Local & community energy: what, why, how?

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What is local & community energy?

Any energy activity that is

i) Managed in an open and participative way

ii) That has positive local and collective outcomes

Diverse..

- Technologies, scales of deployment
- Finance, ownership and delivery models, legal & organisational structures
- Needs, motivations
- Extent of participation.

Hoffman et al., 2013; Walker and Cass, 2007; Walker and Devine-Wright, 2008
<table>
<thead>
<tr>
<th>Project type</th>
<th>Description</th>
<th>Technologies</th>
<th>Avg Scale</th>
<th>Charitable</th>
<th>Where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility projects</td>
<td>Charitable organisations supplying heat or power to community facilities</td>
<td>solar PV, micro-wind, ground/air-source heat pump, solar thermal, woodfuel boilers, (hydro)</td>
<td>15kW</td>
<td>Most</td>
<td>Many</td>
</tr>
<tr>
<td>Social enterprise –</td>
<td>Energy provision for residential and facility buildings, serving as additional income generation for local NGO’s with another primary activity</td>
<td>solar thermal, solar PV, ground/air-source heat pump, wind, woodfuel (hydro)</td>
<td>65kW</td>
<td>Most</td>
<td>Many</td>
</tr>
<tr>
<td>microgeneration projects</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Micro-grids</td>
<td>Fully integrated generation, distribution and supply on private wires or grids</td>
<td>wind, hydro, solar PV, integrated</td>
<td>90kW</td>
<td>Most</td>
<td>Scottish Isles, USA, Italy, rural remote areas with high fuel cost / poor energy access</td>
</tr>
<tr>
<td>District heat networks</td>
<td>Generation and supply of heat (and power)</td>
<td>Woodfuel (CHP)</td>
<td>308kW</td>
<td>Some</td>
<td>Finland, Denmark</td>
</tr>
<tr>
<td>Low carbon micro-generation projects</td>
<td>Local organisations owning and managing local domestic micro-generation as part of broader carbon mitigation programmes.</td>
<td>solar PV, solar thermal, ground/air-source heat pumps, micro-wind</td>
<td>20kW</td>
<td>Few</td>
<td>Many</td>
</tr>
<tr>
<td>Grid integrated direct supply</td>
<td>Direct supply to members of consumer co-operatives.</td>
<td>wind, hydro</td>
<td>400kW</td>
<td>Few</td>
<td>Sweden, Netherlands (“Windcentrale”)</td>
</tr>
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Berka & Creamer, 2016
<table>
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<tr>
<th>Project type</th>
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<th>Where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custodian projects</td>
<td>Environmental and conservation organisations developing standalone renewable energy installations to fund / complement their activities.</td>
<td>hydro-electric, solar PV, woodfuel (solar thermal, heatpumps)</td>
<td>450kW</td>
<td>Some</td>
<td>Many</td>
</tr>
<tr>
<td>Development projects</td>
<td>Run by charities / trusts owning privately constituted project entities that house income generating projects and earmark profits to a wide range of development projects</td>
<td>wind, hydro-electric, (solar PV, woodfuel, tidal)</td>
<td>1300kW</td>
<td>Most</td>
<td>Scotland</td>
</tr>
<tr>
<td>Grid - integrated microgrids</td>
<td>Microgeneration and storage units integrated in low voltage networks and interconnected to the upstream network, typically with demand management strategies.</td>
<td>Solar PV, micro CHP, Heat pumps, EV's</td>
<td>NA</td>
<td>?</td>
<td>USA, Netherlands</td>
</tr>
<tr>
<td>Energy enterprises (co-operatives)</td>
<td>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.</td>
<td>solar PV, wind, hydro-electric, woodfuel (solar thermal, anaerobic digestion)</td>
<td>450kW</td>
<td>None- Few</td>
<td>Germany, UK, Denmark, Australia</td>
</tr>
<tr>
<td>Landowner projects</td>
<td>Local farmers or estate owners collaborating to co-own installations</td>
<td>Wind</td>
<td>800kW</td>
<td>None</td>
<td>UK</td>
</tr>
</tbody>
</table>

Berka & Creamer, 2016
What is local & community energy?

