Whitepaper 1.0

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ABSTRACT

EcoGain is creating the most advanced renewable energy network in the world for encouraging the production, distribution, and consumption of sustainable sources mainly waste-to-energy conversion facility using blockchain and IoT (Internet of things) smart sensors. This process allows for a more accurate analysis of our environment, behavior, rewards, and last but not least, the type of waste that's accepted and processed at the facility.

EcoGain Global Energy Networks (EcoGain) is designed to leverage targeted Artificial Intelligence (AI), blockchain technology, IoT and smart contracts. Our vision is to create and grow a decentralized and sustainable energy market that enables smart monetization for real time peer-to-peer (P2P) energy and data transactions.

Utility companies, grid operators and users alike can obtain real time energy tracking while global energy trade markets will benefit from accurate and real time data. Integration of EcoGain's targeted AI and machine learning technologies will enable a next generation of smart predictions, insights and forecasts across the global energy market. Stakeholders in the energy ecosystem will be able to drive operational efficiencies, save millions and create a positive impact on the global renewable energy marketplace.

EcoGain is characterized by a range of new technologies that are merging the physical, digital and financial worlds, challenging and introducing new ideas about the essence of sustainable human coexistence on this planet.

The intent of this white paper is to create a compelling value proposition for EcoGain and to understand the reasons behind EcoGain's approach to the energy market as it relates to our global climate challenge.

1. Market Analysis and EcoGain Solution

1.1 Pollution and Levels of Carbon Dioxide (CO2)

Energy demand is rapidly growing worldwide in reaction to population, transportation, and economic production changes. This demand surge creates increasing pollution levels of carbon dioxide (CO2) in the atmosphere and threatens our entire ecosystem. The World Bank report claims that air pollution creates health repercussions and costs trillions of dollars annually[1].
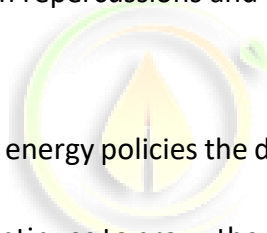
According to the IEA, with the current energy policies the demands will further rise by 1.3% each year up to 2040[1]. As the demand continues to grow, the globe will witness a relentless increase in energy-related emissions. However, after two years of consistent increase, the amount of CO2 emissions for 2019 flattened as can be seen in **Figure 1**. The 2019 IEA World Energy Outlook reports that there has been a decline in CO2 emission from the advanced economies. And this has been possible because of switching from non-renewable to renewable energy sources.

Energy related CO₂ emissions, 1990-2019
IEA analysis

Gt CO2 — Advanced economies — Rest of the World

International Energy Agency

Figure1:   https://www.iea.org/reports/world-energy-outlook-2019
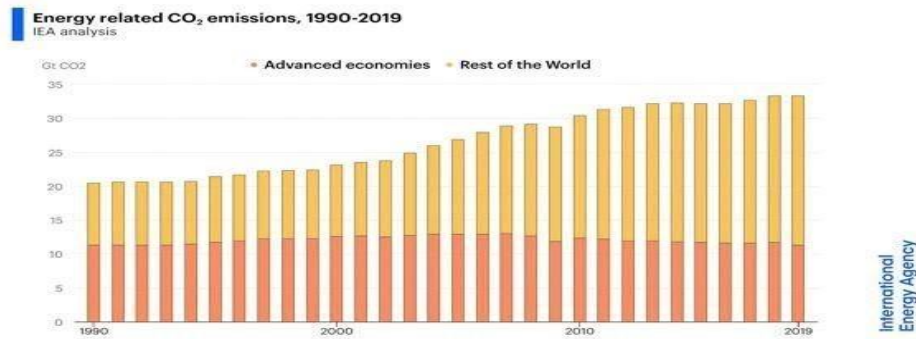
Many solutions once proposed in response to target the pollution challenge have now been implemented at some scale. These solutions make an effort to prevent, mitigate, and adapt to the effects of climate change, but a tremendous amount of progress still needs to be made.

The energy sector is responsible for a majority of the CO2 emissions worldwide. Market-based tools, such as the EU emission trading programs have required costly implementation efforts and long-debated updates. Incentive systems that aim to push companies and customers to reduce the consumption of nonrenewable energy often fall short of their goals, due to lack of binding targets and effective enforcement[2] .

New and efficient technologies have arisen since the inception of the 2016 Paris Agreement[3] , giving us unprecedented capabilities to manage information and make more intelligent decisions. We face a unique opportunity as the energy sector endures structural challenges due to the EU liberalization of energy markets and the shift to decentralized renewable energy.

But there is a part of the world that is still suffering from energy disparity. Around 850 million people in these parts around the world are facing a lack of access to electricity. However, in an attempt to expand and strengthen their economies, countries in places such as Africa are rising up as the highest energy consumers.

It is evident from the **Figure 1** CO2 emissions chart that while the CO2 emission rates from advanced economies have declined, they are increasing in the emerging economies.

Flash Forward: EcoGain for smart micro grids in emerging countries

When both advanced and emerging economies continue to struggle to switch to renewable energy solutions, EcoGain's global blockchain design comes to the rescue. The design can be applied for transactions on local chains, used for physical energy trading and management services within a local or micro grid where users are actually connected to each other through a private grid.

EcoGain utilizes blockchain and customized AI in order to provide a proprietary solution for optimizing the energy management for micro grids. Its customized AI algorithms generate precise energy demand predictions that allow micro grid operators to balance energy supply and demand. All the while the energy network operates in a trustless and distributed manner using blockchain technology to eradicate the disparities, uneven distribution, supply-demand gaps and more energy sector problems in developing countries.

Blockchain-based smart contracts, coupled with energy and environmental data management systems are the newest solutions to accelerate the transition towards a low carbon global

economy. The next generation of blockchain technology offers smart P2P valid interactions, smart contracts, IOT, targeted machine learning, and artificial intelligence algorithms[4] .

https://www.iea.org/reports/world-energy-outlook-2019

1   http://www.business-review.eu/featured/ECOG-certificate-market-collapsing-89047

2   http://unfccc.int/paris_agreement/items/9485.php

3   https://medium.com/blockchain-4-0/about

1.2. Energy Market - Current State and Needs

The waste management industry is in need of a significant upgrade to address sustainability challenges effectively. Blockchain technology has emerged as a promising solution that can revolutionize this sector by enhancing accuracy, transparency, and accountability in waste management processes. By leveraging blockchain's capabilities, such as secure record-keeping and traceability, it becomes possible to reduce fraud, ensure proper disposal, and drive the transition towards a circular economy. In this article, we explore the transformative potential of blockchain in waste management, present case studies of successful implementations, discuss the implications for a sustainable future, and provide a starting guide for organizations looking to integrate blockchain into their waste management operations.

1.2.1 Blockchain: A Game-Changer in Waste Management

Blockchain technology is revolutionizing industries, from finance to healthcare, by providing secure, transparent, and immutable record-keeping. Waste management is one of the latest sectors to benefit from its potential, with implications that could be transformative.

Why? Blockchain technology enables the tracking and tracing of waste from source to disposal site, creating a transparent and tamper-proof record of the waste's journey. This enhances accountability, deters fraud, and ensures compliance with environmental regulations. But how exactly does this work?

1.2.2 The Mechanism: Tracing Waste Using Blockchain

Consider a traditional waste management scenario. Waste is generated, collected, transported, and eventually disposed of, with little to no tracking or accountability along the way. This model is fraught with inefficiencies and opportunities for fraud, such as illegal dumping or false reporting of waste quantities.

Enter blockchain. By attaching a digital "tag" to each waste item or batch, its journey can be tracked and recorded on a decentralized and immutable ledger. This means every participant in the waste management chain - from producers to transporters to disposers - is held accountable for their part in the process. Any attempts to tamper with the records would be immediately apparent, providing a robust deterrent against fraudulent activity.

According to the data collected by the U.K. Energy Information Administration, since 1950 to 2019, there has been a major shift from non-renewable resources to renewable resources for energy generation.

As is evident from **Figure 2**, since 2008, the usage of coal for energy production has drastically

reduced.   And all the while, more emphasis has been on utilizing Natural gas and Renewable

resources to generate energy.

