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Opportunities for Distributed Generation in New Zealand

The Drivers

and

‘What’s in it for You'

Presentation to DG Workshop 30 June 2002

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Project Objective

To answer the question –

"How can I make distributed generation work for me? "

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Framework for Analysis

- Bottom up
- Case studies to identify specific drivers and issues
- Review of international publications
- Monitoring of international work
- Expansion of information from case studies to provide national picture
  - Summary of specific drivers and issues
  - Learning from others
  - What is significant?
  - What are the opportunities?
  - What are the barriers?
- Application of learning to NZ

The Boundaries for DG

- Many Definitions of what DG covers
  - Distributed energy
  - Distributed energy resources
- Can it include non generation?
  - Eg solar water heating
  - off grid 10kWwind turbine
- Can it include demand management?
- Does generation have to be grid connected?
- What size limits apply?
  - Eg is 39MW Kinleith cogeneration facility DG?
  - Is 10kW BP Solar DG?

Distributed generation is local generation, or reduction in generation, to meet capacity, reliability, and security requirements

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DG is not new

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Bullendale in 1886

Reefton in 1888

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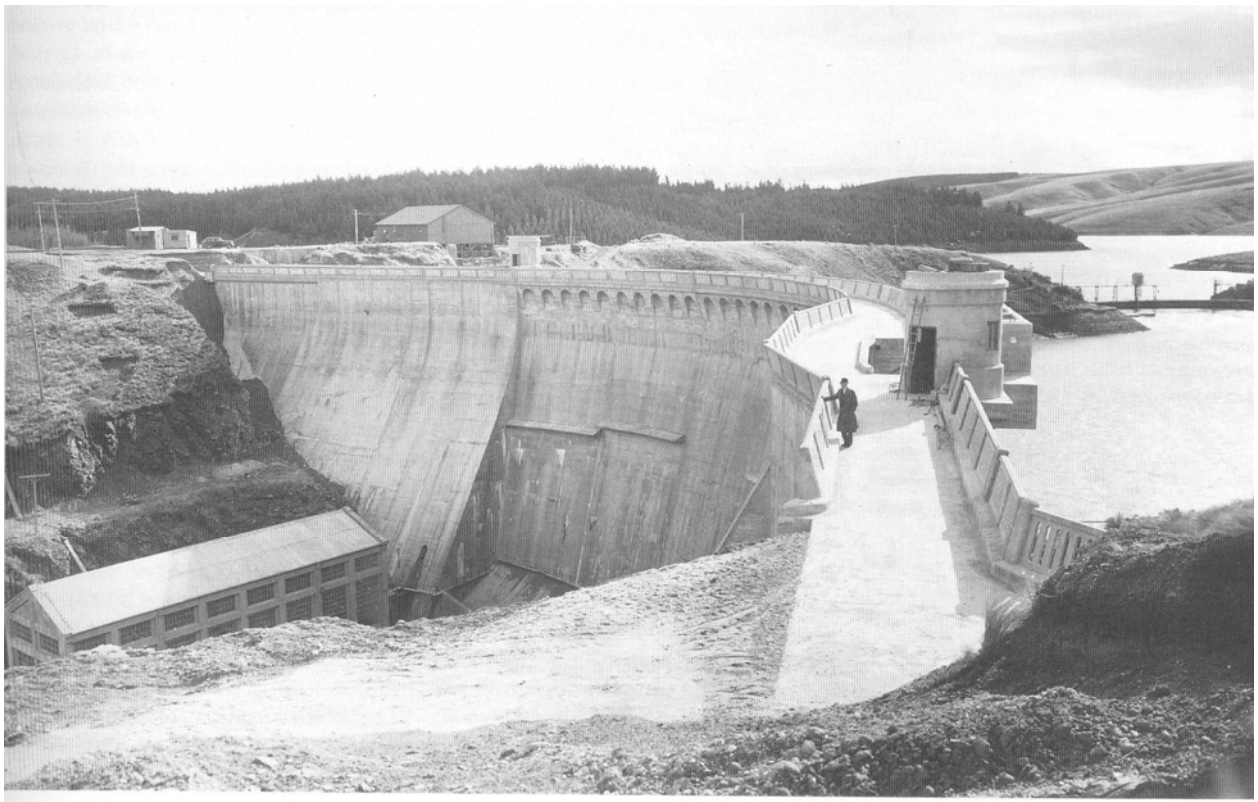
