



User-Centred
Energy Systems



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

4th Task Status Update to the Users TCP

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Contents

Summary.....	2
Objectives for the last six months	2
Participation summary	2
INATBA/GO-P2P Task Force	2
Expert meetings held in the past six months	3
Reports produced in the past six months	3
Emerging findings.....	3
Objectives for the next six months	6
1. Defining the selection framework for pilots	6
2. Designing the research approach	6
3. Ethics approval.....	6
4. Literature reviews.....	7
5. Develop methods and templates for collection of case study data	7
6. Identify relevant cases in each participating country	7
Experts meetings planned in the next six months	7
Reports planned for the next six months	8
Outreach.....	8
Ideas for new work.....	8
Finance	9
Activity time schedule	9
Matters for the ExCo	10
Participating countries	10

Summary

Launched in September 2019, the Global Observatory is a three-year collaborative research project led by University College London (UCL). It represents 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.

Sub-tasks:

- ST 1: Power system integration – led by Lucerne University of Applied Sciences and Arts (Switzerland)
- ST 2: Hardware, software & data – led by International Energy Research Centre (Ireland)
- ST 3: Transactions and markets – led by Carnegie Mellon University (United States)
- ST 4: Economic and social value – led by University of New South Wales (Australia)
- ST 5: Policy and regulatory – led by Florence School of Regulation/European University Institute (Italy)

Objectives for the last six months

Participation summary

The number of persons involved in GO-P2P either as Participants (i.e. based in GO-P2P member countries) or Observers (i.e. based in non-member countries) now stands at 177 persons, an increase of 46 since the last Task Update. Further details:

- **Sectors:** Academia (126), Industry (42), Non-profit (9)
- **Countries:**
 - Eight member countries: Australia (4); Belgium (13); Ireland (16); Italy (13); Netherlands (11); Switzerland (14); United Kingdom (54); United States (9)
 - Two accession countries: Colombia (8); Germany (16)
 - Participants from twelve other countries support this work through providing technical and scientific expertise: Barbados (1); Brazil (1); Croatia (1); Denmark (1); France (2); Hong Kong (1); India (1); Indonesia (2); New Zealand (1); Portugal (4); Spain (3); Sweden (1)

Participants are connected through a GO-P2P mailing list and Slack channel, enabling them to discuss topics and collaborate on additional opportunities.

INATBA/GO-P2P Task Force

The new collaboration between GO-P2P and the International Association for Trusted Blockchain Applications (INATBA), was kickstarted in October 2020 with the launch of a GO-P2P/INATBA Task Force. INATBA is an initiative of the European Union, aiming to establish a forum for dialogue on the standardisation of distributed ledger technologies (DLTs, e.g. blockchain) use in sectors including energy.

So far 41 participants from GO-P2P and INATBA have joined the Task Force, including from countries not represented within GO-P2P such as Norway and Slovenia. The aim of the Task Force will be to analyse P2P/TE/CSC pilots using DLTs across the world and assess ongoing standardisation efforts in the field. Pilots for analysis are currently being selected.

We are planning to hold a webinar entitled “A Government Challenge”, which will be open to the public and target national/international (e.g. EU, OECD) policymakers. The aim is to present an example of how a monopoly (government) use case related to energy trading, namely the half-hourly settlement of energy, could be run using DLTs. Business stakeholders, such as DLT platform providers, will be asked to give a pitch on how their product could help this government use case. A panel including experts in both DLTs and energy systems will make the final decision on the winning pitch.

Expert meetings held in the past six months

Date	Place	# of Experts	Type of meeting	Govern-ment	Industry	Academic	Non-profits
26 November	Online	18	First meeting of the GO-P2P/INATBA Task Force	-	5	12	1
10 March	Online	10	Meeting of GO-P2P sub-task leads	-	-	10	-
11 March	Online	15	Second meeting of GO-P2P/INATBA Task Force	-	4	10	1

Reports produced in the past six months

- October 2020- now: Paper defining P2P/TE/CSC models (findings below)
- February 2021: Second version of GO-P2P Research Strategy document
- March 2021: Sub-task 5 literature review (findings below)
- April 2021: Sub-task 1 and Sub-task 4 literature reviews (findings below)

Emerging findings

Some of the key findings from the literature reviews conducted by GO-P2P sub-tasks 1, 4 and 5 can be found below. Please note that these are preliminary findings at this stage, with literature reviews still needing to be finalised.

Sub-task 1 literature review (power systems integration)

The content in the table below is directly quoted from the (preliminary) study 'Impact of Local Energy Markets on Power Systems: A Comprehensive Review' (ST 1 literature review) by Viktorija Dudjak et al.

Risks of the transition to a sustainable energy grid	High penetration levels of renewable energy can potentially be problematic for the stability and reliability of the distribution network and are expected to cause over-voltages, under-voltages and congestion, as well as phase imbalances that may have a negative impact on power quality, as well as unpredicted bi-directional power flows for which the energy system was not originally designed for.
Decentralised infrastructure of P2P/TE/CSC models	Since P2P/TE/CSC models rely on the data coming from smart meter devices, cyber security attacks pose a risk to distribution grid operation. In case of failure or if one node is attacked, in decentralised models such as P2P/TE/CSC the power system can still rely on the other nodes as the information and decisions are not optimised by a single central entity. This could increase resilience when compared to a (currently used) centralised management approach.
Optimising the system at a local level	Studies show that the deployment of a P2P market results in less energy being purchased during peak hours, which in turn means less power passed through the sub-stations and feeders, helping to prevent the utility from unnecessary investments.
Phase imbalance	The majority of studies assume balance between phases and do not take into account the phases to which households are connected. Network imbalance between phases can lead to bigger voltage rises and higher losses. Therefore future studies should investigate the effects of P2P/TE/CSC models on phase imbalance issues.
Knowledge gap	No research has yet been identified that studies the impact of P2P/TE/CSC models on transmission system level operation and planning.

Sub-task 4 literature review (social and economic value)

The content in the table below is directly quoted from the (preliminary) study 'Defining the Social and Economic Value Propositions and Success Factors of Peer-to-Peer (P2P), Community Self-Consumption (CSC), and Transactive Energy (TE) Models' (ST 4 literature review) by Sophie Adams et al.

Demographic factors	Younger, wealthier and highly educated people who are less politically conservative tend to be more interested in P2P/TE/CSC models.
Complexity, transparency & trust	The complexity of P2P/TE/CSC models is a potential issue, with trial participants tending to favour automation over more active participation. Trial participants also commonly express concerns about financial

	transparency and data protection, with different levels of trust for different types of coordinating actor.
Local benefits/ provenance	Participants tend to value benefits that are created and retained in specific geographic communities or communities of practice. These benefits may be social or economic in nature.
Values driving participation	Commonly observed ethical values which are derived from the environmental benefits of renewable and sustainable energy systems, drive participation in P2P/TE/CSC models.
(Mis)-alignment of project objectives and interests	Studies identify the importance of aligning the objectives of the trial's designers with the host communities.

Sub-task 5 literature review (policy and regulation)

The content in the table below is directly quoted from the study 'Peer-to-Peer Trading and Energy Community in the Electricity Market - Analysing the Literature on Law and Regulation and Looking Ahead to Future Challenges' (ST 5 literature review) by Lucila de Almeida et al. (EUI Working Paper RSC 2021/35)

Platforms enabling P2P/TE/CSC	<p>These can be considered collaborative platforms that offer a hybrid of: offline services, such as the sale of electricity, and b) online services, such as the digital interconnection among prosumers and consumers.</p> <p>Not considering P2P/TE/CSC platforms as energy suppliers would be problematic because it would result in prosumers being deprived of their rights as energy consumers, and the benefits resulting from the public service obligations imposed on suppliers.</p>
Energy suppliers	The intense focus on a single-supplier model in regulatory frameworks is problematic. Most of the current retail arrangements allow only a single supplier to settle the system costs on behalf of an energy consumer. The existing retail market therefore prevents a multiple supplier model. A P2P trading scheme, in contrast, consists precisely of constant and short-term switching between different suppliers.
Legal status of energy consumers producing their own energy ('prosumers')	<p>The main legal issue concerns the status of prosumers that operate in these platforms, particularly whether a prosumer that sells energy to another prosumer in a P2P platform is a business or still a consumer.</p> <p>Enforcing the compliance of prosumers with the strict provisions imposed on suppliers would violate the principle of non-discriminatory treatment to which prosumers are subject in most regulatory regimes.</p>
Data	Scholars have expressed concern around the current level of protection of personal data in the EU. The authors find that dynamic pricing and

	aggregation contracts collect enormous amounts of personal consumption data, which are the cornerstone of P2P/TE/CSC systems.
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Objectives for the next six months

1. Defining the selection framework for pilots

Rationale: A common definition is needed of peer-to-peer energy trading (P2P)/transactive energy (TE)/community self-consumption (CSC) models for the selection and analysis of case studies.

Update: UCL is finalising the concept definition paper setting out the common definition. This will be based on sub-task group interviews carried out in July 2020; a literature review of definitions (academic and grey literature); and a review of legal definitions (drafted by FSR, sub-task 5 lead). Some insights from our work so far are set out below. End date: Q2 2021

Some key findings so far:

- The academic literature is largely dominated by modelling-based papers focused on understanding the effect of different market parameters. There is an under-representation of papers analysing social, regulatory, ICT, and hardware aspects of P2P/CSC/TE models.
- 123 unique characteristics associated with models described as P2P/CSC/TE have been identified through content analysis of 148 documents.
- Most frequently occurring characteristics across the class of P2P/TE/CSC models include:
 - Economic incentives for participation and optimisation behaviour
 - Energy transactions without an intermediary
 - Local energy trading or market within the same geographic region
 - Energy transactions between prosumers and consumers
 - Provide economic, social, or environmental benefits for participants of the scheme
 - Markets based on smart IT platform
 - Controlled by local members or shareholders
 - Promote or include renewable generation

2. Designing the research approach

Rationale: We want the research underpinning these deliverables to be well-designed and defensible, for it to have more uptake and impact. Therefore, the result of this task will be a report reviewing the best methods for pilot data collection and international comparative analysis

Update: In February 2021, UCL completed a second draft of the research design document. The document is being shared with sub-task leads for comments. It will then be shared with all participants for feedback. End date: This is a living document being continuously updated.

3. Ethics approval

Rationale: Necessary for studying live pilots in GO-P2P member countries.

Update: This is necessary in order for interviews of pilots to take place in 2021. In the summer UCL held meetings with designated national experts (named in NPPs) to get their input on country-specific ethics/data privacy guidelines and concerns. UCL submitted the ethics application in February 2021. End date: Q2 2021

4. Literature reviews

Rationale: It is necessary to identify the key environmental (technical, social, economic, policy and regulatory) factors shaping the design of, or supporting/constraining the uptake of these models in each country.

Update: By April/May 2021, all sub-tasks will have carried out literature reviews (of literature on P2P/TE/CSC models from their sub-task's perspective), helping towards identifying missing information to be collected in pilot interviews. Sub-tasks 1 (power systems integration), 4 (economic and social value) and 5 (policy and regulation) have finalised theirs, and some key findings from their literature reviews are set out in the 'Emerging findings' section above. End date: Q3 2021

5. Policymaker briefing

Rationale: It is important to make sure our findings are relevant to policymakers in GO-P2P member countries working with/on peer-to-peer energy trading (P2P), transactive energy (TE) and community/collective self-consumption (CSC) models. We would like to get their input on not only what information they would find useful, but also in what format. In order to engage policymakers, a briefing with our preliminary findings will be drafted and circulated to relevant stakeholders.

Update: The briefing will include findings from the sub-task literature reviews, which are in the process of being finalised. End date: Q3 2021

6. Develop methods and templates for collection of case study data

Rationale: This is to ensure that data from case studies is collected in a consistent manner within and across member countries.

Status: To be started once tasks 1, 2 and 4 (above) are completed. End date: Q3 2021

7. Identify relevant cases in each participating country

Rationale: In some GO-P2P member countries, such as the Netherlands and Switzerland, P2P/TE/CSC pilots are well underway. Therefore, work will start on selecting pilots already being launched to be included in the comparative analysis. Contact with pilots will be established and relevant data collected.

Status: The starting time of this exercise is dependent on when the concept definition paper will be finalised (spring 2021), as pilots are to be selected based on GO-P2P's working definition of P2P/CSC/TE models. End date: Q3 2021

Experts meetings planned in the next six months

Telco's between members of the Task Management Group (responsible for ongoing operational management), namely composed of sub-task leads and the Task Leader, are taking place on a regular basis. The Task Steering Committee (responsible for overall task

governance), made up of ExCo representatives of Task Contracting Parties, is being kept updated on GO-P2P's activities by the Task Leader by email on a regular basis.

The next Task meeting will take place in May/June 2021, online. A host organisation still needs to be secured. The next meeting will serve as the launch event of the next phase of work, namely the case study selection and data collection phase.

Reports planned for the next six months

Planned reports for the next six months are the concept paper (task 1 above) and literature reviews of all sub-tasks (task 4 above).

Outreach

In January 2021, GO-P2P was mentioned in a blog by Nesta (UK Innovation Foundation) entitled '[Where next for peer-to-peer energy exchange?](#)'.

Presentations:

- 30 October 2020: Presentation by A Schneiders on GO-P2P at 'Introduction to Blockchain in Energy Projects' webinar, hosted by IEEE UK & Ireland Blockchain Group
- 12 November 2020: Participation by A Schneiders in the panel session 'Market Design for Peer-to-Peer Energy Trading and Distribution System Flexibility' at INFORMS 2020 event
- 18 November 2020: Webinar on GO-P2P by A Schneiders hosted by the Users Technology Collaboration Programme (TCP) Academy

Further outreach activities include:

- International Association of Trusted Blockchain Applications (INATBA) (regular calls and email exchange)
- ELEXON Design Authority (call in 10/20)
- The Energy Authority (call in 10/20)
- Kurfud (call in 10/20)
- H2020 NRG2Peers project (call in 11/20)
- IEA digitalisation team (call in 11/20)
- Duneworks (call in 11/20)
- H2020 LIGHTNESS project email exchange (12/20)
- InRange.io (call in 01/21)
- ISGAN TCP (call in 03/21)

Ideas for new work

As detailed above, Observatory participants are encouraged to collaborate on additional outputs such as journal special issues, books, reports and joint conference sessions/papers.

Sub-task leads will be shortly submitting their sub-task literature reviews to journals for publication.

Finance

The work is based on a 100% Task-share arrangement.

Activity time schedule

Below is an overview of the foreseen activities and dates by which they will be completed.

1. Preparatory phase

- Defining the selection framework for pilots (concept definition paper)- Q2 2021
- Designing the research approach- This document is a living document which will be continuously updated. Two versions have been drafted so far, in Q4 2020 and Q1 2021.
- Ethics approval- Q2 2021
- Sub-task literature reviews- Q3 2021 (note that sub-tasks 5 and 1 have finalised theirs, sub-tasks 3 and 4 are close to completion and sub-task 2 is ongoing).
- Policymaker briefing- Q3 2021

2. Case study data collection/analysis phase

- Develop methods and templates for collection of case study data (based on information collected in preparatory phase)- Q3 2021
- Identify relevant pilots for case studies in each participating country- Q3 2021
- Case study data collection- Q4 2021 until Q4 2022
- Analysis of case study data (using QCA, Qualitative Comparative Analysis)- Ongoing process running in parallel with case study collection phase.
- Development of Readiness Index based on QCA findings- Q4 2022/Q1 2023

3. Wrapping up and reporting phase

- Final reporting on project and wrapping up- Q2 to Q3 2023.

COVID impact

In light of the pandemic, we decided in spring 2020 to momentarily hold off on the in-person elements of GO-P2P's programme of work, such as interviews of policymakers and pilots/trials, and have been focusing on the desk research elements of the work instead. The elements we have been focusing on so far are the tasks in the 'Preparatory phase' above.

We aim to start policymaker engagement again in Q3/Q4 2021. This will be done using the policy briefing produced for the Task.

Bearing in mind that most GO-P2P member countries are in Europe, and with ongoing developments around Covid on the European continent, we are uncertain as to whether we will be able to start collecting data from pilots at the foreseen time (Q4 2021). We will closely monitor the situation and keep ExCo members updated.

Future work

It is becoming increasingly clear to us that we are in the very early stages of a rapidly evolving field. The rapid uptake of wind, solar, and distributed storage is increasingly forcing power systems to balance locally. This is matched in many countries with an increasing focus on consumer centred energy systems realised at community scales. In this context it's now almost certain that over the transition period to net zero carbon in the next decades, some form of local energy trading/sharing/balancing will be an increasing feature of our energy systems. In response we are seeing governments prioritising prosumers and energy communities to help deliver the transition to net zero and grappling with the considerable implications for consumer engagement, safety and wellbeing.

The question of how to protect consumers taking an active role through platform-enabled sharing models is currently at the forefront of many policymakers' minds, including in the energy sector. This will only increase as decarbonisation accelerates, technologies change, and consumer expectations around data protection, energy security and distributional justice increase. Policymakers can no longer rely on a 'wait and see' approach where they observe a new innovative phenomenon and then decide how to regulate it. Due to the fast-moving speed of innovation, they need to watch and regulate at the same time. Rapid response and incremental adjustments of regulation at the same pace as innovation are key.

For these reasons we think that GO-P2P has an important role to play as an Observatory to continuously monitor and feedback to governments current best practice lessons from as many countries and contexts as possible. It can be policymakers' eyes and ears to learn what works, in what contexts and for whom. To support this need we could see GO-P2P as an open-ended programme of observation and policy learning, subject to periodic Requests for Extension being made every three years to the ExCo and its mandate renewed accordingly.

Matters for the ExCo

Recommend the ExCo to approve the Task Status Update Report.

Participating countries

National participation plan letters have been secured from the following countries:

- Australia
- Belgium
- Ireland
- The Netherlands
- Switzerland



- United Kingdom
- United States

NPP letter still needs to be received from Italy.