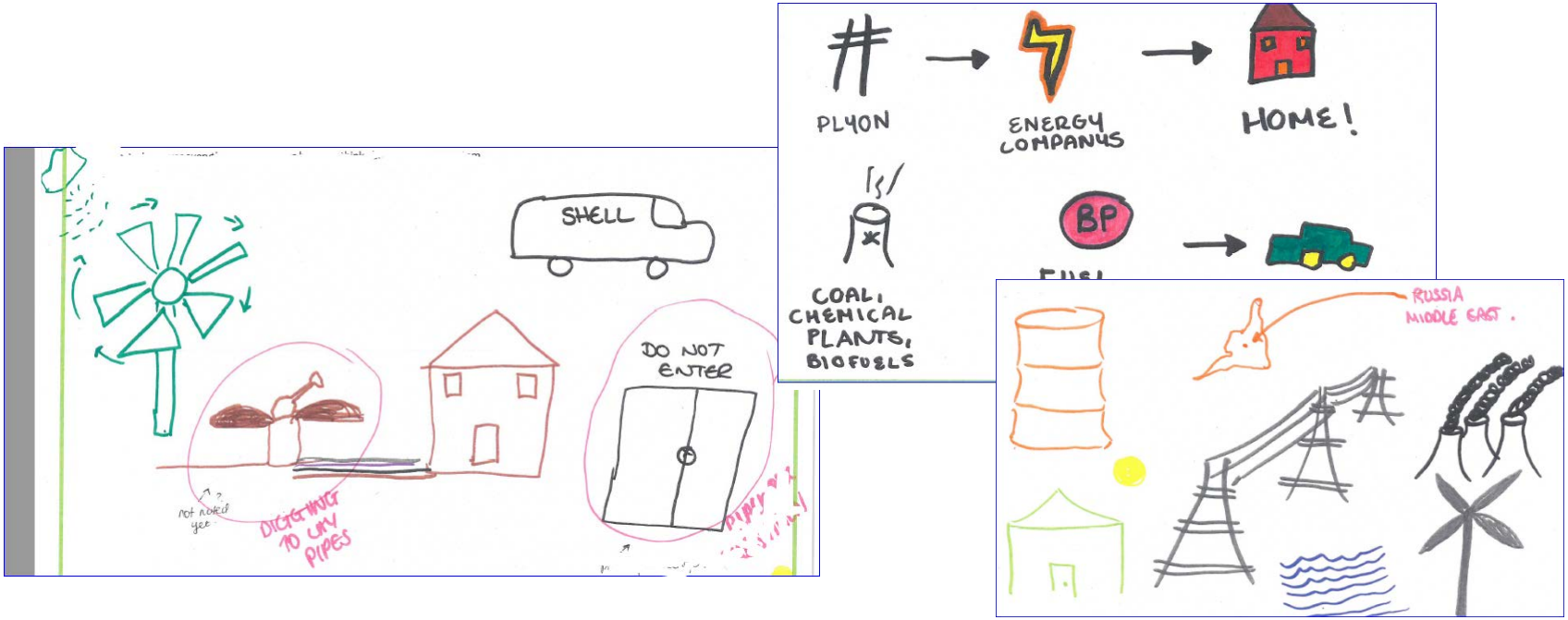

Deliberating the Public Acceptability of Energy Storage- Headline Findings

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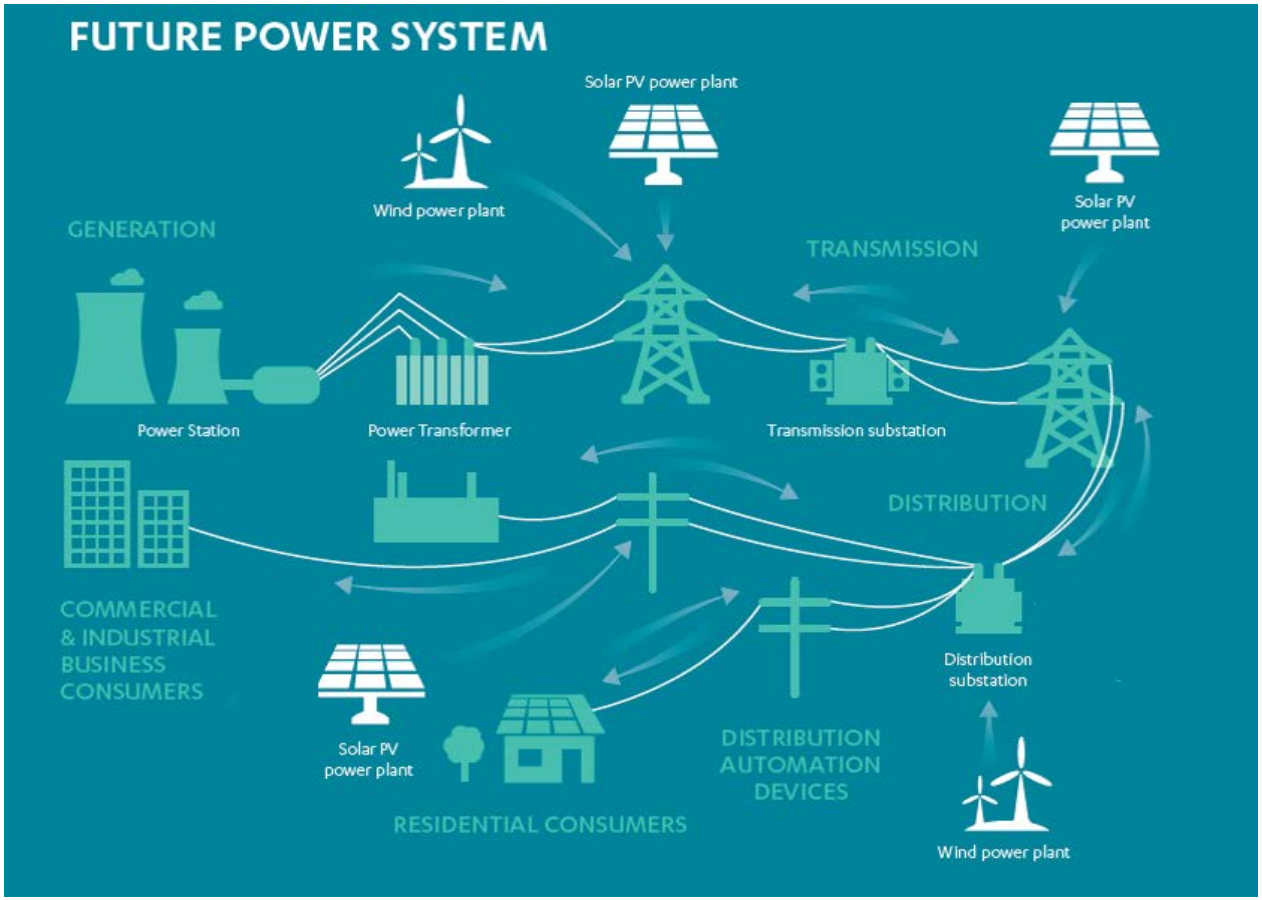
Understanding Risk

Cardiff University / Prifysgol Caerdydd

EPSRC Engineering and Physical Sciences Research Council

Why Energy Storage?



Intermittent renewables less flexible than fossil fuels- **matching supply with demand**.

Unstable and multi-directional energy flows- **grid stability**.

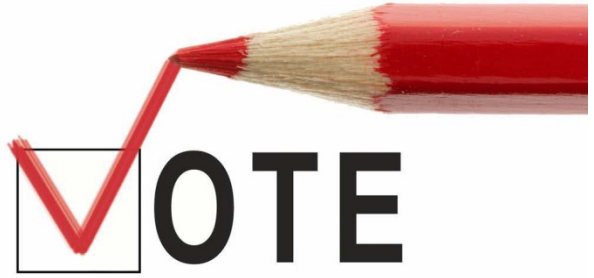
- Image: National Infrastructure Comission (2016)

Why public acceptability?

