Energy Cooperatives: A Missing Piece of the Peer-to-Peer Energy Regulation Puzzle?

Alexandra Schneiders, David Shipworth
University College London (UCL) Energy Institute
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Abstract

Peer-to-peer (P2P) energy trading is emerging as a new mechanism for settling exchanges of energy between renewable energy generators and consumers. Often facilitated through distributed ledgers ('blockchains'), it provides a mechanism for matching local supply and demand. Energy communities across Europe, including in the United Kingdom (UK), have realised the potential of this technology and are currently running pilots testing its applicability to P2P energy trading. The aim of this paper is to analyse whether the legal forms available to energy communities in the United Kingdom could help resolve some of the uncertainties around individual energy consumers using blockchain for peer-to-peer energy trading. These include the legal recognition of 'prosumers' acting as consumers and entrepreneurs, the protection of their personal data, as well as the validity of 'smart contracts' programmed to trade energy on the blockchain network. There is currently a lack of legal clarity on these issues. The analysis has shown that legal entities such as Limited Liability Partnerships and particularly Co-operative Societies can play a crucial role in providing the necessary framework to protect consumers when using smart contracts and engaging in P2P transactions.

Keyword set: peer-to-peer, transactive energy, energy trading, distributed ledgers, blockchain, energy communities

I.   INTRODUCTION

In today's increasingly decentralising energy grid, a distributed ledger technology such as blockchain may bring the speed, automation and decentralisation that is necessary to coordinate the matching of demand and supply. However, the use of this technology is not without controversy, as there are uncertainties around its impact on individual consumers. There is a risk that consumers' data privacy could be undermined due to a lack of legal clarity on whether and how the newly-enforced General Data Protection Regulation (GDPR) applies to blockchains. Furthermore, smart contracts (an added functionality on blockchains) are not recognised in UK law and pose risks to consumers due to their immutability. The law also does not clarify the role, obligations and rights of UK consumers participating in peer-to-peer (P2P) energy trading.

Grouping residents into a single legal entity could shield individual consumers from these risks and further stimulate the technology's uptake within communities having limited access to renewable energy. This paper seeks to answer a question that has not been explored in the literature so far, namely whether energy communities, as they are currently legally recognised in the United Kingdom, could alleviate concerns around the use of distributed ledgers for peer-to-peer energy trading by individuals. This paper, which takes the form of a legal review article, aims to inform and advise stakeholders involved in the practical roll-out and legal recognition of energy communities testing the use of blockchain for peer-to-peer energy trading.

The UK presents an interesting setting for the researching of this question. Firstly, the energy regulator, Ofgem, is enabling peer-to-peer energy trading pilots to take place within the framework of its regulatory sandbox. Secondly, UK energy communities have several legal forms (i.e. legal structures) at their disposal. This is unique in Europe, since other countries' legal frameworks usually offer one legal form to energy communities wishing to incorporate[1]. The characteristics of the legal forms available to UK energy communities could mitigate the risks associated with the use of blockchain technology by individual consumers.

The paper will start out by providing background information on blockchain, the technology's application to the energy sector, and case studies of its adoption by energy communities. It will then analyse the most suitable legal forms available to UK energy communities wanting to engage in peer-to-peer energy trading via blockchains. The characteristics of the most suitable legal forms will be assessed against the main challenges presented by individual use of blockchain for P2P energy trading. These include challenges to consumers' data privacy, the legal recognition of smart contracts concluded to trade energy, and their rights as active consumers ('prosumers'). The paper will answer the research question: *how can UK energy communities, as they are currently legally recognised, shield consumers from the main challenges presented by individual blockchain use for peer-to-peer energy trading*, and provide practical advice to stakeholders.

❖ Blockchain and energy

There has been a rise in recent years in the number of domestic consumers across Europe generating, storing and selling electricity, thanks to a decline in the cost of renewable energy technologies. The availability of smart meters and energy storage further facilitates the integration of these 'prosumers' into the energy grid. The evolution towards a low-carbon, decentralised system, in which domestic producers inject intermittent renewable energy into the grid, is challenging to manage[2]. Today's electricity grids are not designed to absorb excess energy input, such as the energy generated by solar panels. Grids are designed for the

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[1] REScoop interview (6 July 2018).
[2] Enzo Fanone et al, "The Case of Negative Day-Ahead Electricity Prices".

unidirectional flow of energy from generators to consumers[3]. The bi-directional flow created by consumers feeding energy into the grid causes disruption, leading to extra costs for energy consumers, due to increased network management by centralised grid parties[4].