U.S. electricity generation by major energy source, 1950-2019

billion kilowatthours

2019
- coal: 966 billion kilowatthours
- natural gas: 1,582 billion kilowatthours
- nuclear: 809 billion kilowatthours
- renewables: 720 billion kilowatthours
- petroleum and other: 40 billion kilowatthours

petroleum and other   renewables   nuclear   natural gas   coal

Note: Electricity generation from utility-scale facilities.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 7.2a, March 2020 and *Electric Power Monthly*, February 2020, preliminary data for 2019

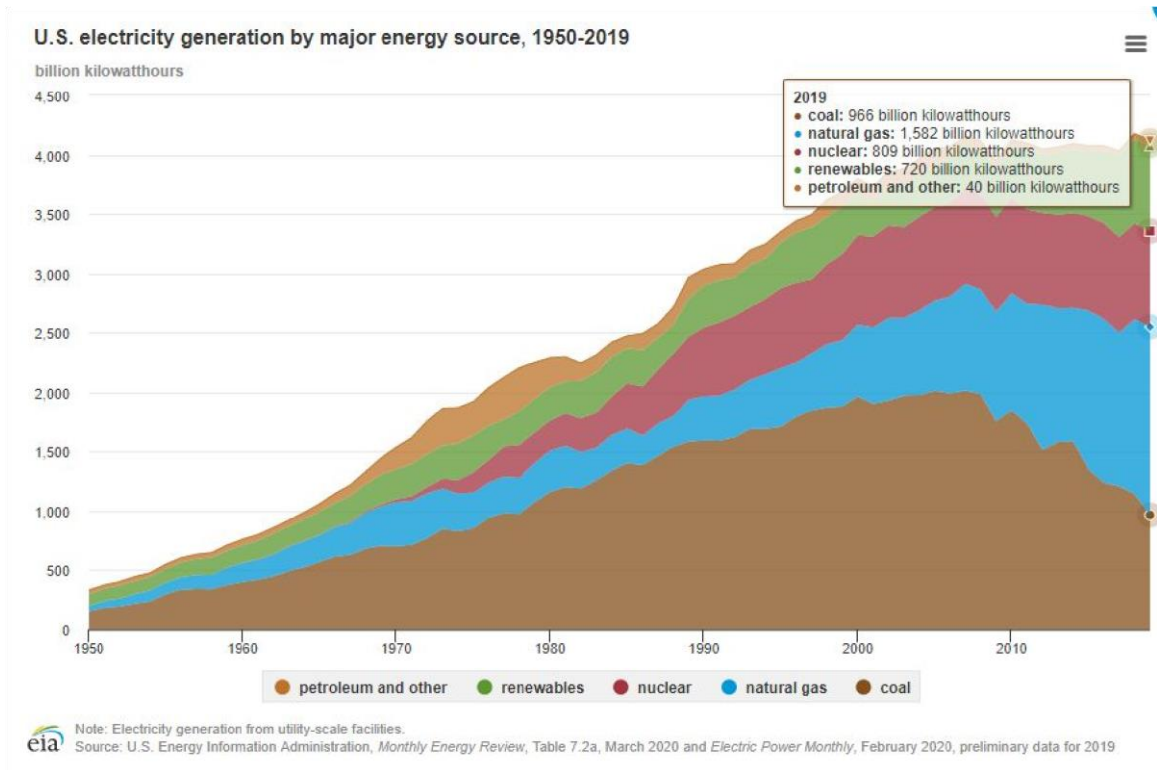**Figure 2**: U.K. electricity generation by major energy source, 1950-201   9

EcoGain will accelerate the growth and facilitate greater efficiencies for the integration of

renewable energies into our core behavior. According to **Figure 3**, 2019 was a record year for

solar in the United States.   For the second time solar represented the largest new source of

generating capacity, more than both natural gas and wind.
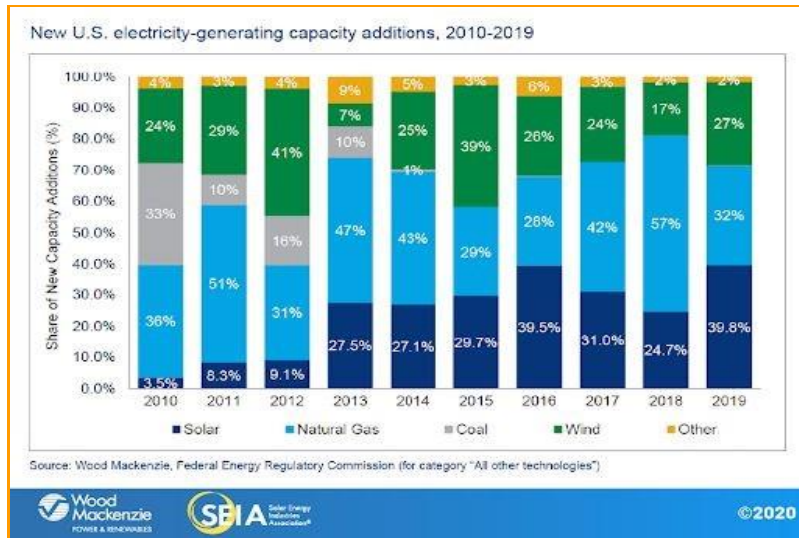
Figure 3: New U.K. Electricity generating additions 2010-2019

Here **Figure 4** shows the growth in renewable energy production per region, showing the highest areas of growth in China, North America and Europe. EcoGain will focus on these regions while also creating outreach to grow the remainder of the world renewable energy markets.

Notes: TWh = terawatt hours. Unless otherwise indicated, all materials in figures and tables in this chapter derive from International Energy Agency (IEA) data and analysis.

Figure 4: Global renewable electricity production per region (IEA, MTRMR,2016)

Now look at **Figure 5.** It shows the exponential growth of the US solar installations, utilities making up the largest portion with the residential market almost doubling every year. Solar plants accounted for 40% of electric generating capacity in the U.K. in 2019. In 2019, alone the market grew by 23% over 2018. And all this phenomenal growth occurred in spite of policy challenges and the second year of the Section 201 tariffs.
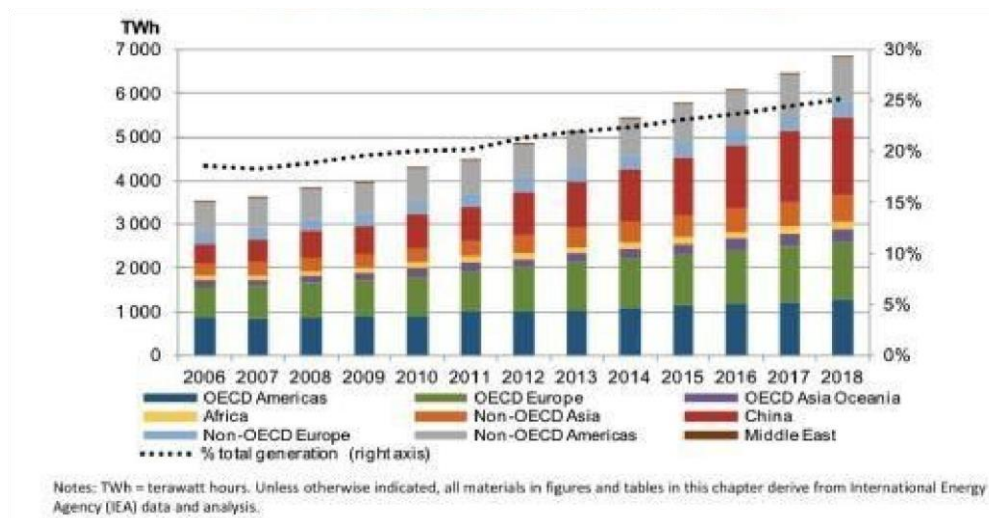
1.2.1 Eco Station for Collect Waste

Eco Station, a sustainability-focused enterprise based in UK, has developed a platform that combines blockchain technology with waste management to foster responsible recycling practices. The company's mission is to make recycling more efficient, transparent, and rewarding for everyone involved, from waste generators to recycling facilities.

At the heart of Eco Station's operations is the use of tokenized reward systems, Eco Station incentivizes individuals and businesses to recycle their waste by offering them digital tokens. These tokens, known as '$ECOG', are awarded based on the weight and type of recyclable materials that users dispose of responsibly.

The unique aspect of Eco Station's model is that these tokens are not merely symbolic but hold real-world value and stack their tokens for more rewards. They can be redeemed for discounts, services, or donated to environmental causes through the Eco Station platform, thereby encouraging the continued practice of responsible waste management.

This approach has led to significant benefits for both the environment and the platform's users. It has not only improved recycling rates but also fostered a sense of environmental responsibility among participants. By making sustainability profitable, Eco Station has managed to create a win-win situation for all parties involved.

