. In April 2003, the restructuring effort (described in more detail below) culminated in an industry referendum on the adoption of a single market rulebook and a single market governance body to replace three existing regulatory schemes. This referendum did not obtain a majority and the result was that a new Crown entity, the **Electricity Commission**, took over operational control of the wholesale market effective in March 2004.

Today, New Zealand's electricity sector has four main utility components; the generation companies which run the main power stations, **TransPower** running the high-voltage (HV) network, the distribution companies running the local medium- and low-voltage (MV and LV) networks, and the electricity retail companies, which buy wholesale electricity and for onward sale to consumers. New Zealand also has a group of commercial and industrial companies that operate captive power stations as well as a number of independent power producers (IPPs). Retailers can purchase electricity directly from smaller generators connected directly to distribution networks such as operators of biomass, landfill gas, and wind power plants.

The **Electricity Commission** is responsible for market compliance and industry

governance as well as promotion of measures to maintain industry and market efficiency. New Zealand's spot market is run on a pool basis whereby electricity generators offer electricity to the market and retailers bid to buy the electricity.

Electricity in New Zealand is largely generated from hydro, gas, coal and geothermal resources with an increasing development of wind generation. There are about 40 major power stations connected to the grid. The main generator companies (gencos) are **Contact Energy Ltd**, **Genesis Power Ltd**, **Meridian Energy Ltd**, **Mighty River Power Ltd**, **Todd Energy Ltd**, and **TrustPower Ltd**.

Transpower owns and operates the national HV grid. The **Electricity Commission** has a contractual service provider agreement with **Transpower** to ensure real-time grid management.

As of April 2010, there were 29 lines companies running New Zealand's local distribution networks. These are owned by a mix of locally-owned cooperatives, trusts or territorial authorities, municipalities, and overseas corporations. Generally, the lines companies sell their services to retailers who manage the electricity supply agreements with end consumers. Some commercial and industrial consumers contract directly with lines companies for electricity supply. Almost exactly half of the distribution companies are on North Island and half on South Island.

New Zealand's power retailers buy wholesale electricity at spot prices from the gencos. Their charges include the electricity cost plus charges for transmission and line services. The key retailers include **Bay of Plenty Electricity**, **Contact Energy Ltd**, **Empower Ltd**, **Energy Online**, **Genesis Power Ltd**, **King Country Energy**, **Meridian Energy Ltd**, **Mercury Energy Ltd**, and **TrustPower Ltd**. Consumers can choose between retailers for electricity supply.

As of 2009, New Zealand's generating capacity totaled 9,486 MW, of which 5,905 MW was installed on North Island and 3,582 MW on South Island. By fuel/technology, the 2009 capacity was 5,378 MW hydroelectric, 1,563 MW natural-gas fired, 1,000 MW coal-fired, 155 MW diesel-oil fired, 27 MW landfill gas and biogas, and 240 MW multifuel cogeneration. All of New Zealand's conventional oil-fired generating units have now been retired.

In 2009, 42,010 GWh of electricity was generated in New Zealand. By fuel type, this was 57% hydroelectric, 20% gas-fired, 11% geothermal, 7% coal-fired, and 4% from wind plant with the balance from other minor sources. In 2009, the five major generating companies provided 93% of New Zealand's generation. These were **Meridian Energy** (32%), **Contact Energy** (24%), **Genesis Energy** (18%), **Mighty River Power** (15%) and **TrustPower** (5%). Just under 58% of New Zealand's power production in 2009 was on North Island.

The largest hydro stations are on South Island and include **Meridian Energy's**

Benmore (540 MW), Manapouri (742 MW), and Ohau A-C (736 MW), and **Contact Energy's** Clyde (432 MW) and Roxburgh (320 MW). The largest hydro plant on North Island is **Mighty River's** Maraetai A&B (364 MW). All New Zealand's thermal plants are on North Island. These use natural gas, coal, and geothermal energy, all supplied from domestic sources. New Zealand's largest thermal plant is the coal- and gas-fired Huntly (1,000 MW) owned by **Genesis Power**. Other large plants include **Contact Energy's** Otahuhu (420 MW) and Taranaki (363 MW) power stations, both gas-fired combined-cycle gas turbine (CCGT) plants. New Zealand's largest geothermal power plants are Wairakei (173 MW), Taonga (140 MW), and Ohaaki (104 MW). Taonga is owned by **Mighty River**, the other two plants are owned by **Contact Energy**.

In an average year, around three-quarters of New Zealand's electricity comes from its geothermal and hydroelectric plants. Most hydroelectric power in the country comes from the South Island (usually about 70%), but at least 60% of the demand is in the North Island, and half of that is in the Hamilton-Auckland area. This makes the HVDC transmission link between the two islands extremely important. When it was completed in 1965, the HVDC Inter-Island link had the world's two longest and highest-capacity submarine power cables, along with the largest undersea power cables. The original equipment is obsolete and in the process of replacement (see below).

Given the dominance of hydroelectricity in New Zealand's power sector, water supply is naturally of great interest. During the winter of 1992, the county experienced very low inflows into hydro lakes. Compulsory electricity curtailments were only avoided by voluntary cutbacks and the closure of part of a **Comalco** aluminum potline. An official inquiry prompted by widespread public criticism of **ECNZ** concluded that the drought was a 1 in 100 year occurrence and that the utility had done an appropriate job given the circumstances. Nonetheless, the drought resulted in the implementation of a 1:60 rather than a 1:20 dry-year reserve standard and prompted **ECNZ** to advance the commissioning of the Clyde project on Lake Dunstan. Similar "dry year" conditions prevailed in 2001, 2003, and 2006 lending continued urgency to government efforts to promote construction of new thermal power plants to ensure security of supply.

