Sustainability and consumer behaviour

Dr Rebecca Ford, Environmental Change Institute, University of Oxford

Presentation at the CEDEC Congress, October 18th 2016

NEW ZEALAND SMART GRID FORUM

University of Otago Te Whare Wānanga o Otāgo New Zealand

Centre for Sustainability
Kā Rakahau o Te Ao Tūroa

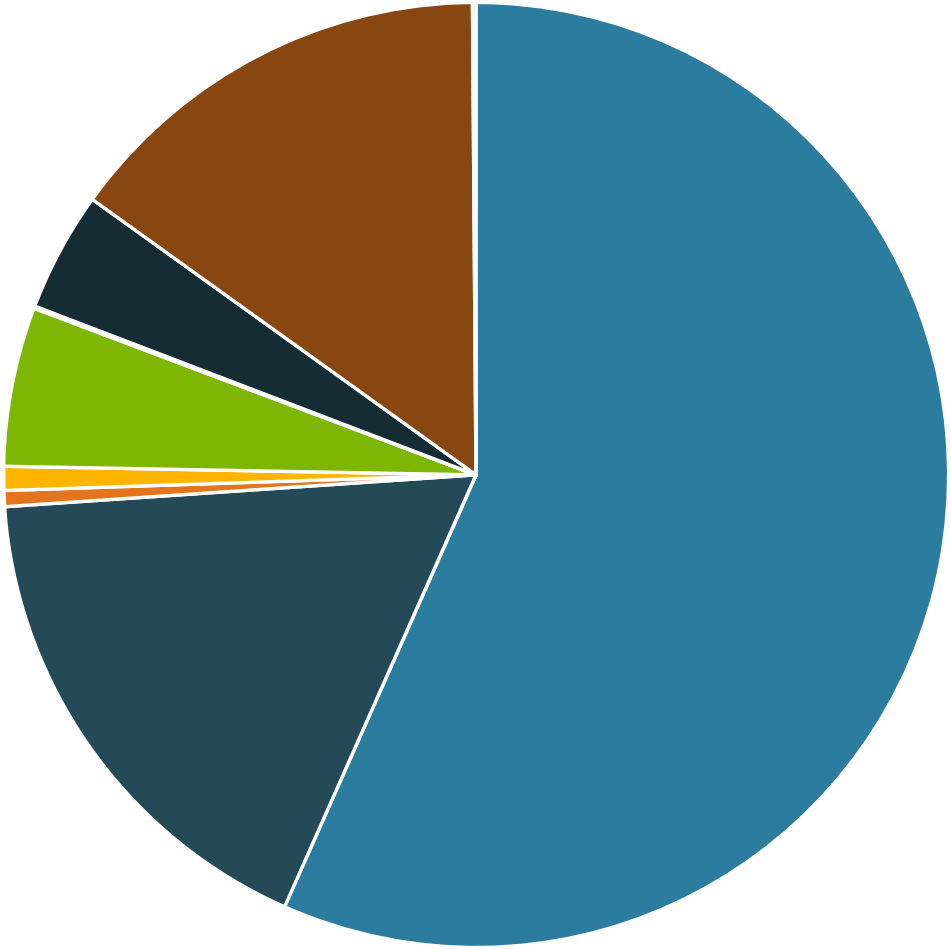
OXFORD MARTIN SCHOOL

UNIVERSITY OF OXFORD

New Zealand


United Kingdom
Scandinavia
Russia
Alaska
Canada
Central Europe
USA
Korea
Japan
China
Israel
Iran
Algeria
Libya
Egypt
Saudi Arabia
India
Taiwan
Hong Kong
Mexico
Hawaii
Sudan
United Arab Emirates
Philippines
Thailand
Malaysia
Singapore
Colombia
Indonesia
Peru
Brazil
Fiji
Australia
South Africa
Chile
Argentina
Tasmania
New Zealand
Antarctica

Electricity Generation



- Hydro
- Geothermal
- Biogas
- Wood
- Wind
- Solar
- Oil
- Coal
- Gas

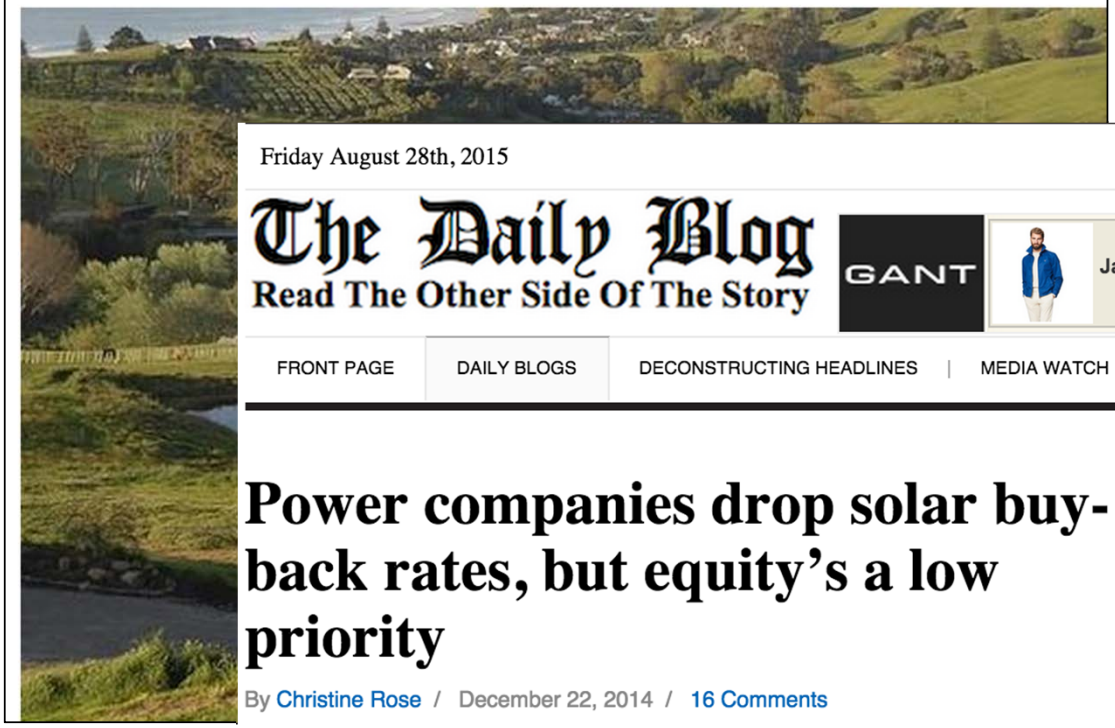
81%

No policy or financial support for solar PV (or electric vehicles)

'Outrage' at solar power buyback cuts

Updated at 8:00 am on 7 November 2014

Supporters of solar power are shocked by Meridian Energy's moves to slash the price it pays back from new solar customers - the second company to do so.



Solar Power: Still shining bright

By William Guy

11:21 AM Tuesday Dec 2, 2014

Green Living | Sustainable Business

108 | 8 | 0 | 3

Solar buy-back rates have been reduced by the power companies, but it appears the boom will carry on regardless.

