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An Electricity Network Challenge

Hamilton-based Roger Loveless, of Odyssey Energy, says New Zealand needs to wake up immediately to the potential of distributed generation and put some serious effort into encouraging DG applications.

His recent investigations for embedding a waste-to-energy plant in the UK highlighted the need for good forward planning and engineering foresight.

The plant will connect to the network company's 132kV network which, in turn, is supplied by lines connected to the national 400kV supergrid. "Unfortunately several other power stations have got in first, and someone may have to pay for some very expensive upgrading," says Roger.

"The total embedded generation capacity is now close to the total capacity of the supergrid transformers at the substation, and is already causing operational difficulties. The four 240MVA 400/132kV transformers at the site now have to be re-configured. Two are connected together by a fault limiting reactor and one is kept off load but on 'hot standby'. This situation now compromises security at the substation, and was certainly not envisaged 30 years ago when the substation was built."

Roger says there are lessons here for New Zealand.

"Gone are the days when a centralised generation authority integrates the power stations and the grid. It is essential that new generation is established in places that suit industrial users and it's inevitable that the network companies will be called on to connect it in a way that is fair to all. As the size of generators reduces, the practicality of moving equipment will increase and we can no longer assume a stable generation scenario on a network."

"Older networks may need to be upgraded and new networks built with some 'fat' in them to cope with changing circumstances, and even then the designers will need new technologies and skill to keep things from falling apart." Roger notes three key imperatives for network planners, designers and operators:

- Planners will need the foresight to identify the worst case future configurations of networks.
- Designers will need to ensure equipment ratings; reliability and security are not compromised.

- Operators will need to work very closely with many more parties than previously to maintain good safety practices and reconfigure their networks on a regular basis.

Roger says his recent experience with DG in the UK illustrates how the New Zealand grid and line networks, mostly laid down more than 50 years ago, need to be upgraded to suit the next 50 years and, specifically, to allow distributed generation to play its part.



Roger Loveless is Managing Director of Odyssey Energy Limited, a company he set up in 1997 and which now has a permanent staff of 6. He has over 30 years experience in the NZ electrical industry, including major power station and reticulation system design and construction.

Roger is a corporate member of both the IEE (UK) and IPENZ and has a graduate diploma in business studies.

General News

Sustainable Energy Report released



The government released a discussion document on October 27 entitled *Sustainable Energy: Creating a Sustainable Energy System*. The report, a summary version and supporting media releases are available for download from www.med.govt.nz/ers/environment/sustainable-energy/index.html.

ers/environment/sustainable-energy/index.html.

DG Faces fewer Barriers

The second annual report of the UK Distributed Generation Co-ordination Group (DGCG) paints an optimistic picture. The group, which advises government departments and energy regulator Ofgem, originally identified 24 barriers to the development of small-scale distributed generators. Now it says that at least half these barriers have been removed.

Barriers that have been removed include a lack of:

- a standard approach by distribution companies where more than one generator is seeking connection to the same section of the distribution network;
- standard technical guidance on the connection of distributed generation; and
- a modern methodology for assessing the contribution of modern types of distributed generation to network security.

Ofgem has said that distribution companies will be guaranteed 80 per cent pass-through costs of connecting distributed generation, plus £2.50 per kW connected per year, offering the prospect of substantial returns. In addition, an Innovation Funding Incentive will encourage DNOs to invest in R&D activities that focus on the technical aspects of network design, operation and maintenance, while Registered Power Zones will provide a mechanism to encourage DNOs to develop and demonstrate more cost-effective ways of connecting and operating generation.

UK Renewables Obligation

The second period of the Renewables Obligation finished in March this year. Electricity suppliers must comply with their Renewables Obligations by 1st October 2004. Suppliers can meet their Renewables Obligations for the year to 31 March 2004 by either producing or Ofgem Renewables Obligation Certificates to the value of 4.3 per cent of electricity supplied to customers, by using a buy-out clause which allows them to pay £30.51/MWh for any shortfall, or by using a combination of ROCs and buy-out.

Creating a single electricity market for Great Britain

The legal framework for creating a single GB-wide electricity market was recently published by Ofgem. This allows the industry to prepare for the creation of a single GB-wide market due to be introduced in April 2005.

The documents set out the proposed text for:

- Transmission, Generation, Distribution and Supply Licences;
- System Operator – Transmission Owner Code;
- Connection & Use of System Code;
- Grid Code; and
- Balancing and Settlement Code.

Scottish Transmission Investment

Energy regulator Ofgem has announced initial proposals for consultation that will permit additional investment in the Scottish electricity transmission network to help support growth in renewable generation not envisaged at the time of the last price control.

- Initial proposals for new mechanisms to fund the upgrade of Scottish transmission system and help unlock potential of Scottish renewables.
- Up to £360 million already likely to be authorised with further investment available when case is made.
- Move means regulatory arrangements will not delay development of Scottish renewables.

- Proposals consistent with Ofgem's commitment to efficient investment and to protecting consumers' interests.

Energy Efficiency Target of the UK

- Gas and electricity suppliers on track to meet Energy Efficiency Commitment (EEC) targets.
- Since 2002, the amount of electricity saved is enough to power 2 million homes per year.
- Cavity wall insulation and energy saving light bulbs most popular measures.
- Ofgem highlights need to achieve right balance between future costs and benefits of EEC.

Environmental Action Plan of the UK

Key achievements in 2003 - 2004 include:

- putting forward proposals to encourage distribution companies to connect renewable generators as part of the next distribution price control;
- putting forward proposals to enable additional investment in the Scottish transmission system to facilitate the connection of additional renewable generation;
- producing Regulatory Impact Assessments, including environmental appraisals, for all important proposals;
- actively engaging in cross-government work advising on how best to implement the EU emissions trading scheme;
- issuing over 7 million Renewables Obligation Certificates; and
- approving 120 schemes under the Energy Efficiency Commitment which have achieved energy savings totalling 47TWh.