Peer-to-peer energy trading using distributed ledgers, such as blockchain, is a potential solution to this problem, since it can facilitate the balancing of demand and supply at local level[5]. The blockchain network enables peer-to-peer transactions using cryptographic proof of ownership (i.e. pre-written codes run by computers), instead of human intermediaries. All transactions are recorded and stored sequentially in an unalterable chain of blocks of data, hence the term 'blockchain'. A copy of this ledger of transactions is kept by all participants (i.e. computers; 'nodes') on the blockchain. Other participants provide computational power to verify new transactions and update the blockchain accordingly[6]. An added functionality is the 'smart contract', first introduced by the Ethereum blockchain. This is a 'computerised transaction protocol'[7] that automatically executes once the contract conditions set by blockchain participants are met[8].

A distinction is to be made between 'public' and 'permissioned' blockchains. The former are open for anybody to join and their transactions are public, Bitcoin being the most famous example. On the other hand, access to permissioned blockchains is restricted to approved participants by a central party, which also determines the rules governing it. This is likely to be the model adopted for peer-to-peer energy trading, due to the use of the energy grid, which is heavily regulated due to its status as critical national infrastructure[9].

In April 2016, the world's first blockchain-enabled energy trade took place in Brooklyn, where the owner of a solar roof panel sold excess energy to a neighbour[10]. Since then, the number of pilots testing peer-to-peer energy trading using blockchain has significantly increased. With the help of a connected smart meter, imported and exported electricity is measured and recorded by the blockchain system. Based on this data, the system matches buyers and sellers of self-generated energy and consequently settles the financial transactions between them[11].

Several energy communities across Europe are testing the use of blockchain for peer-to-peer energy trading. Goiener, an energy cooperative in Spain, is currently running a pilot with the tech start-up Klenergy[12]. The current phase focuses on testing Klenergy's blockchain ('Pylon Network') to provide consumers with a choice of renewable energy sources, including energy generated by prosumers[13]. Future plans include the testing out of P2P energy trading via the Pylon Network[14].

In the UK, Repowering London, a not-for-profit organisation facilitating community energy projects[15], is part of a consortium trialling a local peer-to-peer blockchain-enabled energy

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[3] Ahmad Zahedi, "Maximizing Solar PV Energy Penetration Using Energy Storage Technology".
[4] David Shipworth, "Peer-to-Peer Energy Trading Using Blockchains", p. 5.
[5] Jodie Giles, "Peer to Peer Trading and Microgrids – the next Big Thing?".
[6] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System".
[7] Nick Szabo, "Smart Contracts".
[8] Vitalik Buterin, "A next generation smart contract and decentralized application platform", p. 13.
[9] David Shipworth, p. 7.
[10] Clinton Nguyen, "Brooklyn's 'Microgrid' Did Its First Solar Energy Sale".
[11] David Shipworth, pp. 6-7.
[12] GoiEner, "Pylon Network Instala Los Primeros Medidores de Energía «Metron»".
[13] The Pylon Network blockchain provides full traceability of payments for energy exchanges.
[14] Goiener interview (4 June 2018).
[15] Repowering London, "About Us".

trading platform in London[16]. Urban residents living in the same apartment block will source their energy from a solar PV array on the building's roof, and trade excess energy with their neighbours. The energy transactions and billing between neighbours will be enabled by blockchain, with participants able to set preferences to either sell or donate excess energy[17]. The pilot is being rolled out within the framework of the energy regulator's regulatory sandbox, which aims to test new energy innovations without being subject to all of the regulatory requirements that would usually apply, since peer-to-peer energy trading is currently not allowed under UK law[18].

It should be noted that the term 'energy community' is widely used in the reviewed literature. Another term referring to this phenomenon is 'community energy', which has been defined by Community Energy England as the delivery of energy supply, community-led renewable energy and energy demand reduction projects, whether fully owned or controlled by communities, or through partnerships with public sector or commercial partners[19].

II.   ENERGY COMMUNITIES IN THE UK

Several legal forms are available to energy communities in the UK. In 2017, the most popular forms in England, Wales and Northern Ireland[20] were Community Benefit Societies (47%), Co-operative Societies (19%) and Community Interest Companies (13%)[21]. Another available legal form is the Limited Liability Partnership[22].

Community Benefit Societies (BenComs) and Community Interest Companies (CICs) may not be suitable for energy communities carrying out peer-to-peer energy trading. This is because they are required by law to invest their profits into the wider community and are therefore not set up with their members' own interests as a primary focus[23]. This paper will therefore focus on Co-operative Societies and Limited Liability Partnerships (LLPs), since they are primarily set up to benefit their own members. Despite financial profit never being the main aim of a Co-Operative, it should be noted that community energy stakeholders interviewed for this paper believe that the profit-making aspect of peer-to-peer energy trading does not form a barrier to the forming of a Co-operative Society, since there is still a strong social element present in its activities[24].