Friday August 28th, 2015

The Daily Blog

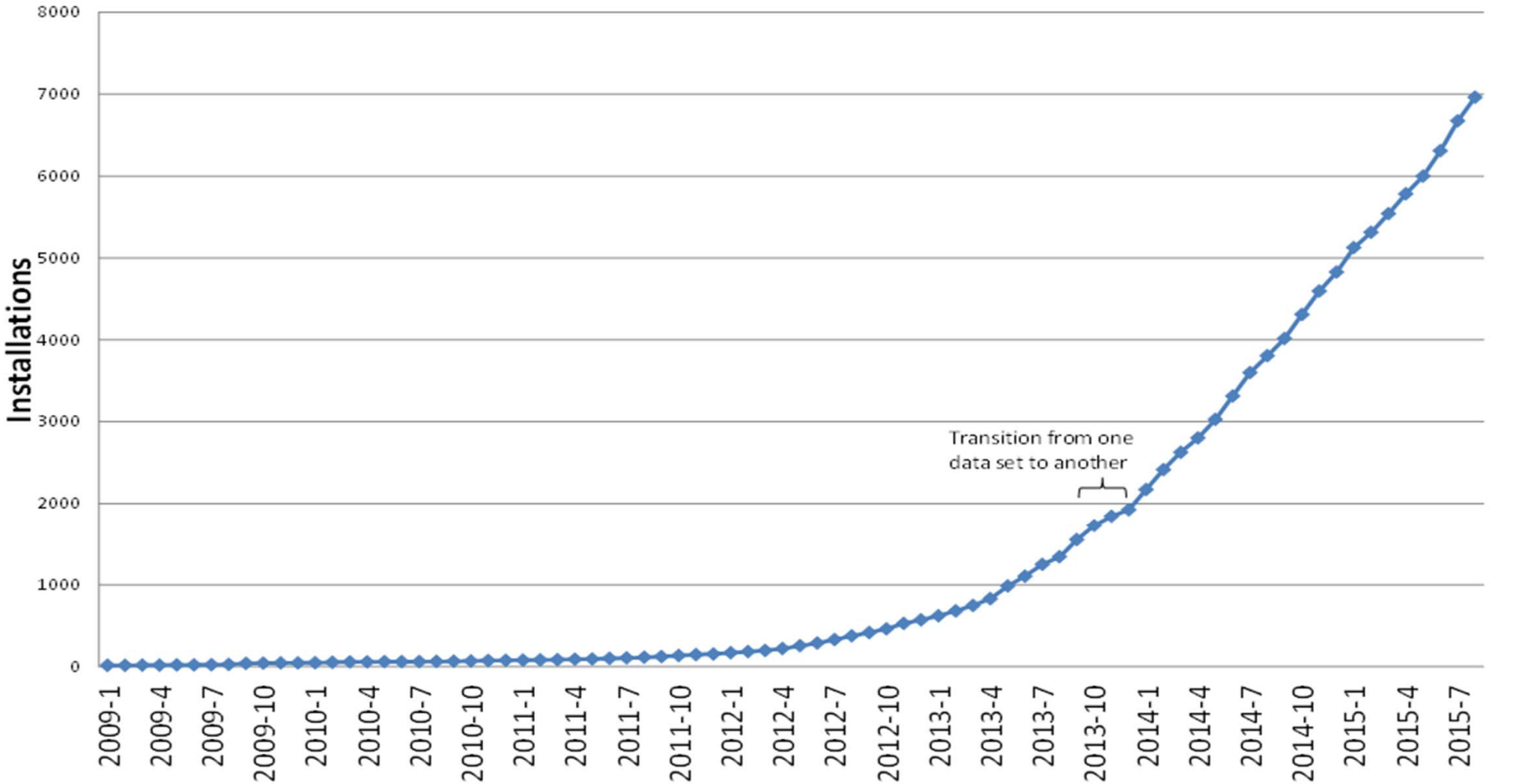
Read The Other Side Of The Story

FRONT PAGE | DAILY BLOGS | DECONSTRUCTING HEADLINES | MEDIA WATCH | THE LIBERAL AGENDA

Power companies drop solar buy-back rates, but equity's a low priority

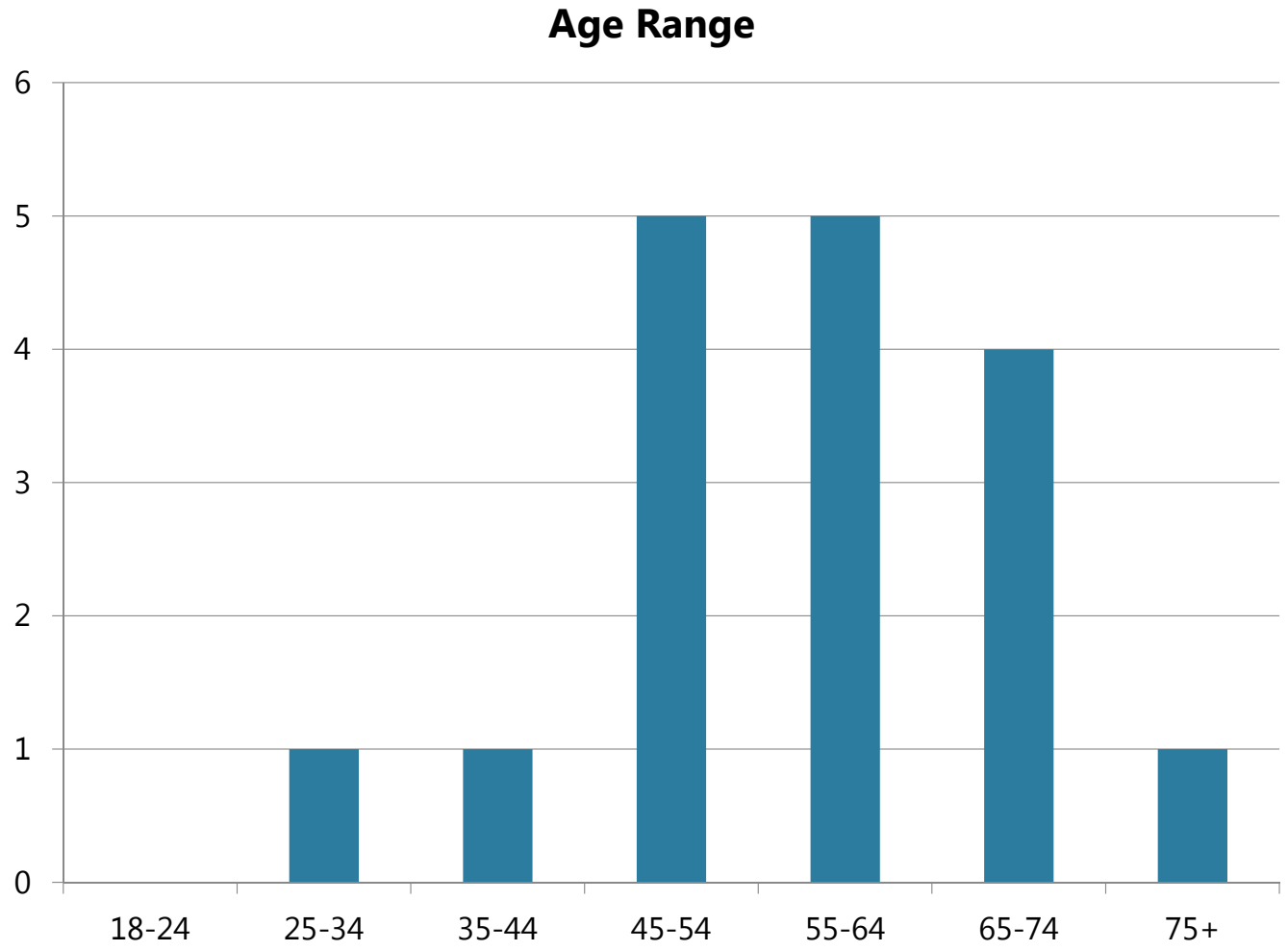
By Christine Rose / December 22, 2014 / 16 Comments

New Zealand PV Uptake



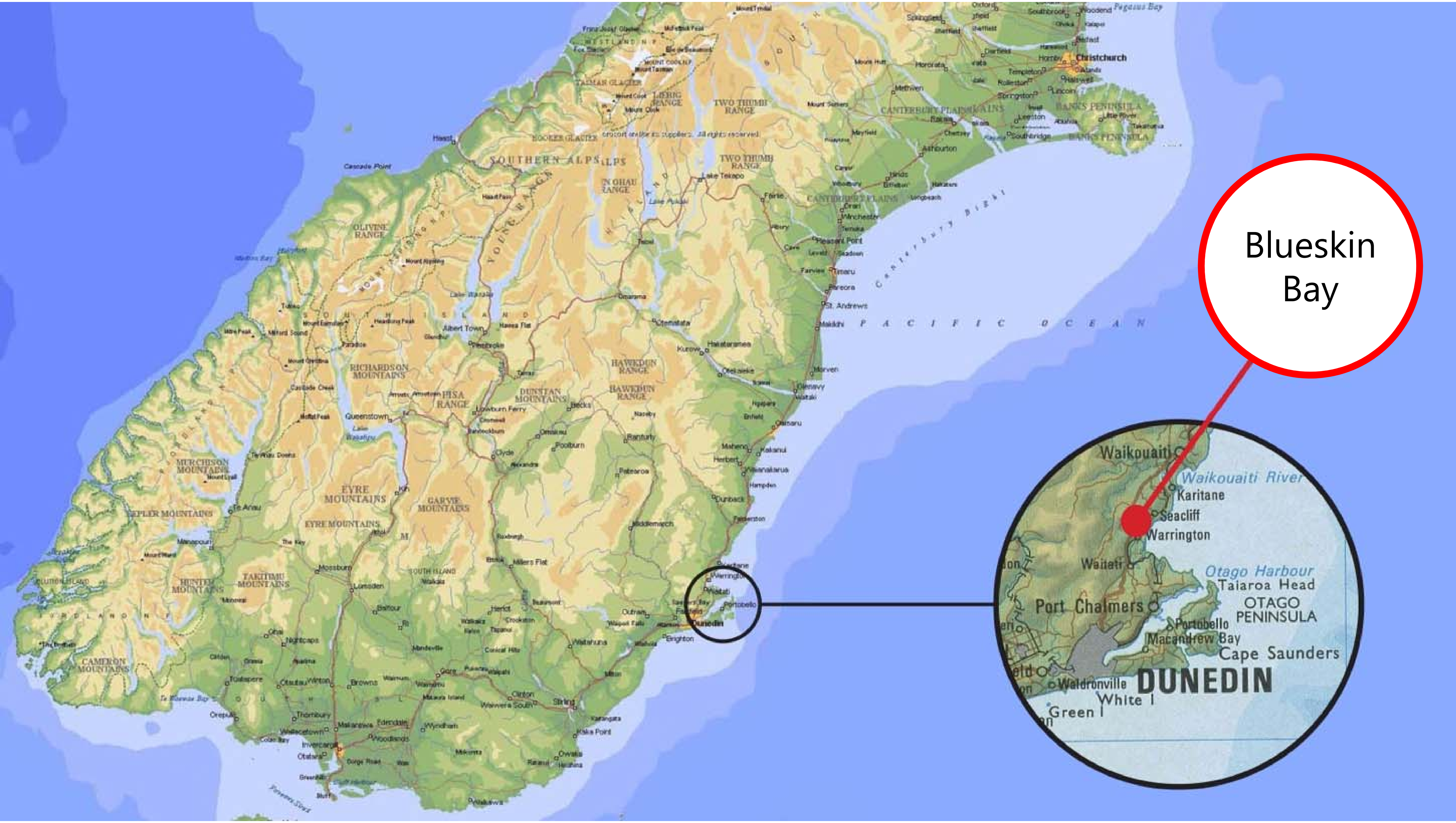
Interviews with early adopters across New Zealand

- Home owners
- Planning to stay in the property long-term
- Spread across income bands
- Technologically competent
- Information seekers
- Lack trust in power co.
- Desire for independence