Priorities for the coming year include:

- work to finalise the new incentive framework for DG as part of the 2005 distribution price control;
- initiatives to improve customer awareness of the environmental consequences of their energy use;
- evaluation of the 28-day rule pilot where suppliers are allowed to offer energy services packages to domestic consumers linked to longer-term supply contracts; and
- continuing work to administer the Government's environmental programmes.

Sustainable Energy



Strong policy measures are needed to support development of the sector and strengthen Australia's response to growing greenhouse emissions, said Ric Brazzale, head of the Australian Business Council for Sustainable Energy. Chief

among them is increasing the Mandatory Renewable Energy Target to 5 per cent by 2010 and 10 per cent by 2020. The Australian scheme has been copied by other countries, which are adopting renewable energy targets of 5 per cent and more, even 20 per cent in some countries.

The BCSE advocates a national energy efficiency target to halve the projected growth of energy consumption, so the increase is less than 25 per cent by 2040, on 2001 figures. Measures such as minimum energy performance regulations in the built environment and requiring information disclosure to inform investment and purchasing decisions across residential, commercial and industrial sectors are seen as necessary.

Energy Mad Bright Idea



Energy Mad Ltd is a small New Zealand company with big plans to replace the five highest used incandescent bulbs in 55% of New Zealand households with selected supermarket stores energy efficient compact fluorescent lamps (CFL's). The strategy is to implement this

regionally in conjunction with Energy Trusts, supermarkets and city councils. Every household receives a voucher to purchase five Ecobulbs for \$10 from selected supermarket stores during intensive promotional campaigns. These Ecobulbs are purchased and installed in place of the five highest use incandescent bulbs in the home.

Non-Domestic CFLs

Not only can domestic lighting be transformed using these latest CFLs, but so can commercial and industrial installations. Larger version CFLs, with ratings ranging from 36W to 125W for the self-ballasted type up to 150W for ones with a separate electronic ballast, can be used in HighBays, LowBays, spot, floodlamps and showroom tracklights to replace self-ballasted mercury vapour, sodium and metal halide lamps. As with the domestic type CFLs, energy savings up to 80% can be achieved with no loss of illumination.

Aside from the energy savings, other advantages for CFLs are less heat produced thereby reducing any air-conditioning load and reducing any heat damage to light fittings. Also, CFLs will give a near instant start and reach full luminosity in a very short time period compared with conventional lamp types. Colour rendition is often a prime consideration when changing to CFLs, although commercial grade lamps are available in different colour temperatures, in the range 2700K to 6400K.

Ceramic Fuel Cells

UK based Ceram Research, an international ceramics consultancy, has formed a partnership with Ceramic Fuel Cells of Australia, to assist CFC's bid to enter the solid oxide fuel cell market.

The SOFC design will aim for domestic and office sites to provide on-site power and heat. A high volume, mass production plant is planned in order to bring unit costs down to appeal to the home and export markets in Europe and Asia.

IC Genset

Cummins Power Generation has introduced a new PowerCommand™ 2.7 MW generator set. While optimised for utility peaking and distributed generation using multiple units, the new 1800 rpm generator set can also be used for large standby applications. For extended operation in environmentally sensitive locations, the new PowerCommand 2.7 MW generator set can be fitted with a selective catalytic reduction (SCR) after-treatment option. Models are available for 50 Hz operation, and can be enclosed in a standard ISO high-cube configuration container.

Gas Turbines

Currently, there are several coal-powered gas plants that operate on coal gasification (IGCC), which uses considerable amounts of hydrogen in the fuel. The combustion chamber concept developed for syngas from coal gasification is well suited for fuel with a high content of hydrogen (syngas: synthesis gas; mixture of carbon monoxide and hydrogen). The usability of hydrogen alone in turbines has been verified by several turbine manufacturers, notably GE.



Siemens-Westinghouse Power Corp. are to pursue a modular gas turbine with new 'enabling' technologies in a single, low-cost system design that holds worldwide applications. The turbine is to operate on natural gas as well as a syngas derived from coal or biomass, and can be integrated into a fuel cell/turbine hybrid system to reach very high efficiency.

By integrating solid oxide fuel cell technology with turbines, the electrical efficiency of a gas power plant can reach up to 80% under optimum conditions. Fuel cells alone have the potential to utilise 60% of the energy in the fuel. The rest is lost in the form of low quality heat, but also because the fuel cells are not capable of utilising all the fuel. The excess fuel in the exhaust gas can, however, be used with the help of gas turbines. Such a plant would still produce NO_x unless pure oxygen is used in the afterburner, but to a lesser degree than in a conventional power plant. Siemens Westinghouse has started a 220 kW SOFC micro turbine 'hybrid' system at the University of California in Irvine. This is the first of its kind and the efficiency is 52-53%. A 550 kW system is under development.

Energy-saving motor project

GE Global Research and Rensselaer Polytechnic Institute (RPI) are collaborating to develop a monitoring system for industrial motors that will

reduce energy waste. The three-year project has funding of \$6m from the US Department of Energy.

The scheme involves installing low-power efficiency-monitoring sensors on motors. A combination of measurements such as vibration, temperature and power quality will be transmitted to a central computer using a radio network. Should a problem develop in a motor, reducing efficiency, technicians could be notified by PDA, mobile telephone, or some wireless paging device. The wireless communications are two-way, so that technicians can send control signals back to the motors, shutting them down or turning on cooling fans if the temperature reaches a certain value.