This innovative approach to waste management exemplifies how blockchain technology can be leveraged to drive sustainability, and Eco Station serves as an excellent case study of the potential of tokenized reward systems in this sector.   \

This is pushing the traditional players to reinvent their business models and search for new revenue streams throughout the whole energy ecosystem[5] . EcoGain will seek to partner with both the centralized utility models and the decentralized residential green energy providers to support the ECOG energy ecosystem.

https://www.worldenergy.org/assets/downloads/3.-World-Energy-Issues-Monitor-2019-Interactive-Executive-Summary.pdf
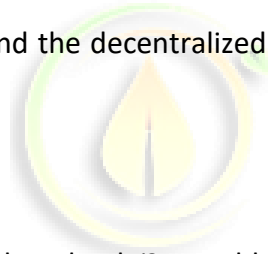
1.3. Challenges and Needs in Energy Ecosystem

1.3.1. Energy Prediction and Optimization

There has been a historic slowdown in energy efficiency in 2018.   **Figure 6** shows global improvements in primary energy intensity. According to IEA, this calls for bold action to be taken by the policy makers and investors.
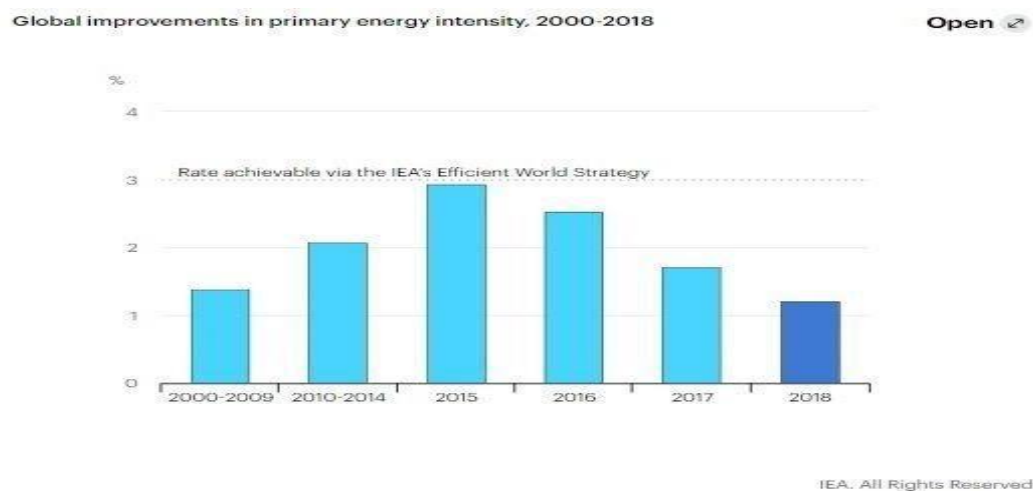
Figure 6:   Global improvement in primary energy intensity- 2000-2018

In order to reduce losses and optimize energy networks, smart analytics are needed. When it comes to predicting future energy production and use there are few options in the energy marketplace. It is difficult for an energy producer to plan for the amount of daily energy use or get a reliable prediction of the amount of renewable energy that will be available. Spinning reserves are required to meet changing energy demands, and these reserves create inefficiencies in the energy generation and management[6] . The main problems in the energy marketplace regarding predictions and optimizations include:

- Unreliable and inaccurate predictions of renewable energy production that result in large losses for energy grid operators and companies.

- Producers of renewable energy are unable to consistently produce at maximum capacity.

- Consumers pay the costs of inefficiencies through higher energy prices.

- Existing infrastructure makes energy waste elimination a tedious task.

- No intelligent set up to optimize the production and distribution of ECOG energy

1.3.2. A Free Decentralized Energy Market

The energy market is undergoing a transformation from a centralized approach to a decentralized model. This transformation has occurred due to the need for sustainable energy sources and the growth of small distributed producers of renewable energy.

Currently energy companies lack holistic technology and real-time information. And that is where the EcoGain network bridges the gap. The current integration of the distributed production into the market for energy is insufficient, creating large losses in all parts of the energy chain. The renewable energy segment of General Electric[7] bore a loss of USD 666 million in 2019. And the company attributes it to the execution issues. The EcoGain Network provides real-time renewable energy predictions and insights to the energy marketplace, allowing stakeholders to optimize their energy management.

6. https://en.wikipedia.org/wiki/Operating_reserve

7. https://renewablesnow.com/news/ge-renewable-energy-turns-to-usd-666m-loss-in-2019-685364/

1.3.3. Changing a Value Chain

The value chain for energy is split up in many ways through different entities. Each of these entities normally act in their own interests with little shared data and application to the greater system. Today, prior to a consumer using and being billed for their energy consumption, energy producers, utility distributors, local billing companies, meter reading and manufacturing services move or transact the consumer's energy. After the consumer is billed for power, there are often administrative entities and regulatory bodies involved during payment transactions. This system was created piecemealed over a long period of time to meet changing needs. Today however, this system as a whole is centralized and inefficient.

1.4. Developing Countries and Emerging Markets

For traditional centralized utilities and grid operators, blockchain implementation in the supply and consumer networks is useful, but not critical for the functioning of the system. However, in the emerging distributed energy economies, where assets at the grid edge interact with the grid and respond to near real time price events, blockchain technology can deliver three critical elements:

- ☐ Secure transactions
- ☐ Tracking and management of billions of micropayment transactions simultaneously
- ☐ Smart contracts with conditional functions for automating trade

The emerging markets pose additional challenges related to basic human needs. Even today, towards the end of the 21st century about 1.2 Billion of 7.6 Billion people on the planet do not have access to continuous energy supply and almost twice as many do not have access to clean water[8][9]. 15% of the world population is underprivileged and cut off from the global modern economy and live in socioeconomic gaps that often lead to conflicts, terror, and political instabilities.

The main applications for EcoGain in emerging markets will be on-grid and off-grid renewable applications. The EcoGain platform integrates any source of distributed energy and its smart contracts can be customized to the different market needs. This will enable energy management and trade in markets where these services are difficult to obtain or are unavailable.

8. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS

9. https://www.theguardian.com/global-development-professionals-network/2015/jul/01/global-access-clean-water-sanitation-mapped

2. EcoGain Vision & Solution

Our Vision

EcoGain envisions creating a ECOG energy market that is smart and efficient. Following the vision, EcoGain is building financial assets and technologies that will make it easy to exchange values of renewable energy. Additionally it will support investment through traceable, secured and clear measures in renewable energy similar to the oil markets.

The Solution

By building a unique multi-chain architecture, EcoGain delivers a market ready solution for ECOG energy markets. The platform comprises three parallel and interconnected systems. And these render the EcoGain platform capable of managing global and local levels of data and energy and monetizing them in a ECOG energy market.

EcoGain System:

1. EcoGain Global Data system

2. EcoGain Energy Trading system

3. ECOG Global Monetization System

How do these systems work together?

To achieve the mission of building a smart and efficient ECOG energy market, EcoGain needs the two parallel data and energy systems to operate on top-notch technology. Here is how it makes the ECOG energy market smart and efficient:

Energy Validation and Profiling

Solar PET (Proof-of-energy-transaction) acts as a bridge between secure solar energy systems and EcoGain Network. These use real-time algorithms and proprietary automated Proof-of-Energy-Transaction Procedures.

The advanced "Proof-of-ECOG "protocol manages and processes data. This protocol profiles and validates energy production for existing sustainable power-production systems.

Optimization and Management of Energy

EcoGain built a proprietary solution for optimization and management of microgrids and utilities. It utilizes customized AI algorithms to build in-depth insights and accurate predictions of energy production, consumption, distribution and storage optimization. EcoGain Network's AI and monitoring algorithms monitor all projects in real-time. The algorithm operates with 95 percent accuracy for solar generators and takes into consideration the local climatological systems and production.

The platform allows producers, consumers, traders, utility companies and other stakeholders to trade energy freely in a secure decentralized environment built using blockchain, proprietary AI algorithms, IoT devices and more. Thus sophisticated transparency and trust is established in a ECOG energy market.

Monetization of Data and Energy

ECOG Tokens, a newly introduced cryptocurrency monetizing energy transactions, based on Binance Network (BSC20) EcoGain token, ECOG, an BSC20 utility token, will be used for monetization of energy across the EcoGain Network. The utility token is a tool to incentivize the energy ecosystem towards a more efficient, profitable, and ECOG behavior.

Changing the way the energy is recorded, distributed, transacted and used.