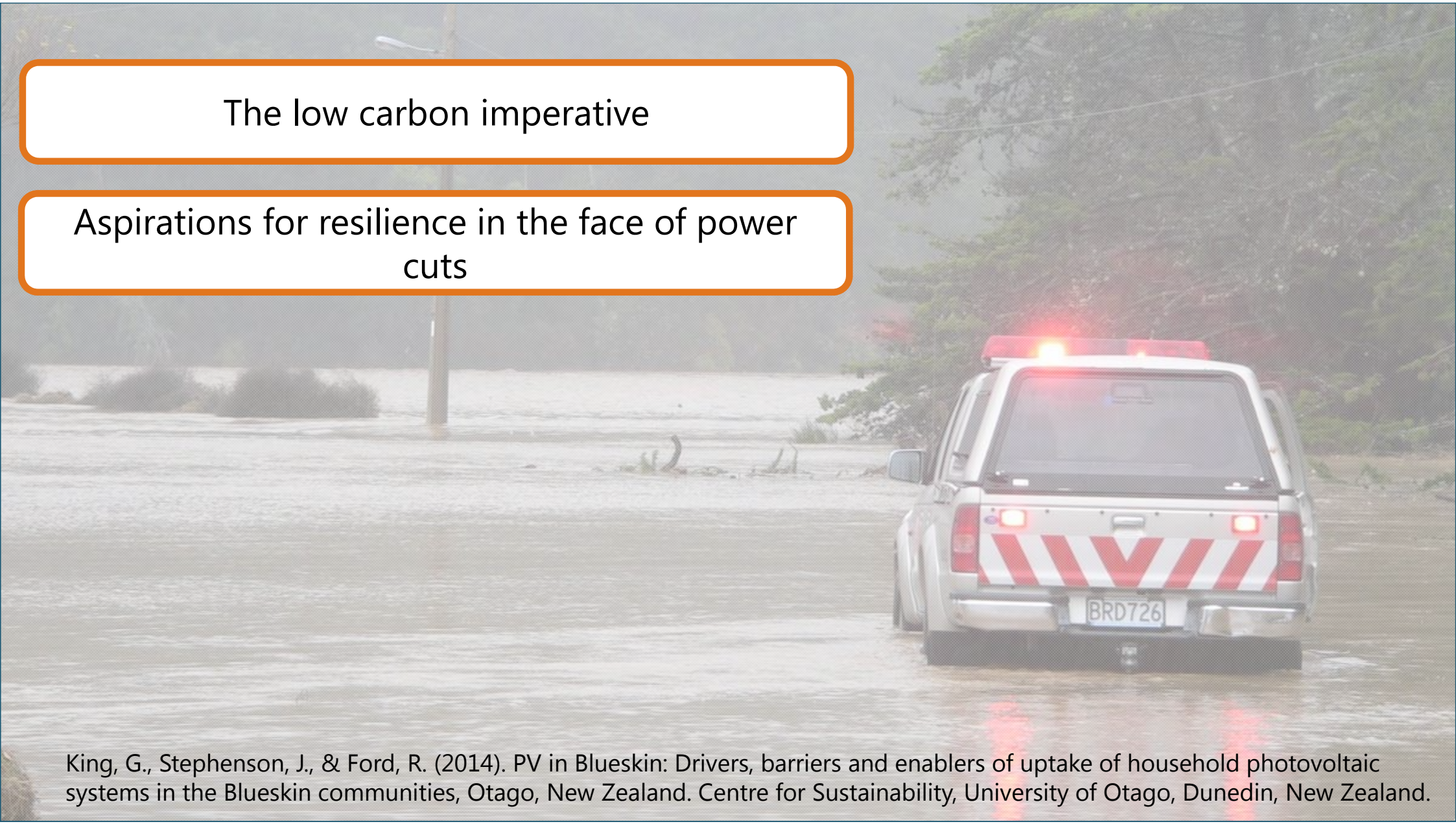
From the Rise of Prosumers

To the Rise of Prosumer Communities

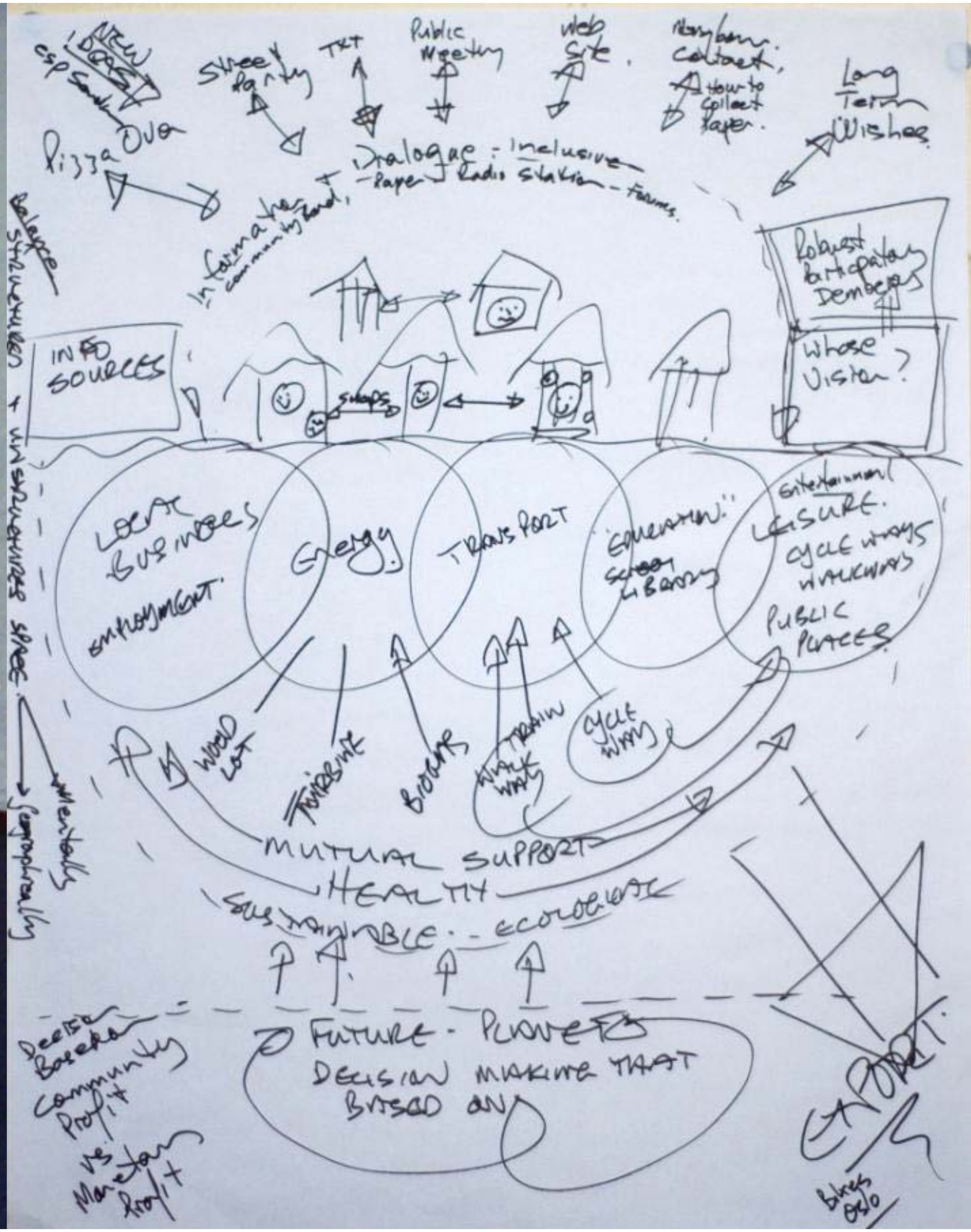

Blueskin Bay
Waikouaiti
Waikouaiti River
Karitane
Seacliff
Warrington
Waitati
Otago Harbour
Taiaroa Head
OTAGO PENINSULA
Port Chalmers
Portobello
Macandrew Bay
Cape Saunders
DUNEDIN
Waldronville
White I
Green I
SOUTHERN ALPS
PACIFIC OCEAN
Canterbury Bight
Christchurch
BANKS PENINSULA
Queenstown
Invercargill
Dunedin
Brighton
EYRE MOUNTAINS
GARVIE MOUNTAINS
TAKITIMU MOUNTAINS
HAWKDUN RANGE
DUNSTAN MOUNTAINS
RICHARDSON MOUNTAINS
TWO THUMB RANGE

The low carbon imperative

Aspirations for resilience in the face of power cuts



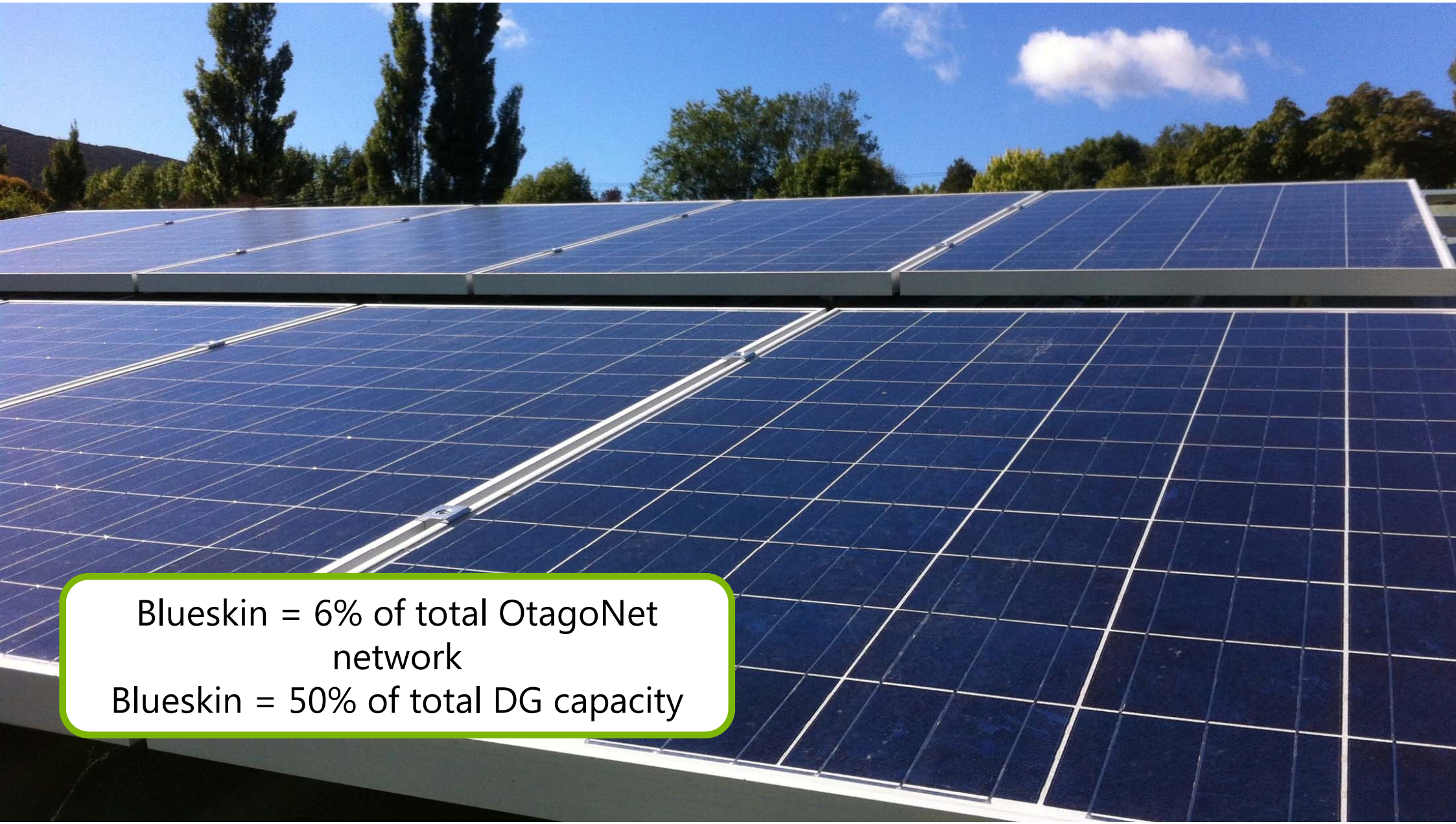
King, G., Stephenson, J., & Ford, R. (2014). PV in Blueskin: Drivers, barriers and enablers of uptake of household photovoltaic systems in the Blueskin communities, Otago, New Zealand. Centre for Sustainability, University of Otago, Dunedin, New Zealand.


