Local Energy Innovation 1: Policy and Context

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Presented at Energy Centre Summer School, 22 February, 2018

Outline

1. Social and political aspects of energy
2. Local ownership and climate change
3. (Local) energy policy & international trends

4. NZ Energy policy & challenges
5. Local and community energy in NZ
6. Summary and future directions

Social and political aspects of energy

1. Increased interest in ‘demand side’
2. More ways to participate
3. Institutions are not given
   - Shaped by politics, power, discourse
   - Real social and environmental implications
   - Tech innovation endogenous to market structure
4. How can government- industry bodies best co-ordinate to direct the speed and quality of innovation?

Challenge:
Competing Interests

Dissecting discourse

Solar PV in New Zealand

"There is misalignment between the 'private' benefits, versus the underlying 'public' benefits of solar PV to New Zealand as a whole. [...] Looking out [in the long term], we expect solar PV to modestly increase the need for fossil-fuelled generation, and therefore add to electricity sector emissions".

- Concept Consulting

"Distributed energy enables New Zealand to move away from fossil fuels, [and] offers [...] benefits related to voltage and power quality, grid reliability and resiliency, equipment life extension, and reduced energy prices"

- SolarCity

Household electricity prices [in New Zealand] have grown much faster than other IEA countries, and were well above IEA average in 2014, while industrial prices are below (IEA 2017, p.76)

Local ownership

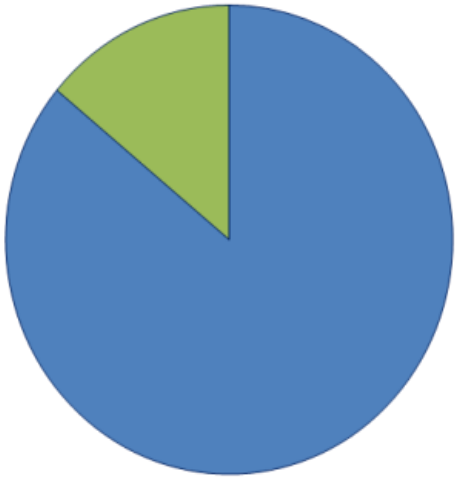
Local and community energy

- Energy projects wholly or partially owned and managed by collective and citizen-led organisations established and operating across a geographically defined community.
- Engagement in project process and collective benefits

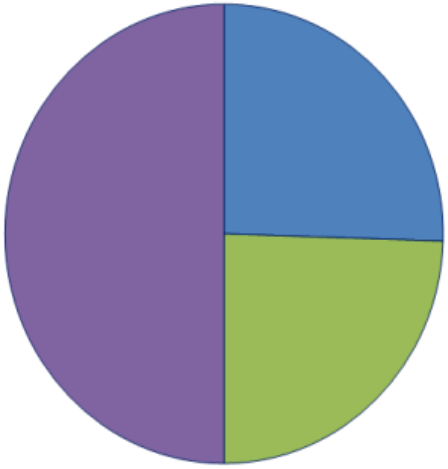
- Power generation (on or off-grid), distribution, charging infrastructure & microgrids, energy storage, heat generation, trading, energy efficiency.

	Project type	Description	Technologies	Scale
Self consumption	**Facility projects**	Charitable organisations supplying heat or power to community facilities	solar PV, micro-wind, ground/air-source heat pump, solar thermal, woodfuel boilers, (hydro)	μ=14kW
	Social enterprise – microgeneration projects	Energy provision for residential and facility buildings, serving as additional income generation for local NGO's with another primary activity	solar thermal, solar PV, ground/air-source heat pump, wind, woodfuel (hydro)	μ=64kW
	Micro-grids	Generation and supply on private wires or grids	wind, hydro, solar PV, integrated	μ=91kW
	District heat networks	Generation and supply of heat (and power)	woodfuel	μ=308kW
	Low carbon micro-generation projects	Local organisations owning and managing local domestic micro-generation as part of broader carbon mitigation programmes.	solar PV, solar thermal, ground/air-source heat pumps, micro-wind	μ=19kW
	Grid integrated direct supply	Direct supply to members of consumer co-operatives.	wind, hydro	NA
Electricity export	**Custodian projects**	Environmental and conservation organisations developing standalone renewable energy installations to fund / complement their activities.	hydro-electric, solar PV, woodfuel (solar thermal, heatpumps)	μ= 456kW
	Development projects	Run by charities / trusts owning privately constituted project entities that house income generating projects and earmark profits to a wide range of development projects	wind, hydro-electric, (solar PV, woodfuel, tidal)	μ=1326kW
	Grid - integrated microgrids	Microgeneration and storage units integrated in low voltage networks and interconnected to the upstream network, typically with demand management strategies.	NA	NA
	Energy enterprises (co-operatives)	Standalone grid-export or installations directly supplying power to local industry, typically financed through IPS's that offer citizens shares, with local, regional or national membership, including crowd sourced projects.	solar PV, wind, hydro-electric, woodfuel (solar thermal, anaerobic digestion)	μ=458kW
	Landowner projects	Local farmers or estate owners collaborating to co-own installations	NA	NA

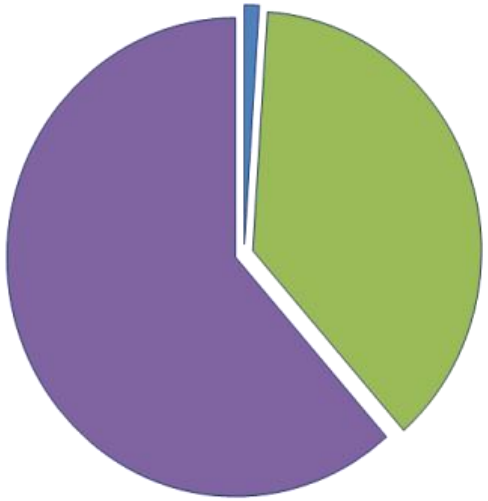
Local ownership



Denmark
(3734 MW)



Germany
(54430 MW)