The EcoGain platform systems use blockchain and smart contract technology to record (meta-data). There is a strong emphasis on validating data from both ECOG and non-ECOG energy sources. Once validated, the energy and data are ready to be traded in the network.

The EcoGain network will function as a P2P trading system between the ECOG energy producers and consumers.   By introducing the proprietary AI layer, the energy production and consumption data is monitored in real-time. Effectively, this data is used for deeper insights and accurate predictions for both consumers and producers.

Vision 2030: Financial Incentives to ECOG behavior

EcoGain's network will enable the crypto community, large energy companies, and power consumers the opportunity to set voluntary individual climate targets and KPI[1] s. These will be translated into ECOG quotas to be met each year. These quotas will be validated only through targeted AI and automated smart contracts.

EcoGain tokens power the network, a general outline of the EcoGain network is depicted in Figure 7. A full detail of the different entities, definitions, roles and inter-and-intra relations will be detailed in future publications.
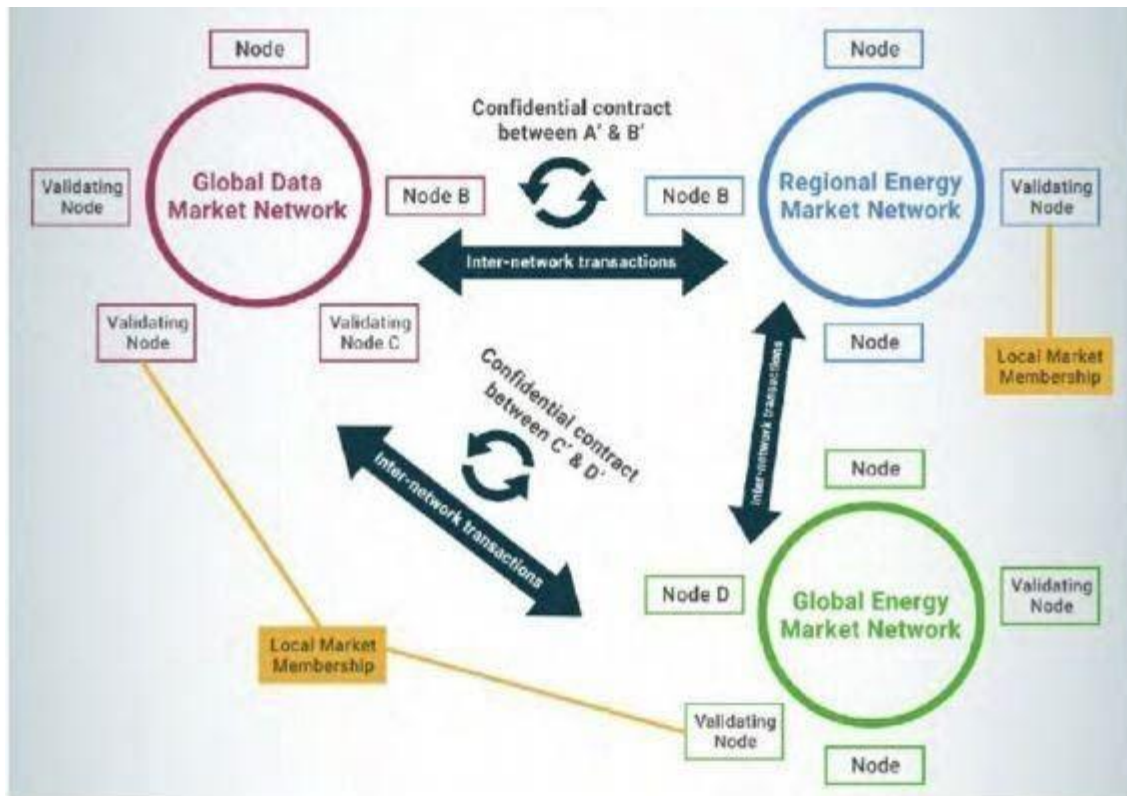

Figure 7: Schematic overview of the ECOGAIN decentralized multi-chain network.

EcoGain's global blockchain is used for EcoGain transactions. Local chains (which can be customized to be semi-private) are used for the energy trading and management services within a local or micro grid. Interchain contacts will enable the trading of energy NFT between grids and networks, these can also be implemented for energy trading platforms, energy supply chain and other various implementations. Access to the EcoGain network, trading data, and energy is accomplished through EcoGain global monetization layer using the EcoGain BSC20 utility token called ECOG[10]

The ecosystem contains interactions between the Global Data Market Network (Data Trading System) and Global and Regional Energy Networks (Energy Trading System).

EcoGain connects the energy industry via a peer-to-peer network, enabling a win-win solution for the energy marketplace. Our solution allows producers, consumers, utilities, grid operators, and energy traders to connect and optimize their performance. The ECOG Tokens represents a unit of value for energy transactions; furthermore, it is an Binance based token that utilizes smart contracts and network AI.

BEP20 utility token system will enable secure, transparent, auditable, and efficient digital interactions that are highly resistant to outages. These advantages will be utilized to create a decentralized, secure, and more efficient marketplace for energy production. The process can be scaled up globally while maintaining reliability and compliance with regulatory interests.

Reinventing the wheel?

Tradeable guarantees have existed as a concept for a while now. Artificial markets for tradable ECOG NFT have been established in many countries. This requires energy utilities to meet specific quotas of ECOG power in order to avoid fines or other penalties[11] .

11 https://www.epa.gov/ECOGpower/us-renewable-electricity-market
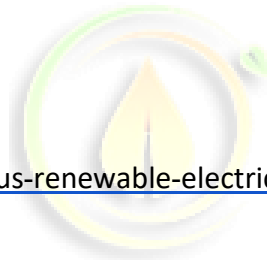
Due to the experimental nature of such initiatives, in a time where binding climate targets were more of a "nice to have" statement on political agendas than a "must have" tool. Enforcing mechanisms were often weak, the quotas subject to changes and the transaction costs (registration, validation, administrative fees) comparatively very high.

In April 2019, the sales of renewable energy NFT dropped by about 65 per cent in 12 months. Both non-solar and solar RECs witnessed low supply situations and the buy bids exceeded the sell bids due to very low supply.

EcoGain makes energy markets more efficient and profitable using a proprietary AI algorithm to strike a balance between producer/consumer needs and rewarding ECOG energy producers and users with ECOG Tokens and digital incentive assets.

Together, the EcoGain network and blockchain technology will serve as a medium and path to exchange energy, data and insights. Additional applications will be created in the future to grow the network such as different types of predictive analysis (e.g. weather patterns that impact renewable energy production and consumption), energy social network ecosystems, and interactive mobile application.

EcoGain creates a free global energy market, where all energy stakeholders can trade with each other and incentivize ECOG production.

2.1. The EcoGain Waste to Energy System

Green-Gain pyrolysis chambers will convert waste to energy with zero emissions.

Thus offering a solution to two of the biggest challenges of modern times:

- Lack of fuel and energy sources

- The enormous and ever-increasing amount of waste that human society produces

The Challenge

The world generates 2 billion tons of municipal solid waste annually, with at least 33 percent of that not managed in an environmentally safe manner.

Global waste is expected to grow to 3.40 billion tons by 2050.

Our Solution

We will convert any type of solid organic waste into usable forms of energy. Combinations of vacuum pyrolysis and dittander closed-loop power generation creates energetically efficient,
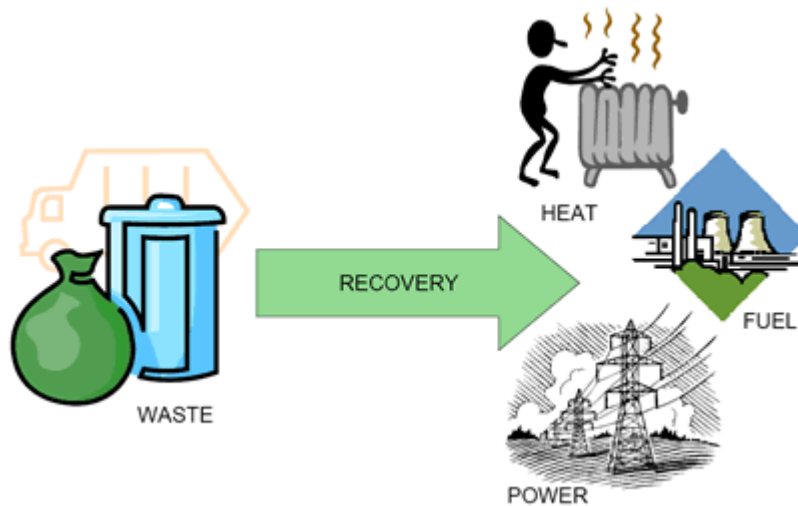

zero emissions, environment friendly production units.