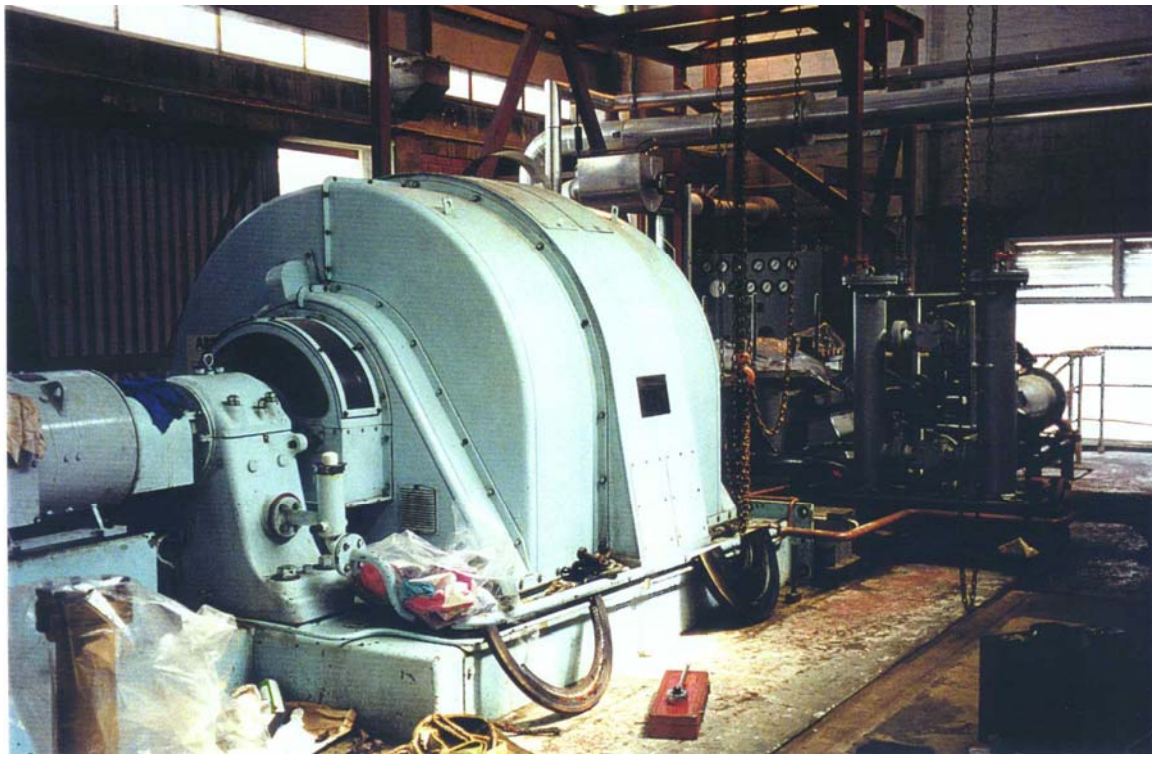
Mahinerangi above Waipori #1



Fertiliser Works Steam Turbine



Small Industrial Diesel Engines

Paerau Gorge Irrigation / Hydro

United Kingdom

- Pursuit of DG through initiatives for CHP, embedded generation, renewable generation
- Significance recognition that many DG technologies relate to heat supply with large efficiency benefits
- Working Group on network issues
  - issues of access for embedded generation to distribution networks
- Payment of shallow rather than deep connection charges for embedded generation
- Exemption for CHP of climate change levy
- Renewables obligation

United Kingdom -Working Group

- Embedded generation Working Group
  - interconnection technical issues
  - connection charges
  - transparent connection and payment structures
  - information disclosure
  - regulatory environment to incentivise network operators

USA

- Strategies
  - California DG Strategy signed off 11 June
  - DOE DG Strategy
- Survey of 23 implemented projects
  - Many corporates investing in DG out of environmental concern eg PV
  - Technology understanding is a key driver
  - Few investing to lower cost of energy
  - Businesses aiming for 99.9999% reliability (30 secs of outage per year)
  - Fuel cells and micro turbine sensitive to gas quality
  - Best to install in a new building
  - Best performance was with turnkey installation - vendor takes all risk
  - Problem when all interconnections are treated as if a major power station
  - Few export electricity