Street Party
TXT
Public Meeting
Web Site
Long Term Wishes
Pizza Oven
Dialogue - Inclusive
Radio Station
Information
Robust participatory Democracy
INFO SOURCES
Whose Vision?
shops
LOCAL BUSINESS
EMPLOYMENT
Energy
TRANSPORT
LEISURE
CYCLE WAYS
WALKWAYS
PUBLIC PLACES
WOOD LOT
TURBINE
TRAIN
WALK WAY
CYCLE WAY
MUTUAL SUPPORT
HEALTHY
SUSTAINABLE
ECOLOGICAL
FUTURE
DECISION MAKING THAT
BASED ON
Community Profit
vs Monetary Profit


BIGGER


1st Energy Expo – Dec 2007


Warm up NZ
pilot scheme


Blueskin = 6% of total OtagoNet network
Blueskin = 50% of total DG capacity


Organically emerging uptake
spreading through community


Cook Strait
Bulls
Feilding
Dannevirke
Porang
1
Palmerston North
Foxton
Tokomaru
Pahiatua
Levin
Eketahuna
Otaki
Manakau
D'Urville Island
Paraparaumu Beach
Waikanae
2
Masterton
Porirua
2
Arapawa Island
Rai Valley
6
Havelock
Wellington
Rimutaka Forest Park
Palliser Bay
Renwick
Blenheim

Further drivers of local energy action

Community benefits

Social cohesion / philanthropy

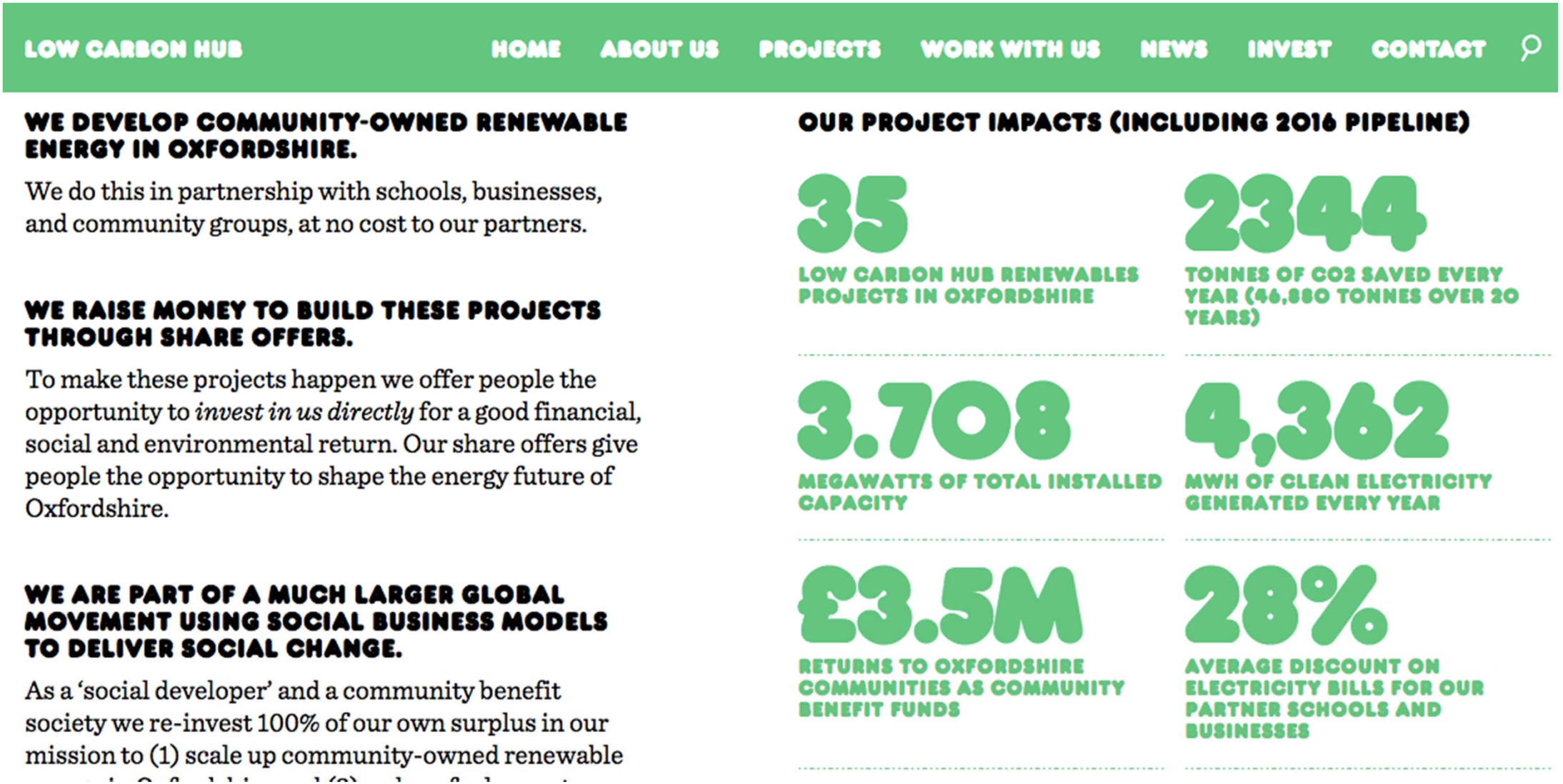
Co-op set-up

Set share prices

Seeking members

Seeking projects

Community partner projects



Planned prosumer communities

Schlierberg Solar Settlement, Frieburg, Germany

Solar power
Guardian Environment Network

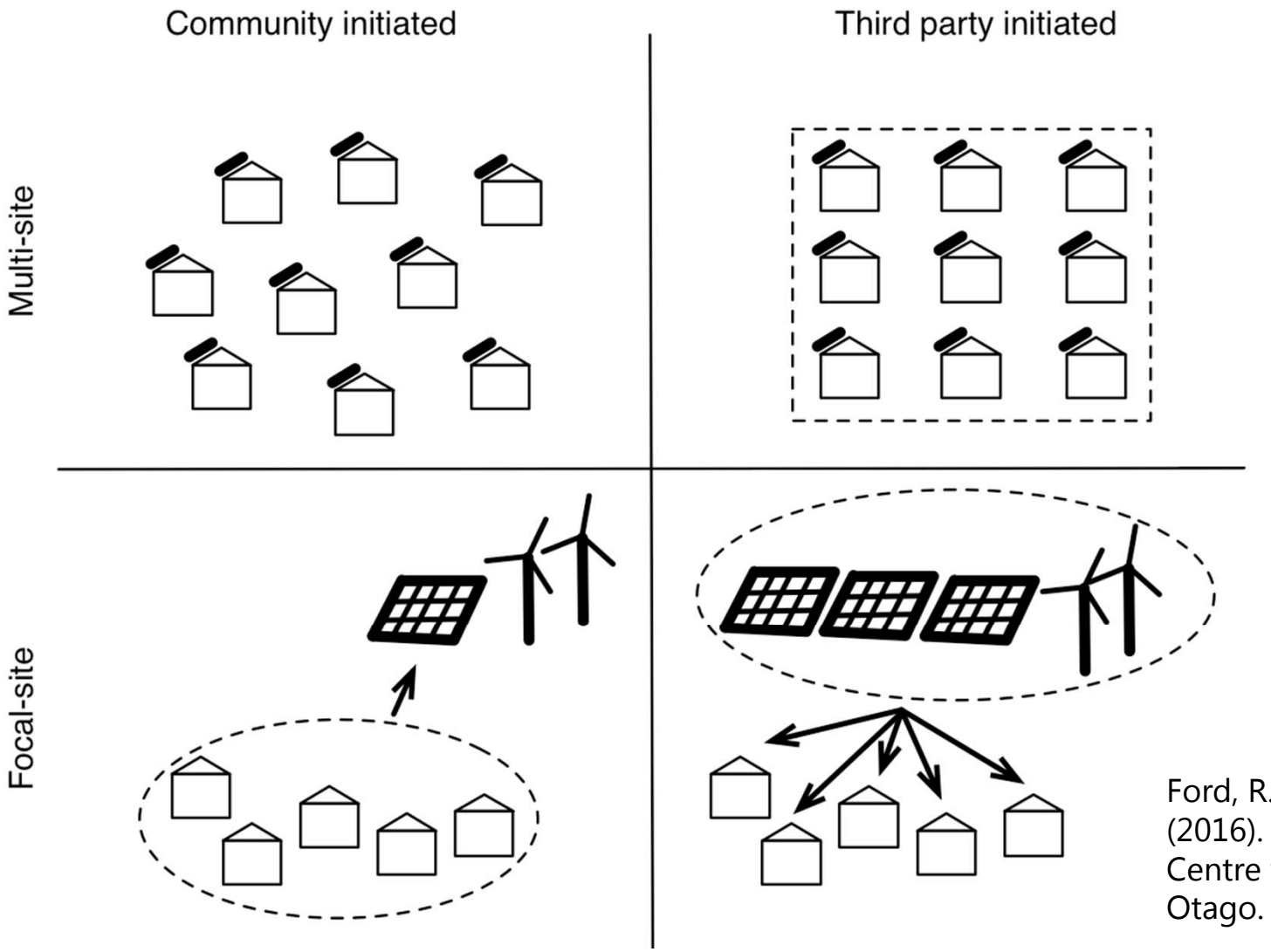
San Francisco adopts law requiring solar panels on all new buildings

Tech capital is first major US city to require all new buildings of 10 storeys or under to have solar panels, reports BusinessGreen

Madeleine Cuff
for BusinessGreen, part of the Guardian Environment Network

Thursday 21 April 2016
10.01 BST

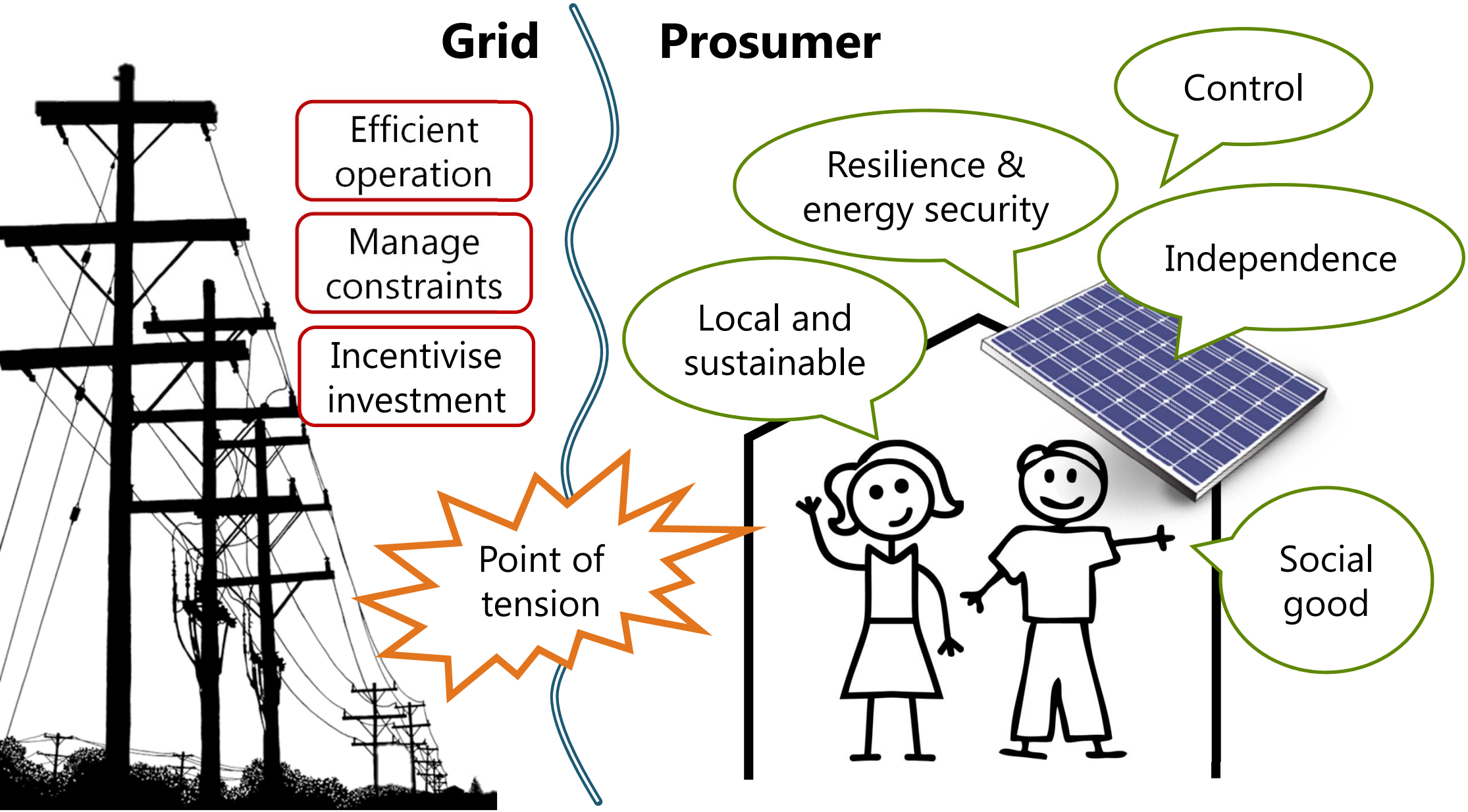
Collective prosumerism



Ford, R., Whitaker, J., & Stephenson, J. (2016). Prosumer collectives: a review. Centre for Sustainability, University of Otago.

How are end-user – energy system interactions changing?

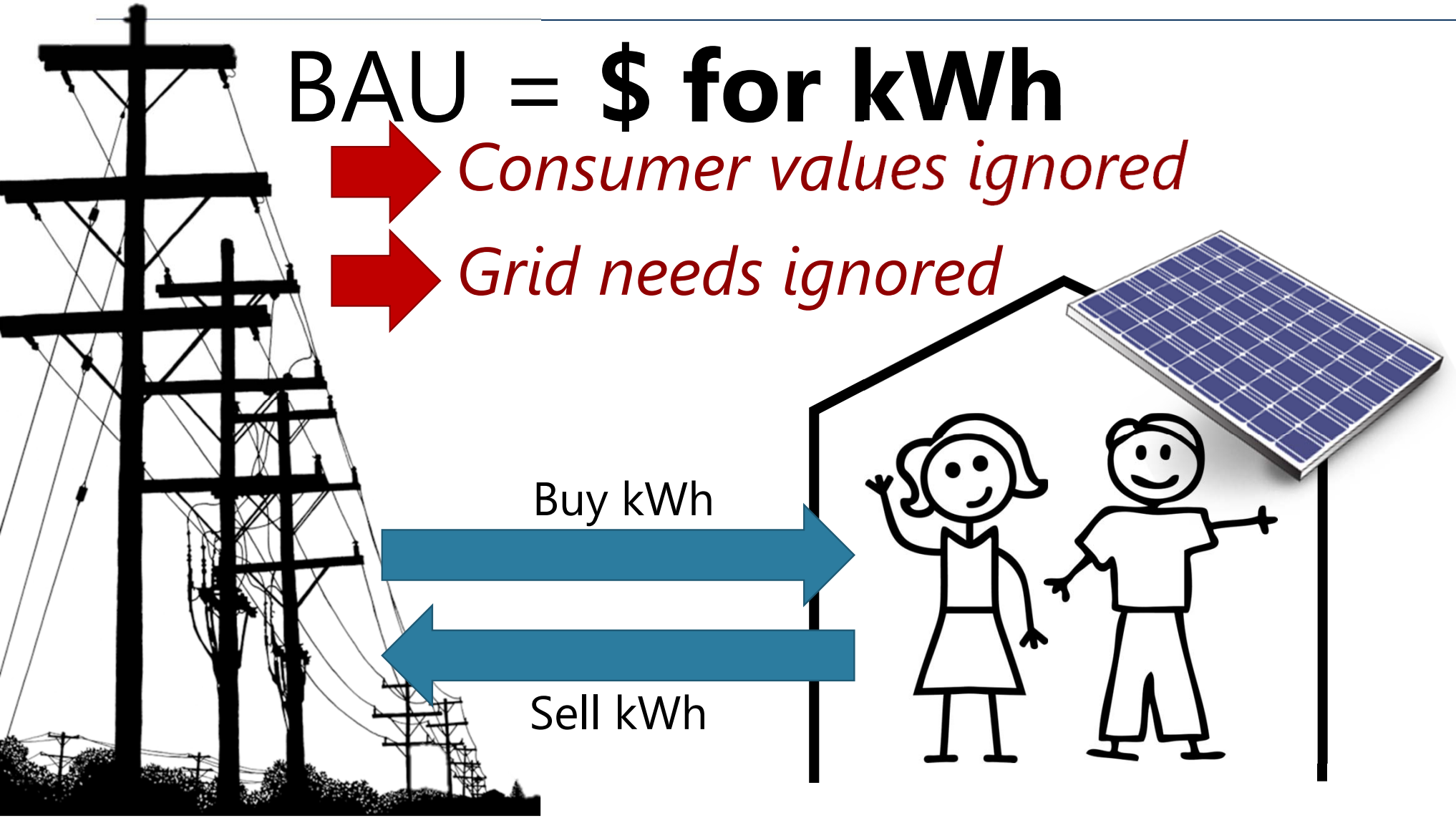
Ford, R., Stephenson, J., & McCulloch, M. (2016). Prosumers, smart grids, and demand flexibility. Proceedings of 4th European Conference on Behaviour and Energy Efficiency (Behave 2016), Coimbra, Portugal.