Waste Plastics Into Electricity

The EZ-Power Generator™ is a new generation of waste plastics cracking units developed by Beijing Roy Environment Technology Co., Ltd. This facility includes feeding unit, reaction unit, distillation unit, sludge extractor/drying unit, circulation water unit, oil storage unit, wastewater treatment unit, scrubbing unit and power generating unit. It converts any waste plastics, including PP, PE, PS, mixed plastics, waste oil and others into oil by low temperature thermal cracking in the absence of air and then utilizes the output to produce electricity in the 300 kW to 900 kW size range.

Geothermal



HotRock GmbH has awarded the Siemens Industrial Solutions and Services Group the planning contract for a geothermal power plant at Offenbach. The plant, with a planned output of 5MW, will be the largest in Germany to date.

Planning is scheduled to coincide with the drilling of the first wells, due for completion by December 2004, to make sure that components critical to the schedule are ordered in good time so construction can proceed more quickly. The economic case is helped by the German Renewable Energies Law, which guarantees a price of up to 15 euro-cents per kilowatt-hour.

The Offenbach plant will operate on the Kalina principle, which converts heat into electrical power more efficiently than conventional power generators.

Flow/ Redox Batteries

Over the next few years, flow/redox batteries are predicted to make an impact in key growth areas within the power industry (including renewable energy systems, energy/asset management, remote area power supplies, secure power provision, and cogeneration enhancement). They will also be used in special-purpose electric

vehicles and may have an important role in innovative fuel cell systems.

Several redox technologies are under development, with characteristics that differ radically from those of established storage systems. These are amongst the most exciting approaches to high-energy storage, targeting applications from a few kW to 10s or 100s of MW.

A new report from EscoVale, released in October, examines the different flow/redox battery technologies and explores the commercial opportunities. Detailed assessments are made of each of the principal application areas. These track developments during the initial transition phase, leading to periods of market penetration and consolidation, with forecasts to 2025 and a longer-term projection to 2050. By 2025, the global forecast approaches 2GW/year (some 9GWh of storage capacity), with an annual value of more than \$1.5bn.

The report *Flow Batteries: Technologies, Applications and Markets Report #5061*, can be ordered from EscoVale Consultancy Service: www.escovale.com/es/flow_management_order.htm.

Transmission Reliability Incentives

Energy regulator Ofgem announced proposals to strengthen the incentives on National Grid Company (NGC) to maintain and improve upon an already high standard of transmission system performance. The scheme proposed will enhance the existing regulatory and legislative framework by providing NGC with direct financial incentives to meet network demands by minimising the extent and duration of power cuts on the national grid.

The scheme is based around rewarding/penalising NGC in accordance with its annual performance against a target level of energy unsupplied from the grid (based on past performance). NGC will be rewarded on a sliding

scale up to 1.0 per cent (around £9m) of its transmission network revenue in the event that all demands for energy are met, or penalised on a sliding scale up to 1.5 per cent (around £13.5m) in the event that approximately 600MWh or more is unsupplied in a given year.

Power cuts on the transmission system as a result of certain, narrowly defined events such as extreme weather, or power cuts affecting three customers or less, will be excluded from the incentive scheme.

GPS Modified

The government policy statement (GPS) on electricity has been modified to exclude the objectives of 'least cost to the economy as a whole' and 'consistent with sustainable development'. Those two desirable objectives have been replaced by 'promote and facilitate the efficient use of electricity.' The GPS is subject to the passage of the new Electricity and Gas Industries Bill 2003.

The new GPS can be found at: www.med.govt.nz/ers/electric/governance-gps/draft/20040921/20040921.pdf.

The previous draft, dated September 2003, is at: www.med.govt.nz/ers/electric/governance-gps/draft/20030914/20030914.pdf

Lack of New Investment

The last major coal-fired power plant to be commissioned in the UK was the second half of Drax Power Station, and was commissioned in the mid-80s. There have been many power stations commissioned in the UK since then, but almost all were gas fired. There are very few fossil fired power station projects underway now. The annual 7 year report published by NGT, the system operator, provides a source of information on power plant and future demand in England and Wales is to be found at: www.nationalgrid.com/uk/library/documents/sys_04/default.asp?sNode=SYS&action=&Exp=Y

Events Calendar

Home Events:

RSNZ Annual Conference, Thursday, 18 November, Christchurch

The Royal Society of New Zealand is holding its annual conference at the Hotel Grand Chancellor in Christchurch on Thursday, 18 November. The theme is energy and will include discussion on how we use it; our usage patterns; and energy sustainability.

The conference will be followed by a one hour reception before Australian energy commentator Mr Alan Pears gives a public talk on "The emerging global and regional imperative: sustainable energy".

Registration details and further information can

be found at:

https://www.rsnz.org/secure/events/rsnz_conf2004.php.

Overseas Events:

Distribution Europe, 26-28 April, 2005, Berlin

Distribution Europe is a forum that identifies, discusses and forecasts developments in the industry.

Top-level speakers from key industry segments will present their views using case studies, in-depth sessions and interactive panels.

Further information can be found at www.synergy-events.com.