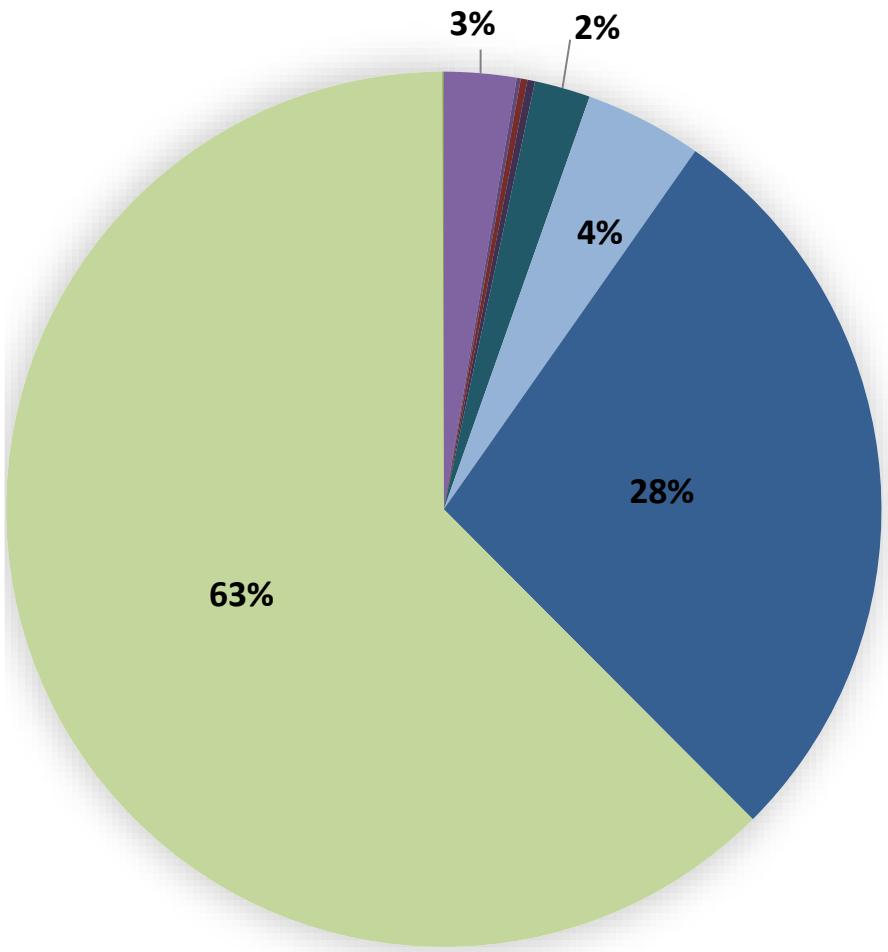


Scotland
(6590 MW)

Locally owned Commercially owned Estimated untapped potential

Estimates of Danish, German and Scottish ownership of wind energy (Source: adapted from EEA 2011, BWEA 2011 and SCENE 2012 – taken from Harnmeijer, 2012)

Local ownership NZ



- Incorporated society (0.3MW)
- Trust (255.5MW)
- Trust - Private partnership (14.6MW)
- Local Authority / Trust (23.7MW))
- Local Authority (26.8MW)
- Overseas private (197.9MW)
- NZ private (415.8MW)
- Big five - private (2665.4MW)
- Big five - majority state owned (5989.2MW)
- Other public (4.6MW)

Generation capacity by ownership type, in % of total operational capacity.

Source: Own data, Electricity Authority, 2015.

Berka & MacArthur, 2018

Promises of Local Participation

Local ownership (+)

1. Energy supply resilience
2. Local / rural economic development
3. Equitable outcomes ('social justice')
4. Energy literacy / sustainable development
5. Buy-in, public support, critical mass, rapid transitions
6. Leverage the public to drive tech learning & cost reduction

Local ownership

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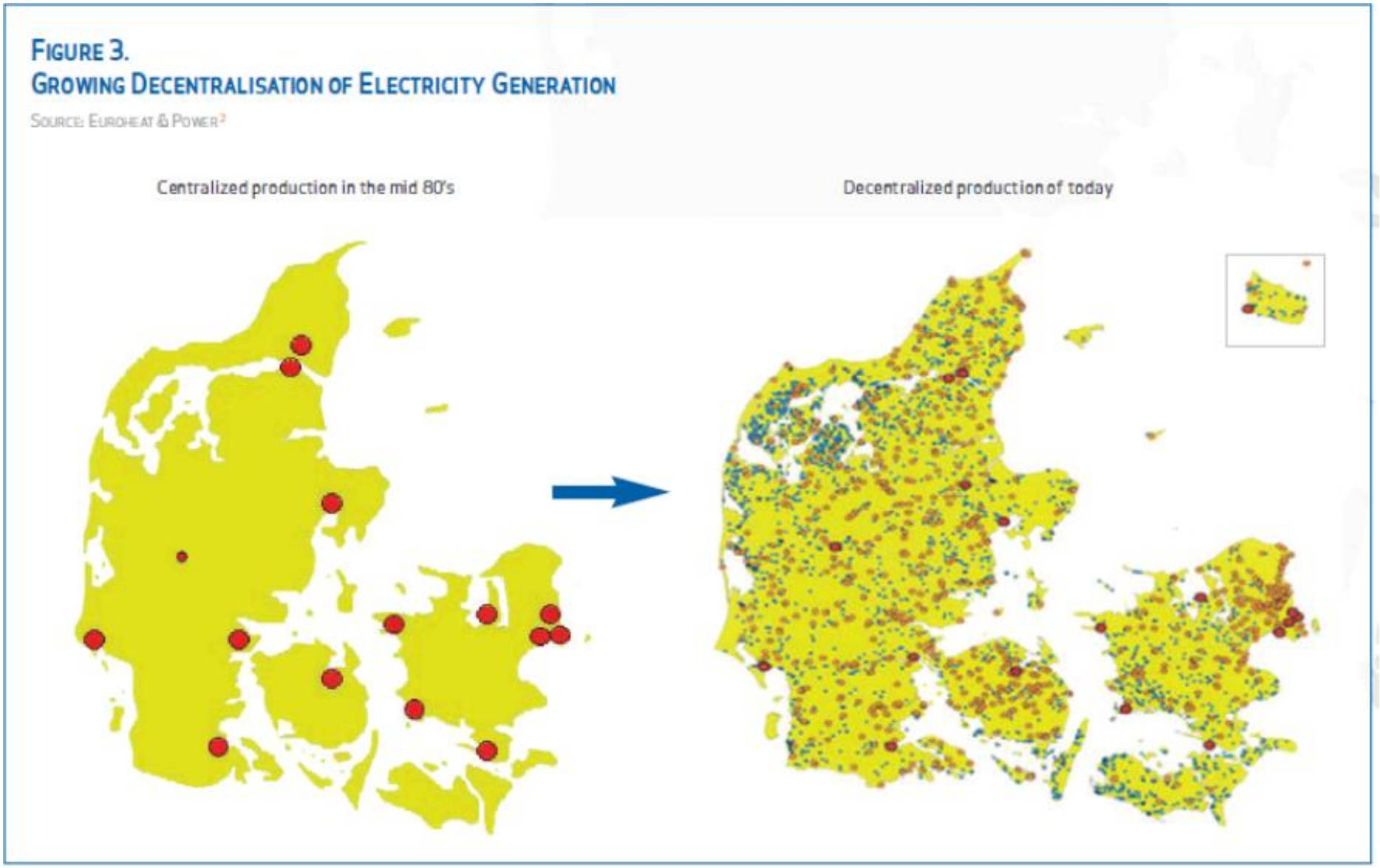
FIGURE 3.
GROWING DECENTRALISATION OF ELECTRICITY GENERATION

SOURCE: EUROHEAT & POWER[2]