❖ The importance of incorporation

It is crucial to understand why energy communities should wish to 'incorporate' into a legal form such as the LLP or Co-operative Society. Under incorporation, a legal identity is created 'for an organisation that is distinct from its members'. The corporate body has different rights and duties to its members, such as the ability to own land or enter into contracts, since it is a

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[16] Liam Stoker, "Peer-to-Peer Trading, Renewables and Blockchain: What's inside Ofgem's 'Regulatory Sandbox' | Current News".

[17] Jodie Giles.

[18] Liam Stoker.

[19] Community Energy England, "What Is Community Energy?".

[20] According to a community energy stakeholder, registered charities and companies limited by guarantee are other forms that are commonly used in Wales and Scotland.

[21] Community Energy England, "Community Energy State of the Sector 2018", p. 17.

[22] Co-operatives UK, "Simply Legal - All you need to know about legal forms and organisational types for co-operatives and community owned enterprises", p. 30.

[23] Section 2 Co-operative and Community Benefit Societies Act 2014 ("CCBSA 2014"); Department for Business, Energy & Industrial Strategy (Office of the Regulator of Community Interest Companies: Leaflets), "Frequently Asked Questions".

[24] Repowering London interview (23 May 2018) and REScoop interview (6 July 2018).

separate person in the eyes of the law. It is registered under an Act and with a regulator. Incorporation is beneficial in how it provides limited liability to members, leading them to share risk more evenly between themselves[25]. If the entity goes bankrupt, they will only be liable to the extent of 'the capital or guarantee they have put in or agreed to put' into the entity[26]. On the other hand, unincorporated organisations are perceived as a group of people that are jointly and individually responsible for the body's activities[27].

In the next section, the main characteristics of Co-operative Societies and LLPs are set out.

❖ **Co-operative Societies**

Co-operative Societies are regulated by the Co-operative and Community Benefit Societies Act 2014. Before registering a group as a Co-operative Society, the Financial Conduct Authority (FCA) considers whether the entity is "an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned enterprise", which is the definition of a co-operative as set out by the International Co-operative Alliance[28]. They are not meant to carry on business with the object of "making profits mainly for the payment of interest, dividends or bonuses"[29].

The Co-operative Society's governing document, or "rules", binds its members[30]. These may provide that any failure to comply with the rules or contravention thereof is an offence, punishable "on summary conviction by a fine not exceeding such reasonable sum as is specified by the rules"[31]. A register of members is to be kept at the Co-operative Society's office, which should include details such as the member's name and postal address[32]. Books of account and balance sheets should also be made available, containing details on the Society's transactions[33]. Members may include corporate bodies[34]. Co-operative Societies have a governing committee overseeing decision-making[35]. However, control over the society lies with all members, exercising it equally ('one member, one vote')[36]. Corporation tax is to be paid on the Co-operative Society's profits[37].

It should be noted that, according to sources such as Community Energy England, the FCA has allegedly refused to accept the registration of new community energy Co-operative Societies since March 2014, with groups having to use the Community Benefit Society model instead.[38]

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[25] The Hive (Co-operatives UK), "Incorporated or Unincorporated Co-Operatives".
[26] Legaleze, "A Glossary of Legal Terms and Expressions in UK Business Law".
[27] Co-operatives UK, "Simply Legal - All you need to know about legal forms and organisational types for co-operatives and community owned enterprises", p. 13.
[28] International Co-operative Alliance, "Cooperative Identity, Values & Principles".
[29] Section 2(3) CCBSA 2014.
[30] Section 15 CCBSA 2014.
[31] Section 20 CCBSA 2014.
[32] Section 30 CCBSA 2014.
[33] Sections 75 and 80 CCBSA 2014.
[34] Section 32 CCBSA 2014.
[35] Co-operatives UK, "The Essential Society Director: In-Depth Guide".
[36] Co-operatives UK, "Simply Legal - All you need to know about legal forms and organisational types for co-operatives and community owned enterprises", p. 31.
[37] Section 140 Corporation Tax Act 2009.
[38] Community Energy England, "Community Energy State of the Sector 2018", p. 17.

❖ **Limited Liability Partnerships**

A Limited Liability Partnership (LLP) is formed by two or more natural or legal persons carrying on a "lawful business with a view to profit"[39]. The main legislative act regulating LLPs is the Limited Liability Partnerships Act 2000. The LLP's members are named in its incorporation document[40] and new members[41] are notified to the registrar at Companies House[42]. The governing document of the LLP is the "agreement", which is not compulsory to draft and can be kept confidential[43].