New Zealand's geothermal power industry dates to the mid-1950s with the first fields developed at Kawerau and Wairakei in the Rotorua-Taupo area. Today, geothermal plants account for around 10% of the country's electricity production.

In 1959, the first major geothermal power plant in New Zealand was commissioned at Wairakei 9km north of Taupo. Some of the original equipment is still operating, the oldest such machinery that continues in regular service.

In 1989, the 116-MW Ohaaki plant was completed at the Broadlands field as New Zealan's second large geothermal power station. The plant has never run at full capacity, illustrating the engineering difficulties involved in securing geothermal energy. Three new deep wells of over 3,500m were drilled to support increased output. Two of these produced viable results and further exploration is underway.

Due to decades of experience, local consultants have found work in the development of new geothermal plants in Indonesia and the Philippines.

In September 2007, New Zealand Prime Minister Helen Clarke announced that the country intended to commit to 90% renewable electricity by 2025. This represents a 20-point jump from the present-day 70% level and the effort promises to be very challenging. A key issue is the matter of wind (or solar) power intermittency and the periodic fall-off in hydropower output when precipitation patterns lower river flows. Geothermal resources can also decline with usage.

Customers and Sales

At the end of 2009, New Zealand's power companies had 1.96mn customers. Total demand was essentially unchanged from 2008, up only 0.67%. By category, consumption in 2009 was 33% residential, 23% commercial, and 44% industrial.

The number of consumers switching electricity suppliers has been increasing gradually. From 2004-2008, the annual percentage changing suppliers was from 8.9% to 10.8%/yr, while in 2009, the number increased substantially to 14%.

Tariffs and Pricing

For the year ending March 2009, the average retail electricity cost in New Zealand was NZ$0.1546/kWh. By customer category, the average cost was NZ$0.103/kWh for industrial users, NZ$0.1823/kWh for agricultural uses, NZ$0.1519/kWh for commercial users (including transport), and NZ$0.20.92/kWh for residential customers.

Transmission and Distribution

As of March 2009, New Zealand's HV grid included 13,046km of 220-, 110-, and 66/50kV lines and substations with 14,106 MVA installed capacity. North and South Islands are interconnected by three 40km high-voltage direct-current (HVDC) subsea cables across Cook Strait. Pole-1 of the HVDC link was commissioned in 1965 and runs over 600km from Benmore in the center of South Island to the Haywards substation in the Hutt Valley in the lower North Island. Pole-2 was completed in 1991. The subsea cables transmit at 350kV and 270kV and, after some additional modifications in 1992, have a capacity of about 1,200 MW.

The backbone of the North Island HV grid consists of 220kV lines running the length of the island from Haywards near Wellington through Auckland and on to Marsden in the far north.

Transpower has control centers near Hamilton (North Island) and in Christchurch (South Island). The communications network includes ultra high frequency (UHF), microwave and fiber optic links, and telephone circuits supplemented by leased circuits.

As of March 2009, the discos had 148,869km of distribution line and cable, of which 38,728km was underground. About 65% of the line length is on North Island. Total transformer capacity was 18,654 MVA.

In early 1998, New Zealand's transmission and distribution business got a great deal of unwanted international trade press attention following a five-week period of blackouts and brownouts of Auckland's central business district. The unprecedented blackout, which occurred during a heat wave, resulted in a prolonged investigation. It was caused by the successive failure of all four of **Mercury Energy** 110kV underground cables serving the central business district (CBD).

TransPower has a NZ$3.8bn capital expenditure program mapped out for 2010-2015. There are four main projects underway.

The HVDC Pole 3 project will cost an estimated NZ$672mn and is to complete in two stages, first an increase in bipole capacity of the HVDC link to 1,000 MW from 2012 and then to 1,200 MW from 2014. The project scope includes new converter stations at Haywards and Benmore, using state-of-the-art thyristor technology to replace the mercury arc ionic valves. The project will also upgrade the existing Pole 2 control systems at the end of 2012 and commission new dynamic voltage control equipment at Haywards in 2014. The principal contract to equip the new Pole 3 converter stations was awarded to **Siemens** in October 2009 and construction got underway in April 2010.

The NZ$824mn North Island Grid Upgrade (NIGUP) is one of the largest transmission projects taken up in New Zealand since 1960. There are three major components: an overhead transmission line, associated substations, and underground cables. The 186km, 400kV-capable overhead transmission line runs from a new substation at Whakamaru to a new switching station in South Auckland. In November 2008, **Transpower** awarded a NZ$230mn construction contract for this line to a joint venture of regional contractor **United Group Ltd** and **Balfour Beatty Utility Solutions**. Four underground 220kV cable circuits will run from the Whakamaru substation, two circuits to a new substation at the existing Pakuranga site and, at a later date, the other two circuits to Otahuhu substation. Construction got underway in January 2010 and the project is to complete in April 2012.

The NZ$473mn North Auckland and Northland (NAaN) project involves installing 37km of 220kV underground cables from Pakuranga to Penrose, through the Auckland CBD and on to Albany. Once operational around 2013, the project will reinforce security of supply and provide diversity into and across Auckland and on to Northland, as well as meet increasing demand for electricity in these regions.