Danish Wind energy

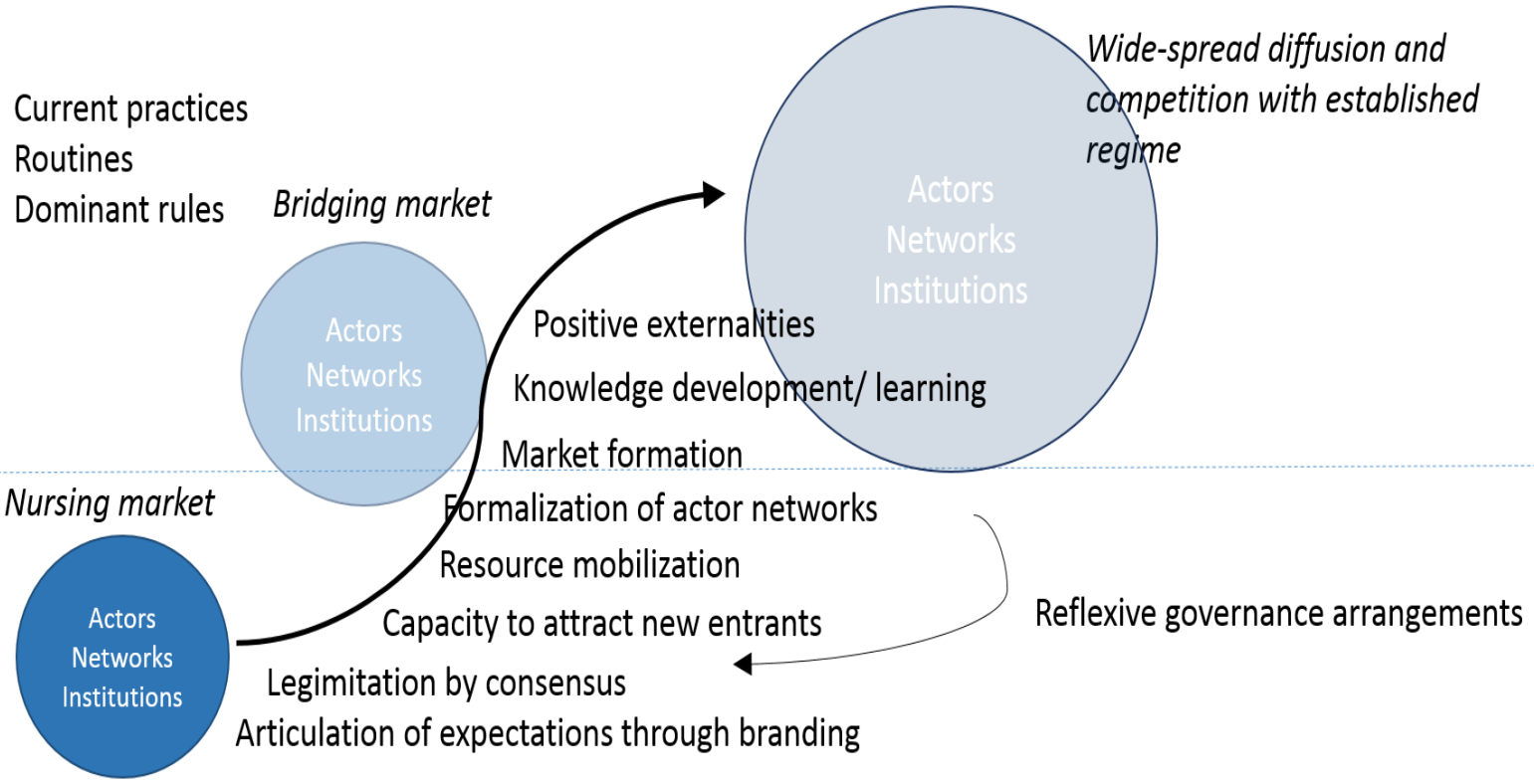
Socio-technical landscape

International climate change frameworks and associated policy instruments
Donor policy
Infrastructure
National/regional energy policy
Technological standards and certification

Regime (established TIS)

Current practices
Routines
Dominant rules

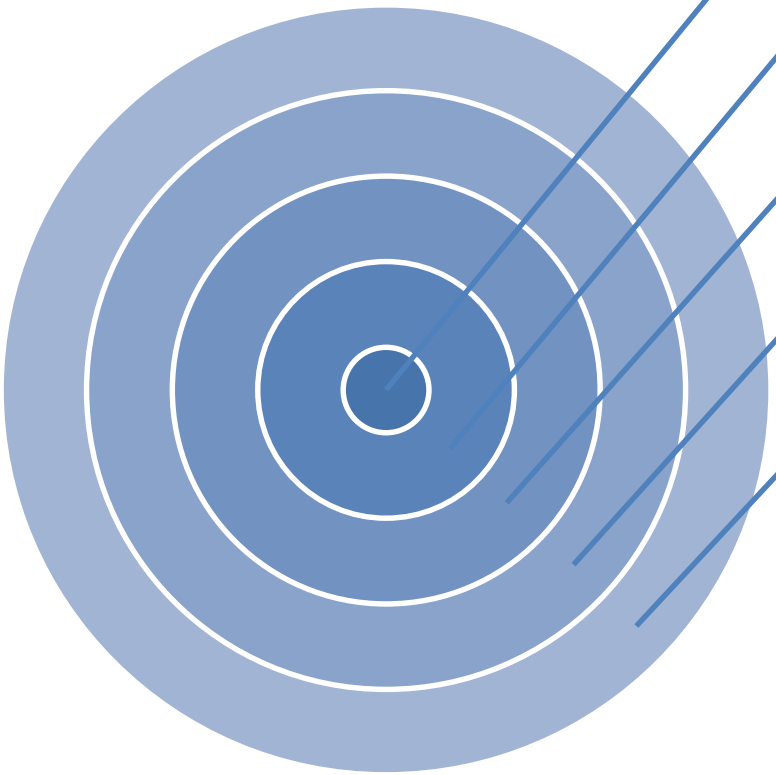
Niche (formative TIS)



Local ownership (-)

- Exacerbates inequality where unequal access
- System balancing / ancillary costs v. deferred upgrades transmission network
- Diseconomies of scale
- Requires high degree of outreach and training