Publics are deeply implicated in how energy systems are shaped and used…

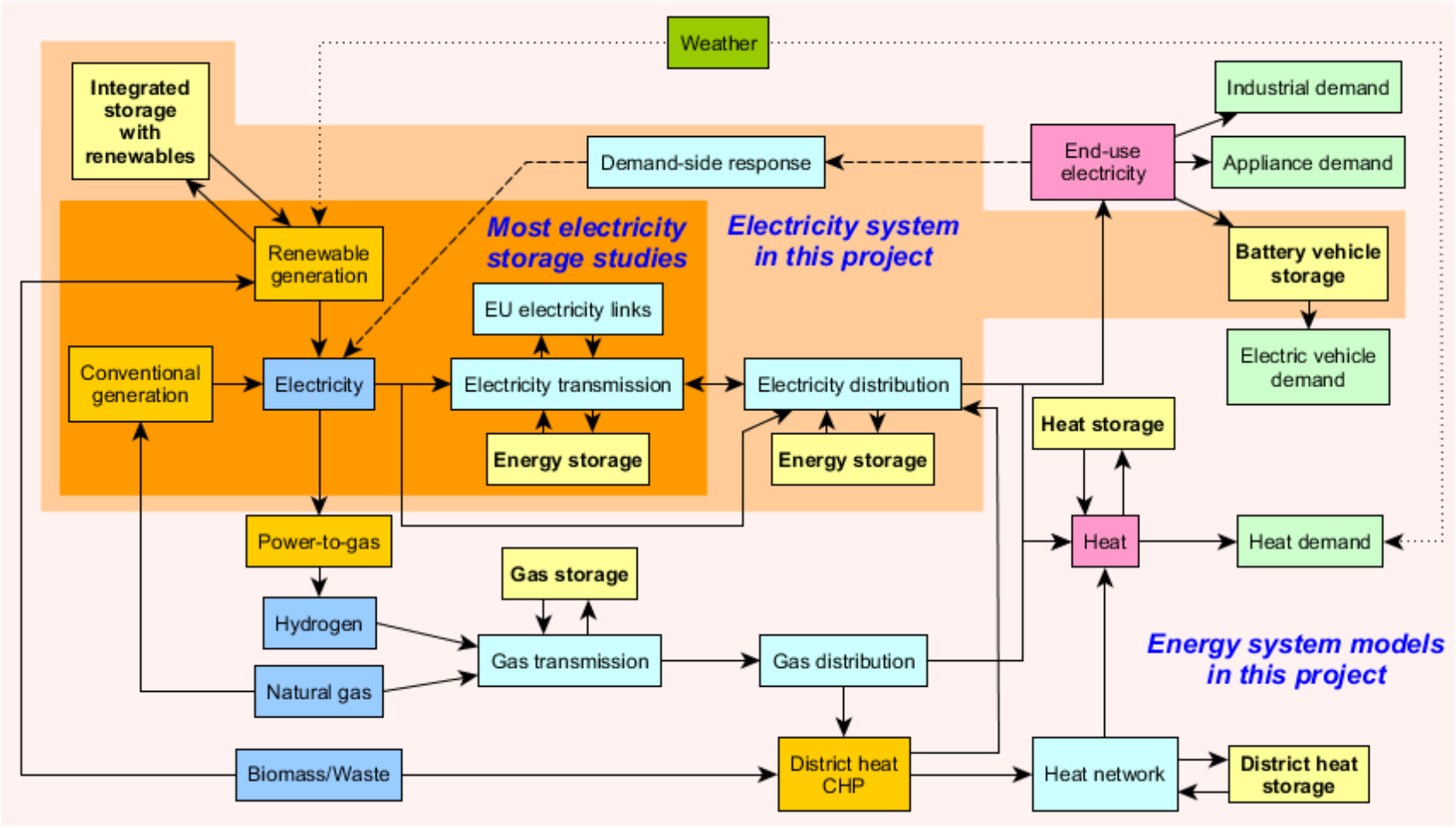
Citizens- taxpayers with voting powers

Energy consumers & producers



Active proponents & protesters

Whole systems approach



Methods

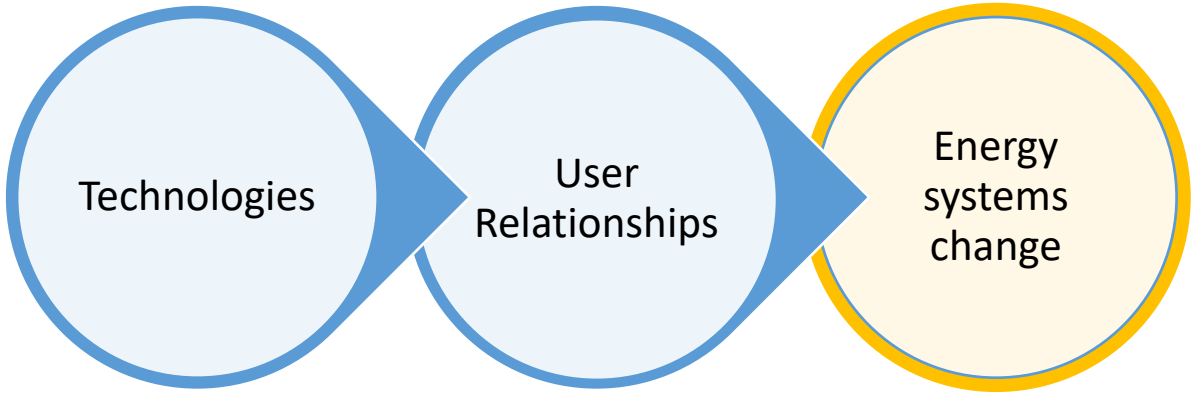
4x seven hour deliberative workshops

Qualitative: 12 participants per workshop

(N=46 after drop outs)

Mix of discussion and information provision:

- Ideas and expectations about present and future energy systems
- Perceptions of individual storage technologies
- Governance- Storage in context.



Initial Impressions:

- Participants unfamiliar with ES as a concept.

  Intermittency and renewable curtailment not previously considered, or assumed to be easily fixed.

  "I think producing it [electricity] from natural sources, is the best method....so, it's taken straight where it's going to be used. But it's obviously not a possible thing to do; I just assumed it would be."

  Mike, Birmingham- homeowner

Source: The Sun, 27th October 2017

Technology Perceptions

- When looking at individual technologies aesthetics and spatial effects, efficiency, reliability, sustainability, safety, and technological progress important in shaping how participants responded to ES technologies

- While some participants expressed clear preferences, no technology emerged as wholly acceptable/unacceptable.

Salient Technology Perceptions

	Network Scale				Domestic/ Community Scale		
	Pumped hydro-electric	**Compressed Air**	**Power-to-gas**	**Batteries on the Grid**	**Batteries in Homes**	**Heat in Homes**	**Community Heat**
Aest. and Space	+	+	n/a	-	-	+/-	0
Efficiency	+	+	+/-	-	+/-	-	+
Env. and Sust.	+	+/-	+/-	-	-	n/a	0
Reliability	+	+	n/a	n/a	+/-	+/-	+
Safety	+	+/-	-	-/0	-/0	0	n/a
Tech. Progress	n/a	+	+/-	+	+	-	n/a

+ positive evaluation - negative evaluation 0 ambivalence or conditionality -/+ divergent opinions between participants

Table indicates issue salience and therefore does not reflect full spread of perceptions relating to each technology, issues raised only briefly and not taken up in wider discussions are thus not included.

Acceptance is about more than technologies…

- Acceptability also contingent on who is introducing a technology and the way that introduction is governed.

Centralised:	Community:	Domestic:
Traditional Consumer	Community Energy	Energy Independence
New Routines	Municipal Energy Company	Virtual Power Plant

