The blockchain and energy attribute tracking

RECS International position paper

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Introduction and background

The role that distributed ledger technologies, commonly known as blockchains, can play in the tracking of energy attributes, either alongside or in competition with established systems remains unclear. Will blockchains enhance attribute tracking and drive it to new heights? Or will their promise fade as market players continue to rely on the proven success of established systems?

If blockchain technologies can facilitate energy attribute tracking by helping to make the necessary infrastructure cheaper, more efficient, more transparent and more secure, and thereby create more value for market participants and producers while creating more clarity for end-users, they could well be embraced by the existing renewable energy industry. To be accepted, blockchain projects have to prove they can meet existing policy and legislative requirements before they can play a mainstream role. While not perfect, existing tracking systems have already set a high standard and blockchain projects will have to prove they can make clear and concrete improvements to surpass existing standards before they become a leading mechanism for tracking the consumption of renewable energy across all of Europe.

The possible interactions between existing systems and blockchain projects are myriad. This document lists some of the background associated with energy attribute tracking, blockchain development in this area and the main claims being made by these standards.

The basics: Energy attribute tracking

At its core, the tracking of energy attributes is a very simple concept. Certificates are issued to renewable energy producers who then transfer them to customers who have chosen to consume renewables. Each certificate represents 1 unit of electricity (a megawatt hour of power transferred into the national grid). When the consumer cancels that certificate, they have the ability to prove the origin of the electricity they use. These certificates have different names in different places, but they all do the same job – providing consumers with factual information of where their power is generated, allowing them to make an informed choice about what kind of electricity they wish to consume. In Europe, Guarantees of Origin (GOs) are well established and are effectively regulated by the EU and its Member States, including through a new law which came into force at the end of 2018 (LINK: RECS art. 19 implementation guidance). North America has the Renewable Energy Certificate (REC) System. A rapidly growing number of other countries are passing legislation on the use of international REC standards such as the use of the International REC standard (I-REC Standard). The information about energy production is held in one central place and monitored by independent authorities.

The basics: Distributed ledger technologies

Like energy attribute tracking, distributed ledger technologies (DLT) are also simple at heart. They are spreadsheets (ledgers) that are held, replicated, and synchronised on different nodes (computers). This means that they are verified by many different parties. Because they are distributed between computers the data is shared among all participants of the DLT and held in more than one place.

The best-known distributed ledger technologies are public ones, like those which support cryptocurrencies. Perhaps counterintuitively, the more public a DLT is the more secure it is. This is because in public ledgers the data can be held on more computers, reducing the risk of data loss, and can be verified by more users, increasing the verification of data.

More private, or permissioned, distributed ledgers grant permission to a limited number of users to work on them. This means that the data can be handled more

flexibly, even being corrected if necessary. However, it also reduces the transparency and security upon which distributed technology ledgers have made their name as there is not "neutral" external verification of the claims made. In the end blockchain is less about a process of creating data and is more about the way in which that data is stored.

Bringing attribute tracking and distributed ledgers together

Both attribute tracking and distributed ledgers are based on simple concepts. But the following important differences need to be acknowledged.

- Energy attribute tracking like I-REC or the European GO system established by the EU Renewable Energy Directive maintain a well-established practices in the green power market, supported by law and/or rooted in industry standards. There are a number of respected organisations, like the CDP (formally Carbon Disclosure Project) and the World Resources Institute through their GHG-P guidelines, who issue extensive guidance for large corporate clients on how attribute tracking should be done.

- Furthermore, the use of attribute tracking certificates is typically overseen by national issuing bodies whose role is mandated by a national government (for example, a list of national issuing bodies in the EU can be seen here - www.aib-net.org/facts/eecs-registries/registries) In other words there are sources of respected guidance, independent monitors and central authorities who collectively act as the trusted guardians of the practice of energy attribute tracking.

- By contrast, distributed ledgers were designed to be decentralised. So while a private blockchain may have a central authority to issue the blocks, they lack the external scrutiny and support of established attribute tracking mechanisms. Instead blockchains rely on the effect of crowd surveillance to ensure the security and trustworthiness of the ledger.