Policy for local ownership



(1) Legal frameworks for mutual ownership

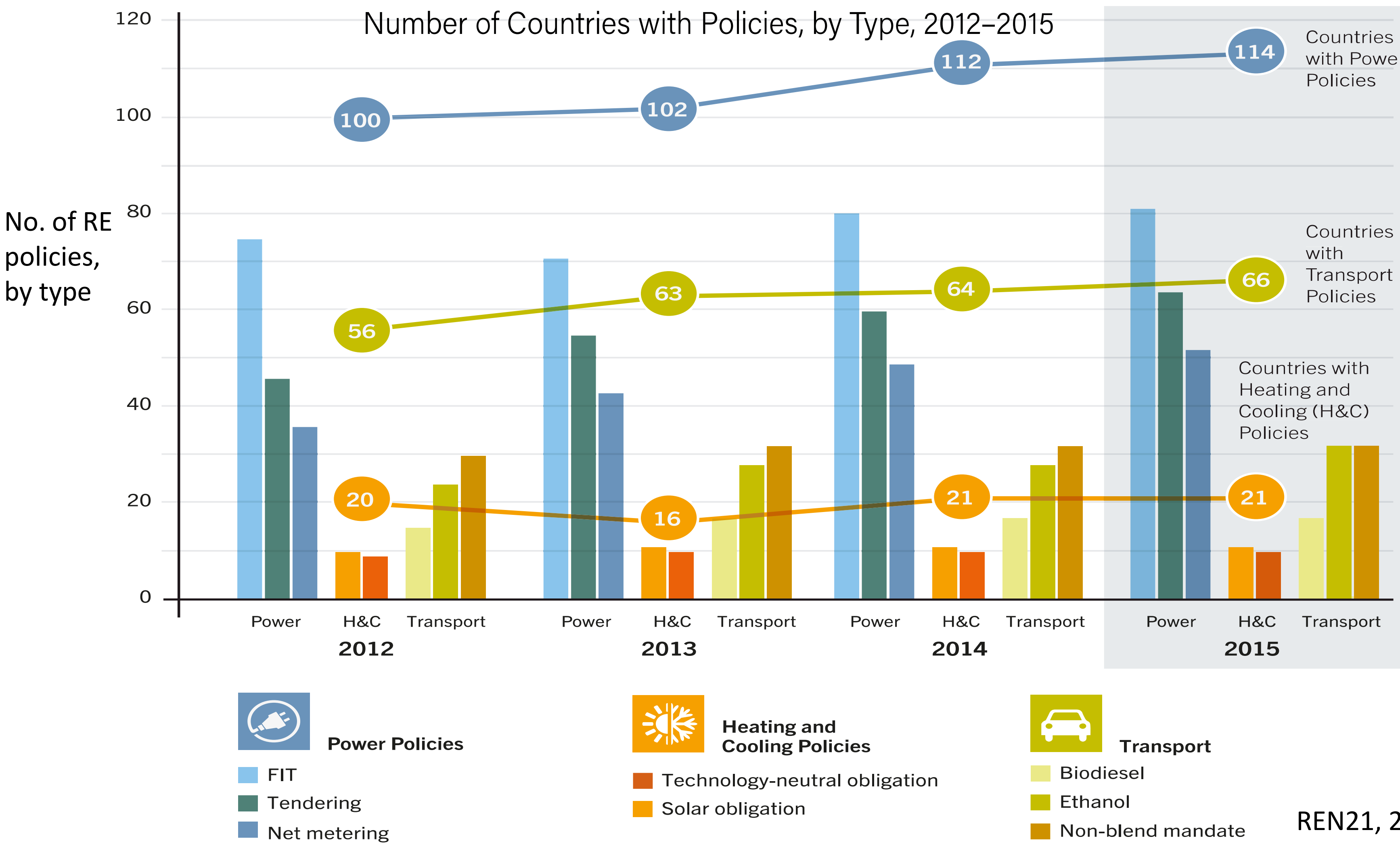
(2) Market access

(3) Demand guarantees & investment incentives

(4) Access to or ownership of key inputs (land, housing)

(5) Financial, legislatory and soft policy tools to build capacity for community organisations

Berka & MacArthur, 2018



Number of Countries with Policies, by Type, 2012–2015
No. of RE policies, by type
120
100
80
60
40
20
0
100
102
112
114
Countries with Power Policies
56
63
64
66
Countries with Transport Policies
Countries with Heating and Cooling (H&C) Policies
20
16
21
21
Power
H&C
Transport
2012
2013
2014
2015
Power Policies
FIT
Tendering
Net metering
Heating and Cooling Policies
Technology-neutral obligation
Solar obligation
Transport
Biodiesel
Ethanol
Non-blend mandate

REN21, 2016

BREAK

Then:

4. NZ Energy policy & challenges

5. Local and community energy in NZ

6. Summary and future directions

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Of people and policy

Are we being stiffed by power prices?

MIKE YARDLEY
Last updated 05:00, February 14 2018

Tom O'Connor: Power to the people, not market forces

TOM O'CONNOR
Last updated 05:00, February 13 2018

BOARDROOM

Changing attitudes in the power game

Tracey Hickman has made it to the top in an industry where management is still dominated by men. She speaks to Mark Jennings about her role at Genesis, her relationship with local iwi, and sexual harassment.

Growth of Electric Cars Faces Charging Station Dilemma

California, which has the biggest and fastest-growing market for electric vehicles, has more than 16,000 public charging stations. But it will need more than 10 times that number if growth is to continue.

BY SKIP DESCANT / FEBRUARY 6, 2018

Green cars in spotlight as India eyes ic revolution

3:59 AEDT, 9 February 2018 | **UPDATED:** 14:04 AEDT, 9 February 2018

Energy in New Zealand

- Renewable supply, legacy of hydro investment
- Increasing (overall) or flat energy emissions since 2008/2009 (MFE 2017)
- Significant inefficiencies in transport, home insulation
- Potential leader in DG, policy change needed (IEA 2017)
- Enviable wind capacity factors (up to 45%)