<table>
<thead>
<tr>
<th>Investment source for community stake</th>
<th>Community Body</th>
<th>Individuals</th>
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<tbody>
<tr>
<td>Includes local development organisations such as Development Trusts</td>
<td>Shared ownership arrangements with local development organisations</td>
<td>Shared ownership arrangements with co-operatives</td>
</tr>
<tr>
<td>Includes co-operatives of all kinds</td>
<td>Community-led projects</td>
<td>Wholly cooperatively-owned projects</td>
</tr>
<tr>
<td>Wholly crowd-funded projects</td>
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</table>
## What is local & community energy?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Types</th>
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<tbody>
<tr>
<td><strong>Source of community finance</strong></td>
<td>Community body (commercial debt, public loans, angel investors)</td>
</tr>
<tr>
<td></td>
<td>Individuals (co-operatives, crowdfunding)</td>
</tr>
<tr>
<td><strong>Legal structures</strong></td>
<td></td>
</tr>
<tr>
<td>Of project vehicle</td>
<td>SPVs, LLPs</td>
</tr>
<tr>
<td>Of community entity</td>
<td>Development Trusts, charities, private limited social enterprises, bona fide co-operatives, community benefit societies</td>
</tr>
<tr>
<td><strong>Respective roles</strong></td>
<td></td>
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<tr>
<td></td>
<td>Community leads</td>
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<tr>
<td></td>
<td>Developer leads</td>
</tr>
<tr>
<td><strong>Timing of community investment</strong></td>
<td></td>
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<tr>
<td></td>
<td>Pre-planning</td>
</tr>
<tr>
<td></td>
<td>Post-planning</td>
</tr>
<tr>
<td></td>
<td>Through warrants</td>
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</table>
### Local benefits

| Social | • Better local engagement; sense of ownership  
|        | • Control over siting, scale, technology  
|        | • Social cohesion and community empowerment  
|        | • Positive public perception and buy-in  |
| Economic | • Regional development, local employment  
|          | • Reduced cost of energy in rural areas  
|          | • (Defers costly upgrades and extensions of the transmission network)  
|          | • (Low cost heat)  |
| Technical | • Scale and quality of energy generation matched to load  
|          | • ‘Islands of stability’ and voltage stability  
|          | • Increased reliability of electricity for community buildings in rural areas  
|          | • (Improved system efficiency if waste heat used locally)  |
National benefits

• Consumers are central to achieving 1.5°C GW
  ➢ Reduced ownership of cars and electronics: ‘usership’ & ‘sharing economy’
  ➢ Optimal operation of household electronics for demand side response.
  ➢ Large and rapid gains in heating and cooling efficiency

• Individualised approaches have their weaknesses
  ➢ Competing trends in home convenience, comfort & time saving

• Community- based approaches are central
  ➢ Increasing energy awareness, reducing energy demand
  ➢ ‘Low carbon lifestyles’ and reduced GHG emissions

Grubler et al. 2018; Strengers & Nicholas, 2017
Civic enterprise has been a key component of successful low carbon innovation to date

• Demand for pre-commercial cleantech

• Widens distribution of benefits = public buy-in = conducive legislative reforms = policy stability = more rapid energy transitions.
A. Windcentrale, Netherlands - 2010

Consumer co-operative

- Dutch citizens can buy equity shares for 250-300EUR
- 10 turbines, 850-2300kW, 15,000 investors, 15m EUR invested
- Members receive dividend in form of electricity based on actual power production
- Windcentrale does not own equity; manages the project only, takes fixed fee per share (10%).
- Seed financed by two founders + NGO + bank grant
- Motivation: energy savings, political mobilisation, increased environmental values/behaviour
B. Mittelgrunden Vindmollelaug, Denmark - 1996

Shared ownership with producer co-operative

- 20*2MW Siemens Windpower
- 3.5km East of Copenhagen harbour
- Site identified by Danish Action Plan for Offshore wind
- Initiative led by Copenhagen Environment and Energy Office
- 50% Municipal utility (Copenhagen Energy) > sold to Energi E2
- 50% Mittelgrunden wind turbine co-operative - 8,553 members, 48.5m EUR total investment
  - Each share = 1000kwH/y, sold for 567 Euro.

