APPENDIX 6

Community Energy
In a Zero Carbon Housing Project

11th September 2020

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Topics

- How does community energy work
- What do we mean by zero carbon homes?
- Energy supply options
- Implications of different design decisions on different organisations
- Legal constraints around selling energy
- Ownership of equipment & market issues
- Long term management issues

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How Community Energy Works

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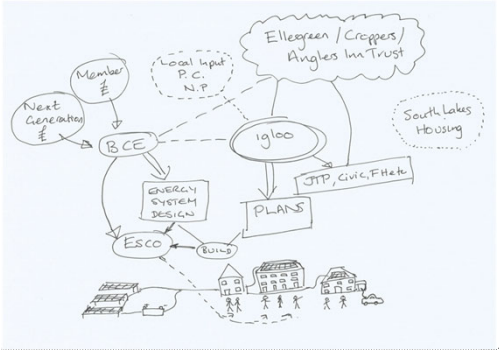
Burneside's Complexities



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Zero Carbon Homes

- Calculating carbon: impact of grid decarbonisation
- Building efficiency standards:
  - Building Regulations – regulated & unregulated emissions
  - Passivhaus
  - AECB
- Fabric efficiency vs zero carbon supply: who pays?
- Design vs in-use energy demand
- Embedded carbon in construction

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Zero Carbon Energy Supply

- Net zero supply
  - Local renewable energy generation kWh = Local demand kWh
  - Peak generation exported, peak demand imported
- Islanded supply
  - All demand is supplied from local generation
  - Ability to be completely separate from grid
  - Reliant on storage and demand management

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Energy Supply Options

- Transport
  - Electricity for EV charging
  - Local or centralized storage? Vehicle to grid?
- Heat
  - Space heating: heat pumps (individual or central), MVHR, direct electric
  - Water heating: heat pumps, solar thermal, direct electric
  - Distribution: individual systems, shared ground loop, district heating
  - Storage: DHW tanks, inter-seasonal?
- Electricity
  - PV only realistic option – daily/annual supply/demand profile problems
  - Import from Croppers – not zero carbon

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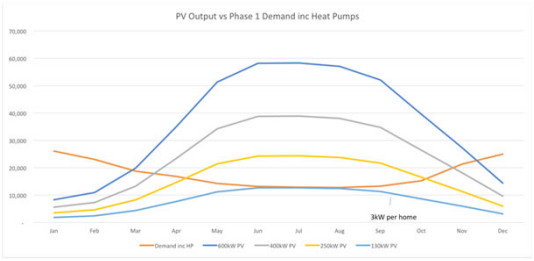
PV Supply/Demand Profile



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Electricity Demand

Scenario	Average New House	AECB Silver + std power	Passivhaus	Passivhaus + low power	Passivhaus + low power +high EV
Number of homes	70	70	70	70	70
Assumed Ave Demand per house	kWh	kWh	kWh	kWh	kWh
Heat	6500	4500	2000	2000	2000
Electric Power exc heat and EVs	3200	3000	2000	1500	1500
EV charging	750	750	750	750	1500
PV capacity needed kW	575	500	335	285	360
PV potential on roofs @ 3kW per roof	210	210	210	210	210
Ground mounted PV needed kW	365	290	125	75	150

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Legal constraints on selling energy

- Micro-grid required for direct electricity sales to domestic customers
  - Greater income from sales
- Alternative: buying scheme for householders
  - Complex and limited value
- Net zero supply via National Grid
  - Unlikely to justify investment
- Highly regulated sector: requirement to allow customers to change supplier
- Heat less regulated but easier to get it wrong: Code of Practice for heat networks
- Market implications?

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Design Decisions impacting BCE

- Housing numbers => system size & financial viability
- Fabric efficiency /solar gain => system size, costs for occupants
- Housing size/type => direct impact on demand
- Layout => density affects costs for microgrid / heat network
- Orientation/ roof design/shading => options for PV locations
- Location => connectivity of energy systems
- Transport => accessibility affects EV demand
- Tenure => lease/ownership of equipment, management plan

- **Construction decisions**: who owns risk if not built to specification?

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Ownership & financial contributions

- Owned by home owner? Paid for by developer?
  - Individual heat pumps/heat exchangers? PV on roofs? Individual batteries?
- Owned by ESCo?
  - Centralised heat supply system? Shared ground loops? External PV? External batteries? PV on leased roofs?
- Grid supply costs
  - Constrained site – additional costs for developer?
  - Benefits of local supply? Who gains?
- Implications for mortgages and insurance
- What about any social housing?
- Market implications?

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Operational Risk

- Long term management by ESCo
- Design & build decisions affect operating costs
  - How much can be passed on to householders?
  - What if not financially viable?
- Reputational risk for all involved… but likely to stay with BCE for the longest

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