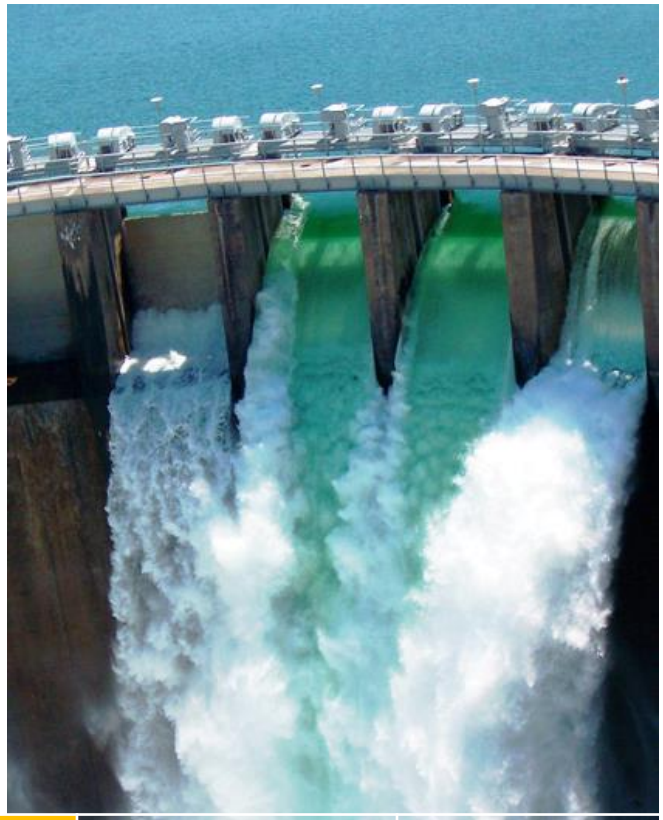
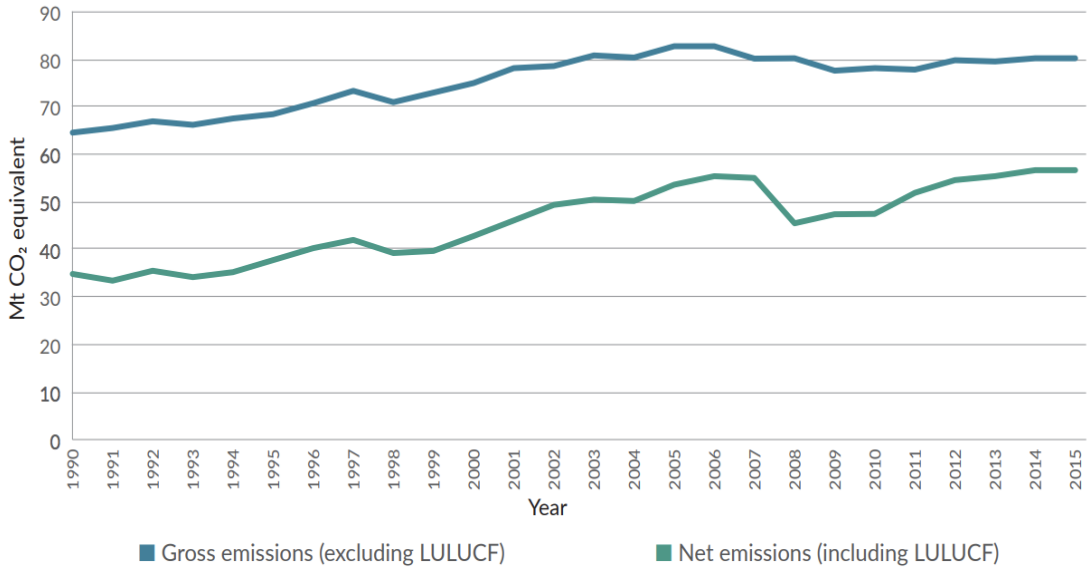


Figure 1: New Zealand's gross and net emissions (under the UNFCCC) from 1990 to 2015.



NZ energy policy in comparative perspective

- Headstart on clean power generation
  - Most hydropower investment in 1880 – 1985
- Less immediate need for capital investment in power generation
- Early centralisation of generation & transmission
  - Subsidised state-led electrification as a means of supporting farm settlement, agricultural development, economic growth and recovery post - 'Gold/Wool Era' (1890- 1920)
  - Relatively minor role of pre-existing local authorities
  - Large players
  - Barriers to entry

New Zealand has yet to adopt additional policies required for the investment in decarbonizing the economy up to 2030 and beyond, to 2050. **Current efficiency targets and carbon price policies are insufficient** (IEA 2017, p.15)

NZ energy policy in comparative perspective

Country	%Δ 1990-2014	%RE in 2014	%RE target	Market access guarantee (Grid connection/upgrades, Priority access/dispatch)	Demand guarantee (Mandates/ obligations)	Investment incentives 1.0 (FITs, ROCs)	Investment incentives 2.0 (Auction/ CfD)	Capacity market	DSR / Storage / Flexibility incentives
New Zealand	-0.98	79.12	$100\%_{2035}$						✓
Brazil	-11%	78.4	$86\%_{2023}$	✓	✓	✓	✓	✓	
India	+7.5%	32%	$40\%_{2030}$	✓	✓	✓	✓		
Mexico	+0.4	25%	$35\%_{2026}$	✓		✓	✓		
Australia	+5.2	14.9	$20\%_{2020}$	✓	✓	✓	✓	✓	✓
Denmark	+53.0	56.2	$52\%_{2020}$	✓		✓	✓		
Germany	+22.8	26.2	$45\%_{2020}$	✓		✓	✓		✓
Netherlands	+9.9	10.0	$37\%_{2020}$	(✓)		(✓)			
UK	+17.6	12.9	$20\%_{2020}$	(✓)	✓	✓	✓	✓	✓

IEA (2015), IEA/IRENA Joint Policies and Measures Database

New Zealand relies on **market driven responses** to ensure security of electricity supply…and weak incentives which, together with current market uncertainties, impact the investment climate for new power generation. There are **no financial support mechanisms or other incentives** to stimulate the market.

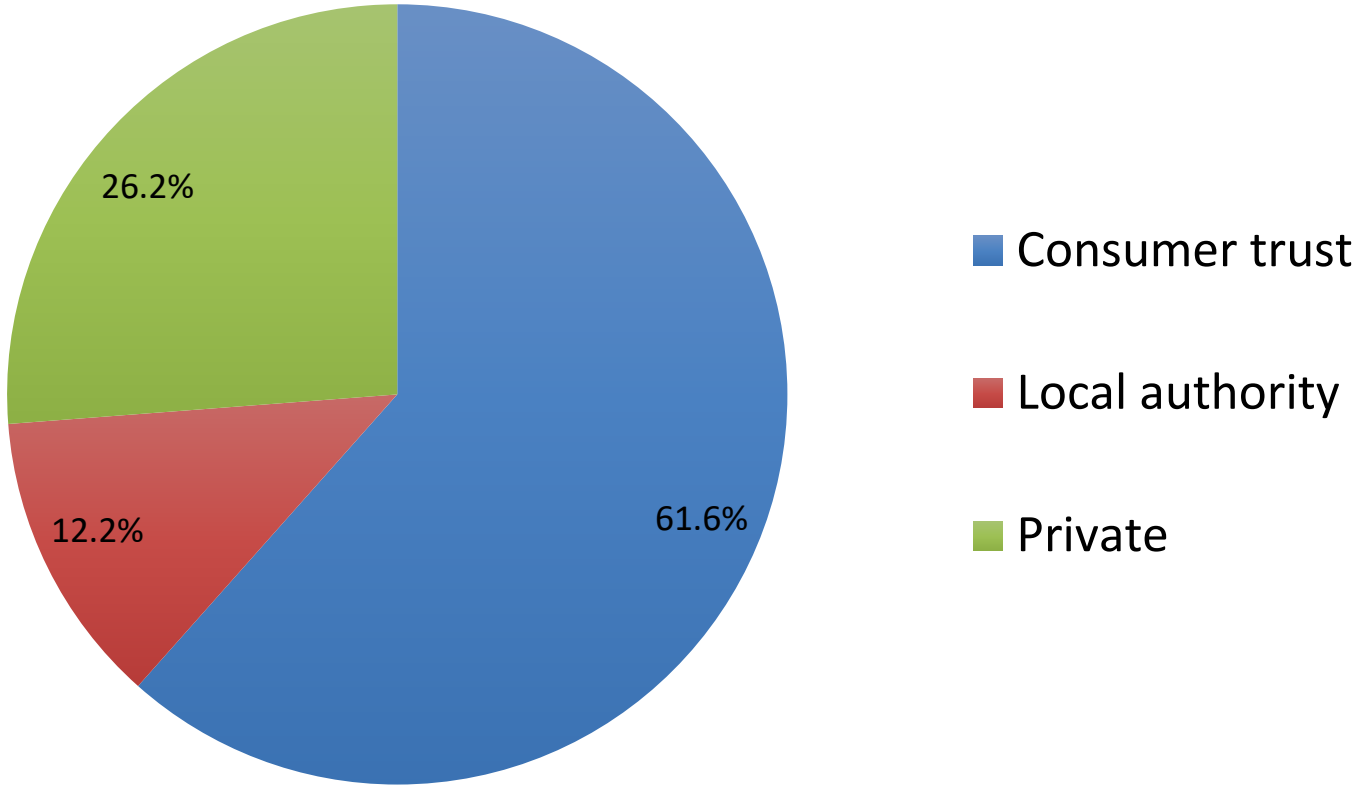
New Zealand ranked about the IEA countries with the lowest level of public spending on R&D (IEA 2017, p.121)

