NATIONAL ENERGY RESEARCH INSTITUTE

SMART GRID DEVELOPMENTS AND MODEL PROJECTS IN NEW ZEALAND

Paul Atkins
CEO, NERI
Chair of the New Zealand Smart Grid Forum

National Energy Research Institute New Zealand. October 2014

CONTENTS

ABOUT NERI

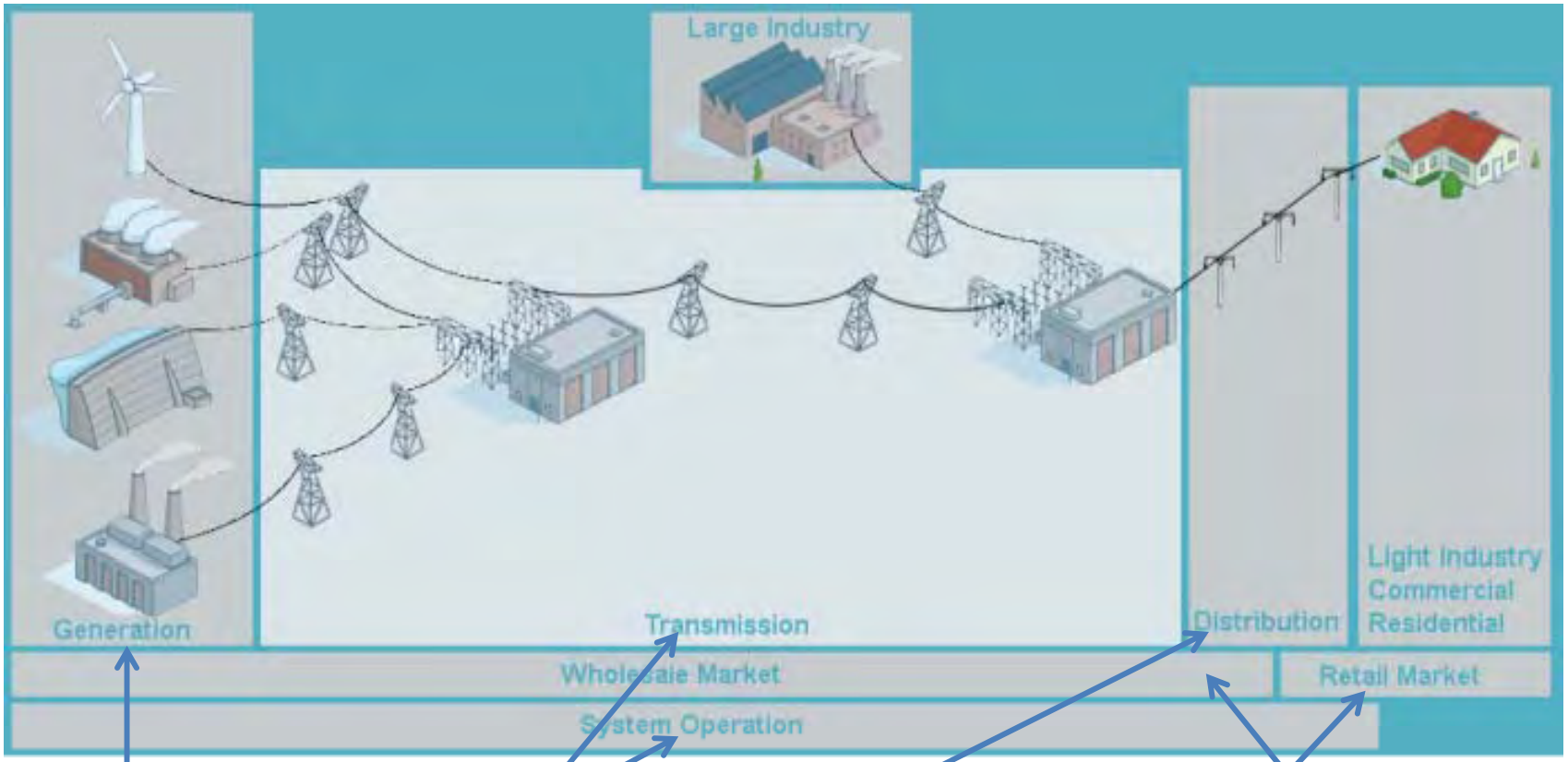
Independent, non-aligned, pan energy sector membership organisation, encompassing researchers, government and industry

Purpose is to:

Stimulate, inform and facilitate New Zealand's transition to a sustainable energy future through multi-stakeholder collaboration and research informed solutions.