US - Consumer Energy Council

- Convened 2 year DG Domestic Policy Forum
- Results recently published
  - Benefits of DG can be realised through coordinated action.
  - However major challenges and concerns to be addressed

- Drivers
  - State of electricity transmission infrastructure
  - Demands for high reliability and quality of supply

- Electricity distribution system not designed for flow from multi generators to multiple buyers

Australia

- Independent Pricing and Regulatory Tribunal (March 2002)
  - interconnection technical issues
  - Light handed regulatory approach
  - Fair connection agreements
  - Framework for small generators
  - National standards and guidelines for connection

Common Overseas Drivers

- Changing industry structures
- DG is actually about distributed energy / resources
- DG - role in competitive markets
- Some new technologies reaching maturity
- Customer choice
- Aging infrastructure
- Growth of importance of reliability and quality
- Regulatory and interconnection issues to be addressed

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Review of International Publications

Article / papers abstracted between Jan 1997 - May 2002

- 384 referenced articles and papers
- 35 referenced conferences on DG
- 51% network and distribution
  - 21% on power quality
  - 6% power converters
  - 9% security issues
- 26% on technologies
  - 10% fuel cells
  - 4% combustion turbines
  - 3% photovoltaics
  - 1% wind
- 21% General DG across all aspects

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Why are we currently interested in DG?

- Free and open energy market
  - Entry of new players
  - Competition
  - Integration of gas and electricity markets
  - Reorganisation of wholesale and retail markets
- Technology developments
- Maturity of the energy market
  - Move from being a commodity
  - Customers considering total energy solutions
  - Niche products and services
- Aging and constrained infrastructure
- Optimisation of asset values
- Commercial incentives rather than national security
  - Established national infrastructure
  - Focus on cost of energy rather than development

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Case Studies

- An Industrial Cogeneration Facility (Kinleith biomass)
- A Dual Purpose Renewable (Opuha hydro)
- A Peak Demand Reduction (Christchurch CBD Network)
- A Regional Network (East Cape & Gisborne)
- A Small Scale Renewable (BP Solar service stations)
- An Off-grid Renewable (Stonyhurst wind/ diesel)
- A Fluctuating Renewable (Christchurch wind turbine)
- A Remote Rural Community (Kumeroa)

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Case Study Drivers

- **Orion**
  - Use of DG to avoid transmission upgrades
  - Value of non-grid connected DG
  - Value of reliable diesels
  - Multiple contracts

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Case Study Drivers

- **Kinleith**
  - Integration of DG with industrial operations
  - Management of transmission connection costs
  - Value of relationship with Network company
  - Value of demand management

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Case Study Drivers

- **Eastland Network**
  - Network optimisation
  - Allows reduction in n-1 network security constraints
  - Flexibility of diesels to meet security, reliability and capacity
  - Short term and long term technology solutions
  - Total energy solutions

    gas, diesel, wind, hydro, solar, transmission, demand management
  - Relationships between market players

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Case Study Drivers

- **Stonyhurst off grid generation**
  - local DG to avoid high cost transmission line
- **Wind farm**
  - Increased value if fluctuating supply can be firmed
  - Need for explicit and helpful network connection policies
- **Opuha small hydro**
  - High benefits to adjacent community
  - High free rider benefits to wider community

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Case Study Drivers

- **Totara valley community**
  - Interconnection and network issues
- **BP Solar**
  - Cost of new technologies
  - Net metering
  - Safety requirements for multi direction electricity flows

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Comparison Between Overseas and NZ

- Overseas
  - Emphasis on fuel cells, microturbines and photovoltaics
  - Small on-site generation (backup, security)
  - Driving to DG for its own sake
  - Supported by government subsidies
  - Outage avoidance
- New Zealand
  - Total energy solutions
  - Traditional technologies
  - Integration of transmission and energy costs
  - Commercial decision making

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Project Hypothesis

That distributed generation allows paradigm shifts in thinking about solutions for meeting consumer energy capacity and reliability requirements.

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