Grid
Prosumer
Efficient operation
Manage constraints
Incentivise investment
Point of tension
Control
Resilience & energy security
Independence
Local and sustainable
Social good

BAU = **$ for kWh**

Consumer values ignored

Grid needs ignored

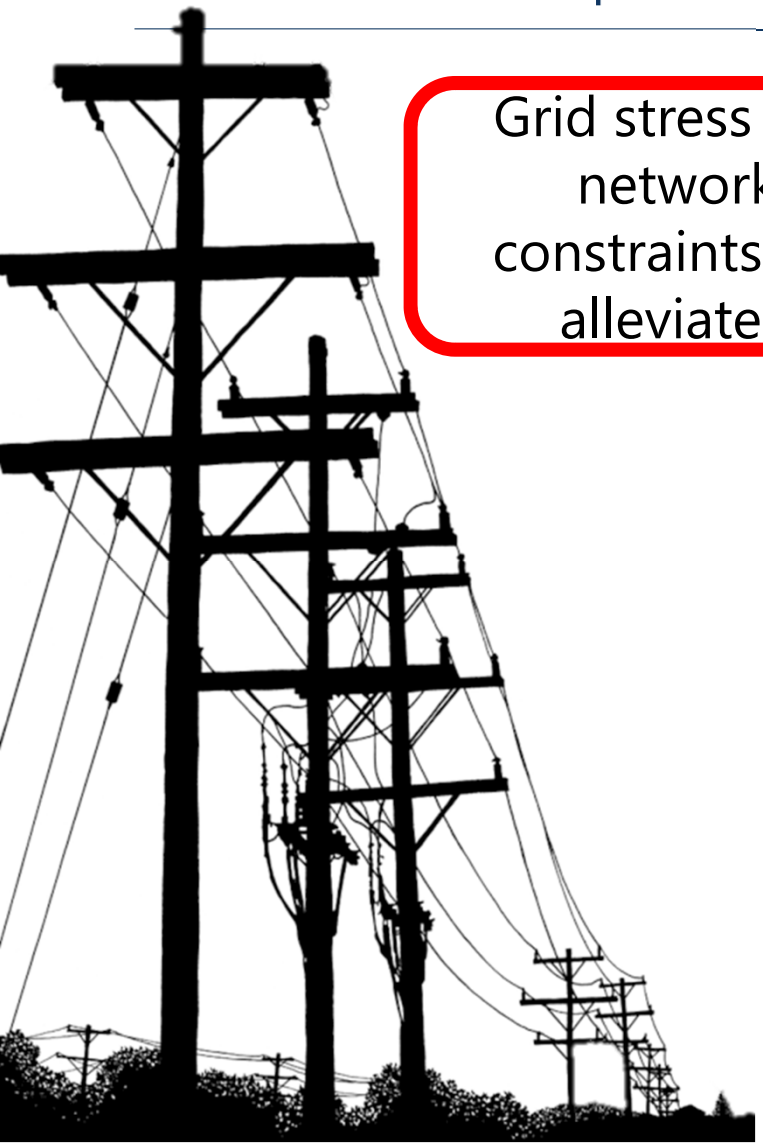


Peer-to-peer trading to sell excess energy

Buy and sell renewable energy - directly

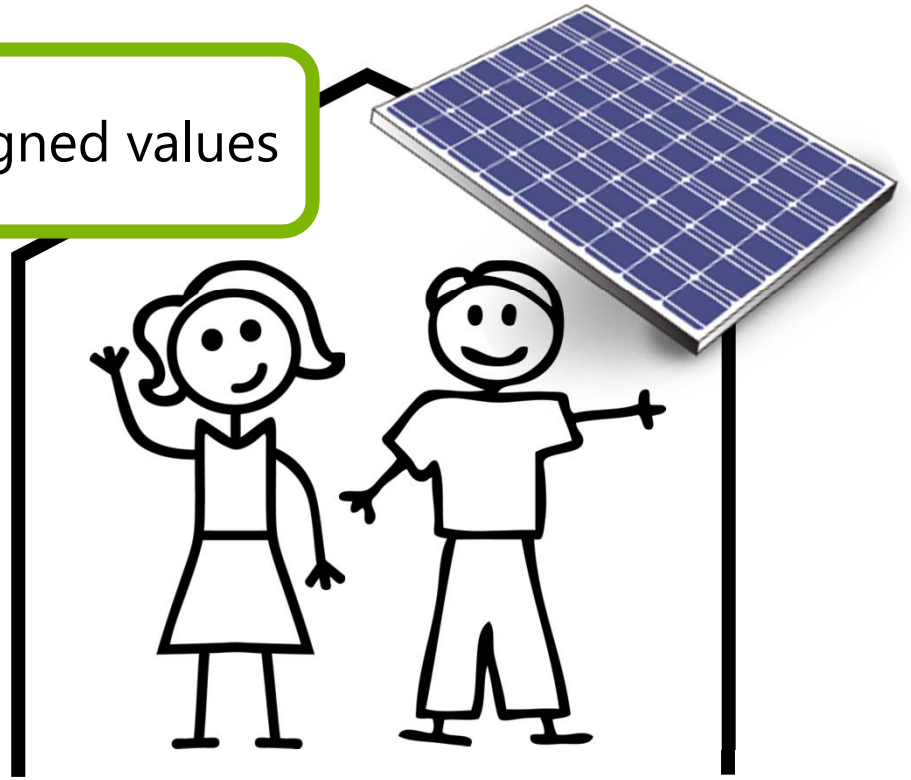
Piclo is an online marketplace for energy - giving renewable generators and commercial consumers more control and transparency than ever before.

Peer-to-peer – good for households, might not benefit grid



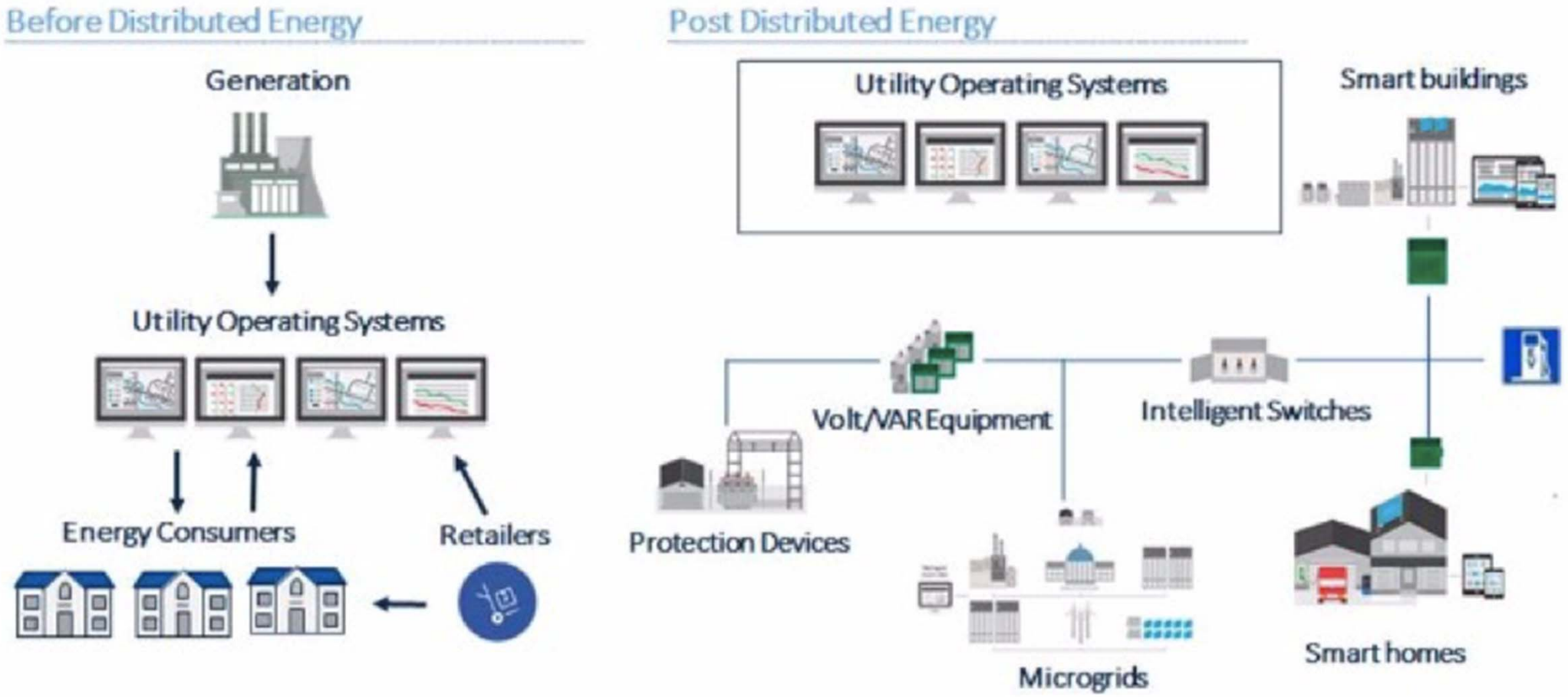
Grid stress and network constraints not alleviated

Aligned values



Re-framing the grid from the smart home up?