Activity Notices

Ofgem

UK's Ofgem has published the following documents recently:

- 170/04 GB Consultation for Connection and Use of System Code (CUSC) Amendment Proposal CAP070.
- 173/04 BETTA consultation on draft licence condition to implement a proposed interim charging measure for small, transmission connected generators.
- 183/04 Structure of Electricity Distribution Charges: Open letter consultation on DNO draft charging methodologies for demand customers and generators (The purpose of this document is to seek views from suppliers, generators and other interested parties on the development of the DNO charging methodologies.).
- 186/04 Transmission charging related conditions and the requirement to offer terms – arrangements under BETTA. An Ofgem/DTI conclusions document.
- 217 /04 Security of supply, October 2003 to March 2004: six month retrospective report.
- 224a /04 Planning and operating standards under British Electricity Trading and Transmission Arrangements: Volume 1.
- 224b/04 Planning and operating standards under BETTA: Volume 2.

To access Ofgem documents, go to www.ofgem.gov.uk.

IEA

International Energy Agency (IEA) has published the following documents recently:

- Newsletter of the IEA DSM Task XIII Project, Volume 1, Issue 2.
- Newsletter of the IEA DSM Task XIII Project, Volume 1, Issue 3.
- Newsletter of the IEA DSM Task XV Project - Network-Driven DSM, #1.
- Spotlight, newsletter of the IEA DSM Programme, August 2004.

These documents can be downloaded from the CAE DG website.

Statistics New Zealand

Statistics New Zealand has published the following documents recently.

Energy Flow Account

The Energy Flow Account report and tables are now available on-line: www.stats.govt.nz/domino/external/web/prod_serv.nsf/Response/Energy+Natural+Resource+Accounts

The Energy Flow Account provides information on the flows of energy products within the New

Zealand economy from 1996 to 1999. The flow tables consist of supply and demand tables in both physical (PJ) and monetary (\$) flows, and associated carbon dioxide emissions. The tables provide this information for each energy commodity, by industry. The monetary estimates are consistent with the National Accounts, and could be used to derive physical-monetary measures such as emissions per unit of Gross Domestic Product, by industry.

This account is a developmental account. It is expected that in 2005 an expanded and improved version of the accounts will be released, updated up to the 2002 year. It will be updated annually in subsequent years.

Energy Monetary Stock Account

The Energy Monetary Stock Account is now available on-line under natural resource accounts:

www.stats.govt.nz/domino/external/web/prod_serv.nsf/htmldocs/Natural+Resource+Accounts

The Energy Monetary Stock Account uses internationally recognised methods to provide asset valuations of New Zealand's non-renewable energy resources - coal, oil and gas. This report also extends these methods to include asset valuations for New Zealand's renewable energy resources - hydro, geothermal, wood and biogas. Energy asset valuations are provided for the period 1987 to 1999.

For further information, contact Kent Hammond (kent.hammond@stats.govt.nz) or Jeremy Webb (jeremy.webb@stats.govt.nz).

Latest Energy Statistics Published by MED

The July 2004 edition of the Energy Data File includes statistics on energy supply, demand and prices and shows that:

- Total primary energy supply declined by 4 per cent in the calendar year 2003, over that for the calendar year 2002. This was primarily due to a 29 per cent decrease in indigenous oil supplies, and a 24 per cent drop in gas. These falls were offset by a 12 per cent increase in imported oil and oil products.
- Petrol consumption went up by 2.8 percent, and diesel by 3.8 per cent. The transport sector accounted for 42 per cent of total consumer energy. New Zealand is currently around 20 per cent self sufficient in oil, a drop of 8 per cent over the previous year.
- Coal production in the year to March 2004 increased by 1.5 per cent on the previous year to 5.0 million tonnes. Total utilisation, including exports, increased by 8 per cent to 5.3 million tonnes for the same period.
- Domestic gas production in the year to March 2004 declined by 26 per cent with 66 per cent coming from the Maui field. Remaining total gas reserves as at 1 January 2004 are reported as 1,462PJ (gross). This figure is only slightly

lower than that for the previous year and reflects upward reviews by operators of recoverable reserves in existing fields.

DTI/OFGEM Information Releases

Have you registered on DTI/OFGEM distributed

generation web site for information releases? The consultation on the draft security of supply engineering recommendation P2/6 is now available.

Go to www.distributed-generation.gov.uk and go to 'whats new' section.

Case Study: The Solar Service Station

Background

This study enables an appreciation of the technical and environmental aspects of on-site, photovoltaic electricity generation interconnected to a network.

Since 1999 BP has progressively introduced solar power to some of its largest service stations in this country. This is part of a wider international effort by BP to install such systems and the company now has almost 400 sites with solar canopies world-wide.

Each solar-powered service station has between 200 and 500 PV solar panels on the forecourt canopy over the fuel pumps. The systems are interconnected with the mains and have no battery storage and generally power is imported as the power demand from pumps, lighting and other loads is in excess of the panel's peak output.

BP Solar is the third largest manufacturer of photovoltaic systems globally and the largest outside Japan. BP is the world's largest commercial user of PV solar. It has nine manufacturing facilities globally, located in Maryland, Virginia and California USA, and in Spain, India and Australia. Output is growing at over 30% per year.

BP launched its solar canopy programme in 1999 and now has almost 400 sites with solar canopies.

Description

The solar panels used in the original BP Plug-in-the-Sun retrofit programme were a crystalline silicon type with a photovoltaic (PV) efficiency of 12%-13% under optimal conditions. Papakura MSA was the first site in New Zealand with arrays of solar cells mounted on the canopy (September 1999) and is fitted with this panel type.

The solar power forecourt canopies installed in the new BP Connect service station and convenience store sites make use of amorphous silicon thin film panels doped with germanium. They have a PV efficiency of about 6% and are supplied under the BP Harmony programme that commenced in 2000.

Where higher levels of efficiency are of benefit, a third product using BP Saturn technology is available. This is high efficiency crystalline technology with an efficiency of up to 16%.



