User-Centred Energy Systems

EnergyREV

INDUSTRIAL STRATEGY

UK Research and Innovation

UK & International implementation of energy communities: drivers & barriers

EGRD meeting - 23 April 2020

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Delivering value to PFER

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Future energy model proving

Collaborative outputs
Demonstrator working group
Joint workshops

Research outputs
Consultations
Activity groups
Participants in research
Collaborative research

CATAPULT Energy Systems

Energy Revolution Integration Service activities

EnergyREV

Synthesis of knowledge within and beyond PFER
Novel research and innovation (whole systems)
Academic evaluation of smart local energy concepts
Academic liaison and domain expertise

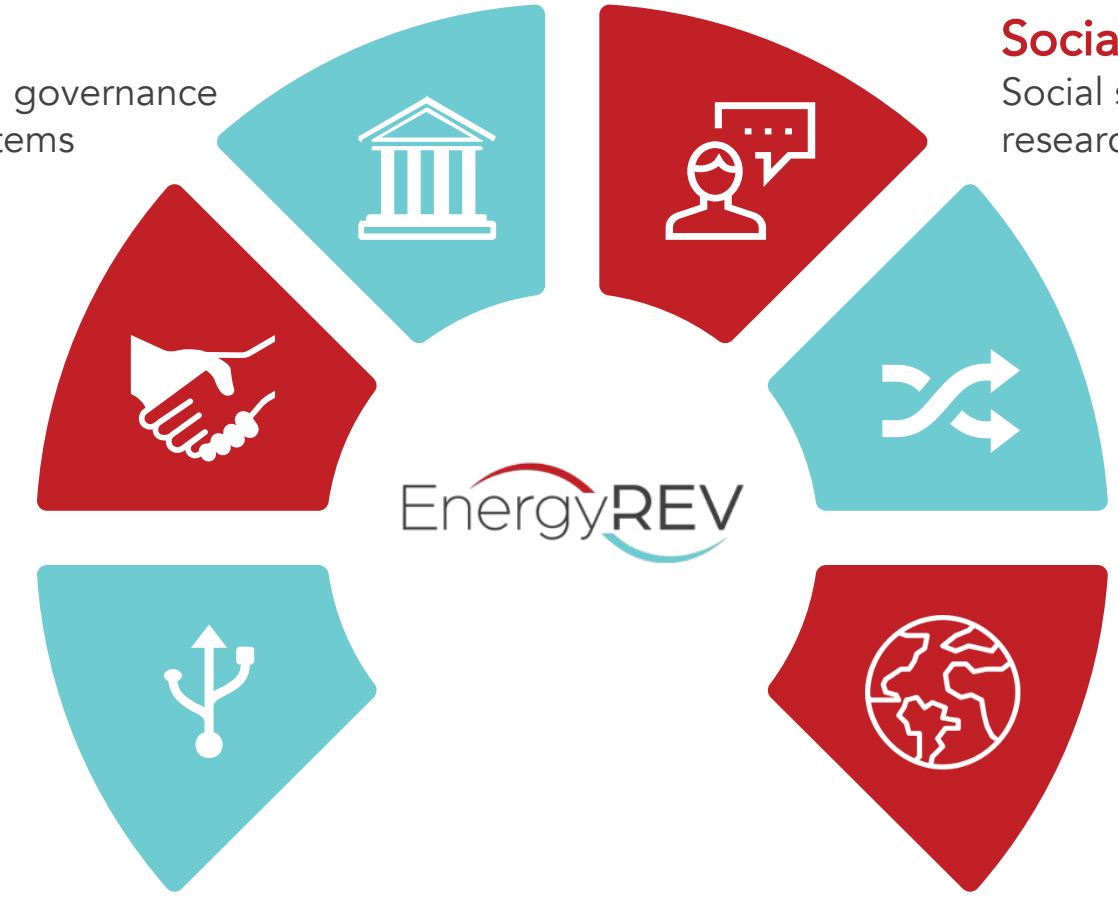
The EnergyREV consortium

Consortium of 32 co-investigators exploring challenges around smart local energy systems from an interdisciplinary and whole-systems viewpoint. Expertise and detailed knowledge in:

Policy and governance
Policy, regulation, markets and governance issues around local energy systems

Social science and user research
Social science understanding of end user research and engagement

Business and innovation
Businesses and financial practices and industry innovation



Multi-vector "whole" systems
Electricity, heat and transport, and system integration

Data and AI
Expertise across wide ranging cyber-physical issues

Energy and environment
Interactions between energy and environmental systems

GO-P2P: Global Observatory on Peer-to-Peer, Community Self-Consumption and Transactive Energy Models

The Global Observatory is a forum for international collaboration to understand the policy, regulatory, social and technological conditions necessary to support the wider deployment of peer-to-peer, community self-consumption and transactive energy models.