New Challenges in NZ

- Transmission, storage, system management and load balancing
- System capacity for new technologies
- Acceleration of residential electricity prices post-reform
- New infrastructural investments
    - Financing
    - Siting & approvals
    - Regulatory setting
    - Public acceptance

New Zealand has has a high share of variable renewable energy in a small, energy constrained and isolated energy system. **Distribution will be at the forefront of [addressing its energy] challenges.** (IEA 2017, p.16)

Local ownership - NZ



Share of total assets owned by distribution line companies in NZ, by ownership type (2016).
Source: Company Annual Reports.

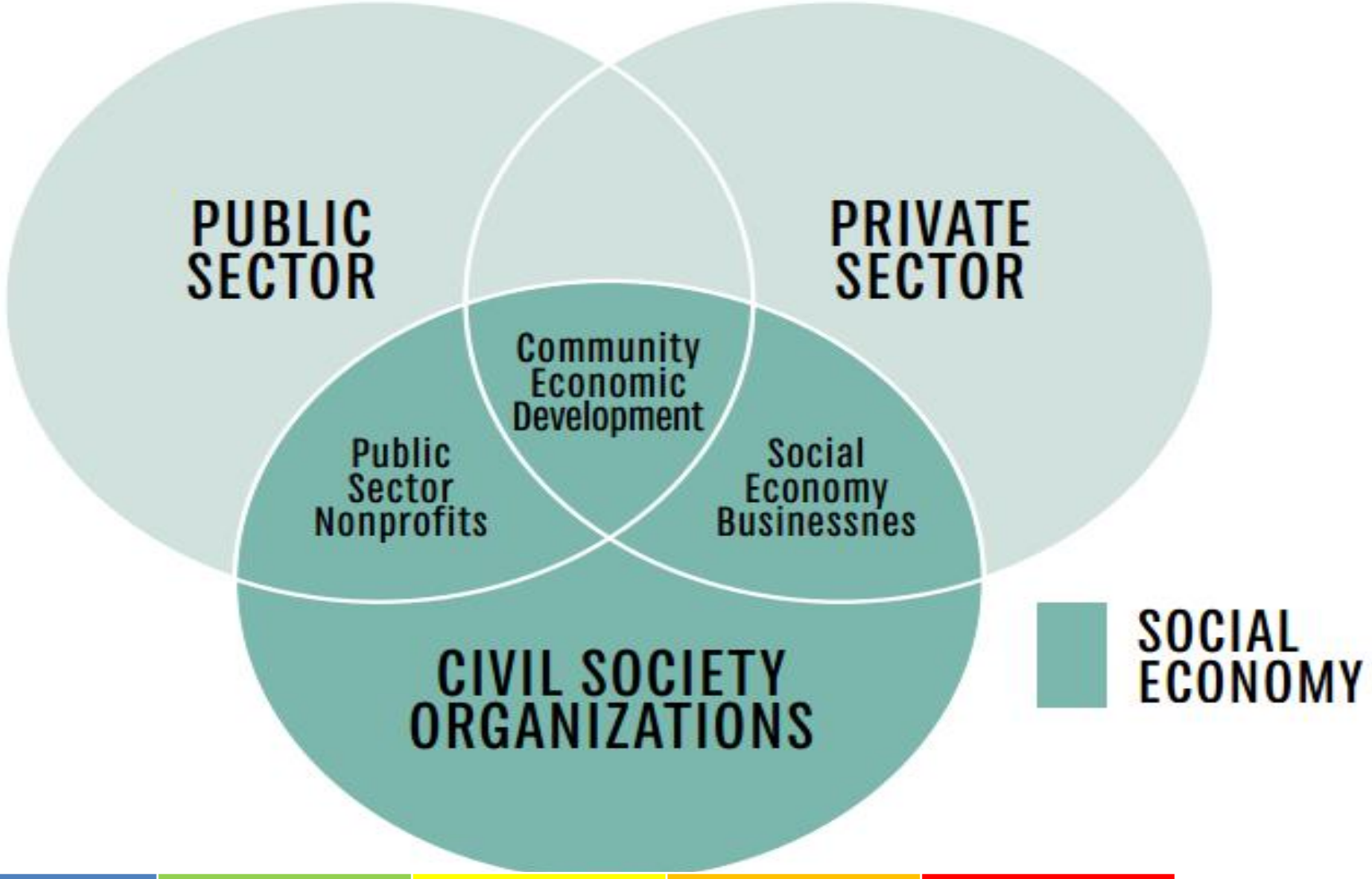
Berka & MacArthur, 2018

Local energy policy challenges

- By virtue of its historical legacy, NZ is short on:
  - Political coalitions and commitment
  - Established intermediaries / service industry
  - Advocacy coalitions
  - 'Reflexive governance' arrangements

….that facilitate robust policy instruments, investment and learning for kiwi-led transport, heat (and power) reforms