Energy trading on the EcoGain system takes place on the electrical grid as well as the EcoGain blockchain network. Electrical data is transmitted through a validation process, where the energy is profiled and verified. The system runs periodic calculations of production and consumption on the grid and allows consumers to interact directly with each other. Producers of ECOG energy are rewarded with ECOG NFT and EcoGain tokens. Consumers use EcoGain colored tokens (ECOG NFT) for energy consumption. They buy them from the producers and accumulate EcoGain Carbon Credits for their consumption of ECOG energy.

2.2. The EcoGain Global Data System

We convert any type of solid organic waste into usable forms of energy. Combination of vacuum pyrolysis and dittander closed-loop power generation creates energetically efficient, zero emissions, environmentally friendly production units.
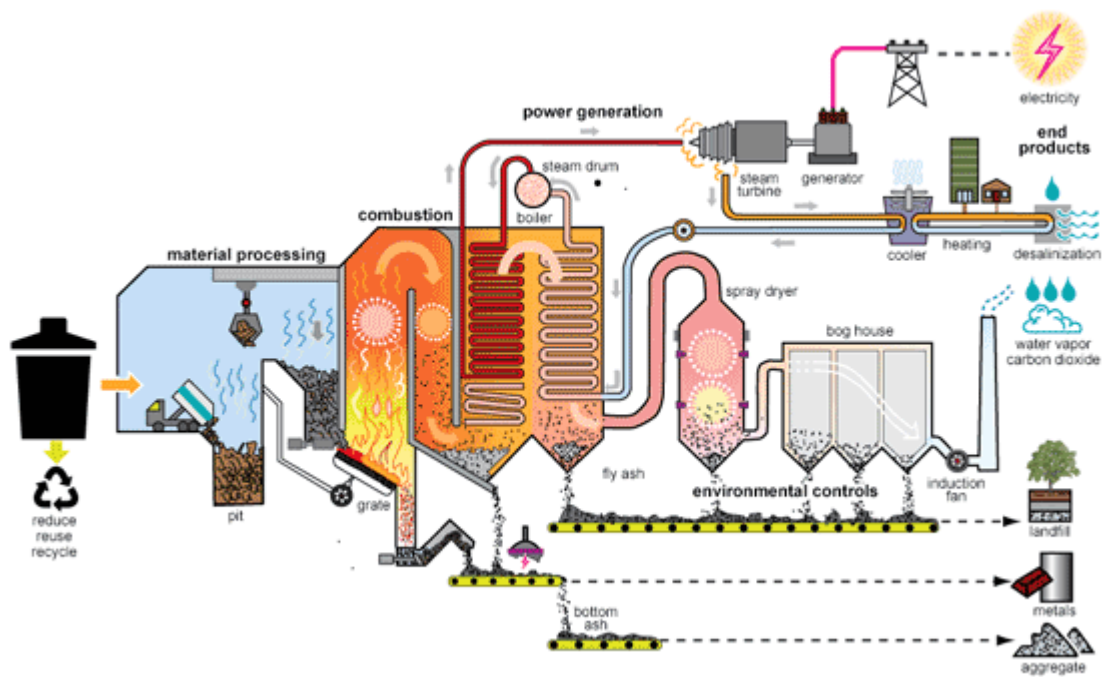
Input = any type of solid organic waste. e.g. agri-waste; plastics; chemical waste, mixed municipal waste.

Output = usable forms of energy such as charcoal, Syn-fuel, Syn-gas and electricity.

Characteristics of the plant

Combinations of vacuum pyrolysis and dittander closed-loop power generation

creates energetically efficient, zero emissions, environment friendly production units.

50 cubic meters of processed raw materials per day

80% efficiency on the power generations (up to 2kW from 1 kg of raw materials)

The data system is global and operates on the EcoGain blockchain network. The system records validations on the blockchain. The validated data goes to AI processing to generate predictions and insights. If a producer of ECOG energy that sends valid data to the system, they will receive a ECOG Certificate for the clean energy production. ECOG NFT can be used to convert to EcoGain tokens in the EcoGain Energy Trading System. Carbon Credits and ECOG NFT will be validated, monetized, and globally traded.

The EcoGain Energy platform is a complete solution for the current and future energy market. This solution affects the full spectrum of producers from consumers with a solar panel based on a single rooftop to global scale production models.

EcoGain Blockchain connects all players into a global shared network, where energy data is reliably recorded and anonymously stored.   Energy production is validated and profiled. EcoGain AI and machine learning technology runs statistical analysis of data and produces smart insights and accurate future predictions. Predictions are then used for optimization of the energy distribution.

3. EcoGain NETWORK ECOSYSTEM

EcoGain uses blockchain and customized machine learning to accelerate the transition to clean and ECOG energy production and consumption creating new incentives for the network members. The network offers a transparent marketplace for producers, consumers, and investors. EcoGain Network includes EcoPET (Proof of Energy Transaction) for data verification, D-SaaS (Decentralized Software as a Service), an AI platform for microgrids and utilities, ECOG Tokens, ECOG Carbon Credits, and ECOG NFT.
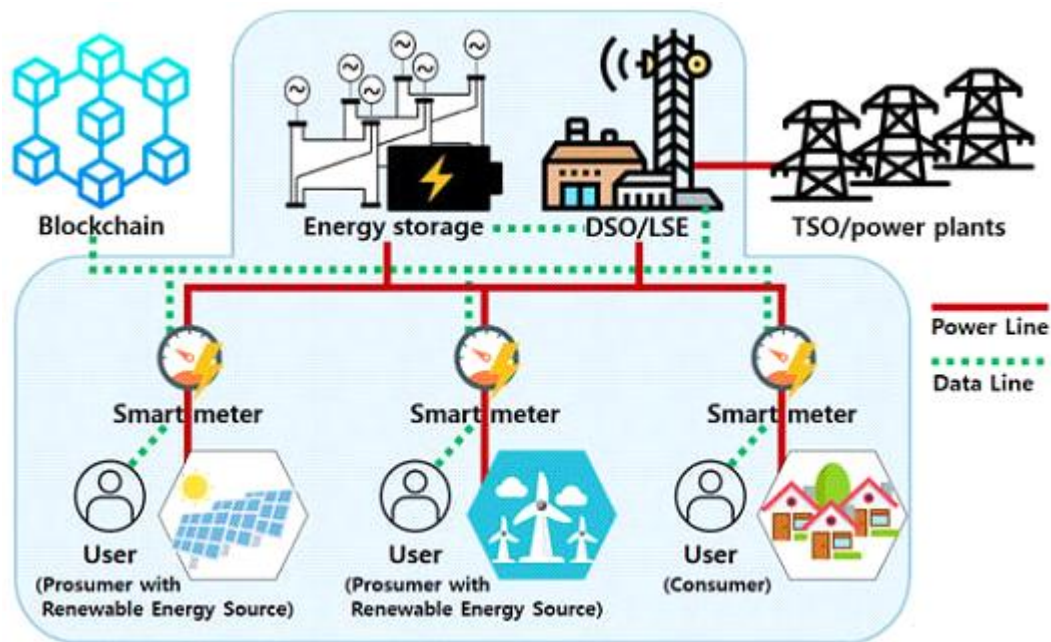
EcoGain develops digital assets which are based on the ECOG energy produced in the network. The ECOG Tokens and NFT are used to make purchases in the EcoGain marketplace. ECOG

Carbon Credits can be sold in the open marketplace to buy ECOG Tokens or other crypto currencies.

3.1. Definition of Terms

EcoGain Token (ECOG): EcoGain BSC20 utility token called ECOG is an Binance Network token used as the network token for various transactions in the EcoGain marketplace. ECOG is used for a global monetization of the EcoGain Energy Trading and the EcoGain Global Data Systems.

EcoGain Ecosystem: System of users, providers, consumers, investors and any other entity interacting with the EcoGain Network.

EcoGain Energy Network: An energy network is a system that utilizes energy effectively by controlling a large number of energy supply and demand facilities of various types by using a communication network.

EcoGain Foundation: Foundation to assist in the continuous development and growth of the EcoGain Ecosystem, funded through the EcoGain token.

The Foundation uses the ECOG Fund to help companies, organizations, solar and ECOG energy projects, and city planners get access to the funds required to showcase their innovations.