THE NEW ZEALAND CONTEXT

THE NEW ZEALAND CONTEXT



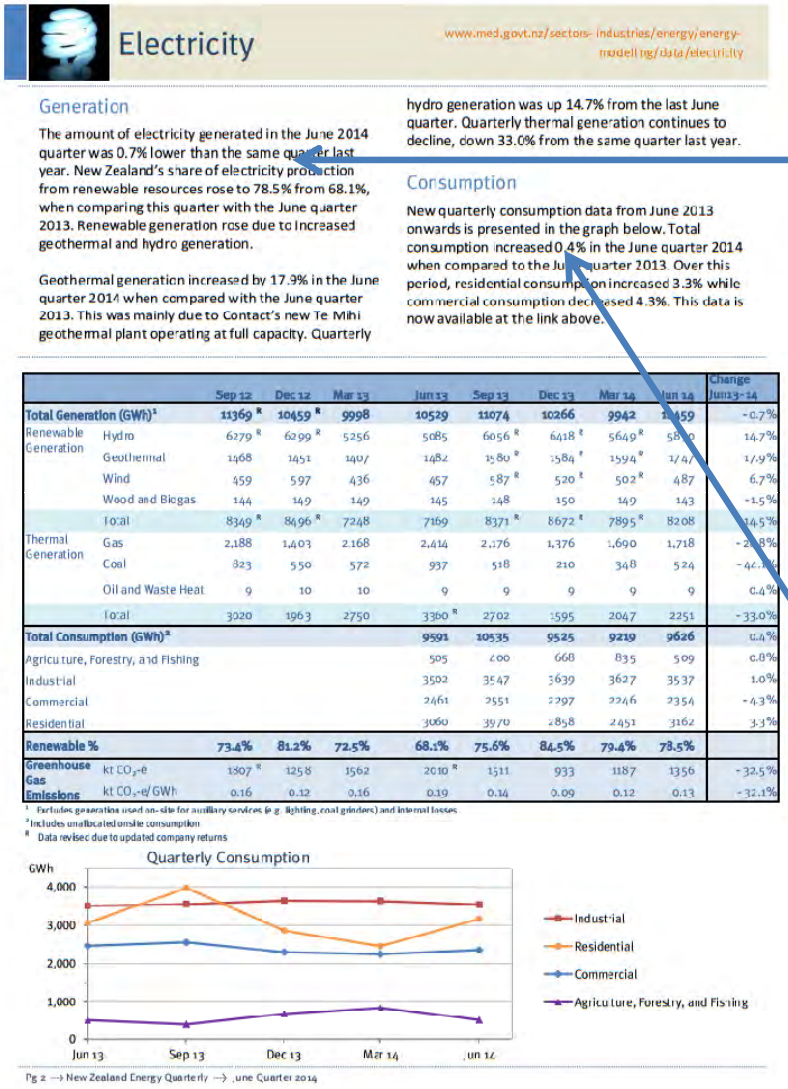
5 large plus 8 small generators

Transpower

28 lines companies

Regulators – Electricity Authority and Commerce Commission

THE NEW ZEALAND CONTEXT



Electricity

www.med.govt.nz/sectors-industries/energy/energy-modelling/data/electricity

Generation

The amount of electricity generated in the June 2014 quarter was 0.7% lower than the same quarter last year. New Zealand's share of electricity production from renewable resources rose to 78.5% from 68.1%, when comparing this quarter with the June quarter 2013. Renewable generation rose due to increased geothermal and hydro generation.

Geothermal generation increased by 17.9% in the June quarter 2014 when compared with the June quarter 2013. This was mainly due to Contact's new Te Mihi geothermal plant operating at full capacity. Quarterly hydro generation was up 14.7% from the last June quarter. Quarterly thermal generation continues to decline, down 33.0% from the same quarter last year.

Consumption

New quarterly consumption data from June 2013 onwards is presented in the graph below. Total consumption increased 0.4% in the June quarter 2014 when compared to the June quarter 2013. Over this period, residential consumption increased 3.3% while commercial consumption decreased 4.3%. This data is now available at the link above.