Smart homes and the grid of the future



Demand management within a smart home

Solar Generation

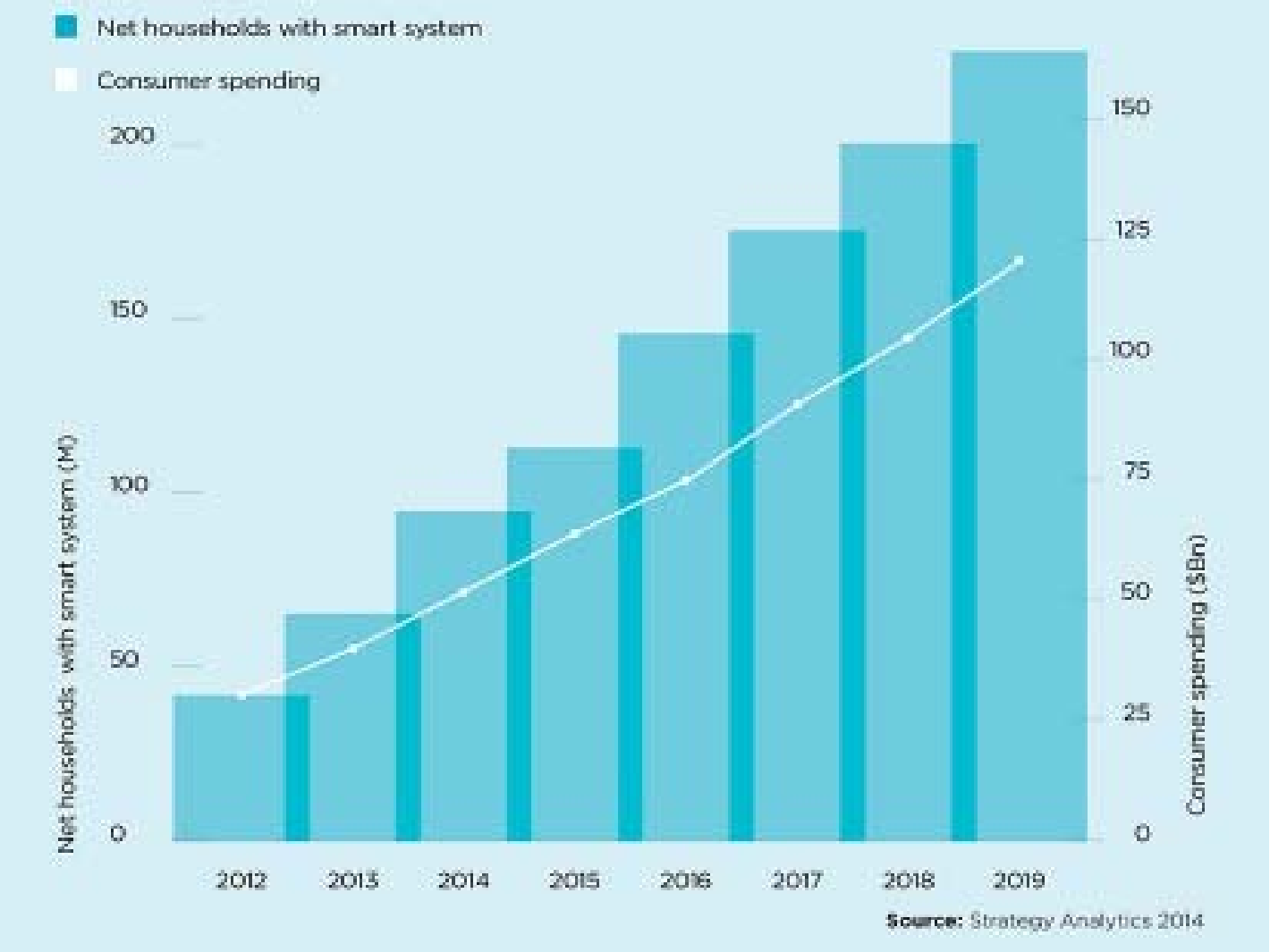
Manager

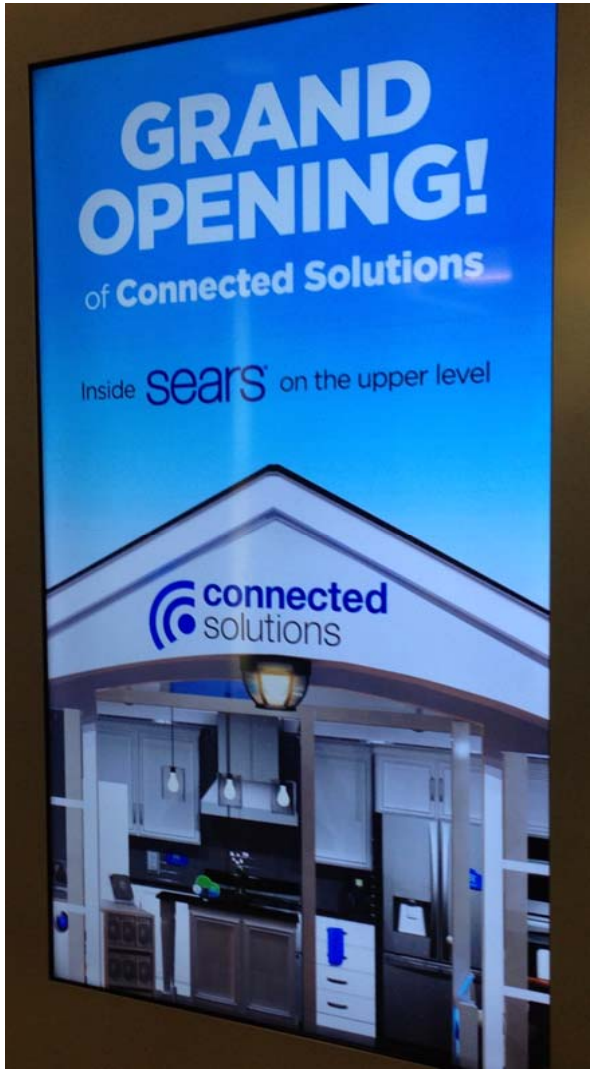
Discretionary load

Storage

Real-time load

Global demand side technology changes





Energy management opportunities

User Interfaces

Energy Portal

In Home Display

Load Monitor

Smart Hardware

Smart Appliance

Smart Light

Smart Thermostat

Smart Plug

Smart Switch

Hubs

Platforms

Smart Home/ Web Services Platform

Utility Facing Web Services

OPOWER 5.5 FLEX

Karlin, B., Ford, R., Sanguinetti, A., Squiers, C., Gannon, J., Rajukumar, M., & Donnelly, K.A. (2015). Characterization and Potential of Home Energy Management (HEM) Technology. San Francisco, CA: Pacific Gas and Electric.

Consumers engagement with smart home technology

Remote control of appliances (79%)

Schedule appliances to run at pre-defined times (71%)

Remotely monitoring appliances (73%)

Ford, R., & Peniamina, R. (2016). Smart Homes: What New Zealanders think, have, and want. (Project Report). Centre for Sustainability, University of Otago

Consumers engagement with smart home technology

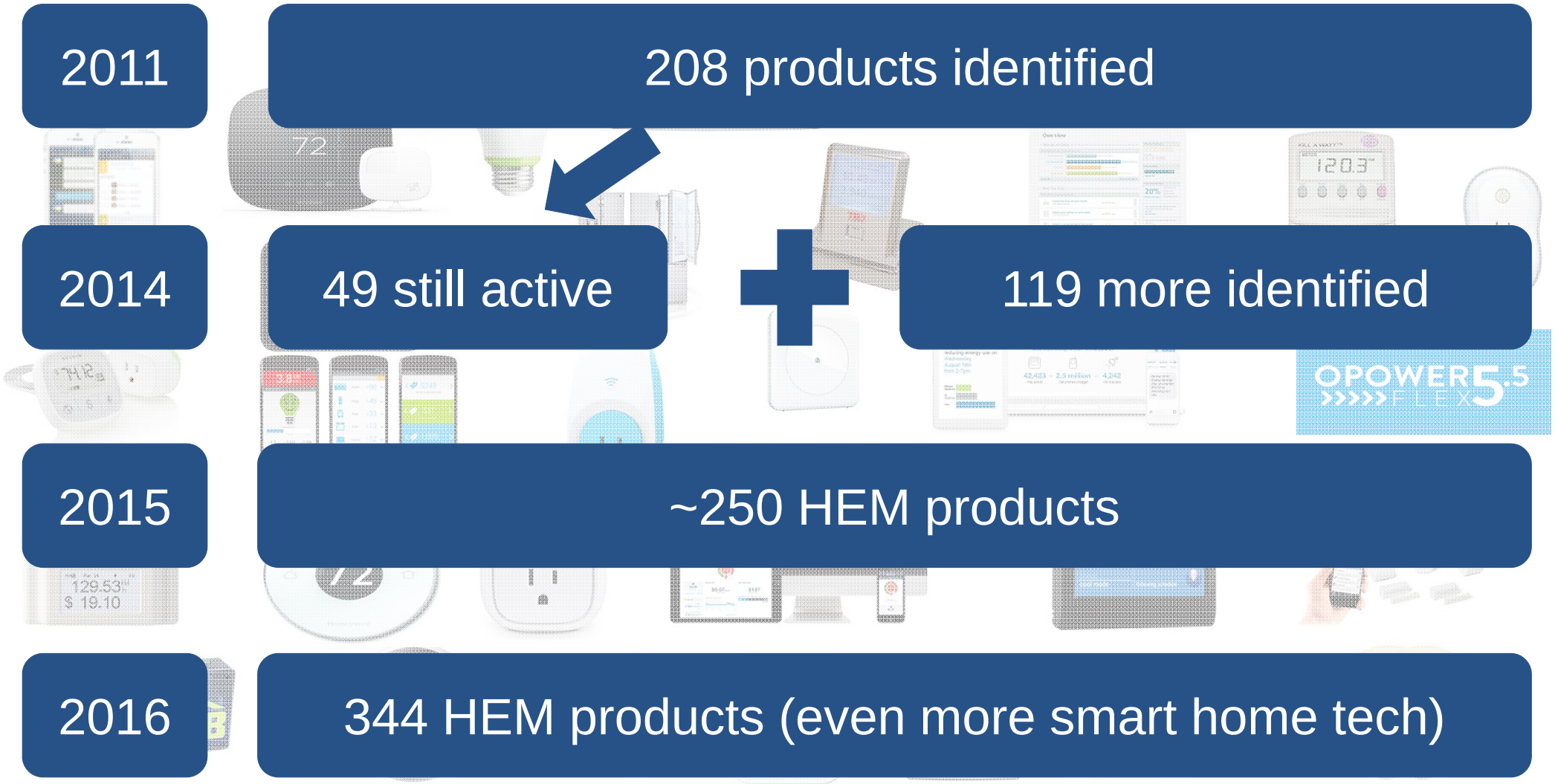
Protect
Security
Safety
Structure

Nurture
Care
Cleanliness
Cooking
Comfort

Conserve
Energy and Money

Barriers to engagement

Technology Volatility



Market instability

"There have been some recent setbacks in the smart home market with companies like Nest closing down Revolv."