Convenience

- Budgeting
- Low Maintenance
- Reliable
- Cyber security

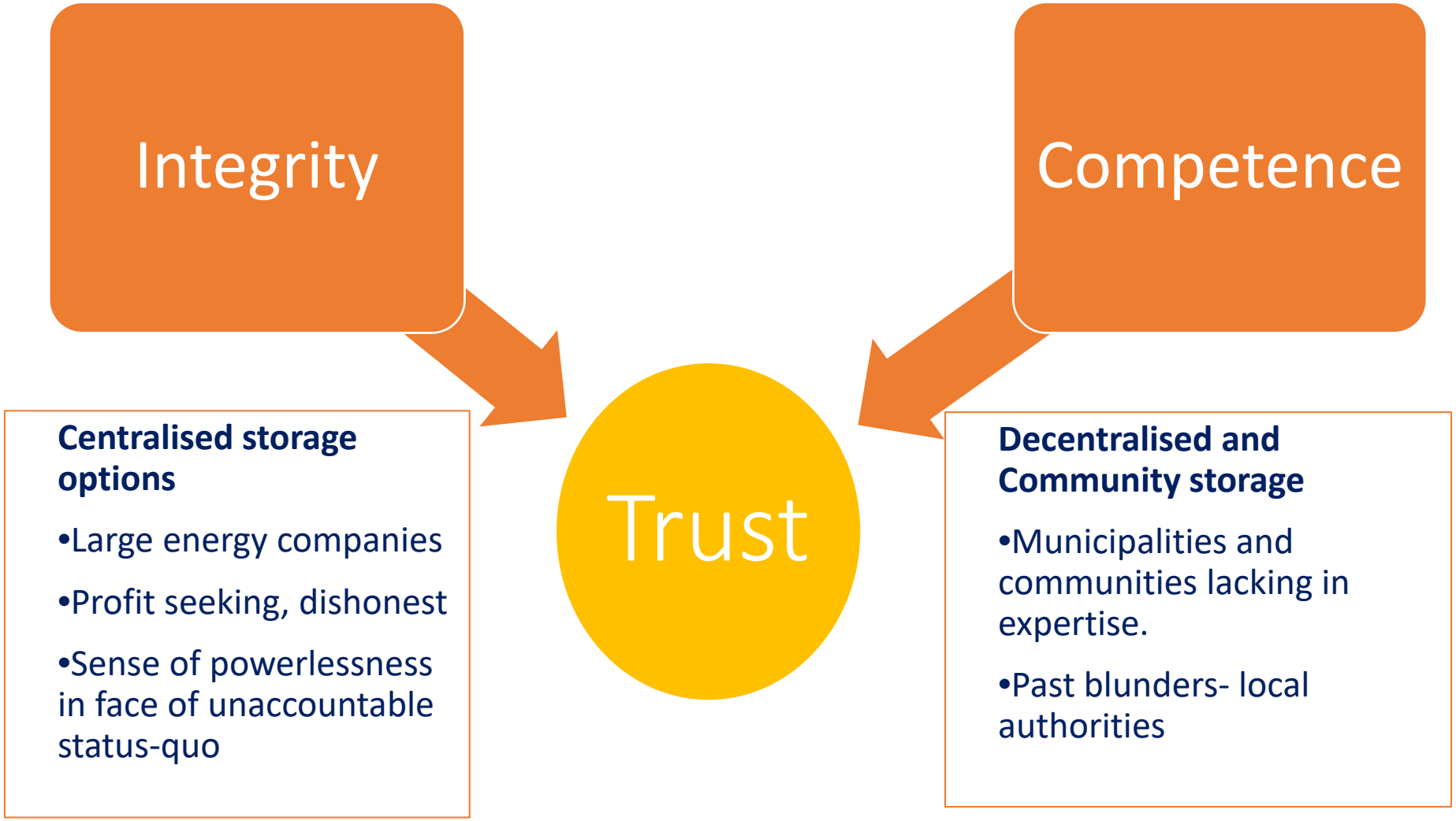
Empowerment

- Empowerment
- Independence/ self-sufficiency
- Enhancing responsibility
- Community cohesion