The fourth major project is the Wairakei to Whakamaru Replacement Transmission Line Project. In September 2009, route options were released for a new, double-circuit, 220kV line between Wairakei and Whakamaru to be built by 2013 to replace an existing, single-circuit 220 kV line with a high-capacity double circuit line. The NZ$141 scheme is also known as the Wairakei Ring project and will support the connection of up to 1,000

MW of new generation (mostly geothermal) expected in the central North Island region over the next decade. Construction is to get underway in 2012.

In June 2010, **TransPower** completed a new NZ$99mn substation at Otahuhu to schedule.

Regulation

Aa noted, New Zeland's electricity sector overhaul got started in earnest in the mid-1990s. A major "upgrade" was completed in 2010 with the passage of a new electricity bill.

The New Zealand Electricity Market (NZEM), New Zealand's wholesale market for electricity, was established in October 1996 and operated until March 2004 within a code of practice known as the "Rules of NZEM," a multilateral contractual instrument developed through a consultative process by generators, purchasers, and traders. The rules covered electricity trading and financial settlement within a pool system. Electricity was priced at market-clearing levels and the price was not capped. The market traded through a custom-built, computerized trading and information system known as COMIT.

For seven years, the **Markeplace Co Ltd (M-co)** was the lead organizer of NZEM. Its roles included market administrator (managing the rule change process and assisting and supporting the Market Surveillance Committee); clearing and settlement manager; and pricing manager (calculation of provisional and final prices). **M-co** also ran COMIT. Up to 90% of the total volume of New Zealand's electricity was traded through NZEM.

In March 2004, control of the New Zealand electricity market was passed to the **Electricity Commission (EC)**, a newly established Crown Entity. The **EC** was established under the Electricity Act 1992 (as amended by the Electricity Amendment Act 2001) when the electricity industry was unable to agree a set of rules for governing electricity supply during dry years and amid more generalized government concerns that the existing industry arrangements did not provide for the effective management of the power sector. The **EC** was accordingly tasked with providing oversight of the operation and governance of the electricity market in accordance with the rules and regulations under the Electricity Act 1992. These rules and regulations were based on the NZEM Rulebook, but modified to reflect the move to a statutory regime.

From that point forward (ca 2004), there have been three entities comprising New Zealand's electricity policy and regulatory structure: the **Ministry of Economic Development (MED)**, the **Electricity Commission (EC)**, and the **Commerce Commission (CC)**. The Ministry remains the primary policy maker and has input on corporate governance and market structure since it monitors market performance, competition issues, and electricity prices. **MED** also oversees the **Electricity Commission**.

The **Electricity Commission's** main function is to develop, monitor, and enforce electricity market rules. The **EC** was also made responsible for emergency management, public information dissemination, forecasting, regulation of transmission investments, and promoting electricity efficiency.

The **CC** is New Zealand's competition regulator and has a specific role in regulating transmission system revenues as well distribution revenue and quality.

In April 2009, the Minister of Energy and Resources began a sectoral review to address growing concerns over electricity prices and the appropriate allocation of risk among industry participants. This resulted in 29 proposed measures to improve market performance. These recommendations were incorporated into an "Electricity Industry Bill" introduced to parliament in December 2009 and passed in September 2010.

The new Electricity Bill will have a number of significant impacts on New Zealand's electricity business. First, the **Electricity Commission** will be replaced by an **Electricity Authority (EA)** as an Independent Crown Entity. The **EA** will be refocused on developing and enforcing market rules to promote competition and efficiency. **Transpower** will now take the lead on emergency management, forecasting, and related activities, while remaining subject to rules set by the **EA** and to expenditure oversight by the **CC**. The **Energy Efficiency and Conservation Authority (EECA)** will take over the **EC's** electricity efficiency programs.

The new bill has other important provisions. Tekapo A and B power stations (189 MW) are to be transferred from **Meridian Energy** to **Genesis Energy** and the government will also require virtual asset swaps among the three state-owned gencos via long-term hedge contracts. The legislation also includes provisions to let the lines businesses back into retailing, subject to various constraints, establishes a liquid hedge market to help generators and retailers better manage volatile spot prices, reduces the complexity of line tariffs, and establishes a fund to encourage consumers to shop for an electricity supplier.

Privatization and Restructuring

In large measure, the New Zealand electric power sector was unbundled and restructured on the U.K. model. In November 1994, the first major overseas investment was made when **TransAlta Corp** from Canada announced that it was acquiring a 20% stake in Wellington-based **EnergyDirect Ltd** for NZ$50mn.

In June 1995, a government Memorandum of Understanding (MOU) described a plan to split the generation sector into four pieces. In November 1995, **ECNZ** signed an agreement with a new SOE -- at first termed **EC2** and later renamed **Contact Energy Ltd** -- to sell eight power plants comprising 28% of the country's capacity. The transfer took effect in February 1996, at which time **ECNZ** received NZ$1.6bn as partial settlement for assets including two hydro plants, two geothermal plants, and four

thermal plants as well as development rights for the so-called Maui gas contract.

In October 1998, **TransAlta** bought **SouthPower** of Christchurch and became the largest distributor of electricity in New Zealand.

At the end of November 1998, the government announced that it would sell all of its shares in **Contact Energy** through a 60% public share float combined with a cornerstone share sale of 40%. The American utility affiliate **Edison Mission Energy (EME)** bid NZ$1.21bn for the 40% shareholding – about three times book value – and the public share float closed May 1999 with very strong interest in the share offering. During the second quarter of 2001, **EME** completed the purchase of additional shares in **Contact** for NZ$152mn, bringing its ownership to 51%.

In February 1999, the U.S. utility holding company **UtiliCorp United** (now **Aquila**) announced that its **UnitedNetworks Ltd** (formerly **Power New Zealand**) had completed the purchase of **TrustPower's** network areas on North Island, adding some 96,500 customers to **UnitedNetworks**. This made it the country's largest electricity distribution company with approximately a 30% market share. **UnitedNetworks** earlier acquired 142,000 lines customers from **TransAlta** and sold to **TransAlta** its retail electricity business in Auckland. **UnitedNetworks'** net expenditures in this double transaction were $243mn. **TransAlta** acquired the **Power New Zealand** name as part of the retail business.

In December 1998, Australia's **Pacific Hydro** and **Todd Energy** won a bid to purchase **Bay of Plenty Electricity Ltd (BPEL)** for NZ$52mn.

In April 1999, **ECNZ's** remaining power plants were divided among three new state-owned companies, namely **Genesis Power**, **Meridian Energy**, and **Mighty River Power**, and **ECNZ** essentially went out of business. **Mighty River Power** is based around the Waikato hydro stations and supplies customers of **First Electric** and **Mercury Energy** (formerly the **Auckland Electric Power Board**). **Genesis Power** has the Huntly thermal station, the Tongariro hydro stations, and the three Waikaremoana hydro stations. **Genesis** supplies the North Island retail business of **Powerco**, **Central Power**, and **Wairarapa Electricity**. **Meridian Energy** on South Island has the Manapouri and Waitaki hydro stations and supplies retail customers of **Wairarapa Power**, **NorthPower**, **Scanpower**, **CHB Power**, and **Waitaki Power**. **Meridian Energy** also supplies **Comalco New Zealand**.

In January 2000, **TransAlta Corp** announced that its subsidiaries **TEC Investments Ltd** and **TransNewZealand Energy Ltd**, had accepted an offer of approximately CDN$625mn from **NGC** for their 75.8% interest in **TransAlta New Zealand Ltd**.

The Electricity Industry Reform Act 1998 mandated that New Zealand's network businesses are to be owned separately from retail and generation businesses. Companies complied with these ownership separation requirements much more rapidly

than required with most companies having completed ownership separation by April 1999. Most existing electricity companies decided to retain ownership of their line (distribution) business and sell their retail business. The line businesses in New Zealand have a variety of ownership forms, varying from listed companies to local community-owned trusts. Arrangements were put in place in April 1999 to ensure that small electricity consumers can change electricity retailer. The state-owned electricity generators **Meridian**, **Genesis** and **Mighty River Power** decided to expand into the retail market, as did **TrustPower** and **TransAlta** (two former integrated distribution and retail companies) and **Contact Energy**.

This second phase of the industry restructuring included more asset purchases. In October 2002, **Aquila** completed the sale of its 70.2% interest in **UnitedNetworks** to **Vector Ltd** for $503mn. The sale was announced in June.

Another large transaction was the takeover of **Contact Energy** by Australia's **Origin Energy**. In July 2004, **Origin** entered into an agreement with **Edison Mission Energy** to acquire its 51.2% interest in **Contact** and in September 2004, the company gave notice of its intention to make an offer for all the remaining fully-paid ordinary shares. The **EME** transaction was completed in October 2006. The transaction cost **Origin** NZ$1.01bn in cash and a further NZ$535mn for assumed debt. The remaining shares of **Contact Energy** are listed on the New Zealand stock exchange.

In October 2006, **Alliant Energy Corp** announced its agreement to sell its interest in **Alliant Energy New Zealand Ltd (AENZ)** to local industrial holding company **Infratil Ltd** for NZ$445mn. At the time, **AENZ** had a 23.77% stake in **TrustPower** and **Infratil** now has a 51% ownership share of the power company.

In November 2008, Hong Kong's **Cheung Kong Infrastructure Holding Ltd (CKI)** announced the acquisition of the entire issued share capital of **Vector Wellington Electricity Network Ltd**. The company is now known as **Wellington Electricity Lines Ltd**.

New Power Plants

New power plants will have to be built in New Zealand since demand continues to increase, albeit at low to moderate rates. While endowed with a variety of fossil and renewable energy resources, plant developers must wrestle with a complex capacity addition and environmental planning process.

Erratic precipitation patterns have highlighted the problems with having a power system overly dependent on hydroelectricity. In any event, plants for construction of more medium- and large-sized hydro plants have already resulted in complicated and risky commercial arrangements. Meanwhile, a depleting natural gas resource base mitigates against any dramatic increase in gas-fired generation. For these reasons, various companies have seriously examined coal-fired generation options. This is generally

popular with business interests and local governments, but adamantly opposed by New Zealand environmentalists. Thus far, no new-build coal projects have advanced and it looks increasingly unlikely that any will be built in the future.

In September 1995, **ECNZ** sold the development rights for the 350-MW Stratford combined-cycle gas turbine (CCGT) plant to a consortium of **Fletcher Challenge** and **TransAlta**. At the transaction close, **Mercury Energy**, the primary power purchaser, took a 33.3% stake equally from the other partners. The plant was planned for one of New Zealand's original gas turbine sites about 50km north of New Plymouth in Taranaki. In May 1996, a turnkey, engineering, procurement, and construction (EPC) contract was awarded in May 1996 to **ABB** for a GT26 gas turbine in single-shaft configuration. US contractor **Stone & Webster** was plant engineer while civil works were carried out by **Fletcher Construction**. The $340mn plant was completed in June 1998 using fuel supplied from the Maui gas field. In March 1999, **TransAlta** bought out both partners, paying **Fletcher** NZ$37.4mn and **Mercury Energy** NZ$42.9mn, and was in turn bought out by **NGC** in September 2000. In December 2002, **NGC Holdings Ltd (NGC)** announced a conditional agreement sell its interests in **Stratford Power Ltd (SPL)**, which holds the gas company's share of the Taranaki plant. The sale of **SPL** to **Contact Energy** was completed for NZ$500mn, less adjustments for estimated working capital of NZ$8.6mn, resulting in net sale proceeds to **NGC** of NZ$491.4mn.

In December 1995, **Mercury Network Ltd** finalized a joint venture called **Mercury Geotherm Ltd** to build a 55-MW geothermal power station about 5km from Taupo. The other partner was the family of landowner Alistair McLachlan, which contributed land and geothermal energy rights to the project. **Mercury Network Ltd**, renamed **MEL Network Ltd**, and later a subsidiary of **Vector Ltd**, had a 67% stake in the project company. The Poihipi power station was officially opened by the Minister of Energy in August 1997 using a **Fuji** T/G set originally intended for installation at The Geysers in California. After market deregulation, it became increasingly uneconomic for **Mercury** to purchase plant output at the originally-agreed rates. **Mercury Network** therefore wrote off about NZ$50mn on its investment in the plant and, in December 1998, put the station in receivership with Auckland accounting firm **Smith Chilcott**. The plant was sold to **Contact Energy** in 2000.

In December 1996, a 110-MW gas-fired cogeneration plant was completed in Auckland by **TransAlta Energy** and **Mercury Energy**. The Southdown 2+1, CCGT plant has two **General Electric (GE)** LM6000 gas turbines packaged by America's **Stewart & Stevenson** and equipped with **Brush** generators, HRSGs from Canada's **Innovative Steam Technologies**, and an **ABB Stal** steam turbine. **Snowy Mountain Engineering Corp** from Australia was plant engineer and **Barclays de Zoete Wedd** was underwriter. **Mighty River** acquired Southdown in December 2002 and, in April 2006, ordered a single 45-MW **GE** LM6000C simple-cycle gas turbine to extend the plant. This was completed in 2007. Up to 26t/hr of process steam is supplied to an adjacent recycled-paper mill.

In mid-1997, **Contact Energy** placed a turnkey order with **Siemens** for a 390-MW, single-shaft CCGT block to be built at Otahuhu near Auckland. Problems with the **Nooter** HRSG supplied by **Hyundai** delayed completion of the new plant until December 1999. At that time, the V94.3A-based block was the world's largest and most efficient single-shaft CCGT plant. In 2005, Otahuhu-B was uprated from its 380-MW original capacity to 404 MW. A second block was planned, but **Contact Energy** was unable to secure sufficient gas supplies for the extension so the project was shelved in May 2002.

In 1998, **NGC** completed a small combined-cycle at its Kapuni gas plant. This has two 10-MW **Solar** Mars 100 gas turbines with **Ideal** generators, a 1.5-MW **Murray** steam-set coupled to one of the **Solar** machines in a single shaft arrangement, **Senior Engineering** HRSGs, and a 3.2-MW **Peter Brotherhood** steam set with a **Leroy Somer** generator

In February 1998, **GEC Alsthom** received a turnkey order for a 6001B gas turbine for a cogeneration project at the **New Zealand Cooperative Dairy** Te Rapa plant. The 40-MW machine went online in 2000 and is operated by **Contact Energy**.

In February 2000, the Mokai geothermal plant was dedicated using a deep, high-temperature resource 25km northwest of Taupo. Initially the land was developed for farming under the management of the **Department of Maori Affairs**. In 1996, the **Tuaropaki Trust** purchased the Crown's interests and decided to develop the geothermal field with a plant configuration pioneered by Israel's **Ormat Industries** that uses both the steam and brine components of the geothermal fluid. Accordingly, **Tuaropaki Power Co** awarded **Ormat** a turnkey contract for a 60-MW plant. **Mighty River Power** agreed to a guaranteed minimum floor price for the electricity produced and also agreed to operate the station. A 32-MW **General Electric** back-pressure turbine was used and the low-pressure steam is condensed in four bottoming **Ormat** binary units of 6 MW each. Two additional 6-MW binary units were installed to utilize the hot brine flow. The motive fluid in the binary units is pentane. An essentially similar plant was then built and Mokai-II was officially opened in February 2006. This has a 19-MW steam turbine from **Mitsubishi Heavy Industries (MHI)**.

In August 2002, **Tuaropaki Power Co** announced that **Ormat** had been awarded a turnkey contract for the 42-MW Mokai-II plant, which was completed in 2006. Financing for the NZ$90mn project was agreed with **ANZ Banking Group (New Zealand) Ltd**. **Tuaropaki Trust** has 75% ownership in **Tuaropaki Power Co** and **Mighty River Power** owns the remaining 25%.

In February 2003, **TrustPower** announced plans for its 70-MW Wairau Valley hydroelectric scheme and a resource consent application was lodged with **Marlborough District Council** in July 2005. The proposed installation comprises six separate small power plants ranging in size from about 7 MW to about 22 MW running over a 50km stretch of the Wairau River in Marlborough District. It incorporates the existing Argyle

(Branch River) plant completed in 1983 (3.8 MW).The Wairau Valley project could cost about NZ$275mn. The final resource consent was issued in July 2008 and promptly appealed.

In October 2003, **Ormat** signed a contract with **Contact Energy** for a 16.5-MW binary plant at Wairakei. The plant has two air-cooled energy converters using about 2,800 tons/hr (tph) of hot brine from the existing plant operations. Completion was in May 2005.

In June 2003, **Meridian Energy** announced Project Aqua, a $1.2bn, 570-MW hydro project on South Island. This elaborate scheme, New Zealand's largest generation project at the time, was planned to divert 70% of the flow from the Waitaki River to a 60km power canal with six 90-MW power stations 5 to 10km apart, each with a single Kaplan turbine. In October 2003, **Meridian Energy** was reported to be considering partial privatization as a way to advance the project. In March 2004, however, the company cancelled Project Aqua citing commercial uncertainties, particularly the assignment of water rights.

In November 2003, the New Zealand government agreed to buy three 52-MW oil-fired **Pratt & Whitney** FT8 gas turbines for a new peaking plant at Whirinaki, Hawke's Bay District. The turnkey plant went online in 2004 for "dry year" service at a cost of about NZ$150mn. **Contact Energy** is plant operator.

In May 2004, **Genesis Power** installed a 48-MW **GE** LM600PC Sprint gas turbine for peaking service at Huntly, the so-called "Project 40". In August 2004, the company confirmed plans to install a NZ$520mn, 385-MW combined-cycle at Huntly. In September 2004, **MHI** in consortium with Australia's **Downer EDI Ltd** was awarded a turnkey contract for the a 1+1 CCGT block with a M701F gas turbine. **Downer** completed civil work, equipment installation, HRSG fabrication and installation, and related activities. The plant, in planning since early 2001, went online in August 2007.

In May 2004, **NZ Refining** announced that the government had agreed to grant carbon credits for an 84-MW gas-fired cogeneration plant at the Marsden Point refinery. About half of the electric output would be available for sale into the grid. This project did not advance.

In September 2004, **Contact Energy** applied for resource consents for Hawea Gates. The plan involves adding a new hydropower station at the existing control gates at Lake Hawea, the storage lake for the Clutha hydroelectric scheme. The project was approved in June 2007, but subsequently delayed. Two 8.5-MW sets are now expected online in 2012 after about two years of construction.

In April 2004, **Silicon Metal Industries** proposed to build a 100-MW, lignite-fired power plant for a new ferrosilicon refinery planned at Pebbly Hills in Southland. The project was planned with **Solid Energy**, but did not advance.

In October 2004, it was reported that **Solid Energy** was developing a coal-fired power project of about 250 MW. Initial cost estimates were around NZ$330mn. The preferred site was north of Westport near **Transpower's** Waimangaroa Substation. This proposal has apparently been tabled.

In November 2004, **Mighty River Power** filed resource consent applications to repower the Marsden-B, a 250-MW oil-fired unit completed in 1979, but never commissioned. The site has the required transmission and cooling system infrastructure and a deepwater port. In March 2007, **Mighty River** terminated the Marsden-B repowering effort. In September 2009, it was reported that the main equipment had been sold to an unidentified Indian company for NZ$20.4mn for planned dismantling and reconstruction overseas. In the early 1980s, a 1,000-MW coal-fired plant was proposed for the site, but this also did not advance.

In March 2005, local dairy coop **Fonterra** received an air emission resource consent for a planned 250-MW coal- and gas-fired CHP unit to extend an existing 68-MW cogen plant at Hawera Dairy built by **Whareroa Cogeneration Ltd**, a 50:50 joint venture with **Todd Energy**. The cogen plant came online in 1996/98. The extension project did not advance.

In August 2005, **Mighty River Power** filed resource consent applications for the 90-MW Kawerau geothermal power station. This was the largest geothermal project in New Zealand for about 20yrs. In November 2006, Japan's **Sumitomo Corp** and **Fuji Electric** received a ¥10bn EPC order for the plant. **Fuji Electric** supplied the double-flash T/G set and related equipment and New Zealand's **Hawkins Construction Ltd** was hired as the lead civil contractor. Ground-breaking was at end of November 2006 and the plant was put into commercial operation in August 2008 about 1mo ahead of schedule at a cost of NZ$300mn. The generator is located 3km east of Kawerau Township and connects to a six-well steam field by an 8km pipeline.

In October 2005, **Genesis Energy** began a public consultation process for a CCGT plant in Rodney District near Auckland. The company acquired an option on a 18ha parcel of land 5km north of Helensville and obtained various resource consents for the NZ$500mn gas-fired power station, but the country's long-term development plan released in 2007 prohibited new coal, gas, and diesel power plants putting the Rodney project in limbo. The project's capacity has been variously quoted at 360 MW, 380 MW, and 480 MW.

In October 2006, **Meridian Energy** lodged the first stage application for resource consents for the proposed Waitaki North Bank hydroelectric project with **Environment Canterbury**. The project comprises a tunnel scheme to take water from Lake Waitaki and discharge it back into the Waitaki River 34km downstream near Stonewall. Two 130-MW generating units would be installed with potential annual output of 1,100 to 1,400 GWh. This would make it New Zealand's largest hydroelectric project since Clyde was finished in 1992. In September 2009, the **Environment Court** granted conditional

water rights for the North Bank project. A final investment decision on the NZ$900mn scheme is expected in 2012.

In January 2007, **Ormat Technologies** received a $20mn EPC contract from **Top Energy Ltd** for a 15-MW extension to the Ngawha geothermal power plant, New Zealand. The site is near Ngawha Springs, Akaroa County in West Coast District where **Top Energy** has been operating a 12-MW Ormat binary plant since June 1998. The new plant went online in October 2008. In total, the station provides about 70% of the electricity used in New Zealand's Far North. The Ngawha field is a large, but challenging geothermal resource with relatively low heat content and high levels of dissolved material and gases.

In August 2007, **Contact Energy** field consent applications for the 220-MW Te Mihi geothermal power plant north of Taupo. In September 2008, the **Environment Ministry** approved the application. A first 60-MW phase may be online in 2013.

In October 2007, **Meridian Energy** began filing planning, consent, and public information documents for a proposed 65-85 MW hydropower scheme on the Mokihinui River in Buller District about 40km north of Westport. This would feature an 80m dam on the Mokihinui River 3km upstream of Seddonville. The dam would create a 335ha ribbon lake extending about 14km upstream and generally around 200m wide. A new 29km transmission tie-line would traverse the Stockton Plateau and link with the existing Inangahua-Waimangaroa 110kV line. The project was granted resource consents in April 2010 but the approvals were appealed to the **Environment Court**. As of late 2010, the project was said to be on hold due to a forthcoming project on the Stockton Plateau (see below).

In January 2008, **Mighty River Power** was granted resource consent for the Nga Awa Purua geothermal project sited 10km northeast of Taupo. This was the power company's second joint venture with **Tauhara North No 2 Trust**. As with the Kawerau, **Sumitomo Corp** was the EPC contractor, **Fuji Electric** supplied the 140-MW, triple-flash T/G set and related equipment, and **Hawkins Construction Ltd** was the lead civil contractor. Construction got underway in April 2008 and was completed in January 2010. The NZ$430 power station, renamed Taonga, is close to the existing Rotokawa geothermal power station and was connected into existing 220kv transmission lines running over the field. With a maximum rating of 147 MW, Taonga has the largest, single-shaft geothermal turbine in the world and was officially opened by Prime Minister John Key on 15 May 2010.

In January 2008, Hawaii-based **Innovations Development Group (IDG)** and the **Kawerau A8D Ahu Whenua Trust (A8D)** executed a Memorandum of Understanding (MoU) which confirmed the selection of **IDG** for exclusive development rights to the geothermal resource under A8D land. This scheme is being promoted as a Native-to-Native business model (N2N) project. **IDG** is negotiating with various parties to provide technical and operational support for a proposed 50-100 MW geothermal

power station known as Kawerau KA-22.

In April 2008, **Contact Energy** contracted with **General Electric (GE)** to purchase two 100- MW, LMS-100 gas turbines for installation on the site of the company's former Stratford gas turbine station. These are the first LMS-100 machines in the Australasia region. **United Group (NZ) Ltd** was the EPC contractor and the new units went online in late 2010 to schedule. The project cost about NZ$250mn and is unique in the country in using gas stored nearby in the depleted Ahuroa gas field.

In July 2008, **Contact Energy** contracted Ormat to supply an construct a 23.3-MW binary geothermal power station on Centennial Drive in Taupo. At that point, the necessary wells had already been drilled. In May 2010, the NZ$100mn, 23-MW Te Hukka binary geothermal plant was completed 3wks ahead of schedule. The plant is also known as Tauhara One.

In September 2008, **Geothermal Developments Ltd (GDL)** commissioned the 9.5-MW Kawerau KA-24 binary geothermal plant. The local developer secured benefits from the now defunct "Projects to Reduce Emissions" scheme and commissioned **Ormat** to build the power station. In April 2010, the KA-24 project was sold to power company **Eastland Group** for an undisclosed price.

In November 2008, the local firm **Hydro Developments Ltd (HDL)** applied for resource consents for a hydroelectric scheme using tributaries of the Ngakawau River which have been polluted by outflow water from **Solid Energy's** Stockton coal mine property in Buller. In February 2010, **Solid Energy** came forward with a competing scheme in the same general area. In October 2010, the **HDL** scheme was permissioned and **Solid Energy** withdrew its opposition, having earlier contested the proposal in the **Environment Court**. In a joint statement, the companies said they had reached an agreement on using water from the Stockton plateau. The next steps are a geotechnical drilling program, project design, and fund-raising for the NZ$200mn+ project, which on present plans would comprise a 25-MW powerhouse at Granity and an 8-MW instatllation at Weka, each with two generating units. **HDL** also said it was negotiating land swaps with the **Department of Conservation**, which supported the project. Projected power production is around 240 GWh/yr, enough to power **Solid Energy's** and **Holcim Cement's** industrial operations in the area.

In November 2008, **TrustPower** received resource consent for a 46-MW hydroelectric plant on the Arnold River. This consent was appealed. The project will cost an estimated NZ$185mn and might come online in the 2015-2020 timeframe.

In March 2009, **Todd Energy**, said it would build a $NZ250mn, 200-MW CCGT power station. While sites in Auckland, Wellington and Taranaki were investigated, the company said that Taranaki was the likely location due to its proximity to gas supplies and transmission lines.

Renewable Energy Sources

Given the government's official goal of increasing renewable energy use in electricity production to the 90% level, it is safe to assume that the country will continue to expand the use of existing resources and likely expand to other resources not yet in wide use such as biomass and biogas. On the other hand, New Zealand is already heavily dependent on hydroelectricity and the prospects for new larger plants are limited. This leaves minihydro plants as the main area for expansion in the hydroelectric sector.

In 1998, **Networks South Ltd** commissioned the Opuha power station. This has a 7.4-MW **Kvaerner** Francis turbine and an Ideal generator.

In early 2003, **Pioneer Generation** started construction on Falls Dam, a 1.2-MW project in the Central Otago area. This has a turbine from **Turab** in Sweden coupled to a generator from Spain's **Alconza**.

In May 2008, **TrustPower** commissioned the Deep Stream hydro project at Waipori in Otago. This has two Francis turbines, one 3.1 MW and one 2.85 MW. The machines were manufactured by local suppliers **Hydro Works** and **Mace Engineering Ltd**.

Other than hydro plants, geothermal energy is New Zealand's most important renewable energy resource. New geothermal power projects are described in the previous section.

Wind energy is an attractive power generation option in New Zealand, which has an excellent wind energy resource capable of supplying 10-15% of electricity requirements without widespread modification to the existing grid according to some experts. **ECNZ** started an R&D program in 1989 and the country's first commercial wind plant was built in 1996 by **Wairapa Electricity** at Hau Nui 21km from Martinborough. Seven 500-kW **Enercon** E40 wind turbine generators (WTG) were put in.

At year-end 2009, total wind energy capacity in New Zealand amounted to 496 MW, nearly triple the amount in-place in 2006.

The country's first large-scale plant is **TrustPower's** 31.7-MW Tararua wind farm 11km north of Palmerston North. The plant consists of forty-eight 660-kW V47 **Vestas** turbines installed in 1998/99. In May 2003, **TrustPower** gave the go-ahead for a 30.9-MW plant extension, again with **Vestas** equipment. The new plant const NZ$60mn and went online in May 2004.

In May 2003, **Meridian Energy** announced development of the Te Apiti wind plant on the north side of Manawatu Gorge near Palmerston in southern North Island. The $100mn plant came online in August 2004 with 55 **Micon** 1.65-MW turbines ordered in November 2003.

In November 2005, **TrustPower** ordered 31 **Vestas** V90, 3-MW WTGs for Tararua -III. The extension went online in 2007.

In July 2007, **Meridian Energy's** White Hill wind plant went into operation as the first wind project on South Island. The plant near Mossburn in Southland has 29 **Vestas** V80 2-MW WTGs.

In October 2007, **TrustPower's** Mahinerangi project near Dunedin in Otago was granted resource consent. The first phase of the 200-MW scheme includes a dozen **Vestas** V90, 3-MW machines due for service in 2011.

In October 2007, **Meridian Energy** received local government approval for its 630-MW Project Hayes wind farm near Ranfurly, 70km northwest of Dunedin in central Otago.

In August 2008, **Contact Energy** said that the Environment Minister was calling in the company's resource consent application for the 540-MW Hauauru Ma Raki south of Port Waikato. In September 2008, **Contact Energy** filed a consent application for the 177-MW Waitahora project southeast of Dannevirke in Hawke's Bay. Original development was by local power company **Unison Networks Ltd** and wind plant developer **Roaring 40s**.

In November 2009, **Meridian Energy** awarded **Siemens** a contract for 28, SWT-2.3-101 wind turbines for the Te Uku wind park near Hamilton. This is the launch project for this 2.3-MW machine in the Asia-Pacific region. **Siemens** previously supplied 62, SWT-2.3-82VS wind turbines for the **Meridian** West Wind site.

In November 2009, local supplier **Windflow Technologies** secured approval from the **Wellington City Council** for a 12.5-MW wind plant using 50, two-bladed Windflow 500 wind turbines. In July 2008, the Long Gully project in the Wellington suburbs had been proposed with **Mighty River Power**, which has a 19.95% stake in **Windflow**. The project's deployment was delayed by a commercial dispute involving this model WTG at two other locations. In June 2010, **Mighty River** said it was withdrawing from the Long Gully project, which may yet proceed under different ownership.

New Zealand also has considerable biomass energy potential, both from forestry products, agricultural wastes, and biogas. **ECNZ** partnered with **Carter Holt Harvey** to build a 35-MW wood-fired cogeneration plant at the Kinleith pulp and paper mill near Tokoroa. **Rolls Royce Industrial Power** obtained the turn-key contract and the plant was commissioned in 1997. **John Thomson** supplied the 180 tph boiler, **W H Allen** the steam-turbine, and **Peebles** the generator. Some of New Zealand's large forest-products companies have wood-fired generators as well.

As of 2009, New Zealand had eight landfill gas power plants installed, mostly near Auckland and Wellington. Total capacity is around 28 MW. The newest facility is a 4-MW plant completed in 2010 by **Envirowaste Services Ltd** at Hampton Downs landfill

north of Te Kauwhata near Auckland. This has four **Waukesha** engines.

New Zealand has a number of solar power installations, but nearly all are very small and built at remote sites such as lighthouse and agricultural installations. The largest solar power plant in New Zealand at present is believed to be a 13-kW thin-film photovoltaic plant finished in 2010 at the Mangere factory of **Hubbard Foods** near Auckland. **Vector** was the EPC contractor.

In July 2009, **Todd Energy** announced that it had a 30% shareholding in tidal power development company **Crest Energy Ltd**. The company has applied for consents for a proposed tidal electricity generation project of up to 200 MW at the mouth of the Kaipara Harbour in northern New Zealand. This is one of the largest harbors in the world covering 900km², with 3,000km of shoreline, and extending for 60km.

Future Prospects

New Zealand is a small, wealthy energy market with positive growth potential. Lengthy and expensive resolution of environmental and cultural impact issues are a dominant feature of the country's heavy infrastructure and industrial development and this has often slowed or indeed halted power plant and network development. The government has also made a large commitment to expanded deployment of renewable electricity facilities.

Two phases of electric power restructuring have been essentially completed in New Zealand, with the first wave of international energy companies already come and gone. These have been replaced with regional investors. Substantial consolidation in the electricity production business has been accomplished, but the distribution business remains fragmented and in large measure run by municipal authorities and other public entities. On several occasions, the government has had to step in and impose new regulatory requirements to keep the New Zealand electricity market running properly.

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