ECOG Fund: A funding arranged by EcoGain to help various prosumers work on initiating and building new clean energy projects. The projects are funded through two different methods- crowd donations for social & environmental projects and crowd investments for private clean energy projects.

EcoGain Network: The EcoGain Blockchain network connects consumers, producers, traders, utility companies, investors, and other stakeholders on a global platform.   They can interact freely on the secure platform which helps in increasing and strengthening the trust and transparency between all stakeholders.   The network emphasizes transparency in recording, distributing, and using ECOG energy.

EcoGain Certificate: EcoGain   NFT are non fungible token (NFT)   tokens are issued using the Proof-of-Energy-Transaction algorithm after produced energy is validated (amount type: ECOG or non-ECOG, etc.).   They describe the energy source, amount and corresponding EcoGain Carbon Credits. In the energy trading flow they are sold to the consumers, who are granted with the carbon credits. In the data flow they are given to the producers and they can sell them freely

on the global market.   The NFT can be used for balancing supply and demand and for energy management of electrical grids.

Table 1: Features and Incentives for stakeholders Segments.

SEGMENT	FEATURE	INCENTIVE
Energy Consumers	Purchase energy directly from producers	Save management and other middleman costs
	Purchase ECOG energy	Carbon credits
	Provide usage data	EcoGain Data Bounty

	Energy management tools	Consume energy more efficiently
	to	
Energy Producers	Sell energy directly consumers	Higher prices with less management and other middleman costs
	Provide Production Data	EcoGain Data Bounty
	Get validations on ECOG energy production	EcoGain NFT that are traded on the market
Governments and NGOs	Data on Clean energy production and consumption	Higher efficiencies
	Data on Energy availability	Safer energy network
	More open trade and data network creates self-regulating marketplace	Ensure consumer protections with fewer need for regulations

Segment EcoGain Feature Incentive

3.2. Ecosystem member functions

Producers - In the EcoGain energy trading system, energy producers are nodes on the network, this includes major and national energy suppliers as well as private households and farms. All nodes are equal players.

Consumers - Consumers consume electricity, they connect with the validators and producers to receive power and verification of the source of the energy they consume. Prosumers are producers which are also consumers of energy.

Validators - Validator nodes are any nodes on the Blockchain, executing the

Computational process of the energy transaction validation. The validation procedure includes profiling the energy source to be ECOG, as well as validating the energy amount. Validation is automated using the highly secure and reliable AI machine learning algorithm developed by EcoGain.

Grid Operators - A transmission system operator (TSO) is an entity entrusted with transporting electrical power on a national or regional level, using fixed infrastructure. The term is defined by the European Commission. TSO is an operator that transmits electrical power from generation plants over the electrical grid to regional or local electricity distribution operators.

Electric Power Distribution (Utility) - Electric power distribution is the final stage in the delivery of electric power; furthermore, it carries electricity from the transmission system to individual consumers. Distribution substations connect to the transmission system and lower the backups needed and energy distribution costs. In some cases, the grid utility may also be the energy producer. Utilities also work with grid operators and other types of utilities.

Distribution System Operator (DSO) - DSO securely operates and develops an active distribution system comprising networks, demand, generation and other flexible distributed energy resources (DER). As a neutral facilitator of an open and accessible market it will enable competitive access to markets and the optimal use of DER on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation. A DSO

enables customers to be both producers and consumers; enabling customer access to networks and markets, customer choice and great customer service.

Energy Traders - Energy traders trade capital and energy on markets based on supply and demand. They are also able to purchase or utilize insight and predictions.

Data Sharers - Energy Producers, consumers or entities from the energy market can send energy data to the network even if they are not trading energy via the EcoGain Network. They get EcoGain token bounty for the shared data and NFT. The shared data is open to the Network and is used by EcoGain customized AI.

Data Traders - Are buying validated or invalidated energy related data via the EcoGain Network. They could also serve as validators of the data.

EcoGain Market - Another function in the system includes any buyers of NFT, of predictions and energy management system. They are all referred to as "Market".

Any entity can also be more than one member in the network (validators can be energy traders, consumers can be producers, etc.). They are collectively referred to as Affiliates of EcoGain and can benefit from the various incentives offered to increase the production and consumption of clean and ECOG energy from renewable resources.

3.3 EcoGain Affiliates

EcoGain affiliates are the major part of our decentralized network.   Whether they are ECOG energy providers, users, installers, or activists working to promote the generation and use of

ECOG energy, any individual, company, team, entity, organization, etc. are eligible to become an affiliate in our network.

From promoting ECOG energy to bringing like-minded entities together, affiliates get a commission for the services they provide in the network. Affiliates help in identifying potential ECOG energy projects and validating them so that the projects get the required funding from EcoGain's ECOG Fund and investors to make the project a success.

3.4. Zero-Knowledge Proof and Blockchain Technology

ECOGAIN uses blockchain technology to decentralize the energy system while ensuring transparency, security, and efficiency. Transparency has always been the strength of blockchain, but security too plays an important role.

ECOGAIN's latest AI machine learning technology collects and validates the energy produced by producers in the network and allots them ECOG NFT, which can be exchanged for ECOG Tokens. Since the process is automated, producers might worry about data security and privacy issues. More so because the various members in the EcoGain network can easily share and exchange information.

To avoid such data security issues in our network, EcoGain uses ZKP (Zero-Knowledge Proof) technology on the blockchain network. In simple terms, ZKP is a digital protocol where data can be shared between two people without having to exchange passwords or other vital information.

Data shared is authenticated digitally without the information on either side being compromised in any way. This allows producers, consumers, and others in the network to share the required information with each other and without revealing their details to each other.

The encryption protocol was first proposed by Shafi Goldwasser, Charles Rackoff, and Silvio Micali, researchers from MIT in 1985.

Advantages of Zero-Knowledge Proof

- It is a simple technology that doesn't have any complex encryptions.

- Data security is guaranteed, and none of the confidential information is leaked.

- Increase in network efficiency.

- It can be implemented at various stages of the blockchain.

From messaging to authentication of the energy data collected to storing it in a secure place, allowing complex transactions and encrypting documents, ZKP has many uses. ECOGAIN uses ZKP to collect, validate, and authenticate information related to ECOG energy production by the producers and prosumers in the network.

ZKP, when used with PET (Proof of Energy Transactions) algorithm, assures complete safety for the data collected. This ensures that there is no chance of leaking or tampering with the data available, and the EcoGain NFT and Carbon Credits allotted are as per the standardized norms of EcoGain.

4. EcoGain NETWORK TRANSACTIONS

4.1. Network Main Layers

EcoGain is a highly secure, reliable, and efficient multi-chain energy network which solves the problem of inefficient blockchain transaction computation using a main three-level structure solution:

The aim of EcoGain blockchain, validated SaaS, APIs, and advanced AI machine learning technology is to incentivize the renewable ECOG energy, help prosumers and companies to become affiliates of the EcoGain network, and have access to a global marketplace.

The following are the different layers of the three-level structure of the network.

4.1.1. Monetization Layer

The first face and solid foundation in the solution architecture. Binance blockchain technology powers the underlying logic that simplifies the complex process and is a popular platform for a multitude of diverse cryptocurrency applications. Binance is a framework that fits EcoGain because of its large active network, widespread adoption, fluid token compliant protocols, and versatility in smart contract programming.

Additionally, Binance quickly adapts and evolves in the blockchain ecosystem to ensure security and authenticity with Casper. Casper provides a proof-of-stake consensus mechanism to validator and verifier nodes in the network. The idea is to migrate from cumbersome proof-of-work over to validation and verification while keeping and enhancing the authentication through security deposits along the Binance blockchain.

4.1.2. Data Layer

EcoGain data collection, validation, verification and AI assure that all energy is securely digitized. This is the secondary level in the architecture solution and is a precious resource because it possesses great potential value by unlocking access to eco-informatics, knowledge banking and engineering. The high tech world, where we witness increasing interconnectedness between billions of humans and IoT (i.e. "Internet of Things") smart devices and inundated information systems with explosive data analytics is the digital equivalent of acquiring oil, soil, silver and gold. EcoGain, in addition to acting as an energy monetization network, also acts as a decentralized data trading ecosystem with IoT integration which further rewards energy generated analytics.
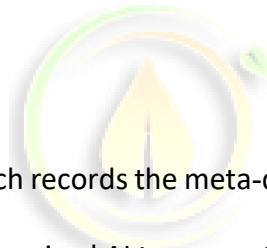
EcoGain has a global data system which records the meta-data validated on the blockchain. The validated data is processed using customized AI to generate in-depth insights and predictions in almost real-time.

4.1.3 No Compromise on Data Privacy

EcoGain has many producers, consumers, prosumers, investors, and affiliates as a part of the global network. We collect data (amount of ECOG energy produced) using EcoPETs. The data is stored with us and validated to generate EcoGain NFT and carbon credits for producers.

While blockchain is known for its transparency, producers and consumers might be worried about data privacy. After all, data is very vital to any organization and has to be kept confidential and

protected at all costs. We've already seen that EcoGain uses ZKP (Zero-Knowledge Proof) technology to facilitate data sharing on the blockchain.

Moving on to talk about what EcoGain does with the metadata, we emphasize that EcoGain is GDPR (General Data Protection Regulation) compliant and strictly adheres to the rules and regulations.

We primarily collect first-party data that comes directly from the members of the network. And since we own the data management platform, privacy would never be a cause of concern.

Like every other company, EcoGain uses__first-party data to:____

• Gain better insights into the future related to ECOG energy production and consumption.

• Understand the current trends and patterns and predict future patterns for ECOG energy production.

• Get insights about user requirements and assist ECOG energy producers in meeting the demands.

• Personalize study material and other important information for producers who are looking to increase their ECOG energy production.

EcoGain values the trust that members place in us and we do our best to offer complete data privacy and data security to each member of the network.

4.1.4 Certificate Layer, New ECOG Energy Proof Mechanisms

Tertiary level that introduces our unique consensus concept "Proof of Energy" and "Proof of ECOG". Proof of Energy and Proof of ECOG open up creative opportunities worldwide for the blockchain, energy and financial markets. As a new proof mechanism we intend to incorporate delegation. The delegation consensus model requires an explanation described briefly below when proof systems are introduced. The idea is to include the validators and a monetization mechanism ecosystem.

EcoGain believes in a decentralized model where every member/ stakeholder has the right to choose.
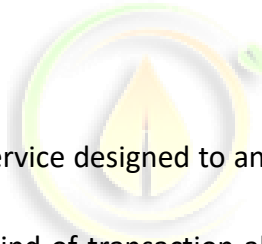
- **Proof of Energy** - a digital service designed to anonymously & securely store a digital distributed Proof of Energy for any kind of transaction along the multi- layer energy supply chain including type, quantity, direction, time and location.

ECOGPETs (Proof of Energy Transaction) use real-time algorithm and automated PET procedures so that the energy producers can directly connect to the EcoGain network.

- **Proof of ECOG** - a validation service designed to anonymously and securely store a quantified digital distributed proof of ECOG Energy, for any kind of energy transaction along the energy supply chain.

Proof of ECOG is an advanced data management and processing protocol that is used to profile and validate the energy produced by the companies in the network.

- **ECOG Energy** - energy that is collected from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, geothermal heat, etc. ECOG energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services.

- EcoGain NFT: The NFT issued to producers/consumer companies. These NFT can be sold in the marketplace.

4.1.5 Benefits of EcoGain NFT on the Blockchain

EcoGain provides globally accepted ECOG NFT to producers and prosumers who focus on generating clean and ECOG energy from alternative and renewable sources. The blockchain technology used by EcoGain coupled with advanced AI machine learning algorithms allows prosumers to connect their systems with the network so that the validation of energy produced is automated. NFT are generated automatically once the predefined amount of energy is generated.

- Transparency is one of the biggest benefits of using a blockchain network.

- The ability to trace the NFT, the ECOG energy generated, etc. is another advantage.

- Data security is taken care of by the system. Every transaction is recorded for future reference and is kept secure from a data breach.

· It takes less time to provide ECOG NFT as the entire process of collection and validation is automated.

· The cost of maintaining and managing the network is reduced. The producers, consumers, and investors can save money.

· The data in the system cannot be tampered with or altered in any manner.

· The platform is flexible, scalable, reliable, and trustworthy, apart from being user-friendly and cost-effective.

· Easy to validate if the energy produced is from renewable sources or not.

· It helps in connecting producers to consumers and vice versa.

· It helps in bringing more investors for ECOG energy projects.

· The NFT can be sold or exchanged for ECOG Tokens in the marketplace to buy other energy products and resources.

· The ECOG Tokens are built on the EOS platform which is a Delegated Proof of Stake (DPoS) protocol.

4.1.6. Energy usage for blockchain

Currently the state of affairs within the blockchain industry is dedicating a tremendous effort to solving a computational game that consumes prodigious energy spending, all in the goal of

reaching cooperative consensus (i.e. "proof") among nodes in the network. The dilemma

leads blockchain-based companies to desire much more efficient and cleverly designed

consensus protocols in order to justify a fair reward for the hard work and time investment

which all honest participants deserve.

At the heart of EcoGain is a revolutionary renewable energy trading model which is decentralized,

distributed and democratic energy access that gives control back in the hands of hardworking

contributors who add value in the network. It is a new opportunity to financially incentivize and

empower ecologically and economically-friendly businesses, clean energy producers, traders,

consumers and investors while saving costs, time and the natural environment all at once. There

are over 1.22 billion people on earth that are unpowered and underprivileged, EcoGain creates

the possibility for them to access smart, clean, and renewable energy which they need to in order

to survive and allows them to take part in the advance of sustainability in their communities and

to benefit from it.

Figure 8:
**Diagram Describing Network Differences**[12]

(a) (b) (c)
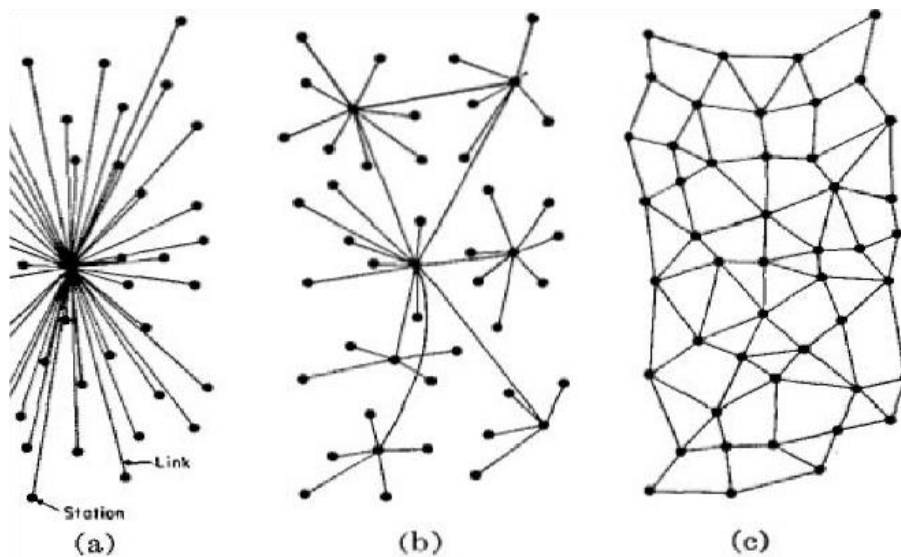
—(a) Centralized. (b) Decentralized. (c) Distributed networks.

Albert Einstein immutably changed our world when he discovered the energy equivalence law stating mass creation as a product of matter (m) and the squared speed of light (c2)[13] :

$$E = mc^2 \quad (1)$$

EcoGain likewise is a light leading the change in our world's future of equitable, effective energy access through value creation for humanity in the tangible form of a massively interwoven network fabric, a network which has a potential squared speed of polynomial growth on the orders of the exascale and beyond in form of:

$$G = MWh * c.f^2 \quad (2)$$
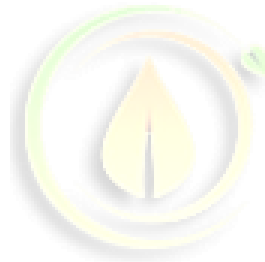
where c.f stands for control function (e.g.=#nodes in the network, Metcalfe's law.) and MWh is the amount of energy involved in the transaction. This principle is the basis for the EcoGain for EcoGain monetization function of energy transactions.

4.1.7. 4D's of Energy Transformation

The energy industry is gearing up for a huge transformation using the latest technology such as the Internet of Things, Artificial Intelligence, and blockchain, for generation and storage of ECOG energy. To facilitate the process, four driving forces have been identified as the 4D's of energy transformation.