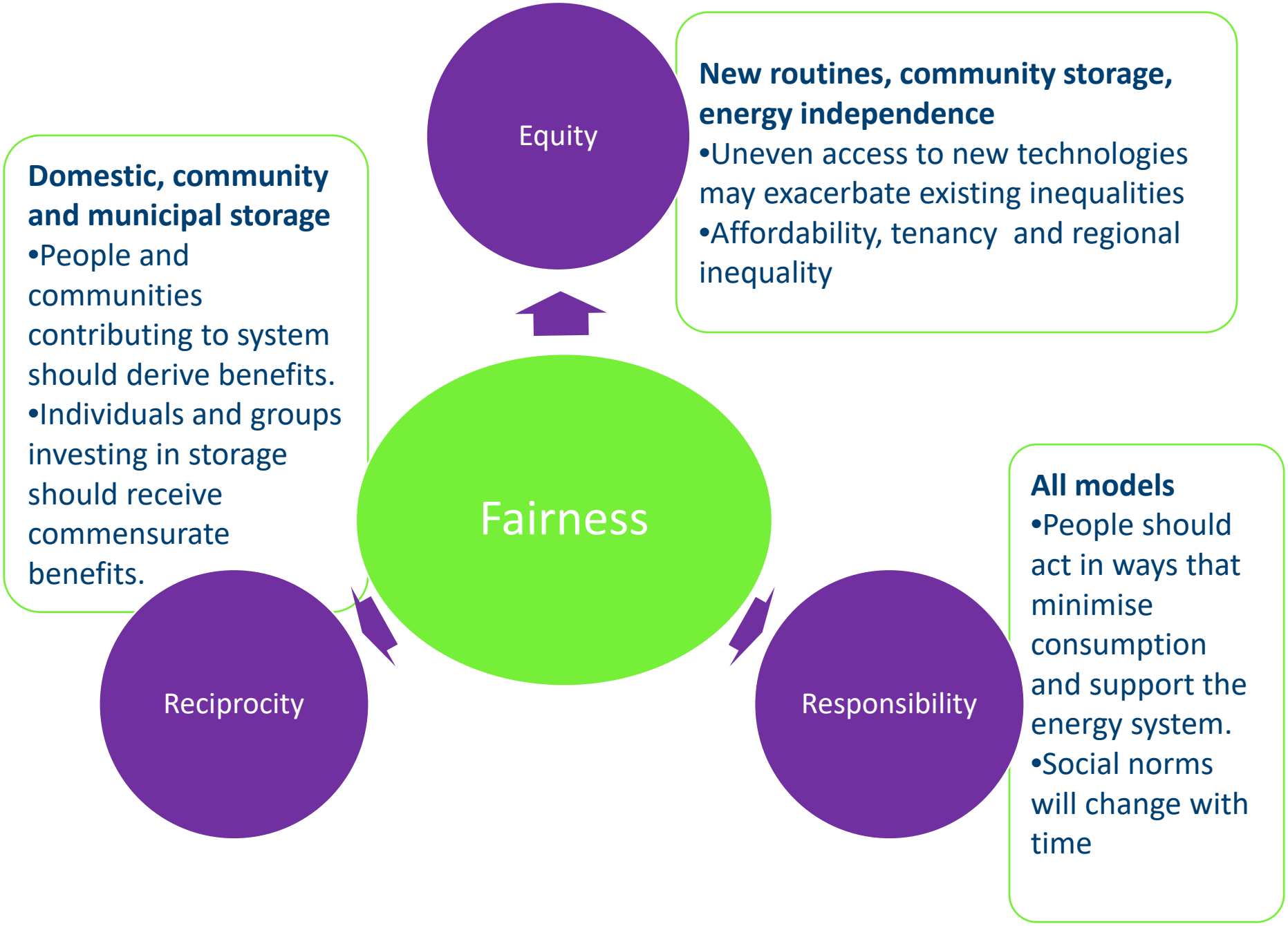
Traditional Consumer

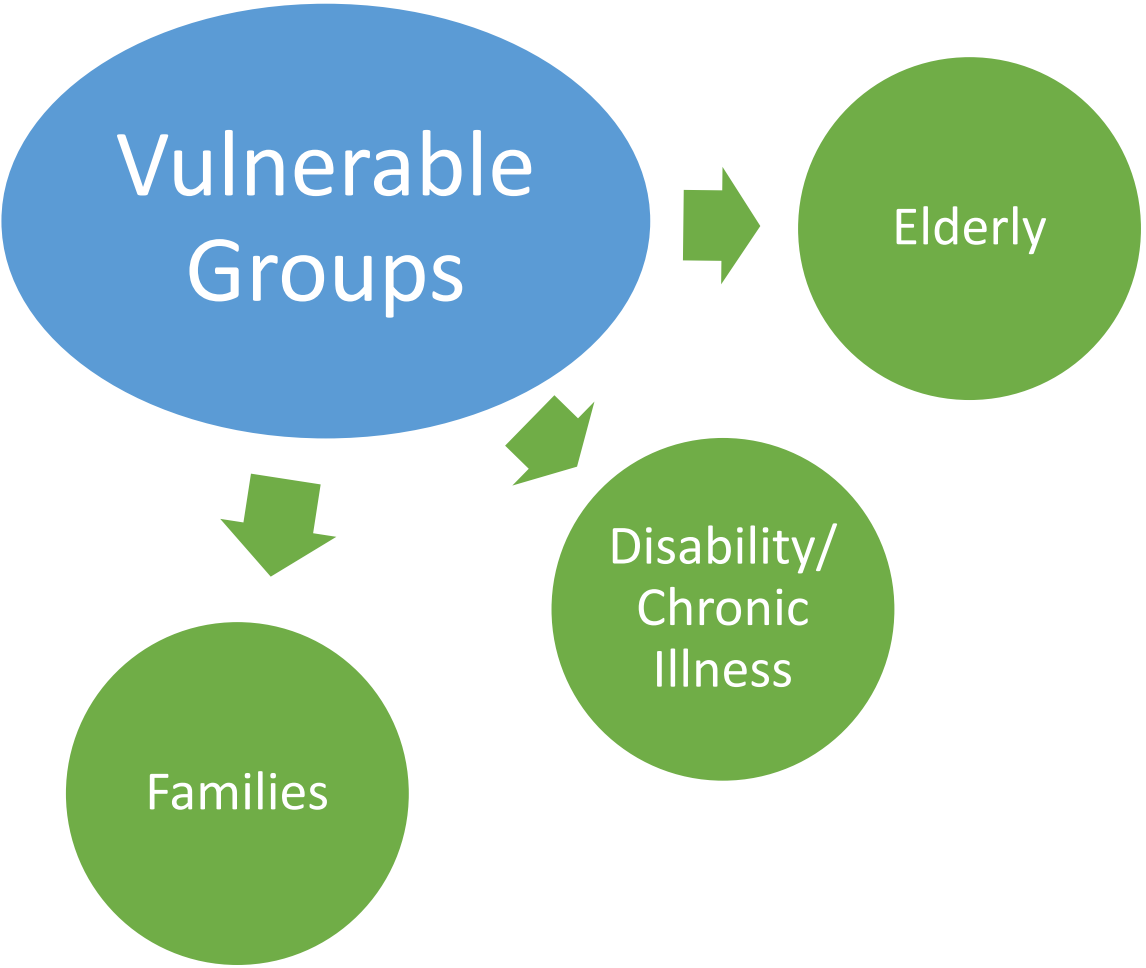
Municipal Energy Co.
Virtual Power Plant
New Routines

Energy Independence
Community Energy Storage



➢Appetite for new actors and hybrid forms of energy storage provision?


Equity
New routines, community storage, energy independence
•Uneven access to new technologies may exacerbate existing inequalities
•Affordability, tenancy and regional inequality
Domestic, community and municipal storage
•People and communities contributing to system should derive benefits.
•Individuals and groups investing in storage should receive commensurate benefits.
Fairness
Reciprocity
Responsibility
All models
•People should act in ways that minimise consumption and support the energy system.
•Social norms will change with time



Demand response, community & domestic storage

- "Vulnerable" groups should not be penalised/ left behind by societal shifts to storage.
- Require flexibility, automation and ability to tailor energy services to meet needs.

"Amy: Disabled people on dialysis machines, and…things that they have, you know, and these oxygen things that they need to use during the day time.
Ken: I think it's balance, and obviously tail… tailored to individual needs, but you shouldn't be penalised." (Amy & Ken, B1)

Conclusions

- Intermittency/ curtailment unfamiliar problem for many. Could come as an unwelcome surprise!
- Responses best characterised as ambivalent and conditional but no technology or governance option proved wholly acceptable/unacceptable- context dependent.
- Desire for both independence and convenience varies between people- but appetite for novel forms of energy and service provision- people want choices.
- 'Fairness' was a key issue, particularly around time-of-use pricing, not adequately addressed in policy discourse around storage.
- Our findings should guide further engagement with affected communities prior to planning practical deployments of storage.

Thank you

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Acknowledgements: