The Role of Blockchain in the Arab Sustainable Energy Transition

Main question: How can blockchain technology enable and accelerate the sustainable energy transition in the Arab Region?

EGM target outputs:

- Highlight promising use cases from around the world which leverage blockchain technology to expand access to modern, sustainable energy and increase integration of renewable energy
- Identify key barriers to adoption of blockchain technology for a sustainable energy transition in the Arab region
- Propose and discuss pathways to overcome these barriers

Report: Outputs from the EGM will be integrated into a technical report (to be launched early 2023). The report will be circulated to EGM participants in Fall 2022 for peer review ahead of publication.

EGM Programme (20 September, 15:00-16:30 GMT+3)

Opening remarks: Ms. Radia Sedaoui, Chief, Energy Section, United Nations ESCWA

Scene-setter: Blockchain within the Arab region - Opportunities and challenges (~5 mins)
Mr. Sean Ratka, Economic Affairs Officer, United Nations ESCWA

Case study presentations (~5 mins each)

- Distributed energy resource management and trade (Energy Web)
- Energy attribute certificate issuance and trade (Reneum Institute)
- Decentralised project finance (Engie + Energy Web) and energy transparency platform (TEO by Engie)

Interactive panel (Davos style) (~60 mins)
Moderator: Ms. Radia Sedaoui, Chief, Energy Section, United Nations ESCWA

- Mr. Thierry Mathieu, Co-Founder, TEO by Engie
- Ms. Brianna Welsh, Co-Founder and CEO, Reneum Institute
- Mr. Sam Hartnett, Director of Product Marketing, Energy Web
- Mr. Samer Zawaydeh, Lecturer, Al Hussein Technical University, Jordan
- Ms. Jessica Obeid, Non-Resident Scholar, Middle East Institute

Wrap up: Mr. Sean Ratka, Economic Affairs Officer, United Nations ESCWA

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Register here: https://www.unescwa.org/events/blockchain-sustainable-energy-transition

Background document

Introduction

The Arab region is large and diverse and shares a rich geography known for its natural resource wealth as well as its climate vulnerability. It is home to some 400 million people, stretching from the Atlantic coast of North Africa in the West to the Straits of Hormuz in the East, and includes some of the world's wealthiest as well as some of the world's poorest nations. The ability to harness the pool of natural resources through adequate choices of infrastructure, technology, governance, and sustainable management practices will be key in creating economic opportunities for young people and improving their living standards. It is also a main driver of socioeconomic development and the attainment of gender equality, empowerment of women and intergenerational equity, which are also at the heart of driving long-term prosperity in the Arab region.

Many of the countries within the region contain areas with some of highest solar irradiance seen anywhere on earth, increasing the cost-effectiveness of large-scale solar PV projects. In fact, 2020 and 2021 witnessed three record low bids for utility-scale solar PV, all of which were in the GCC subregion: USD 0.0157/kWh in Qatar; USD 0.0135/kWh in the United Arab Emirates; and USD 0.0104/kWh in the Kingdom of Saudi Arabia. With the rapid development of solar PV technology, decentralised energy resources (DER) are also becoming increasingly important, providing clean energy; employment; reduced emissions; and accelerating sustainable development.

Ensuring access to affordable, reliable, sustainable, and modern energy for all (Sustainable Development Goal 7 (SDG 7)) is a key condition for reducing inequalities, poverty eradication, advances in health and education, sustainable economic growth, and the principle of "leaving no one behind". It is within this context that the United Nations Economic and Social Commission for Western Asia (ESCWA) has undertaken a project on the role of blockchain, as an emerging digital technology, in accelerating progress on sustainable energy development within the Arab region. As part of this project, ESCWA has organised an Expert Group Meeting (EGM) in order to collect expert insights from around the world which will be integrated into a report to be published in 2023.

Expanding access and increasing the share of renewables

The integration of renewables and access to affordable, reliable and modern energy services within the region, particularly for those in rural areas, is lacking, despite their falling costs. Via blockchain technology, several innovative means of solving these related issues have been developed, trialled, and implemented globally. These innovative solutions and lessons learned can be studied, filtered, and applied in the Arab region to accelerate progress towards the sustainable energy transition.

Project finance

Blockchain's role in facilitating small-scale project financing has been particularly potent, with thousands of megawatts (MW) of renewable energy generated and tonnes of CO_2 avoided to date. The technology is increasingly used as a tool to leverage decentralized finance (DeFi) to accelerate sustainable energy access in developing countries. Funds are distributed as micro-loans to residents of low-electrification communities, enabling them to gain access to affordable solar energy. Access to direct, low-cost financing which unlocks capital from the global cryptocurrency market is enabling small scale, off-grid consumers to install solar PV systems with no or minimal upfront costs. Instead, consumers pay a fixed rate for their renewable power to global investors, either in local currency or cryptocurrency. Start-ups in Africa, such as The Sun Exchange, are enabling local schools, businesses and organisations to install solar by facilitating funding rounds where global investors contribute to projects, a local construction partner installs the solar PV systems, and the schools, businesses or organisation pay investors directly for the electricity they use. Online dashboards keep investors up to date on: solar project status updates;

solar PV system earnings; the clean energy the solar PV systems generate (kWh); the amount of carbon the solar PV systems offset (kg CO_2); investor wallet balance; and payments and withdrawals (The Sun Exchange, 2022).

The decentralized and borderless nature of cryptocurrency, with minimal transaction fees (depending on the blockchain used), may make it an ideal medium of exchange for this purpose. The transparency and immutability of blockchain transactions also means these payments can be audited and verified at any point by all parties. Via ENGIE Energy Access and Energy Web, more than seven million lives across nine countries have benefited from solar and battery installations, through access to light, education and everyday appliances (ENGIE, 2022).

Distributed energy resource (DER) management and trade

Blockchain-based solutions to DER management and trade are enabling not only prosumers to monetise their services (flexible loads and decentralized generation and storage) but also distribution system operators (DSOs) now have the ability to interact with customer-owned assets, namely: solar systems; batteries; and other sources of flexible load, often operated by aggregators. This increased visibility of assets at the grid edge provides grid operators with insights into how and when they can help make the grid more flexible from the bottom up. Open-source platforms built on blockchain, such as Energy Web's Project Edge in Australia, make this possible by linking the local market operator and the distribution utilities via a common, shared, open-source infrastructure, rather than each organization using their own siloed systems (Energy Web, 2022).

As grids shift from centralised to decentralised structures, new tools are required to manage this complexity in a highly agile market. Blockchain firms are developing software for clients and partners that allows consumers and producers to track, trace and trade every kWh of energy. In Australia, xGrid by Power Ledger allows an electricity retailer's customers to trade solar power across the grid. Agile, real-time pricing can benefit customers, retailers and distribution networks alike. Projects such as these enable households and businesses to sell energy generated from their solar panels to other energy consumers connected to the same electricity grid (if regulations allow). Via blockchain, these transactions can be done with customers with the same electricity utility or across different utilities. Any participant with or without renewable generation assets or energy storage can now trade electricity with their peers (Power Ledger, 2022).

Energy attribute certificates (EACs)

Producers of renewable energy require new solutions to monetise the full value of their green electricity; this can be done via EACs, which represent an amount of renewable generation (e.g., 1MWh) and can be sold directly to corporate, institutional, or individual buyers, or via listed crypto-currency exchanges in the form of a token. This enables generators to: yield the full value and benefit of their environmental attributes; realize an additional revenue stream; and benefit from the surging demand for renewable energy by large and medium-sized corporates, as well as smaller and more local buyers.

Many current EAC schemes carry a technology bias, are administratively cumbersome, inaccurate, illiquid and potentially open to fraud. In some countries, regulators and utilities have close ties and show limited ambition to speed up renewable capacity deployment and connection to the grid. Emerging solutions use blockchain technology to provide benefits which include streamlining third-party verification processes, preventing double counting of EACs, ensuring projects are actually producing 100% renewable energy, and facilitating trades of EACs in the form of tokens to reduce friction and increase transparency (Reneum, 2022).

Iberdrola group has begun a green energy certification pilot project based on blockchain to guarantee, in real time, that the energy supplied and consumed is 100 % renewable. Using blockchain technology, they have successfully

linked plants where electricity is produced to specific points of consumption, allowing the source of the energy to be traced. This increased transparency may lead to higher use of renewable energy, particularly in the charging of electric vehicles, which is already being tested in conjunction with VW (Iberdrola, 2022).

Other emerging use cases (to be expanded based on expert input)

Other use cases, such as blockchain-based platforms which tokenise trading of carbon offsets are being explored and developed, including by the International Monetary Fund, whose new framework will use emerging blockchain technologies as an innovative way for capital markets to fully engage in carbon credit trading in a transparent, secure, fair and beneficial manner.

As part of the EGM and via peer review process, other emerging use cases will be included and expanded upon based on input from experts.

Key factors to enable the adoption of blockchain technology for a just and sustainable energy transition in the Arab region

Implementation of blockchain technology within the Arab region is largely confined to developed urban areas, such as Dubai. Interest in cryptocurrency mining and trading has surged in countries like Lebanon, where the devaluation of the local currency has pushed people to use these emerging digital assets as a means of facilitating remittances. In terms of use cases in the energy sector, including project finance, energy trading, and grid management, however, action in the Arab region remains limited.

Select challenges to adoption within the Arab region include:

- Lack of technological awareness, particularly in rural areas
  - Confusion on blockchain vs cryptocurrency
  - Lack of end-user readiness
  - Lack of trust in decentralised systems without intermediaries
  - Lack of clarity on dispute resolution and how this will impact self-executing smart contracts
  - Lack of common interoperable standards
  - Fear of energy usage associated with blockchain
    - Note: use cases in the energy sector often rely on consensus mechanisms such as proof-of-stake (POS) or proof-of-authority (POA) which use less than 1% the energy that proof-of-work (POW) chain (like Bitcoin) use
- Access to appropriate technology and training
  - Shortage of skilled labour
  - Lack of local blockchain firms or global firms operating locally
- Regulatory hurdles
  - Lack of full energy market liberalisation
  - Lack of regulatory sandboxes to test new solutions
  - Lack of customer and producer support and empowerment
  - Uncertainty in the ability of prosumers to freely sell power generated to other consumers
- Lack of required policy
  - Lack of policy and for promoting safe, efficient, and cost-effective electricity transmission and exchange at the country level and within the Arab region
  - Lack of policy promoting the interaction of new blockchain-based trading and evolution of existing electricity trading regulations
  - Lack of policy promoting decentralised generation

- Cross-cutting challenges such as political instability and conflict
- Others to be identified by EGM experts and peer reviewers

Way forward

a. Identify global use cases that would be most effective within the Arab region
b. Identify key barriers to adoption of blockchain technology for a sustainable energy transition in the region
c. Outline pathways to overcome these barriers and enable adoption in an equitable and just manner

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