The Social Economy



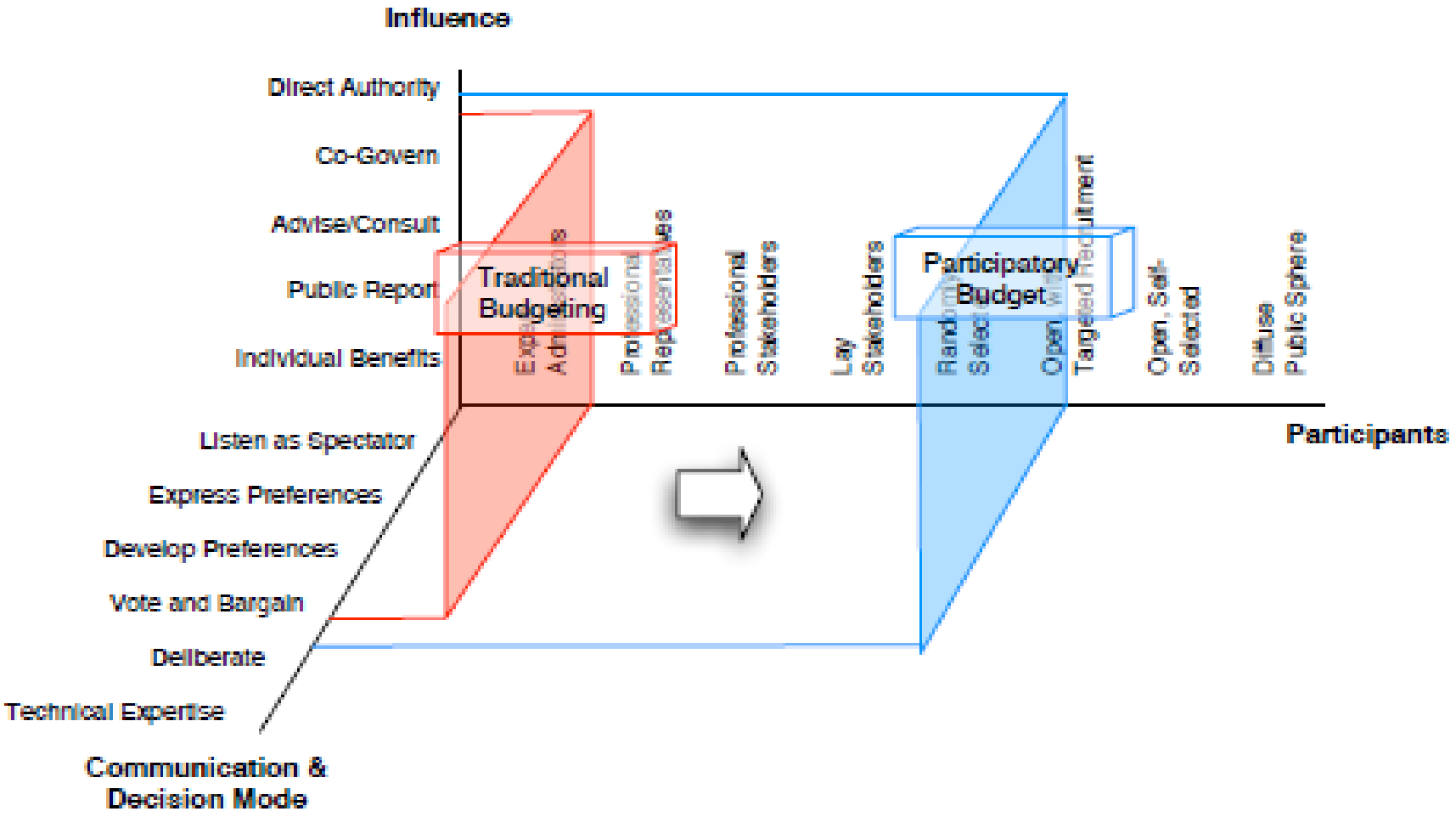
Energy Co-operatives

Three questions

1. *Who participates?*
   - *From expert administrators and state agents through industry experts, stakeholders & diffuse publics*
2. *How do they communicate and make decisions?*
   - *From listening, to articulating, deliberating and sharing expertise.*
3. *What is the connection between their conclusions and opinions on one hand and public policy and action on the other?*
   - From personal benefits through advising, co-governing and direct authority.

(Source: Fung 2006)

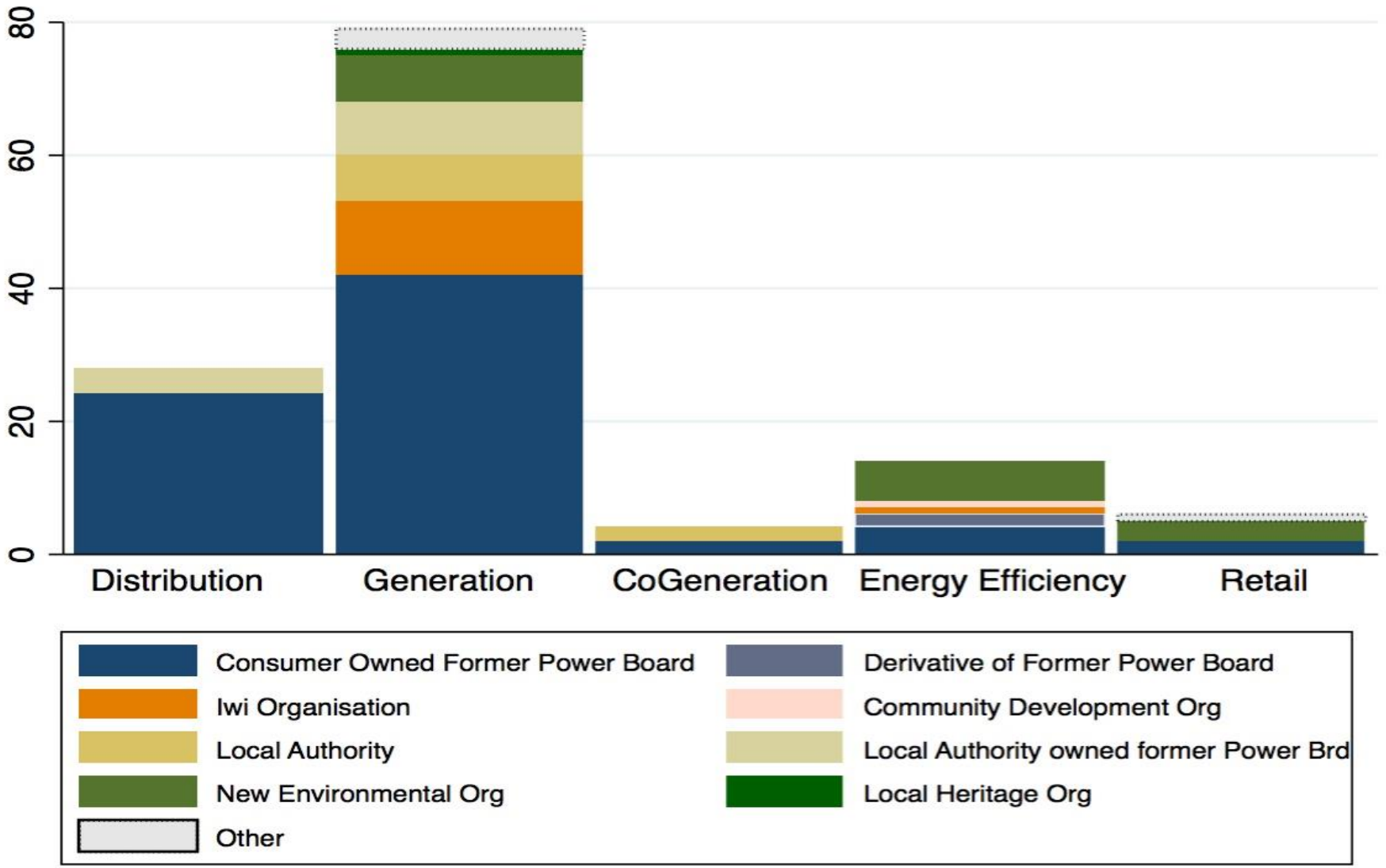
The Democracy Cube & Participation



(Source: Fung 2006)