GO-P2P

- **Launched:** 3 September 2019
- **Duration:** Three years + six-month reporting phase
- **Member countries:** Australia, Belgium, Ireland, Italy, Netherlands, Switzerland, UK and USA
- **Participation:** 98 participants from 14 countries, of which 73 are from academia; 20 from industry; and 5 from non-profits.
- **Engagement with:**
  - International Energy Agency (IEA)
  - International Association for Trusted Blockchain Applications (INATBA)
  - European Commission/Alliance for Internet of Things Innovation (AIOTI)
  - International Renewable Energy Agency (IRENA)
  - Solar Power Europe
  - European Federation of Renewable Energy Cooperatives (REScoop),
  - National Energy Ombudsmen Network (NEON).
  - International case studies: Quartierstrom (CH), ènostra (IT), SHAR-Q (Horizon 2020 project), VICINITY (Horizon 2020), Transactive Energy Colombia project (COL).

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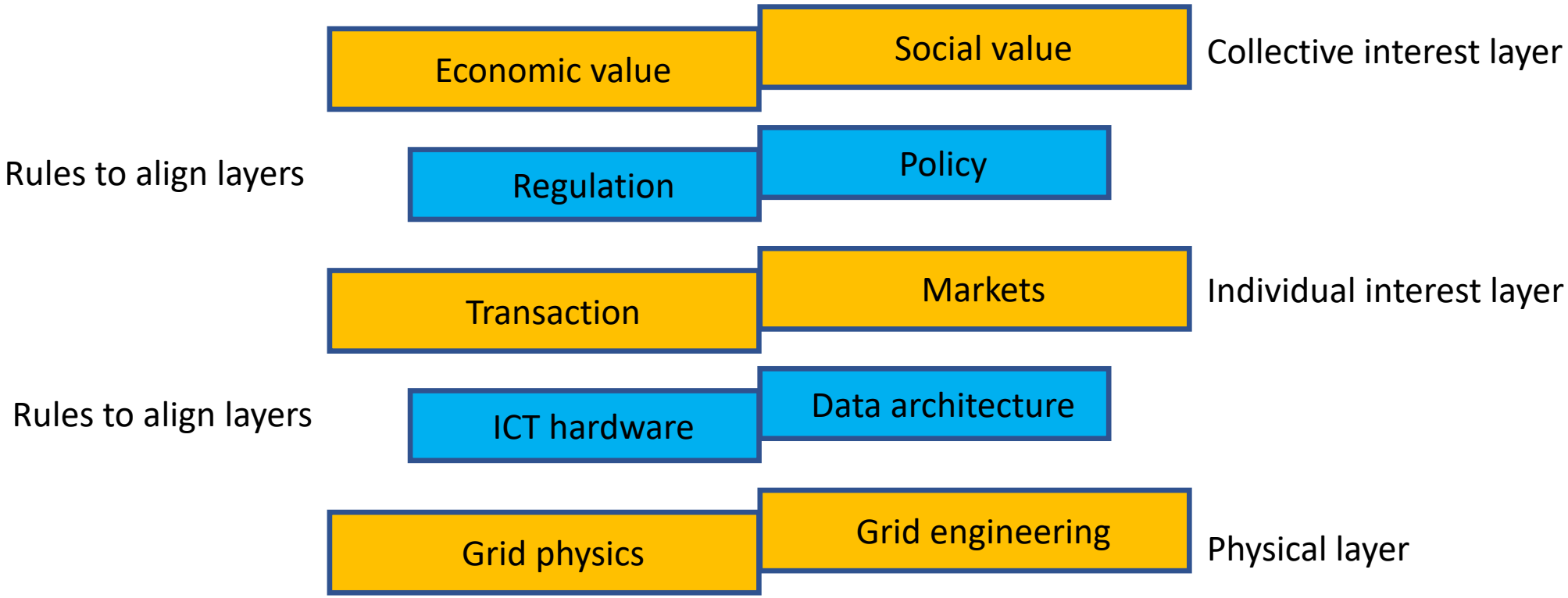
Key challenge: Aligning value across domains

- Gold layers can (frequently are) misaligned:
  - Transactions don't follow 'electrons';
  - Individual interests don't align with collective interests.

