GREEN Grid

Future Proofing New Zealand's Electricity Supply

What is GREEN Grid?

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GREEN Grid Background

In December 2011 MBIE asked for research proposals to address the following questions:

1. What are the supply variability characteristics of current and potentially applicable renewable resources across all energy markets, what are the challenges they present for efficient and secure energy supply and how can new technologies and practices for managing variability help?

2. What economic and technical models can be utilised to evaluate the potential impact of renewable energy feeding into our distribution networks?

3. What mechanisms can be used to investigate the performance of low voltage networks, subject to bi-directional power flows as a result of the input of renewable energy?

The EPECentre, at the University of Canterbury (UC), led a bid called "Renewable Energy and the Smart Grid" with the Centre for Sustainability, University of Otago (CSAFE), and the Power Systems Group, University of Auckland (UA PSG), to address these questions. In late 2012 MBIE awarded a contract to UC to carry out the research proposed in UC's bid. While officially named "Renewable Energy and the Smart Grid", the research team call the project GREEN Grid, after the acronym coined by the late Professor Arrillaga and Professor Bodger: Gathering Renewable Energy in Electricity Networks. A general article about GREEN Grid is at this location:

Get Smart– Power to the People (from IPENZ's Engineering Insight)

GREEN Grid Structure

The challenges facing the grid from new technology in both the supply and demand side, and the GREEN Grid project structure, are depicted in the diagram below. The GREEN Grid project structure is broadly classified into two areas:

Impact Statement One: Managing Supply Variability of Renewable Energy in the Network. This comprises three research aims (RA) – the green ovals in the diagram below.

Impact Statement Two: Cost-effective, Functional and Safe Distribution Network. This comprises four research aims – the blue ovals in the diagram below.

The research groups carrying out the research for each RA are also shown in the diagram below.

Results

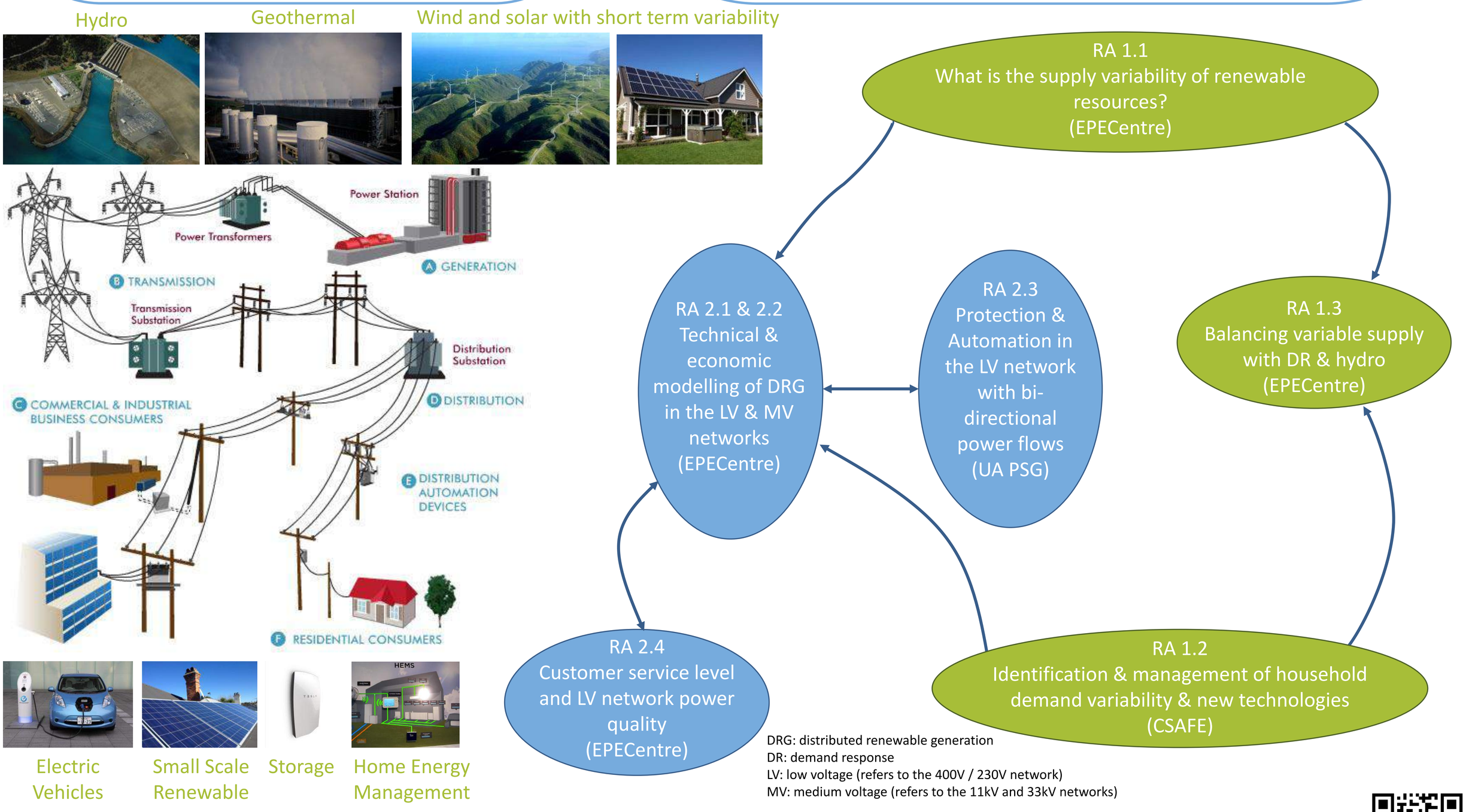
GREEN Grid results and research carried out by the EPECentre team are summarised in accompanying posters. These include:

- Simulating the Impact of Distributed PV in Distribution Networks (RAs 1.1, 2.1, and 2.2), Scott Lemon, PhD candidate
- Renewable Resource and Demand Variability Analysis (RAs 1.1 and 1.3), Luke Schwartfeger, PhD candidate
- Managing Renewable Energy (RA 1.3), Josh Schipper, PhD candidate
- Simulating Wind Power (RA 1.1), Dougal McQueen, PhD candidate
- Distributed Generation Hosting Capacity (RA 2.2), Tim Crownshaw, Transpower staff member seconded to the EPECentre
- Environmental aspects of Photovoltaic Solar Power: the New Zealand Context (RA 2.1), Luke Schwartfeger, completed as a summer scholarship
- The Economics of Photovoltaic Solar Power (RA 2.1), Dr Allan Miller
- Demand Response in New Zealand (RA 1.2), Dr Richard Strahan, EPECentre staff member
- Electric Vehicles and Demand Response: an Economic Perspective (RA 1.2), Dr Allan Miller

Results of surveys of PV and EV perceptions as part of RA 1.2 by CSAFE are at these links:

Photovoltaic Uptake in NZ: The story so far

Keen on EVs: Kiwi perspectives on electric vehicles, and opportunities to stimulate uptake



DRG: distributed renewable generation
DR: demand response
LV: low voltage (refers to the 400V / 230V network)
MV: medium voltage (refers to the 11kV and 33kV networks)

Figure 1: A typical power system structure, showing New Zealand's mainly centralised renewable generation (top) and new technologies connecting to the distribution network (bottom), highlighting the need to understand their impact on the distribution network. Images are courtesy of the EPECentre, World Solar, Meridian Energy, Tesla, and Toshiba.

Full papers on many GREEN Grid outputs are available here:

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