So can these two worlds, so similar in some ways and so different in others, come together to create a system that is more the sum of its parts? More specifically, and from the perspective of RECS International as a membership organisation representing the users of attribute tracking systems in the energy business, in which ways do DLT energy projects improve energy attribute tracking? To answer these questions RECS International studied a number of blockchain based energy attribute tracking projects before inviting them to answer a questionnaire and provide more detail in follow up phone interviews. Based on this analysis, RECS International considers that the interaction between of blockchain energy attribute tracking projects and existing systems will fall into three categories:

1. Cooperative and supporting of existing systems: could lower transaction costs and administrative barriers to attribute tracking while also providing more granular data to energy consumers on top of current registry systems.
2. In parallel to existing systems: could increase the risk of unregulated double counting or claiming of attributes.
3. Undermining of existing systems: could create confusion among consumers and risks undermining energy attribute tracking.

Each of these categories are set out in more detail below.

1. Cooperative and supporting

Blockchains that are cooperative and supporting of existing attribute tracking systems

A number of distributed ledger attribute tracking projects are seeking to enhance the use of existing certificate schemes, rather than replace them. This is particularly the case in Europe where the recast Renewable Energy Directive (paragraph 19.8) states: "*Where an electricity supplier is required to demonstrate the share or quantity of energy from renewable sources in its energy mix for the purposes of point (a) of Article 3(9) of Directive 2009/72/EC, it shall do so by using guarantees of origin".* These projects are seeking, through different means, to become integrated within the existing GO system and to add granularity to it, particularly in terms of the time when a certified unit of power is produced and/or used. They have the potential to make attribute tracking easier and more cost efficient, while allowing established GO

issuers to certify units of power smaller than 1 MWh (such as 1 kWh). in this way, such blockchain projects could also support the European Union's goal of promoting small producers and prosumer-concepts as well as peer-to-peer-trading

This aspect of DLT and energy attribute tracking could, if it can be shown to work, go beyond increased consumer control over the type of power they use, and extend it to increasing information over the amount of energy they use. By enabling real-time coordination of electricity supply and demand data consumers can choose to delay or defer their power use to a time when more renewables are producing for the grid. This does not directly link to attribute tracking using

certificates, and is more closely related to shaping demand to meet renewable supply. However, integrating this kind of real-time information to consumers, supported by integration with a certification scheme, in theory could open up new avenues for increasing renewable energy production through consumer demand, for example via information about the production time on the GO or smaller units of proof like kWh. The practical implications, however, are still to be seen.

Another aspect of increased granularity that integrating distributed ledgers and attribute tracking could provide is the use of location and congestion based network tariffs. This means that if you consume power that is produced more closely to you, and/or consume it at a time where there is spare capacity in the power grid, then you are placing less demands on the grid and should pay less for using it. This could encourage a more efficient use of the grid, and therefore a smaller grid overall which should decrease costs for everyone. Certified units of power that are traceable in near-real-time through distributed ledgers could support this development.

Many stakeholders focused on the development of renewable markets mention, however, that this increased granularity is not the main challenge, and that much of it is already available within the current attribute tracking systems. Instead, they note that a more important factor for many stakeholders is decreasing the disclosure period, or the accounting period, for with energy attribute certificates can be moved. Moving from a yearly energy accounting period to a monthly, daily or even hourly period would better reflect the real availability of resources on a seasonal scale and

support in better price development in the EAC market. The concern remains that the focus on real-time information is prone to errors because of the inability to verify the data produced.

2. Blockchains that run in parallel to existing attribute tracking systems

In contrast to the engaged and constructive approach, as described above, taken by some blockchain energy projects, others ignore the well-established systems and standards for attribute tracking and instead seek to reinvent the wheel. Not only can this create confusion that reduces trust in attribute tracking in general, it can go so far as to undermine the basic principles of using renewable energy certification schemes and renewable energy markets more broadly.

It is important that market players use recognised energy attribute tracking systems because this avoids the risk of different certificates being issued for the same unit of power. If a number of different certification schemes, including various public or private blockchains, were to grow in parallel there would be no way of avoiding double counting between the various systems.

The focus here is that all blockchain systems working in the renewable energy market will be creating the certificate on the back of a specific asset, the MWh of produced electricity. While most blockchains are themselves very secure unless they are associated with a nationally mandated system they are unable to guarantee that another "secure" blockchain is not also issuing certificates for the same asset, the MWh of physical generation. Without the link to a national system, blockchain projects lack a robust form of double coordination that avoids double counting. This could mean that consumers trust the certificates they receive for their power less and less, and move away from renewable markets - whether blockchain based or otherwise - due to a lack of standardization.

Even more important is that any attribute tracking scheme follows the basic and established principle of a certificate being issued for the power that is produced, transferred from producer to consumer, and cancelled for the power that is used. Some blockchain energy tracking schemes promote the idea of the certificates being used as a cryptocurrency, that can be transferred in an ongoing way without being

cancelled. This completely undermines energy attribute tracking, and the concept that MWh are consumed, as it gives the attribute a life of its own, separate to the underlying asset, the power that being certified. Attribute tracking then becomes a fig leaf for cryptocurrency development – which is clearly unacceptable to those dedicated to the effective tracking of energy and the development of markets for renewable electricity.

3. Blockchain projects that undermine existing attribute tracking systems

In terms of security and reliability of data, there is limited scope for blockchain projects to improve on the existing practices of GO systems and registries that are held accountable by national authorities. This is because, as mentioned above, the blockchains being used in energy attribute tracking systems are not the hyper-secure public chains made famous by Bitcoin. They are private chains that are only open to a limited number of users and which are therefore not intrinsically more secure than other, more traditional, databases.

These private, sometimes known as protected, chains are not held on many different nodes and so benefit less from the distribution and replication of the data across computers. Also, they are not immutable in they way that public chains are. Instead they can be verified and modified, if necessary, by users. This means that is no "trusted" and/or "neutral" control of attribute tracking by auditors outside the private chain. This is particularly problematic because attribute tracking blockchains have to be editable as data from meters is not always infallible and may have to be reconciled with reality after the fact.

Most current GO systems are owned or regulated by the same entities that regulate the physical delivery of power through the grid. These organizations have a critical central function and we trust them to keep our lights on. It is logical that these are the same organizations to be trusted with the attributes linked to that underlying power. Therefore, as and when blockchain projects claim to be more secure than established systems they undermine those systems and reduce consumer confidence in established forms of attribute tracking. This could posing a serious threat to renewable energy markets, which depend on effective tracking systems that all market players can rely on.

In conclusion

Not all blockchain based renewable energy certificate projects are the same. There are those who seem to disregard the huge strides that have already been made in energy attribute tracking – seeking to disrupt established systems and re-draw them in their own image. And there are those who have clear expertise both in the energy sector and in blockchain technology – who hope to bring these two elements together for the benefit of consumers.

It is, perhaps predictably, the second group that engaged most with this RECS International research. They completed a detailed questionnaire via email and/or participated in detailed phone interviews. It should be noted that this was self-selecting group which was actively looking to engage constructively with established players and systems. They may not represent all, or even a majority of, the growing number of blockchain energy projects. But they do, in our opinion; show there is hope that the good in these projects can overcome the bad and the ugly in others. Vigilance is required by all market players to ensure this happens.

Overall, the view of RECS International is that blockchain related attribute tracking systems can provide a potential refinement of established national or regional systems. As they add a degree of complexity, they should only be instituted / allowed within schemes that are already based on robust practices such as GO, RECs, and the I-REC. It is only appropriate to add blockchain projects in energy tracking systems / markets where a clear local framework is in place based on national legislation and / or internationally recognized standards, such as the EECS Standard or I-REC Standard. Where blockchain projects can build on and add value to existing attribute tracking systems they could be supported as long as they adhere to well established market norms and practices.