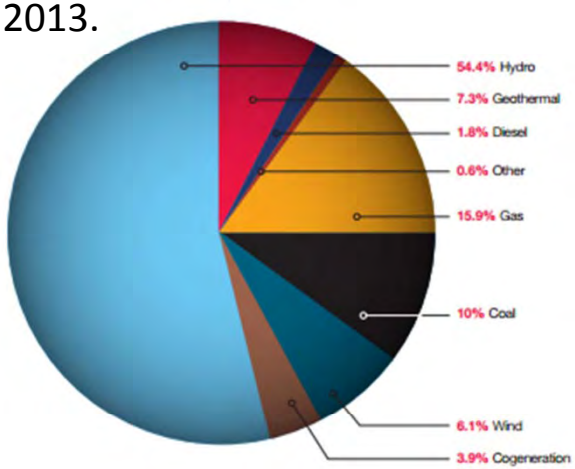
		Sep 12	Dec 12	Mar 13	Jun 13	Sep 13	Dec 13	Mar 14	Jun 14	Change Jun13-14
Total Generation (GWh)[1]		**11369 R**	**10459 R**	**9998**	**10529**	**11074**	**10266**	**9942**	**10459**	**-0.7%**
Renewable Generation	Hydro	6279 R	6299 R	5256	5085	6056 R	6418 R	5649 R	5830	14.7%
	Geothermal	1468	1451	1407	1482	1580 R	1584 R	1594 R	1747	17.9%
	Wind	459	597	436	457	587 R	520 R	502 R	487	6.7%
	Wood and Biogas	144	149	149	145	148	150	149	143	-1.5%
	Total	8349 R	8496 R	7248	7169	8371 R	8672 R	7895 R	8208	14.5%
Thermal Generation	Gas	2,188	1,403	2,168	2,414	2,176	1,376	1,690	1,718	-28.8%
	Coal	323	550	572	937	518	210	348	524	-44.1%
	Oil and Waste Heat	9	10	10	9	9	9	9	9	0.4%
	Total	3020	1963	2750	3360 R	2702	1595	2047	2251	-33.0%
Total Consumption (GWh)[2]					**9591**	**10535**	**9525**	**9219**	**9626**	**0.4%**
Agriculture, Forestry, and Fishing					505	600	668	835	509	0.8%
Industrial					3502	3547	3639	3627	3537	1.0%
Commercial					2461	2551	2297	2246	2354	-4.3%
Residential					3060	3970	2858	2451	3162	3.3%
Renewable %		**73.4%**	**81.2%**	**72.5%**	**68.1%**	**75.6%**	**84.5%**	**79.4%**	**78.5%**	
Greenhouse Gas Emissions	kt CO_2-e	1807 R	1258	1562	2010 R	1511	933	1187	1356	-32.5%
	kt CO_2-e/GWh	0.16	0.12	0.16	0.19	0.14	0.09	0.12	0.13	-32.1%

[1] Excludes generation used on-site for auxiliary services (e.g. lighting, coal grinders) and internal losses
[2] Includes unallocated onsite consumption
R Data revised due to updated company returns

Quarterly Consumption

Pg 2 → New Zealand Energy Quarterly → June Quarter 2014

Electricity production from renewable resources rose to 78.5% from 68.1%, when comparing this quarter with the June quarter 2013.



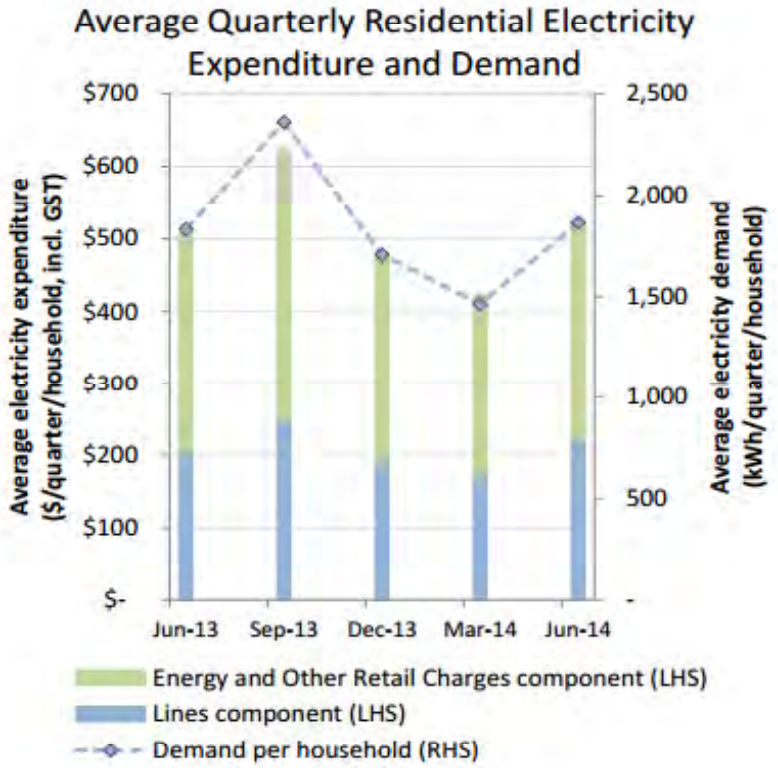
Total consumption increased 0.4% in the June quarter 2014 compared to the June quarter 2013. Over same period:

- residential consumption increased 3.3%
- commercial consumption decreased 4.3%.

THE NEW ZEALAND CONTEXT

Government target of 90% renewables by 2025

THE NEW ZEALAND CONTEXT



[1] Net revenue is total revenue after taking into account multi-product discounts, prompt payment discounts, incentive credits, and other credits given to customers.

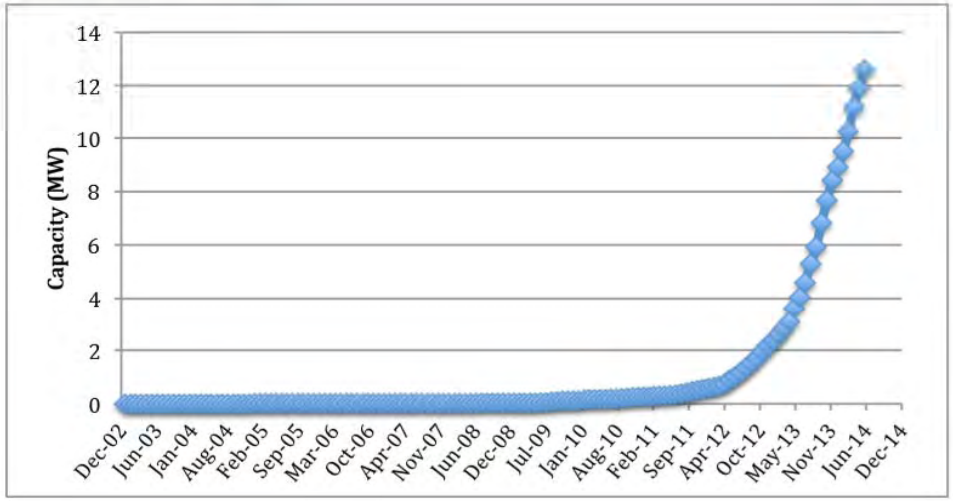
Pg 6 → New Zealand Energy Quarterly → June Quarter 2014

THE NEW ZEALAND CONTEXT

1. PV Uptake in New Zealand to Date

New Zealand's electricity infrastructure was designed to support the flow of energy from large centralised power stations toward end users, including households and businesses. However, a shift to a more distributed supply may be beginning with the growing interest in small-scale photovoltaic (PV) solar generation. In the **last 2 years** alone the quantity of grid-connected small-scale **PV systems in NZ has grown by at least 330%**[2]. Although PV installations to date are relatively few, such that the current installed capacity is about one-tenth that of Meridian's West Wind power station near Wellington, a continuation of the **growth that can be seen in this market** (Figure 1) could have substantial impact.