Any assets resulting from business or trade with a view to profit are taxable, with members being taxed separately[44]. An LLP must at all times have a registered office in the UK[45]. It should also keep a register of its members and make it available for inspection at its office[46]. Details to be included in the register include names and dates of birth[47]. The LLP has a duty to deliver annual returns to the registrar[48], as well as its accounting records. It must have at least two 'designated members', who have additional administrative responsibilities[49].

III. METHOD

Since the aims of this paper are to assess and advise on the current legal challenges presented by blockchain to individual consumers, as well as how the legal recognition of energy communities may shield them from such risks, the main research method of this paper consisted of reviewing secondary literature and legislation.

Publications such as reports by lawyers and international organisations, as well as research by legal academics, formed the bulk of the literature reviewed for the main analysis. This was the first step of the research process; narrowing down the main legal challenges to consumers presented by blockchain. The literature chosen focused on the regulation of blockchain as well as of Internet platforms hosting peer-to-peer transactions. The next step was to review UK and EU legislation in the fields of consumer, energy, contract and data privacy law. Provisions that were applicable to the situation of a consumer trading energy on a blockchain were analysed and included in the main analysis. Due to the newness of the technology, there was a limited amount of applicable case law.

In parallel to the literature and legislation review, interviews with three stakeholders took place to inform the direction of the paper. The interviewed stakeholders included organisations representing energy communities at European level (REScoop) and those currently involved in the active roll-out of P2P energy trading via blockchains (Goiener in Spain and Repowering London in the UK). The latter two provided the case studies justifying why the use of blockchain by energy communities for peer-to-peer energy trading is a trend that is worth looking into. Repowering London and REScoop both provided valuable input on the most relevant legal forms for P2P energy trading in the UK. REScoop, as a European-level

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[39] Section 2 Limited Liability Partnerships Act 2000 ("LLP Act 2000").
[40] Section 4 LLP Act 2000.
[41] According to a community energy stakeholder, the LLP form is used to a minimal extent by energy communities, since there are difficulties encountered when adding new members to the structure.
[42] Section 9 LLP Act 2000.
[43] Section 5 LLP Act 2000.
[44] Section 59A LLP Act 2000.
[45] Section 14 LLP (Application of Companies Act 2006) Regulations 2009 ("LLP 2009").
[46] Section 162 LLP 2009.
[47] Section 240 LLP 2009.
[48] Section 854 LLP 2009.
[49] Gov.uk, "Set up and Run a Limited Liability Partnership (LLP)".

organisation, highlighted the uniqueness of the UK legal landscape in Europe. The questions asked to interviewees were tailored to their knowledge. Interview transcripts and the final version of this paper were sent to them for review.

IV.   LEGAL CHALLENGES

A) Data privacy

On May 25th 2018, the European Union's General Data Protection Regulation (GDPR) became directly applicable in the legal orders of all EU Member States, including the United Kingdom[50]. In the UK the GDPR is supplemented by the Data Protection Act 2018, having recently replaced the Data Protection Act 1998. Following the UK's exit from the European Union, the GDPR's rules will likely be incorporated into UK law under the European Union (Withdrawal) Bill, which is currently before Parliament[51].

The GDPR lays down rules protecting natural persons with regard to the processing of their personal data by means of (semi-) automated means[52]. Personal data is defined as "any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person"[53]. The GDPR is not applicable to anonymous data[54].

The literature on GDPR and blockchain has identified several issues, namely:

❖ The GDPR is applicable to pseudonymised data since this type of data can be attributed to a subject with the use of additional information[55]. Data on the blockchain is available in plain text, hashed (i.e. compressed), or encrypted (i.e. revealed using a set of keys)[56]. According to the Article 29 Working Party, an advisory body having issued guidelines on the application of EU data protection legislation, hashing and encryption are pseudonymisation techniques[57]. Academics argue that the public keys used by blockchain users to transact with each other are pseudonymous data falling under the GDPR's scope[58]. This is because they can be traced back to the IP address of an individual, which is 'personal data' as concluded in the ruling *Patrick Breyer v Germany*[59].

❖ The rights set out in the GDPR may thus be invoked by natural persons participating in blockchains. These include the right to request the data controller for rectification of inaccurate information (Article 16), the right for data to be erased ("right to be forgotten") in Article 17, and the right to data portability in Article 20, namely to "receive the personal data concerning him or her, which he or she has provided to a controller…

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[50] European Commission, "Communication from the Commission to the European Parliament and the Council: Stronger protection, new opportunities- Commission guidance on the direct application of the General Data Protection Regulation as of 25 May 2018".
[51] House of Lords, "Data Protection Bill: Explanatory Notes", p. 7.
[52] Article 2(1) General Data Protection Regulation ("GDPR").
[53] Article 4 GDPR.
[54] Preamble (26) GDPR.
[55] Ibid.
[56] Michèle Finck, "Blockchains and Data Protection in the European Union", p. 10.
[57] Article 29 Data Protection Working Party, "Opinion 05/2014 on Anonymisation Techniques", p. 20.
[58] Michèle Finck, pp. 12-16.
[59] European Court of Justice (CJEU), Patrick Breyer v Germany.

and have the right to transmit those data to another controller". These rights clash with one of blockchain's main characteristics: once information is recorded on it, it is very difficult to remove or amend it. This is to fend off attacks and discourage fraud[60].

❖ The GDPR also imposes obligations on the controllers and processors of personal data. Not only are these responsible for the enforcing of rights, but they must also fulfil certain conditions. These include obligations such as keeping data "for no longer than is necessary for the purposes for which the personal data are processed" (Article 5(e)), designating a data protection officer (Article 37) and communicating a personal data breach to the data subject (Article 34). The controller is defined as a natural or legal person determining "the purposes and means of the processing of personal data"[61], while the processor is a natural or legal person processing "personal data on behalf of the controller"[62]. In the context of a blockchain it is difficult to pinpoint who is the processor and controller. Some academics argue that the users of the blockchain could be considered as being data controllers, since they decide which information is included in a transaction. Yet they could also be processors, since their computers run the blockchain[63].

In a private blockchain, which will probably be the model adopted by an energy community, the controller is likely to be the legal entity in charge of running the community (Co-operative Society or LLP), and the processor is a blockchain platform provider. Provided that all members are natural persons, the data processed on the blockchain falls under the scope of the GDPR. If members are legal entities, which is possible in the case of Co-operative Societies and LLPs, the GDPR won't be applicable to them[64]. Only a few members are likely to be legal entities, since the registration and running thereof implies significant costs and responsibilities[65].

In order to comply with GDPR rights, data will need to be stored off the blockchain. There are several ways to do this, such as storing it in a 'content-addressable storage system' and retrieving it by using the reference to the storage included in a smart contract[66]. As for the public keys, it is impossible to store them off-chain since they are indispensable for the validation of transactions on the blockchain. Satoshi Nakamoto, pseudonymous creator of the Bitcoin blockchain, recommends that a new pair of keys be used for each transaction to avoid disclosing the owner's identity[67]. There are other ways in which to make public keys indiscernible, such as 'Ring Signatures', a technology providing a set of public keys without disclosing which is the real one[68]. However, we do not know whether these methods will be judged as constituting anonymisation, and therefore whether public keys fall under the GDPR's scope. It also remains to be seen how GDPR rights will be interpreted by the courts. For instance, the term 'erasure' is not defined in Article 17 and provides margin for interpretation[69].

The document ruling the relationship between the LLP or Co-operative Society and their members, which could include the consent given by members for their data to be processed

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[60] Satoshi Nakamoto.
[61] Article 4 GDPR.
[62] Ibid.
[63] Michèle Finck, p. 18.
[64] European Commission, "Do the data protection rules apply to data about a company?".
[65] Gov.uk, "Running a Limited Company".
[66] Jacob Eberhardt and Stefan Tai, "On or Off the Blockchain? Insights on Off-Chaining Computation and Data".
[67] Satoshi Nakamoto.
[68] Vitalik Buterin, "Privacy on the Blockchain".
[69] Michèle Finck, p. 25.

by the entity, should explain how data will be moved off-chain, as well as the uncertainty around public keys. If the methods deployed to try to anonymise public keys are later judged to be inappropriate, the legal entity will be penalised. Members would need to willingly take this risk when consenting to the ruling document. Additionally, they would be personally liable and incur significant costs if they were considered to be the processors. Should the processor be a platform provider, it will be difficult to find one that is open to accepting the potential risk of penalisation. In sum, legal entities such as Co-operative Societies and LLPs do not remove the risk of data privacy infringement for individual consumers.

B) <u>Smart contracts</u>

A smart contract is a transaction that self-executes once parties' terms, pre-programmed into computer code, are met[70]. Once executed, it become visible to all blockchain participants and cannot be destroyed nor tampered with[71]. In the context of energy trading, smart contracts function in the following manner: terms are programmed by members of an energy community, connected by the public energy grid or a microgrid, by using a blockchain interface linked to their smart meter such as an app[72]. Parties' terms specify the conditions under which the sale, purchase or donation of energy is to take place. For instance, an individual wants to purchase energy at X price once it is made available on the grid, while another will want to sell energy for Y price. Also, someone else may wish to donate excess energy to a person with an income below X or living on benefits. Once the blockchain finds matching terms, the 'smart contract' is executed, with a financial transaction automatically taking place whenever two traders' terms match [73].

Smart contracts are not explicitly recognised in UK nor European law. The revised EU Renewable Energy Directive, which will enter into force in the near future, defines peer-to-peer energy trading as taking place "by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction directly between participants"[74]. This could be interpreted as including smart contracts. Currently, national contract law is the most reliable source to assess the validity of smart contracts.

Under English law, parties must reach agreement before a contract is formed. This is achieved when the offeror makes an offer that is accepted by the offeree[75]. There needs to be an intention to create legal relations between parties[76]. The contract will not be binding if it is not supported by "consideration"[77]. This is based on the idea of reciprocity, namely that '"something of value in the eye of the law" must be given for a promise in order to make it enforceable as a contract'[78], i.e. payment of money. The literature agrees that these requirements are fulfilled by smart contracts[79]. It should be noted that an agreement lacks contractual force if it is so uncertain or vague that 'no definite meaning can be given to it without adding further terms'[80]. A smart contract without terms, purely digitising a process, will

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[70] Medium, "10 Advantages of Using Smart Contracts – ChainTrade – Medium".
[71] Consensys, "Grid+: Welcome to the Future of Energy (White Paper)", p. 17.
[72] Exergy, "Business Whitepaper", p. 14.
[73] Jennifer Runyon, "How Smart Contracts [Could] Simplify Clean Energy Distribution".
[74] Council of the European Union (General Secretariat), "Proposal for a Directive of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources-Analysis of the Final Compromise Text with a View to Agreement".
[75] Hugh Beale, *Chitty on Contracts: Vol. 1 & Vol. 2*, 2-001.
[76] Ibid, 2-167.
[77] Ibid, 4-001.
[78] Ibid, 4-002.
[79] Norton Rose Fulbright, "Can Smart Contracts Be Legally Binding Contracts?: An R3 and Norton Rose Fulbright White Paper", pp. 22-26.
[80] Hugh Beale, 2-147.

not satisfy this requirement[81]. This is not applicable to smart contracts for energy trading, since they will need to specify the conditions in which a transaction may take place.

Once executed, smart contracts are immutable and cannot be undone. This means that they are not able to keep up with changing circumstances, something that is foreseen in contract law[82]. For instance, a traditional contract may be discharged on the grounds of "frustration". This is when something occurs after the formation of the contract that renders it commercially or physically impossible to fulfil[83]. Examples include a subsequent change in the law or in the legal position of a party[84]. Furthermore, it is common for parties in a contract to include open-ended clauses limiting the impact of unforeseen events[85]. An example is the "force majeure" clause, a contractual term that is included as a ground to modify or cancel performance of the contract following an unspecified event or event beyond the party's control[86]. Since it is self-executing, a smart contract cannot stop or reverse once an instance of force majeure or frustration takes place.

Therefore, judges and arbitrators will play a crucial role in the 'reversing' of transactions and assessing defendants' claims for reimbursement. The difficulty of writing flawless code into a smart contract[87] is also likely to increase reliance on third party input[88]. Parties should therefore anticipate that the smart contract could go wrong and include, in a separate document kept off the blockchain which is reviewed by a qualified third party (appointed by the community), as well as linked and referred to in the smart contract, a detailed description of their contract terms. This is particularly relevant in the case of an energy community, be it a Co-operative Society or LLP, since members will be personally liable in case a smart contract with another member does not go as planned. It should be noted that in case of smart contracts between corporate entities, contract law also applies, albeit with less protection of parties' interests.

In order to further avoid future disputes, members of a Co-operative Society or LLP trading energy on the blockchain should sign a 'participating agreement', included in the governing document of the legal entity[89]. The agreement should make the formulation of the 'off-chain' document containing parties' detailed terms compulsory, as well as indicate the third parties that will provide legal input pre- and post- dispute. These should be enforced, particularly in the case of a Co-operative Society, by imposing financial penalties on non-compliant members[90]. In sum, it can be concluded that the characteristics of LLPs and particularly Co-operative Societies smoothen out smart contracts' shortcomings, since members are bound by their governing document, which could include rules on the terms of smart contracts and dispute resolution, which is significant in the current absence of legal clarity.

C) Prosumer rights

The blockchain was created with the aim of enabling seamless peer-to-peer transactions without the trusted 'middleman'[91]. It provides a platform for the trading of energy within a community, where anyone having access to the Internet and a smart meter can become an

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[81] Ashurst LLP, "Smart Contracts - Can Code Ever Be Law?".
[82] Eric Tjong Tjin Tai, "Formalizing Contract Law for Smart Contracts", p. 3.
[83] Hugh Beale, 23-001.
[84] Ibid, 23-022.
[85] Ibid, 23-003.
[86] Ibid, 15-152.
[87] Ashurst LLP.
[88] Eric Tjong Tjin Tai, p. 4.
[89] Ashurst LLP.
[90] Section 20 CCBSA 2014.
[91] Satoshi Nakamoto.

active consumer and sell energy for profit[92]. In this scenario the line between traders and consumers becomes blurred, and it is unclear at which point consumer law, which is designed to protect the consumer in business-to-consumer (B2C) transactions, becomes applicable[93].

Under the UK's Consumer Rights Act, a trader is defined as "a person acting for purposes relating to that person's trade, business, craft or profession, whether acting personally or through another person acting in the trader's name or on the trader's behalf". A consumer is defined as "an individual acting for purposes that are wholly or mainly outside that individual's trade, business, craft or profession"[94]. These are in line with the definitions set out in relevant EU legislation such as the Directive on Consumer Rights, Directive on Unfair Commercial Practices, Directive on Unfair Terms in Consumer Contracts and Electronic Commerce Directive. However, the definition of "consumer" in EU law does not contain the nuance included in the definition thereof in the Consumer Rights Act ("wholly or mainly outside"), which was added with peer-to-peer transactions in mind. In light of this, the UK government has made it clear that where an individual is simply "selling something or offering a service as a side-line", UK consumer law is not applicable[95]. On the basis of these definitions, the consumer engaging in peer-to-peer energy trading would not be considered as a "trader".

In its Communication on the Collaborative Economy, the EU lists the following criteria as guidelines to assess whether a consumer can qualify as a "trader": frequency of services (i.e. offering of services "on a purely marginal and accessory basis as opposed to regularly"); profit-seeking motive (i.e. those obtaining remuneration beyond cost compensation will "likely have a profit-seeking motive"); level of turnover (i.e. the higher the turnover, from one service in particular, the higher the chance that the peer is a trader). For instance, a person offering gardening services through a P2P platform on a regular basis, seeking to "obtain substantial remuneration", qualifies as a trader[96]. Interestingly, the first two criteria could be fulfilled in the case of peer-to-peer energy trading, particularly if an individual starts to trade daily and views it as a profit-making venture.

The revision of key EU legislative texts, such as the Electricity Directive and Renewable Energy Directive, provides clarification on the rights of energy consumers and energy communities. The latter Directive recognises "renewable self-consumers", and the former Directive recognises the "active customer". These have a right to generate, store, consume and sell electricity, while preserving their rights as customers, on the condition that these activities "do not constitute their primary commercial or professional activity"[97]. The Renewable Energy Directive even stipulates the right to conduct peer-to-peer energy trading "without prejudice to the rights and obligations of the parties involved as final customers". Consumers can also participate in renewable energy communities without losing their rights as customers, and communities have the right to arrange for the "sharing of renewable energy within the community that is produced by the production units owned by the community", while retaining members' obligations and rights as customers[98]. Based on these provisions, peers trading

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[92] Exergy, p. 14.

[93] Organisation for Economic Co-operation and Development (OECD), "Protecting Consumers In Peer Platform Markets: Exploring The Issues", p. 4.

[94] Section 2 Consumer Rights Act 2015.

[95] HM Government, "UK Government Response to EU public consultation on Digital Platforms".

[96] European Commission, "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A European Agenda for the Collaborative Economy".

[97] Council of the European Union (General Secretariat), "Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast)".

[98] Council of the European Union (General Secretariat), "Proposal for a Directive of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources-Analysis of the Final Compromise Text with a View to Agreement".

energy within a community are not likely to qualify as traders, since profits would not be significant enough for it to become a "*primary* commercial or professional activity". The revised Directives are in the final stages of negotiation.

The clarity provided by the revised energy Directives is crucial, since consumer law imposes significant obligations on traders in business-to-consumer transactions. Individual consumers do not have the same organisational, technical and legal resources as a traditional company. There is also the question of whether it is fair to impose these obligations on a peer participating in today's 'sharing economy' model. In the end, treating peers as traders could become a disincentive for further participation and eventually choke such innovative market models[99].

Provided that they are not corporate entities, peers trading energy on the blockchain are participating in consumer-to-consumer (C2C) transactions. The UK government recently clarified that it has no plans to extend consumer law to C2C transactions, since they fall under the scope of contract law. In its opinion, 'both parties…have equal status and should therefore have the freedom to contract as they wish'[100]. This presumption of an equitable position between consumers is questionable in an online environment, where there is no human contact nor room for negotiation[101]. Additional safeguards for consumers engaging in P2P trading should be formulated, as has recently been done in France. In February 2016, French contract law was amended so that Article 1171 of Order No. 2016-131144 stipulates that clauses creating a "significant" disequilibrium between the rights and obligations of parties to a contract in "adhesion contracts", contracts containing pre-determined and non-negotiated terms (Article 1110), are considered void[102]. Smart contracts on the blockchain are equivalent to adhesion contracts, since they execute automatically once parties' terms match, without any prior negotiation taking place.

In the absence of legal protection in P2P transactions, Co-operative Societies or LLPs running the private blockchain will ultimately play the role of ensuring the protection of members using their blockchain network. It is not clear yet whether and how blockchain trading platforms are subjected to consumer law. However, in the interest of maintaining members' trust and ensuring their well-being, energy community entities will need to work together with members to formulate suitable rules for platform use[103]. These should be included in the entity's governing document, and infringement thereof penalised by means of a fine (as can be done by a Co-operative Society). The burden of protecting consumers on the platform becomes a shared one between the legal entity and its members[104], creating a collective sense of responsibility[105]. This 'self-regulation' approach has been hailed by some academics as a suitable way to regulate today's peer-to-peer platforms, instead of only applying B2C-focused consumer law[106]. Local entities such as LLPs and Co-operative Societies can therefore become crucial actors in this new form of regulating peer-to-peer networks.

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[99] Organisation for Economic Co-operation and Development (OECD), p. 22.

[100] HM Government, "UK Government Response to EU public consultation on Digital Platforms".

[101] European Commission, "Exploratory study of consumer issues in online peer-to-peer platform markets", p. 122.

[102] Ordonnance n° 2016-131 du 10 février 2016 portant réforme du droit des contrats, du régime général et de la preuve des obligations.

[103] Organisation for Economic Co-operation and Development (OECD), pp. 4-5.

[104] Natali Helberger and Joris van Hoboken, "Little Brother Is Tagging You - Legal and Policy Implications of Amateur Data Controllers", p. 109.

[105] Ann Kristin Stene and Henriette Frolich Holte, "Why Do Norwegian Consumers Participate in Collaborative Consumption?-A Case Study of Airbnb and Bilkollektivet", p. 33.

[106] Molly Cohen and Arun Sundararajan, "Self-Regulation and Innovation in the Peer-to-Peer Sharing Economy".

V.   <u>CONCLUSION</u>

Distributed ledgers such as blockchain provide the infrastructure for the matching of supply and demand at local level, enabling prosumers to feed their self-generated energy into the grid and sell it to neighbours. Energy communities across Europe, including in the UK, have realised the potential of this technology and are currently running pilots testing its applicability to P2P energy trading. In the UK, Co-operative Societies and Limited Liability Partnerships (LLPs) are the most suitable forms for a community engaging in peer-to-peer energy trading, since their focus lies on the benefiting of members.

The analysis has found that Co-operative Societies and LLPs would not be able to resolve the uncertainties around data privacy. This is because it is not clear whether users' public keys, which are impossible to remove off the blockchain, constitute data falling under the GDPR's scope. When it comes to the validity of smart contracts and consumers' rights in P2P transactions, LLPs and Co-operative Societies can play a crucial role in providing the necessary framework to protect consumers, which is valuable in light of the current lack of legal clarity on these issues. Co-operative Societies would provide more safeguards for consumers, since they can punish members not respecting the rules set out in their governing document. The LLP's governing document is not compulsory, and its content is not regulated to the same extent as that of Co-operative Societies. It should be further noted that the limited liability aspect of Co-operative Societies and LLPs is only marginally relevant in the protection of data privacy, since the entity is responsible for enforcing the GDPR if members are natural persons. In the case of smart contracts and consumer rights, this aspect plays no role, since peer-to-peer transactions are still regarded as private transactions between members.

To conclude, energy communities not only have the potential to further stimulate peer-to-peer energy trading, but also to enhance the uptake of renewable energy as well as allow residents to collectively benefit from renewable energy installations. Entities such as Co-operative Societies will play a key intermediary role in the decentralised and 'peer-to-peer' energy system of the future. The UK government should already anticipate this, and provide support to local energy communities by for instance rolling back the recent cuts made to the financial support which these communities were benefiting from[107]. Furthermore, the regulator should recognise that peer-to-peer transactions will eventually take place within energy communities, and accordingly adapt the registration process for Co-operative Societies, as well as the laws around the protection of their members. Further research will need to be conducted on the applicability of the 'bottom up' regulatory approach currently being applied within sectors experiencing peer-to-peer transactions (e.g. transport and accommodation) to the energy sector, and the role of energy communities in this approach.

VI.   <u>ACKNOWLEDGEMENTS</u>

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