Blue layers are the rules we write to align the Gold layers

- ICT and data architectures (measurement, frequency, ontologies; interoperability; etc)
- Policy and regulation design (distributional impacts; grid defection; regional pricing; etc)



Can deliver key benefits across domains

- The policy outcome dictates the regulatory change which determines the business model which drives behaviour.
- Community energy provides opportunities to:
  - Generate widely distributed, high value jobs and skills in communities
  - Create regional competitive advantage for industry relocation
  - Create greater end-user understanding and engagement in energy
  - Create new business models delivering existing and new energy services
  - Reduce distribution system reinforcement costs
  - Support greater penetration of distributed renewable energy
  - Increase energy system resilience under global or local constraints

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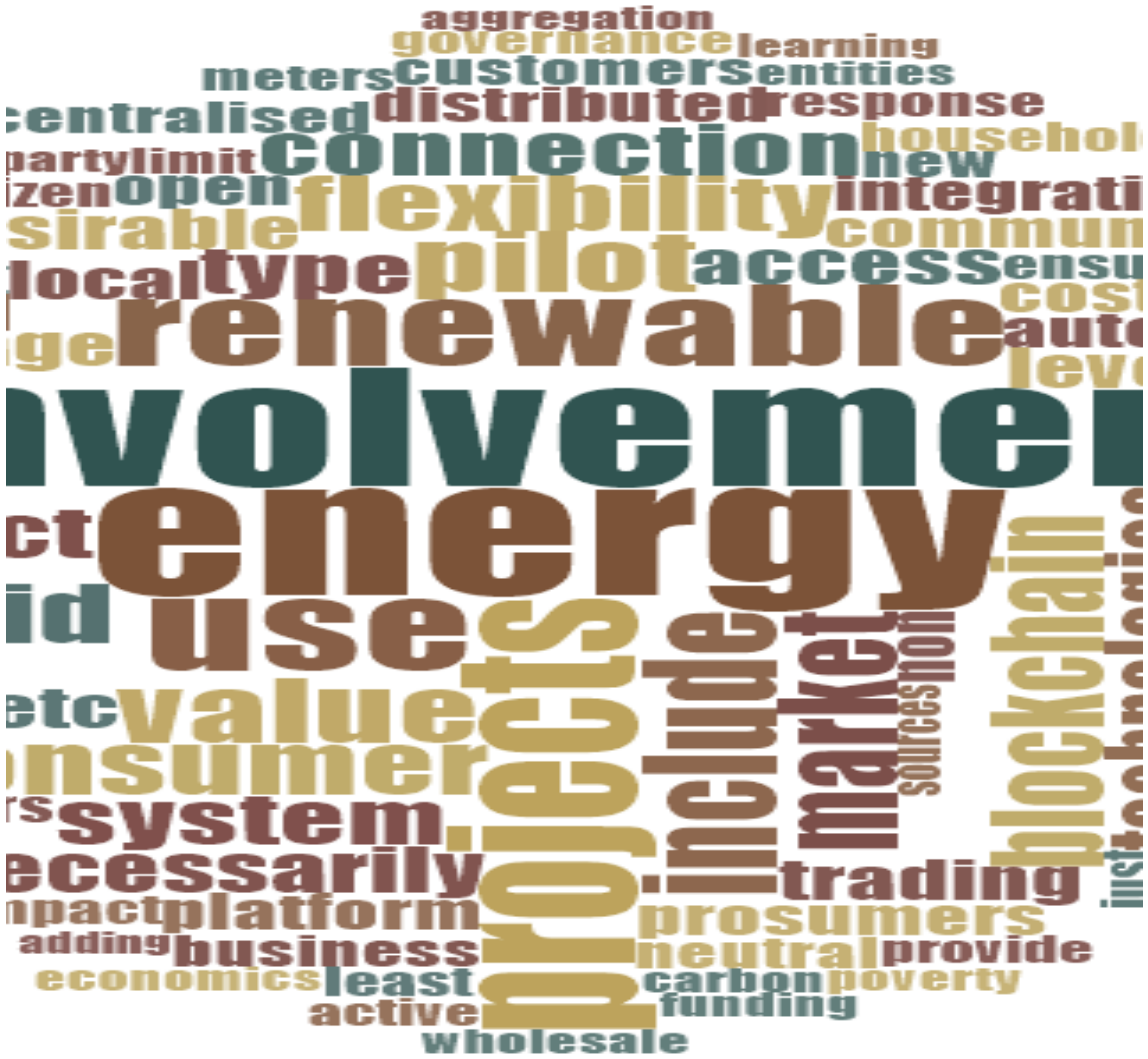
System characteristics from the Florence meeting

- Finding common definitions (particularly globally) is challenging - but identifying common characteristics can be helpful.
- Common characteristics of the P2P/TE/CSC models include:
  - End-user participation
  - Renewable energy integration
  - Social purpose
  - System scalability
  - Participant diversity
  - Technology neutrality



Global Key challenges

- This is a preparadigmatic field with competing approaches and actors.
  - Individual self-consumption -> collective self-consumption -> peer-to-peer -> community self-consumption models (de Almeida 2020)
- Community energy is distinguished by the focus on local multiple-benefits value generation, asset ownership and governance. It is the most socially reconstructive model: challenging incumbents & empowering consumers.
- There is no clear pathway to scale.
  - Existing models stop at demonstrators and regulatory sandboxes, leaving it up to the market to drive wider adoption.
  - Incumbency in both the energy code development process and in financial and knowledge capital make the playing field very uneven for smaller actors.
- Distributional impacts matter.
  - How we avoid ghettoing, socialise the cost of national infrastructure, and socialise local imbalance risks remains unclear.

UK Legal challenges go well beyond energy

(Schneiders et al 2018)

- Data privacy and GDPR
  - Encryption & hashing are pseudonymisation – not anonymisation techniques.
  - Right to be forgotten (Art.17), or for data to be corrected (Art.16) clash with DLT immutability.
  - Obligations on controllers and processors of data - who are these in a DLT?
- Smart contracts
  - A smart contract can be considered a ‘contract’ under UK law
  - Smart contracts are immutable and irreversible, therefore cannot reflect changing circumstances (required in contract law).
- Prosumer rights
  - Domestic energy consumers producing their own energy (‘prosumers’) are not recognised in UK consumer law.
- Legal protection for P2P participants needed
  - Co-ops and LLPs can address some, but not all of these issues.

CommUNITY – Brixton – London

- **Residents:** 62 apartments with pre-pay meters, gas central heating, electric immersion heaters. Paying ~14p/kWh
- **Generation:** 37kWp rooftop PV supplying landlord load (communal lighting + one lift). > 90% of power exported. Payed FITs ~4p/kWh.

CommUNITY – Brixton – London

- Maximises self-consumption
- P2P market floats between import (~14p/kWh) and export (~4p/kWh).
- Local benefits:
  - Saves residents 10-20% on electricity
  - Pays more to community cooperative that owns PV
  - Provides local grid balancing services to DSO
- Wider benefits through demonstrating:
  1. Viability of P2P model for multi occupancy buildings
  2. Social value stacking for consumer engagement in local energy
  3. Financial value stacking for PV in urban area

CommUNITY – Regulatory Issues

Some regulatory issues related to the CommUNITY trial include:

- **Informed choice principle**: How to compute the estimated annual cost? How to compute the relevant alternative cheapest tariff?
- **Tariffs**: single tariff supply contract including CommUNITY rebate or separate contracts?

Other issues related to different delivery options may include:

Metering

- Recording
- Meter ownership
- Registering and maintenance of metering asset
- Meter resolution

Billing

- Multiple-supplier billing
- Accounting for self-consumption

Supplier license

- Balancing Settlement Code (BSC)
- Distribution code
- Grid code
- Smart energy code
- Master registration agreement (MRA)

Tariffs

- Time of use tariffs
- Network charges
- Policy charges

Settlement

- Local settlement for individual consumers

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Transactive energy Colombia Project

- Community energy scheme in Comuna 13 – Medellin.
- Social strata 1 & 2
  - Semi-formal communities on mountains around Medellin.
  - Mostly low rise with roof space.
  - Pay ~median -20%/kWh
- Social strata 5 & 4
  - Wealthy communities in central Medellin.
  - Mostly high-rise flats with no roof space
  - Pay ~median +60%/kWh
- Generation and storage embedded in valued local community center

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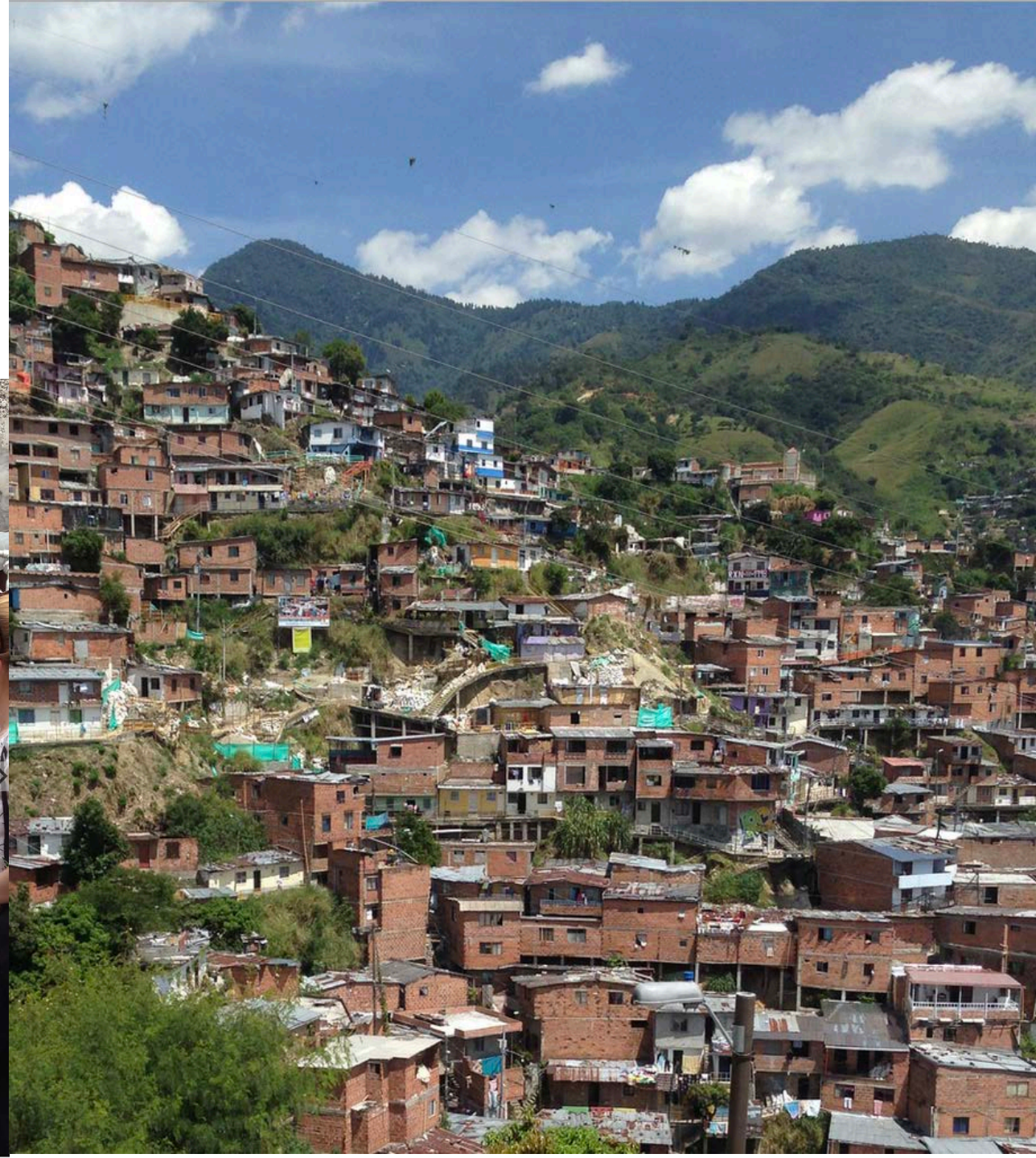

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- Global Observatory on Peer-to-Peer, Community Self-Consumption and Transactive Energy Models (GO-P2P): https://userstcp.org/annex/peer-to-peer-energy-trading/