(Technology company)

Lack of reliability

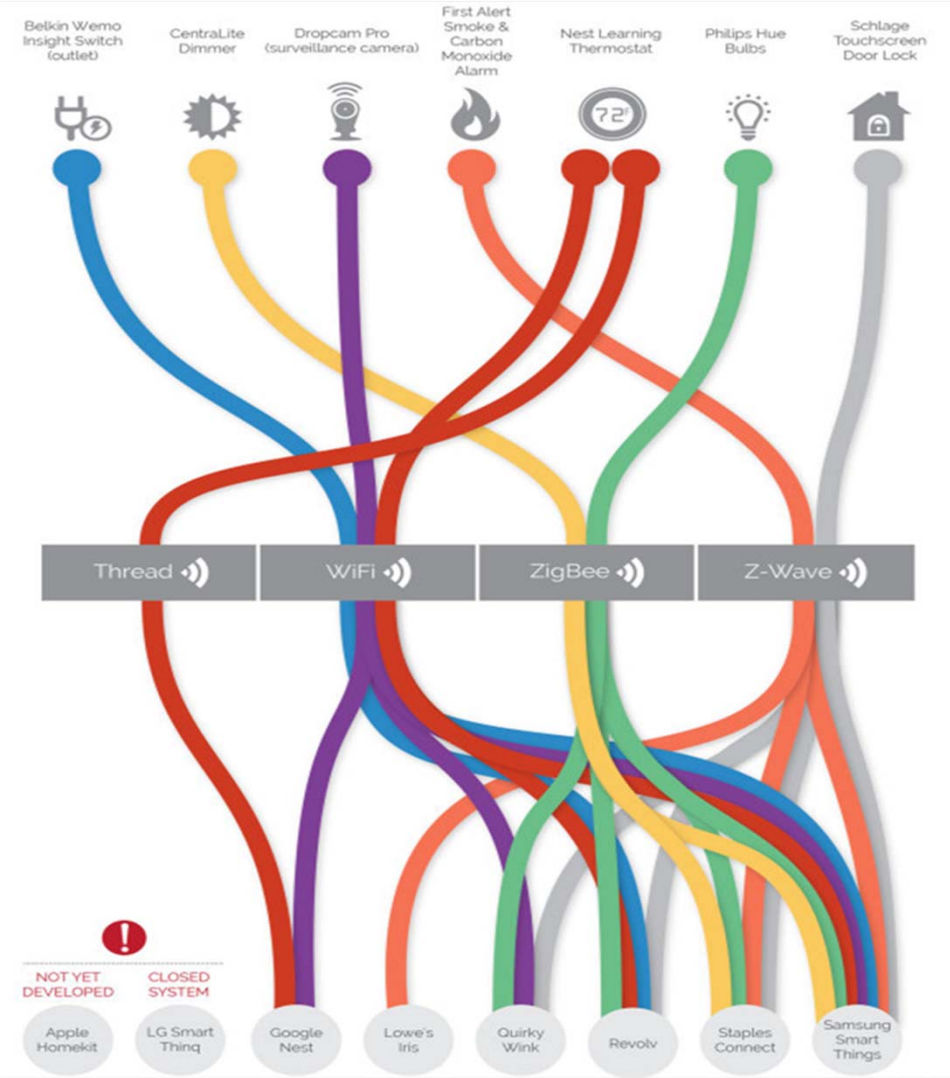
"These kinds of products need to work 100% of the time without fail and that's not the case right now."

(Retailer)

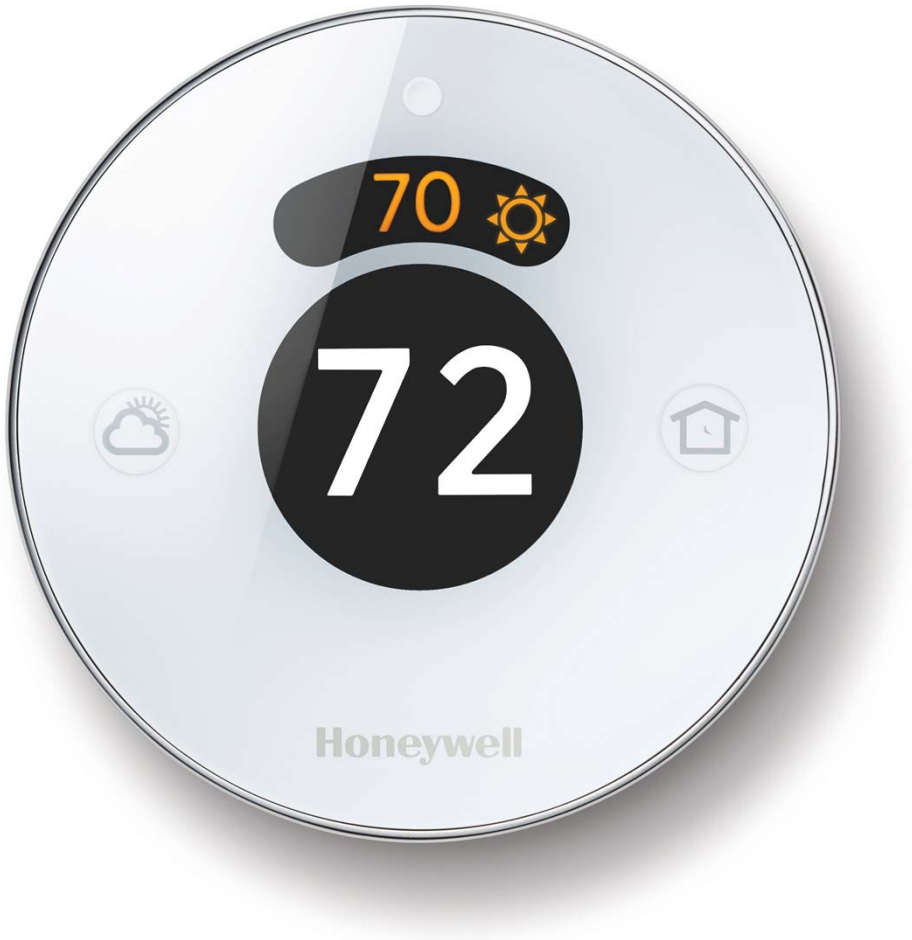
Lack of interoperability

"I wish these home automation companies would get on a standard. It's too confusing for consumers."

(Customer Review)



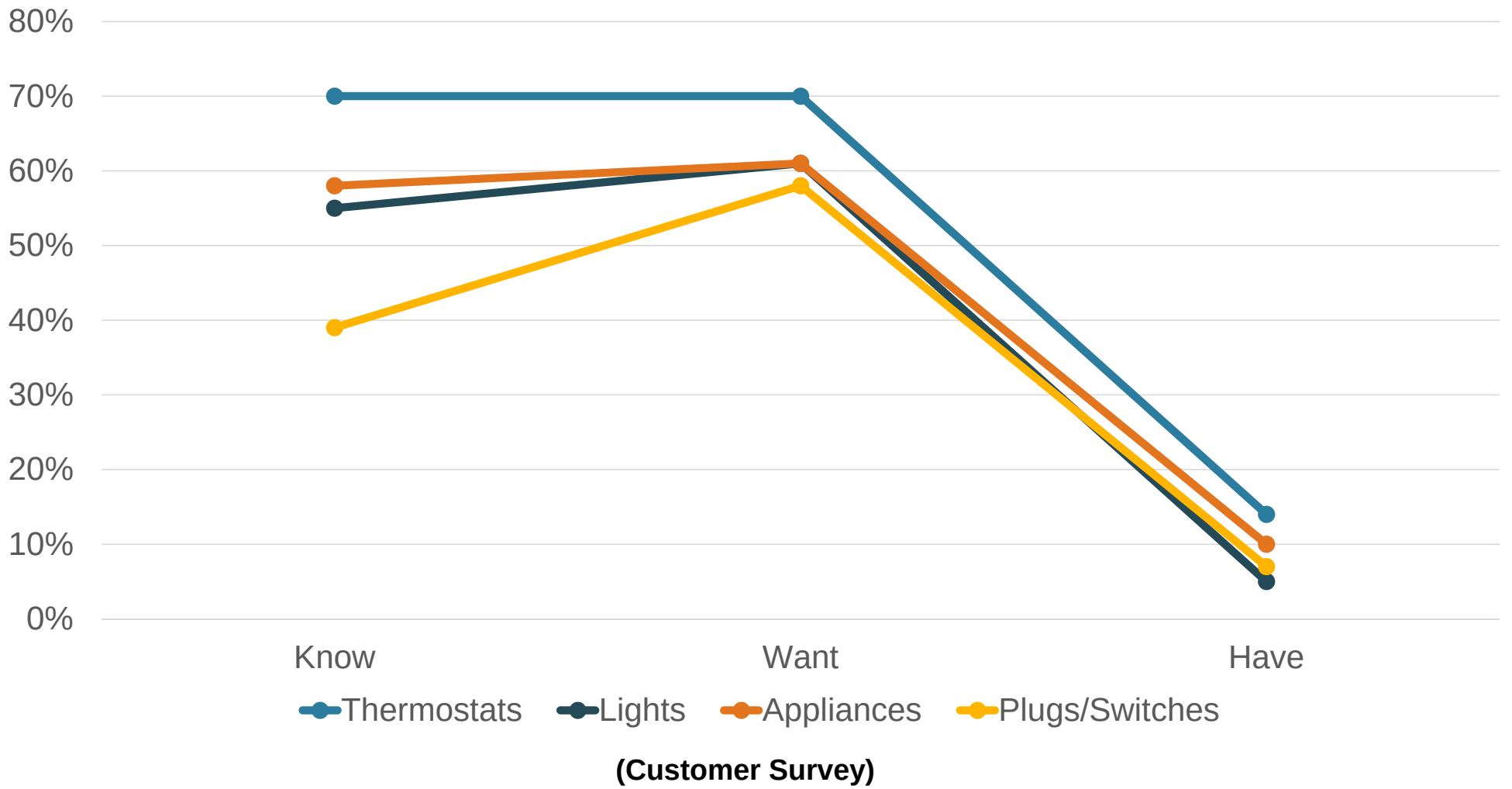
Poor understanding



"I thought this was a CD”

(Retail customer)

Consumer inaction



(Customer Survey)

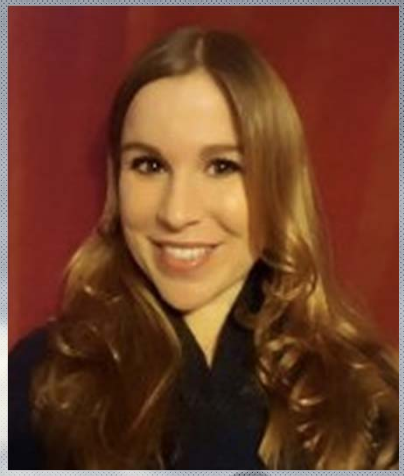
So what?

Implications for delivering a smarter home and grid

- **Value Proposition**:
  Identify how new technologies deliver value to consumers and to grid (load reduction and load shifting)
- **Education**:
  Demystify market, upskill customers in understanding how new technologies work to deliver a smart home environment
- **Interoperability**:
  Identify how different products work individually and together, and how this may be dynamic over time
- **Interaction**:
  Explore how energy management technologies (and systems) can work with solar home systems to deliver maximum benefits to households and grid alike







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New Zealand Smart Grid Forum

PG&E

Oxford Martin School

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