Profile	Legal status	Activity	Motivation	Level of engagement	Outcome
Iwi energy organisations	Settlement trusts (Ngāti Tūwharetoa BOP settlement trust)	GEN	Normative (Self-sufficiency, self-empowerment); Instrumental (Employment, community development)	Consent, Voting rights, Partnership	Education and employment for Iwi beneficiaries
	Charitable Trust (Te Rūnaka o Awarua Charitable Trus)	EE			Local community
Consumer trusts and co-operatives in distribution	(Charitable) Trusts. (Entrust)	Gen/DIST	Instrumental (member material benefit, lower cost of energy, community development)	Voting rights	Consumers
	Co-operative (Electricity Ashburton)	DIST	Instrumental (member material benefit, lower cost of energy)	Voting rights	Consumer members
New environmental organisations	Charitable trusts (Blueskin Resilient Communities Trust)	Gen/ EE	Normative (environmental stewardship, local ownership)	Citizen control	Local community
	Co-operatives (Energy Share)	GEN / R	Normative (environmental stewardship, local ownership)	Citizen control	Local community
Local authorities	Auckland Council	EE / GEN	Instrumental (Local energy supply resilience)	Informing, consultation	Local community

Local Energy Projects By Activity



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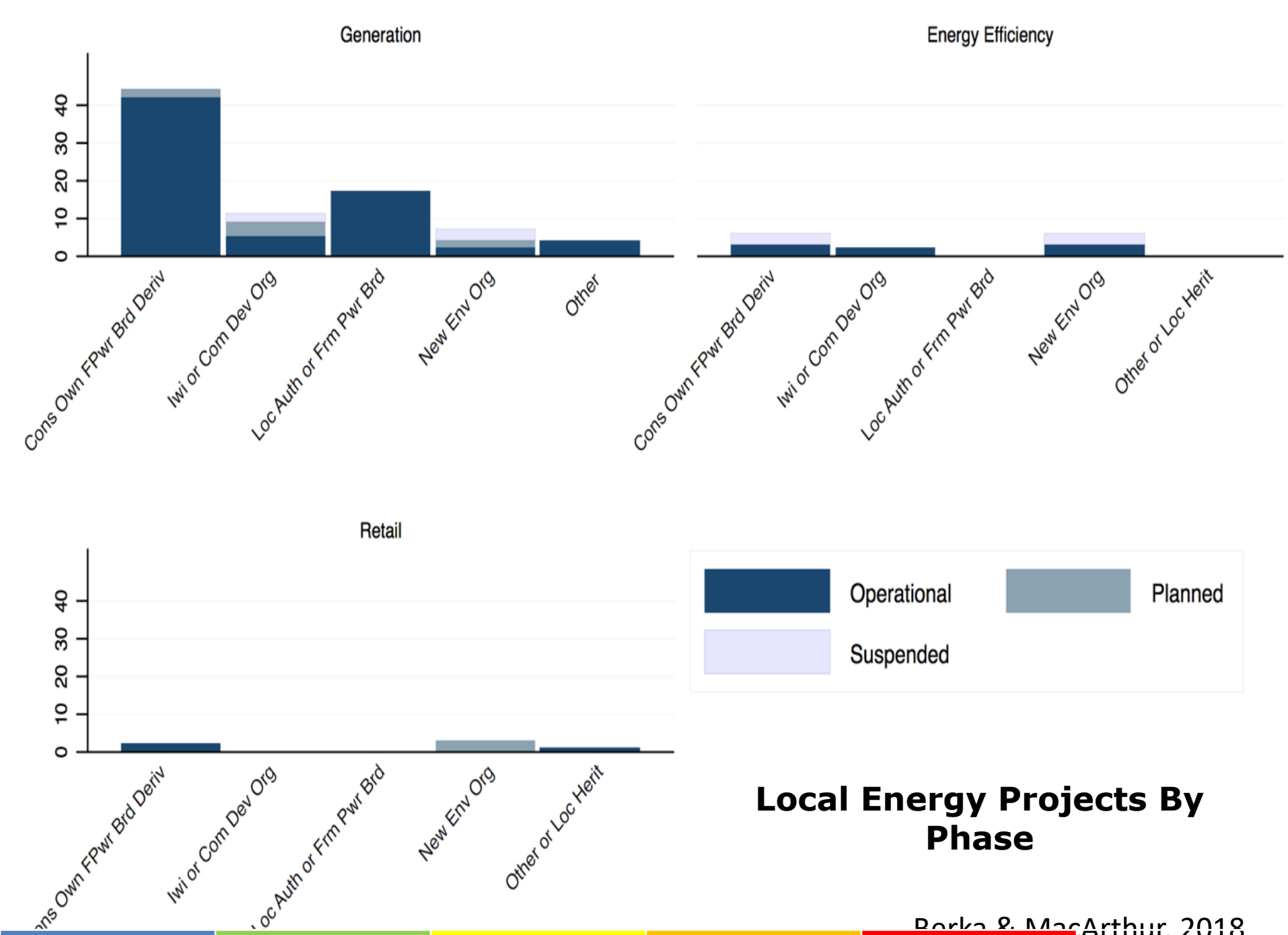

Local Energy Projects By Phase

Borka & MacArthur, 2018

Prospects for civic or community energy in New Zealand

- Appetite on the consumer side, culture of entrepreneurialism.
- Targets without matching support frameworks
- Insurmountable policy constraints?
  - Lack of guaranteed demand: low buy back rates that are not fixed in legislation
  - Lack of grid access legislation
  - No investment incentives for renewable energy
  - High risk market integration mechanisms
- Lack of political will:
  - Reticence to integrate social/ environmental policies in energy policy
  - The government has majority ownership of all major utility companies
    - Financial benefits from business as usual
    - In theory control, in practice, corporatized & arms length

Conclusions

- Sizeable unique local ownership ‘sector’ 294MW, 11b NZD assets, 131 projects.
- Mainly shaped by electricity restructuring 1990’s and resource transfers from Treaty violations
- Very limited growth since then, high failure rates.
- High risk, lack of market access (wholesale market)
- Game changers: Low cost solar/storage
- Unlikely to see growth without targeted policy support and sector co-ordination.

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Questions?

Group Discussion

What is the main challenge for New Zealand's transition to a more sustainable energy system?