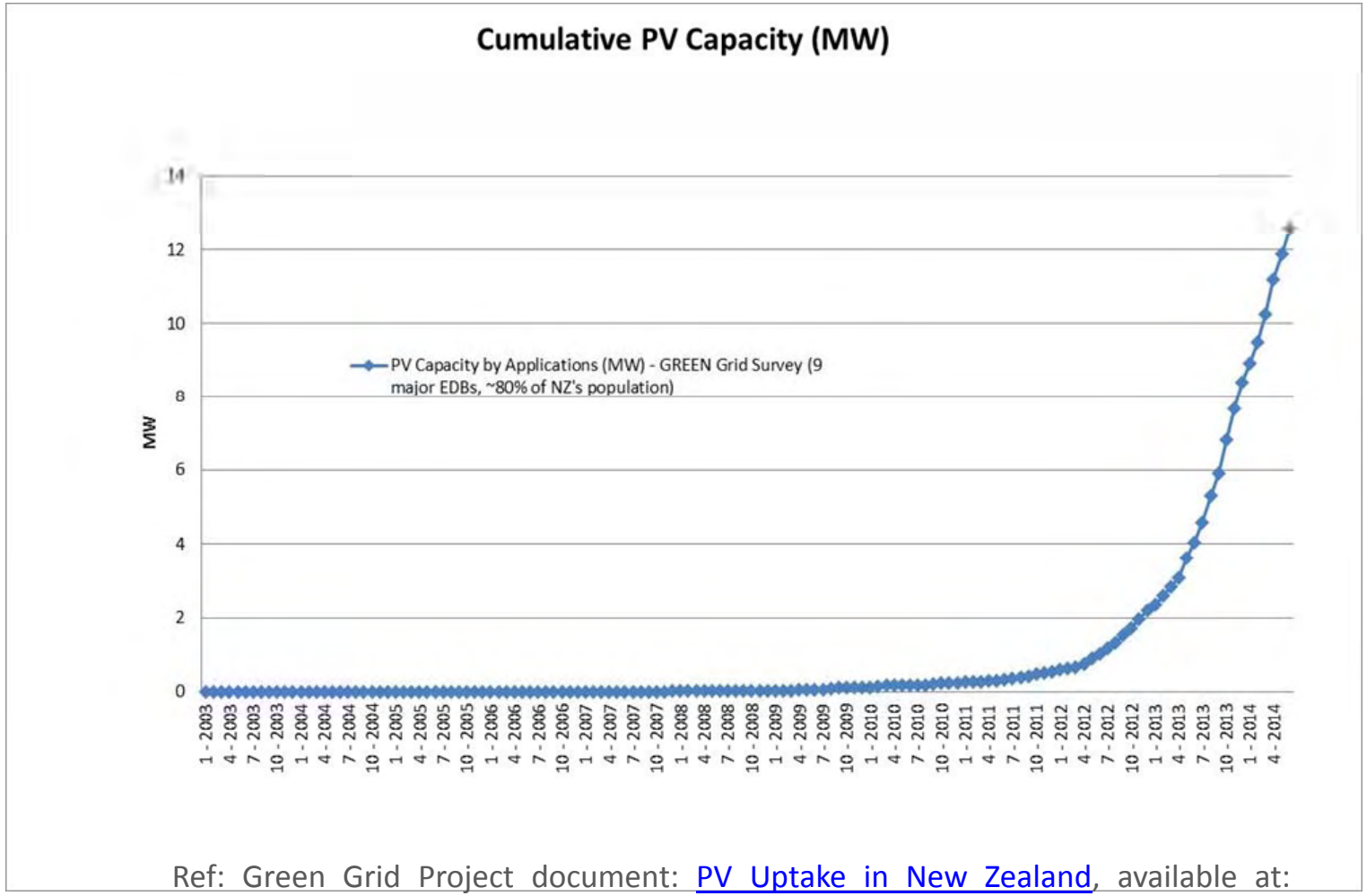
Figure 1: Cumulative PV Capacity by Applications (MW) - GREEN Grid Survey (9 major EDBs, ~80% of NZ's population)



[1] See http://energycultures.org/ for more information.

[2] Miller, A., Williams, J., Wood, A., Santos-Martin, D., Lemon, S., Watson, N., & Pandey, S. (2014). Photovoltaic Solar Power Uptake in New Zealand. Presented at the EEA Conference & Exhibition 2014, 18 - 20 June, Auckland. Note: these figures only cover around 80% of NZ applications for PV, and do not include off-grid systems. Recently the Electricity Authority has launched a query tool on its EMI web site that gives details of distributed generation connections.

THE NEW ZEALAND CONTEXT



Ref: Green Grid Project document: PV Uptake in New Zealand, available at: http://www.epecentre.ac.nz/research/

THE NEW ZEALAND SMART GRID FORUM

- Established in early 2014 – commissioned by MBIE and ENA
- Total of 22 members selected from 70+ applicants. Representation from across the whole system
- 3 full Forum meetings to-date, plus 8 teleconferences with working groups
- 2 update reports to the Minister expected in first year

http://www.med.govt.nz/sectors-industries/energy/electricity/new-zealand-smart-grid-forum

Purpose

The Forum's objective is to advance the development of a smart electricity system in New Zealand through information sharing and dialogue, supported by analysis and by focused work-streams where these are considered to be appropriate.

NEW ZEALAND SMART GRID FORUM

Architecting a future electricity system for all New Zealanders