Larsen, 2005
A electricity-to-heat and load shifting project

- 70 households, adjusted off- and on-peak tariffs, remote management of residential storage heaters and hot water cylinders.

- Objectives: optimise use of existing wind / hydro capacity, reduce fuel poverty, offload excess electricity in context of grid constraints

- Collaboration: community organisation, lines-retail company, community energy developer, dynamo manufacturer

- Finance: 1.8mGBP from Local Energy Challenge Fund
Take home messages

• Local & community energy emerging worldwide in developed, emerging and less developed country contexts

• Policies marry local social and economic needs, decarbonization and energy system objectives.

• Community energy projects build local capacity for a wide range of carbon mitigation activities:
  ➢ Energy efficiency, housing, waste, mobility, education, food and agriculture.
Take home messages

• There are challenges:
  ➢ Legitimacy
  ➢ Local capacity
  ➢ Access to finance
  ➢ Policy streamlining
  ➢ Messy and time-consuming

• Shared ownership models overcome some of these challenges
  ➢ Can increase development times but also increase engagement, learning and benefits
  ➢ Improve trust and reputation of utilities
Take home messages

• Commitment from policy makers generates public interest and awareness of possibilities

• Growth is dependent on programmatic support:
  ➢ Energy policy - low risk market integration mechanisms, civic energy targets and strategies, shared ownership obligations, loan schemes
  ➢ Social ‘third sector’ policy – tax exemptions, capacity building
  ➢ Rural development policy – project entrepreneurship, knowledge exchange
  ➢ Devolved energy and climate change policy and planning
    o Mapping demand and supply, regional energy plans.
    o Site identification, project entrepreneurship & co-ordination by local authorities
    o Socio-economic impacts material consideration in resource consent
Take home messages

The opportunity in New Zealand:
- Public opposition to wind
- Widespread distrust of energy utilities
- Disempowered citizens
- An active local and community energy base: iwi trusts, environmental charities, consumer trusts, local authorities, peer-to-peer start-ups
- Uneven regional development, social inequality.

<table>
<thead>
<tr>
<th>MBIE, BEC, Vivid 2050 low emission scenarios</th>
<th>Opportunities for local &amp; community energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced peak seasonal lighting &amp; heating loads</td>
<td>EE and self-consumption</td>
</tr>
<tr>
<td>20-50 TWh additional generation</td>
<td>Local / shared ownership in geothermal (8TWh) &amp; wind (12-30TWh); solar (1-5TWh).</td>
</tr>
<tr>
<td>ST flexibility and ancillary services</td>
<td>Hydro (2-10TWh), demand response</td>
</tr>
<tr>
<td>Renewable dispatchable alternatives to gas</td>
<td>Small-scale biomass CHP</td>
</tr>
</tbody>
</table>
Contact me for best practice guidelines for shared ownership, policy overviews

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@AnnaHarnmeijer
Example: Scottish shared ownership guidelines

Good Practice Principles

1. **Consistent** delivery of shared ownership for renewable energy projects.

2. **Flexibility** incorporated by all parties.

3. Increased **mutual understanding and engagement** in the development itself, renewable energy and the local area.

4. **Commercially viable** for both/all partners.

5. **Inclusive**, to involve all relevant stakeholders.

6. **Distinct** from community benefit funds.

7. **Timing** should be reasonable and workable for all parties.

8. **Transparent** communications, particularly **cost transparency**.

9. **Liability** should be minimised.
Policy instruments enabling community energy

| (2) Market access for independent power producers | Grid connection guarantees  
| Net metering or billing  
| Power purchase guarantees  
| Regulated buy-back rates above wholesale price  
| Priority dispatch  
| Grid upgrade and congestion management costs distributed  
| Fees for energy export and/or system services  
| Tax on electricity sales  
| Zero payment for grid injection  
| Tax on generation or capacity |

| (3) Demand guarantees and market based investment incentives | R&D grants  
| Investment subsidies/capital grants  
| Public loans  
| Feed-in-tariffs  
| Premiums  
| Renewable Heat Incentives  
| Tax credits/exemptions  
| Supplier mandates or obligations  
| Quota based Renewable Certificates  
| Auction systems (parallel to wholesale auctions)  
| Incentives for small-scale DSR & ancillary services |

| (4) Regional resource planning | Regional investment incentives  
| Direct investment by local authorities  
| Regional energy demand and supply mapping and planning  
| Local authority mediated site pre-feasibility mapping  
| Procedures facilitating access to public or private land  
| Preferential/rapid planning procedures |

| (5) Targeted community energy legislation | Community tariffs or premiums  
| Community energy grants  
| Public seed/capital loan programmes, loan guarantees for community energy  
| Local ownership legislation/shared ownership legislation  
| Tax privileges  
| Service/knowledge exchange/capacity building platforms  
| Integrated Civic Energy Strategy |

Berka (in press)
## Country level variation

<table>
<thead>
<tr>
<th></th>
<th>UK</th>
<th>New Zealand</th>
<th>Denmark</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dominant functional activities</strong></td>
<td>Electricity generation</td>
<td>Distribution, electricity generation</td>
<td>Distribution, heat and electricity generation</td>
<td>Electricity generation</td>
</tr>
<tr>
<td><strong>Dominant organizational types</strong></td>
<td>Scottish local development trusts (41%), energy co-operatives (24%)</td>
<td>Distribution network operators arms-length owned by consumer trusts and co-operatives (56%); Iwi trust joint ventures (9%)</td>
<td>Municipal companies and consumer co-operatives; wind guilds; traditional and new wind co-operatives; foundations; joint ventures.</td>
<td>(1987-1990: regional and local authorities; Joint ventures between regional economic corporations, local utilities and turbine manufacturers)</td>
</tr>
<tr>
<td><strong>Dominant technologies</strong></td>
<td>Onshore wind, standalone solar PV</td>
<td>Hydro, geothermal, standalone solar PV</td>
<td>Wind, gas and biogas CHP</td>
<td>Wind, (solar PV)</td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>&lt;1% of total generation capacity (2016)</td>
<td>7% of total generation capacity (2018)</td>
<td>30% of wind capacity (2016); 95% of DH companies (2016)</td>
<td>&lt;&lt;1% of total generation capacity (2016)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>790 organisations, 105MW</td>
<td>131 organisations, 294MW</td>
<td>507 – 1575MW wind</td>
<td>&lt; 100 MW solar PV</td>
</tr>
<tr>
<td><strong>Emerging activities</strong></td>
<td>Shared ownership; PPA’s; behind the meter innovation</td>
<td>Peer-to-peer; gen-tail; rural solar-battery</td>
<td>Wind to heat; small-scale DSM, ancillary services</td>
<td>Co-operative retail</td>
</tr>
</tbody>
</table>

Berka & Creamer, 2018; MacArthur & Berka and Gonnelli (in preparation); Wierling et al., 2018.
Abundance, UK

Crowdsourced debenture

• An intermediary
• Individuals buy transferrable debentures – provide debt – to a commercial project, and earn interest on their investment through an FCA regulated online platform.
• School solar rooftop projects – receive low cost electricity
• Wind/AD/hydro projects
• Minimum investment 5GBP, payback 15-20 years.

https://www.abundanceinvestment.com/why-abundance/our-track-record/funded-projects