BP's solar powered canopy systems are grid-connected, ie they interface with the mains power supply rather than providing power from a segregated source. By supplying part of the service station's electrical requirements, they provide a modest saving in electricity costs and reduction in greenhouse gases (CO₂) that would otherwise be emitted due to marginal electricity generation.

The solar power system comprises photovoltaic panels, single-phase inverters and a fault monitoring system. The solar panels form the roof of the Connect forecourt canopy and are an integrated element of the canopy structure. They replace the conventional canopy roof.

The DC power generated by the solar panels is converted to mains 230V 50Hz AC power by inverters. These are connected direct to the mains at the site main switchboard and operate in parallel with the grid.

The components used for the solar power systems have been standardised for the BP Sunflower and Harmony programmes with the exception of the USA, where specific UL requirements apply. The components have been selected so they will form a functioning and productive solar power system whichever country they are used in.

Published Articles

American Council for an Energy-Efficient Economy (ACEEE)

With increasing prices for oil, natural gas, coal, and electricity beginning to slow the economic recovery, energy efficiency offers the only near-term option to decrease energy bills by reducing both consumption and prices. To help policymakers gauge efficiency's prospective contribution to energy and economic policy, the American Council for an Energy-Efficient Economy (ACEEE) released a new paper recently that assesses the size of the energy efficiency potential in the United States.

"Because the current high prices stem from the imbalance between supply and demand creating very tight energy markets, small changes in either supply or demand can have disproportionately large impacts on energy prices," said Anna Shipley, a researcher and analyst with ACEEE. "Our research last year showed that a 4 percent reduction in natural gas consumption nationally by means of energy efficiency could reduce wholesale prices by almost 20 percent. Natural gas markets have tightened even further this year, so price effects would be even more dramatic." For more information, see www.aceee.org/energy/natlgas.htm.

Beyond its immediate effects on energy markets, saving energy would also help stabilize the economy as a whole. "Economists agree that high energy prices are crimping the economic recovery," said Bill Prindle, ACEEE's Deputy Director. "Taking action now to moderate energy demand is one of the best ways to take the brakes off the economy. Efficiency investments themselves stimulate economic growth, but efficiency's larger effects on energy prices create much broader benefits for all energy consumers and the economy as a whole."

Since tight markets now exist for all major energy sources, few options exist to switch among energy sources. "Energy markets are interrelated," said Neal Elliott, ACEEE's Industrial Program Director. "As demand for gasoline increases, refiners use more natural gas and produce less heating oil, driving heating oil prices to record levels." ACEEE shares industry observers' concerns about high prices and even the potential for shortages in these very tight markets for heating oil and natural gas for home heating this northern winter, particularly if there is an unusually cold winter.

If energy efficiency is our best option to rebalance energy markets, it is

"Past and future load growth to 2025" (from *New Zealand's Load Growth from 1974 and Expected Demand to 2025*, by Bryan Leyland. Copies of the report can be downloaded from www.caenz.com)

important to know how much of this resource is available. The response to the electricity crisis of 2000/2001 in California conclusively demonstrated that an aggressive public information campaign for conservation, coupled with expanded funding for energy efficiency programs, can achieve remarkable reductions in customer energy demand. In 2001, California averaged a 10% cut in peak demand during the summer months (with a record reduction of 14% in June), and overall electricity use declined in 2001 by 6.7%, after adjusting for economic growth and weather, according to an ACEEE report (see <http://aceee.org/pubs/u033full.pdf>).

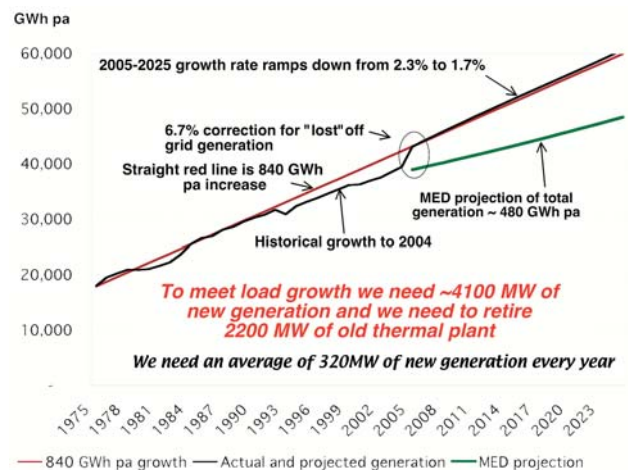
"The savings potentials found in these studies tended to be similar to the savings potentials found in studies from the 1990s, despite the fact that many measures included in the 1990s studies (such as T8 lamps and electronic ballasts) are now widely implemented," said Nadel. "What has happened is that many new measures have been developed (e.g., 'super T8 lamps' and high-efficiency packaged commercial refrigeration equipment) that replace the measures that have been implemented over the past decade."

Energy Report Strikes the Nail on the Head

The Centre for Advanced Engineering (CAE) says the report by energy consultant Bryan Leyland is a highly credible analysis that illustrates the rate at which New Zealand's energy gap – the different between supply and demand – is worsening. CAE's executive director, Dr George Hooper, said the findings demonstrate the importance of immediate systems-level reform.

The Leyland report says electricity demand is already 6 per cent higher than Government estimates and growing faster than expected. It says New Zealand needs to add 320MW of supply each year – much more than the 130-150MW estimated by the Ministry of Economic Development.

"The report leaves absolutely no doubt that this is a time for action and a time for comprehensive



change in the energy sector," said Dr Hooper. "New Zealand's economic future is on the line. We either modernise and optimise our national energy systems now, or we struggle on with a model that has not delivered what was expected, and suffer the effects of ongoing shortages and much higher pricing. The Electricity Commission has been given an enormous responsibility. It's up to Governments and energy sector leaders to put aside their agendas and support the EC's work in any way they can".

"CAE advocates a systems-level review that will allow the use of alternative energy strategies including systems-optimisation, conservation and efficiency, demand-side management and – in particular – Distributed Generation." CAE has made the full Leyland report available to the public on its website www.caenz.com.

Renewable Energy Tariffs - Has Their Day Come?

The short answer is 'yes'. One doesn't have to look beyond Germany to see their benefits. While the Danes may have created the concept of renewable tariffs, it was the Germans who took the idea to the next level and put the power of the world's third largest industrial economy behind it.

No one has made a more profound and consistent commitment to renewable energy than the Germans. And with recent revision of their ground-breaking Renewable Energy Sources Act (Erneuerbare Energien Gesetz, or EEG), they will maintain their momentum -and their leadership - in renewable energy development.

Germany's EEG not only explicitly states that renewable power generators have a right to connect to the grid, but also spells out exactly how much they will be paid and for how long. The EEG sets out specific prices for a host of technologies, from wind energy to manure-fired power plants. It's this level of detail that separates what French researcher Bernard Chabot calls Advanced Renewable Tariffs from the Danish system and the earlier German one.

For outside observers, the numbers are simply staggering. Since 1991 when their program was launched, the Germans have installed more than 14,000 megawatts of wind-generating capacity, more than twice the amount constructed in all of North America. Last year alone, Germany installed more than 20,000 solar-electric systems. This year they expect that number to increase by another 50 percent.

Germany now leads the world in almost every category of renewable energy development. They are the world's largest manufacturer of wind turbines. In solar-electric systems, they are second

only to Japan. Germany leads Europe in generating electricity from biomass as well.

While Americans vainly struggle to re-instate their Production Tax Credit for wind energy, Canadians push to increase payments under the ill-named WPPI (Wind Power Production Incentive), and environmental groups clamour for Renewable Portfolio Standards, the Germans just forge ahead with their renewable tariffs.

More than 45,000 people are employed in the German wind industry, and another 10,000 work in the solar-electric sector. Germany expects employment in renewable energy to rise to more than 100,000 by 2010.

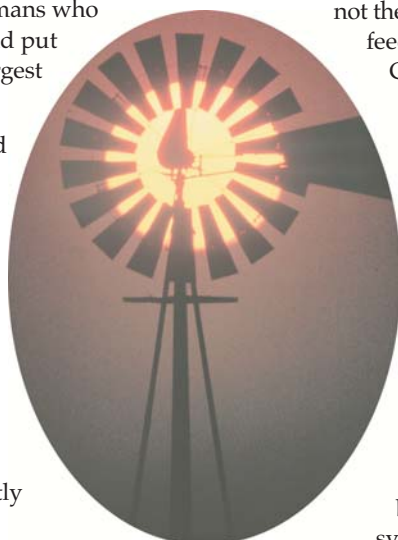
More than 300,000 Germans now own shares of wind turbines. Worldwatch's Janet Sawin notes that with so many employed in the renewables industry and with so many owning solar, wind, and biomass power plants, renewable energy in Germany enjoys broad political support from people in all walks of life.

It would be easy to dismiss renewable tariffs if they were successful only in Germany. That's not the case, however. Renewable tariffs, feed laws, or – as Ole Langniss at the Centre for Solar Energy & Hydrogen Research in Stuttgart calls them – Minimum Price Standards, have driven Spain to become a wind powerhouse in its own right, pushing it ahead of the mighty USA. France, a country not known for its enthusiasm for non-nuclear sources of energy, has embraced Chabot's advanced renewable tariffs. Though the French system is not without its weaknesses – chief among them being a tariff for solar-electric systems too low for profitable development – it has spurred feverish activity.

Chabot, a researcher at ADEME (Agence de l'Environnement et de la Maitrise de l'Energie) in the south of France, reports that since French renewable tariffs were implemented, some 14,000 megawatts of applications for building permits have been filed. French planning bureaucracy is now the only roadblock to another market the size of those in Spain and Germany.

Today there are nine countries in Europe and South America using renewable energy tariffs as the principal pricing mechanism. Two more European countries are considering renewable tariffs: Italy for solar-electric systems, and the Czech Republic for wind and solar energy. Turkey's parliament will debate the issue when it returns from its summer recess this autumn.

More significantly, China has concluded that it's not ready for Renewable Portfolio Standards and their sophisticated trading schemes. At the World



Wind Energy Association's annual conference in Beijing this November, China is expected to announce that it will move forward with some kind of renewable tariff.

There are even faint stirrings of interest in renewable tariffs in North America, the RPS stronghold. Advocates are no longer limited to Europe-savvy academics like Jim Manwell at the University of Massachusetts, solar industry observers such as Janet Sawin at Worldwatch, or campaigners like Steve Sawyer at Greenpeace International.

Renewable tariffs, or as some North Americans dub them, production-based, premium payments, are becoming mainstream. Prince Edward Island's legislative assembly will consider Minister of Energy Jamie Ballem's proposal to supply 100 percent of the province's electricity with renewable energy. Ballem plans to meet that goal in part with a renewable tariff for community-owned wind turbines.

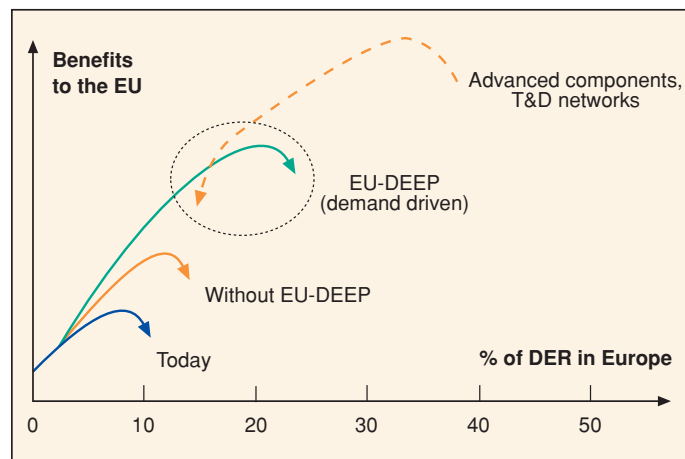
And what of California, the birthplace of RPS? Maybe it will take an Austrian to revamp the on-again, off-again, administratively-demanding capital subsidy for solar-electric systems that has bedeviled solar installers since so-called electricity restructuring in the late 1990s. With the political uncertainty in the USA, anything is possible as prices for both oil and gas rise simultaneously.

Renewable energy tariffs are not only holding their own against the RPS and problem-plagued British tendering systems, they're gaining converts. Ole Langniss, in his masterly doctoral thesis concluded that "There is no policy shift toward RPS." [Emphasis appears in original.] Langniss found that the number of countries adopting renewable tariffs continues to grow.

Like Langniss, Worldwatch's Sawin sums up the different market mechanisms for developing wind and solar energy by noting that renewable tariffs, or pricing laws, have consistently proven to be the most successful. Countries with renewable tariffs see the most significant growth and the strongest domestic industries.

Renewable Energy Tariffs – their day has indeed come.

SolarAccess.com by Paul Gipe



European Union DEEP Initiative

Distributed energy resources (DER) comply with the European Directives requiring to act on the demand side, improving efficiency, ensuring security of supply of clean energy and completing the development of new sustainable energy generation and transformation technologies, such as renewable energies and fuel cells. However, there is a trade-off point between the benefits of DER and the adverse grid effects at distribution and even transmission levels that penalise today the wide penetration of DER in Europe.

As the diagram below shows, EU-DEEP wants to start from the present situation in Europe, and to provide solutions to dramatically change the DER penetration in Europe to a new trade-off point, where benefits and drawbacks of DER have changed to a point favouring more DER contribution.

A group of eight leading European energy utilities have joined forces to remove, during the next five years, most of the technical and non-technical barriers which prevent a massive deployment of DER in Europe. In partnership with manufacturers, research organisations, professionals, national agencies and a bank, they follow a demand-pull rather than technology-push approach.

This new approach will provide five 'fast-tracks options' to speed up the large-scale implementation of DER in Europe, by defining five market segments which will benefit from DER solutions, and fostering the R&D required to adapt DER technologies to the demands of these segments.

Microgeneration

(Extract from a recent speech by UK opposition leader opposition, Hon. Michael Howard)

"Low carbon power generated by individuals, small businesses and communities to meet their needs, is likely to play an important part in this drive towards greater energy efficiency. I know that the Green Alliance have been active in making the case for bringing microgeneration into the mainstream, and I am sympathetic. We should be doing more to facilitate localised generation not least because it is an opportunity to engage

the public more closely with the benefits of energy independence and efficiency. We also want to make the most of a proven, but shamefully underused technology, which is more than twice as efficient as centrally-generated energy sources. If only we used CHP - combined heat and power - properly we could greatly expand the possibilities for household energy efficiency."

"For every 1000 megawatts of CHP energy operating in the UK, nearly one million tonnes of carbon are saved each year. When I was

Secretary of State for the Environment, the Conservative Government created Britain's first CHP target. We set the country on a firm path to achieving it, and then increased it. Labour have missed our CHP target by four years and the reality is that CHP capacity is now in reverse as ministers invent excuses for inaction or actively discourage it. For example, the new electricity trading arrangements put CHP producers at a significant disadvantage."

"CHP and micro CHP could be much more prominent, and they will be under the next

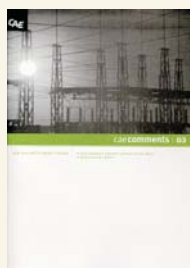
Conservative Government. We will give the CHP industry the confidence it needs to invest for a successful future. We will work closely with local authorities to encourage them to implement more community CHP schemes, particularly in new housing developments. And we will learn from examples of local success. We will look closely at schemes like that in Woking, whose town centre now largely runs on CHP. Britain needs more schemes like Woking's, an entirely achievable goal that would make an immense contribution to our climate change objectives."

From the Editor...

The first issue of *Energy21news* was generally well received. The main suggestions made by the free subscriber survey were to provide real examples of projects and to identify practical ways for industry to use DG. Another suggestion was to centralise the debate on a sustainable energy strategy for New Zealand. These objectives will be addressed in future issues.



CAE, in fact, has already published material that goes towards meeting these aims. A major study undertaken for the supply industry on the Opportunities for DG was published in 2003.



Subsequently two companion volumes for general readership were published: *Distributed Generation: A Study of Opportunities* (CAE Comments Series 02), containing eight case studies of actual DG projects around NZ, and *New Zealand's Energy Future: A Sustainable Energy Supply after Maui* (CAE Comments Series 03).

Both these publications may be ordered from CAE.

Pipes & Wires is a monthly newsletter dealing with a wider perspective on news and events for all utilities. To obtain your free copy go to www.utilityconsultants.co.nz/newsletter.htm.

Clear Policy Objectives Required

Pre-privatisation, New Zealand operated an implicit energy policy towards electricity generation based on the twin pillars of hydro with some geothermal, supported by coal (Huntley) and natural gas (New Plymouth). Most other western countries operated similarly.

In the UK for example, the twin pillars were indigenous coal with a substantial element of nuclear. Stations were brought onto, and taken off line according to a strict merit order of operating costs.

Privatisation in both countries swept away the old energy policy assumptions, without resolving the central issue of the appropriate role of government in a liberalised market. Was electricity to be treated as just another product, like baked beans, whose availability and price is subject to market forces (if supply is plentiful prices are low; if supply is scarce prices are high), or is a dependable electricity supply so inextricably linked to quality of life and national survival that government direction is simply unavoidable?

Is New Zealand moving towards a solution with the Electricity Commission to provide advice to the government of the day? Has the UK got the answer in its Office of Gas and Electricity Markets (OFGEM) and the newly launched Institute of Energy Research and Policy at Birmingham University? Either way, it is now clear that the unfettered hand of market forces cannot be guaranteed to deliver a safe and secure supply of electricity at all times.

As Professor Sterling, Vice-chancellor of Birmingham, said: "We want to provide the definitive voice (for the industry) based on facts and not spin."

Questions & Answers

We would welcome your input! If you have a question, or would like to express your viewpoint, please e-mail it to us at energy21@caenz.com.

And finally...

Don't forget to check the DG page on CAE's website where you can download newsletters, presentations, reports and other resources. Go to www.caenz.com/DistGen/DistGen.html

Editor, E21news

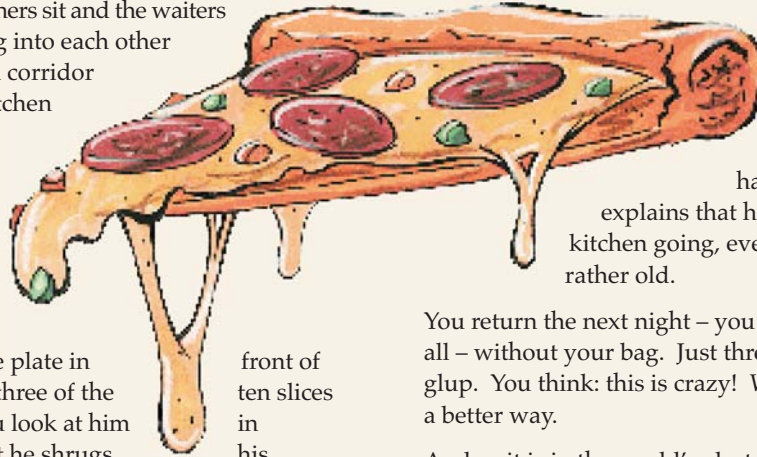
It's Pizza Time!

You are in a pizza restaurant and have just ordered your usual Neapolitana. You take a sip of your Italian red wine, nibble at the bread and wait expectantly for your meal. You are hungry. Then you notice something strange going on and you are surprised to see your harassed and careless waiter dropping many of the slices of your freshly cooked pizza on the kitchen floor – his dish is too small and there are no diners nearby who can retrieve the slices before they hit the floor. Also, because the kitchen is some way from where all the diners sit and the waiters are all bumping into each other in the long thin corridor between the kitchen and the dining room, another one or two slices slide from the dish on his way to your table.

He deposits the plate in front of you with only three of the remaining ten slices in his amazement but he shrugs his shoulders and suggests you should go to another restaurant if you are not happy: "In this town we charge for ingredients to make ten but you get three," he says. He is right, he knows that all the other pizza restaurants do the same thing. You reflect. The pizza is tasty (though you, along with all the other customers, end up dropping a good deal of it on to your lap) and it seems to be cheap so you can just order some more. And the waiter is right - all the pizza restaurants drop most of the food on the floor. It must be because the ingredients are abundant and inexpensive.

You, go home and wash your trousers and reflect again. All that pizza on the floor is becoming a real problem and your town is awash in mucky cheese and tomato glup. Also, one of the new ingredients has become so popular that a few people are concerned that a shortage of it might push the pizza prices up.

You have an idea. Next evening, you go back to the restaurant. "Just wine and bread please," you announce to the startled waiter. As he returns to the kitchen, you take out of your bag a small cooking pan, a little cooker and the ingredients for the Neapolitana. You proceed to make your own pizza at your table. It does not take too long, a small amount is spilled as you transfer the pizza to your plate but you end up with nine slices instead of three. Overall, you work out that, slice-for-slice, your pizza is cheaper than the restaurant's. And much less glup (though somehow you manage to drop some on your lap again). You think: "this is a win-win. I hope the



owner sees this – he will soon arrange for all pizzas to be made at the tables."

You are wrong. The portly restaurant owner in the distant kitchen looks on with severe disapproval, but does nothing. However, when he hears other customers saying that they might do the same as you tomorrow night, and when he sees you offering to sell your last slice to your neighbouring diners (you have eaten enough) he strides towards you and deposits a bill on your table. You are astonished by the high amount he has charged. He explains that he has to keep his kitchen going, even though it is rather old.

You return the next night – you have to eat after all – without your bag. Just three slices, more glup. You think: this is crazy! We know there is a better way.

And so it is in the world's electricity industry. Around 60-70% of primary fuel energy used for electricity generation is lost before it reaches the customer. Most is lost at central power stations as heat. The rest is lost in the transmission and distribution system which are needed to ferry the energy from remote plants to consumers. The energy loss is about the same as the total energy consumption of the global transport sector. The carbon emissions are causing climate change. We know there is a better way. Decentralised energy – high-efficiency cogeneration and on-site renewable energy. Is it not time to reform the restaurants so that less pizza is wasted and each slice costs less?

*From an editorial by Michael Brown,
"Cogeneration & On Site Power Production"
May-June 2003*

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