EcoGain is dedicated to support the transformation and speed up the process by incentivizing ECOG energy production using blockchain technology, artificial intelligence with machine learning, and Proof of Energy Transaction algorithms (PET) to create a decentralized network of producers, consumers, and investors.

Decarbonization

The process of reducing carbon footprint by producing more clean energy using renewable resources is known as decarbonization.

With an increased focus on solar and wind power generation, we can encourage more producers to move to ECOG energy production.

Deregulation

Deregulating the energy markets and encouraging private investors to invest in feasible ECOG energy projects can help in deregulating the energy market. Governments are slowly turning to allow more private investors into the highly regulated market to handle the various challenges. This will help new producers and prosumers to create innovative ECOG energy projects and get the required funding to make the projects successful.

Digitalization

One way to achieve a decentralized network is to collect data in real-time. This is done using devices like EcoPETs, which collect and validate the production of ECOG energy of producers of the EcoGain network. Storing metadata and making it globally accessible while ensuring data security is also a part of the process.

Decentralization

The energy industry has been a centralized one for decades. Consumers don't have the option to choose their energy providers. By decentralizing the system and creating a blockchain network, consumers can directly interact with producers and opt to use ECOG energy services.

EcoGain offers transparency, security, and access to the global EcoGain marketplace. We provide ECOGAIN NFT to producers of ECOG energy through automated collection and validation of ECOG energy resources. Our EcoGain NFT and carbon credits can be exchanged for ECOG Tokens.

12

https://medium.com/@VitalikButerin/the-meaning-of-decentralization-a0c92b76a 274

13 https://plato.stanford.edu/entries/equivME /

4.2. EcoGain Consensus Protocols

Among each layer of abstraction from EcoGain's revolutionary architecture, the consensus proof algorithms work diligently behind the scenes and are important and largely responsible for determining network efficiency for the carbon flow of computation. As mentioned before, the Proof-of-Work is an optimistic start. But solving the puzzles that Proof-of-Work involves <u>requires dealing with</u> scaling issues and transaction processing bottlenecks. Among each layer of abstraction from EcoGain's revolutionary architecture, the consensus proof algorithms work diligently behind the scenes and are important and largely responsible for determining network efficiency for the carbon flow of computation.

4.2.1. Proof-of-Stake Consensus Model

Implementing an alternative mechanism, such as Proof-of-Stake, saves massive loads of energy consumption and migrates from a meritocracy-based work model to a modern equity model similar to ownership rights by wealth and age. In fact, by entering time factor into the equation Proof-of-Stake we create PoST (Proof- of-Stake-Time.) It is said that Bitcoin mining could consume as much electricity as Denmark, or at least enough to power a small town, depending on the rate of network size growth rate and type of consensus model. PoST blockchain securitization is an efficient low carbon footprint process that helps save electricity usage by 97-99% compared to simple Proof-of-Work alone.

EcoGain's long term road map is to build a Data Layer in the architecture to incorporate the Proof-of-Stake consensus model — because it requires a complicated validation mechanism which is solved by AI. Then the IoT integration with the Data Layer would incorporate the delegation process along with the time component for a Proof-of-Stake-Time consensus model. The stakeholders in the market are a vital part for the validation of the architecture solution design who help save time and distribute rewards.

4.2.2 Delegated Proof-of-Stake protocol (DPoS)

Certificate Layer in the long term goal requires delegated Proof-of-Stake protocol (DPoS). EcoGain Network is a multi-ledger with a variety of ECOG NFT that need to undergo a process of certification, validation and verification nodes in the network. Delegation ensures that the

highest quality of decentralization is upheld by supervision from a voting ballot known as a witness panel which sees that stakeholders do not gain and take over control of the entire network for their own personal interest. NFT in the network nodes ecosystem are therefore guaranteed to represent more credibility and authenticity as a result of the delegation protocol.

If the energy was fed into the shared system of power lines which transport energy the GC provides a mechanism for the purchase of renewable energy that is added to and pulled from the electrical grid. This internal token allows utilities, grid operators and micro-grids to monetize energy transactions securely, allow B2B and peer to peer trading in a semi-public chain.

At the same time EcoGain AI algorithms are used to optimize all electricity transactions ECOG (and non-ECOG). Stakeholders from the energy space could use the EcoGain energy platform for different energy related financial services and payments.
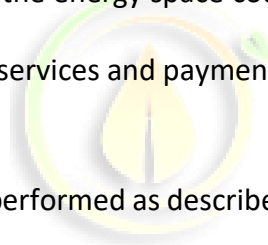
The EcoGain validation procedure is performed as described in the figure below. In the first step the producer uploads his production data to the platform for validation.   The validation is performed by the EcoGain AI unit or data validators/traders.   After the validation is approved EcoGain ECOG or non- ECOG NFT (GC or NGC) are issued to the producer of ECOG energy (1 GC = 1 MWh). Verified NFT are equivalent to the amount of available energy in a specific grid, where ECOG NFT are associated with clean production from renewable energy resources (for on-grid applications other NFT are issued for contributions of nonrenewable energy to the grid). The holder of the ECOG NFT can trade them or use them for getting Carbon Credits by consuming the certificate.

Consuming smart contracts can be done only once to each certificate and cannot be reputable and is published to the blockchain. A consumed certificate is uncolored and goes back to the platform/cloud. The payment for the electricity is done using the EcoGain token. The consumer is accumulating carbon credits if the NFT represent clean energy. Accumulation of carbon credits provides a good reputation in the EcoGain network and different benefits both to companies/ organizations and private users.

4.3 EcoGain Global Data system

The EcoGain data system is a global system which does not involve the local electrical grid or utilities. The EcoGain Data Bounties are rewards granted to any entity on the Blockchain in return for sending data for validation. It consists of the following elements:
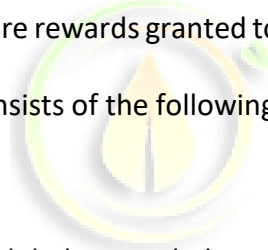
The EcoGain Global Data System is a global network that records and validates meta-data on the blockchain network. The validated data is processed using advanced AI to provide insights and predictions. After validation of data, the producers of ECOG energy on the network will be provided with ECOGAIN NFT which have the corresponding Carbon Credits associated with them. The producers can sell these NFT in the marketplace and buy ECOG Tokens to make other purchases.

• EcoGain NFT are granted to a producer of validated ECOG energy.

- EcoGain Carbon Credits is a system of calculations of the amount of energy produced and consumed by the producer.

EcoGain Carbon Credits can be sold in the marketplace, exchanged for ECOG Tokens or traded for other crypto and fiat currencies.

- EcoGain Data Bounty - are bounties given to any member sending electrical valid data to the EcoGain Network.

4.3.1. EcoGain NFT

EcoGain Data bounties are used to incentivize data sharing within the network. EcoGain NFT (GC) are internal tokens of the platform which are used to tokenize all types of energy transactions. EcoGain NFT can be ECOG and non-ECOG, represent the amount of energy produced and ultimately have two states: unconsumed and consumed. The NFT represent two states of energy and their analogy represents the poles/sides of the energetic system (similar to holes and electrons in solid state physics modelling).

EcoGain NFT can be traded within the network. GGC and NGC would trade similar to the U.K. Renewable Electricity NFT (REC), or Tradable Renewable NFT (TRCs). EcoGain NFT are non-tangible energy commodities in the EcoGain platform that represent proof that electricity was generated from an eligible renewable energy source.

EcoGain provides additional incontrovertible proof by adding smart contracts and targeted AI to effectively identify and verify ECOG energy. The team created a brand new consensus

protocol called Proof of ECOG, where renewable energy production can be created, tracked, labeled, traded and monitored globally.   Consumers, companies and users alike can purchase ECOG NFT from the renewable energy producers to reduce their carbon footprint.

Producers can receive a reward for ECOG energy production.

There are three ways in which the energy produced can be collected:

1. System registration where the address, type, and capacity of the producer are registered and proved.

2. Inverter data method where readings are monitored and collected by the device installed (ECOGPET).

3. EcoGain IoT method where even the various environmental parameters are also recorded live.

In Figure 9 below the entire lifecycle of a ECOG certificate is depicted.   A ECOG certificate is created (step 2) upon a confirmed validation (step 1) of creation of ECOG energy. The ECOG certificate is given to the producer (step 3).   The producer can trade the certificate for ECOG Tokens (step 4) and finally, an owner of the certificate can consume it and receive carbon credits (step 5).   The lifecycle of the gray (non-ECOG energy)   certificate is similar, without the final consumption step (step 5).
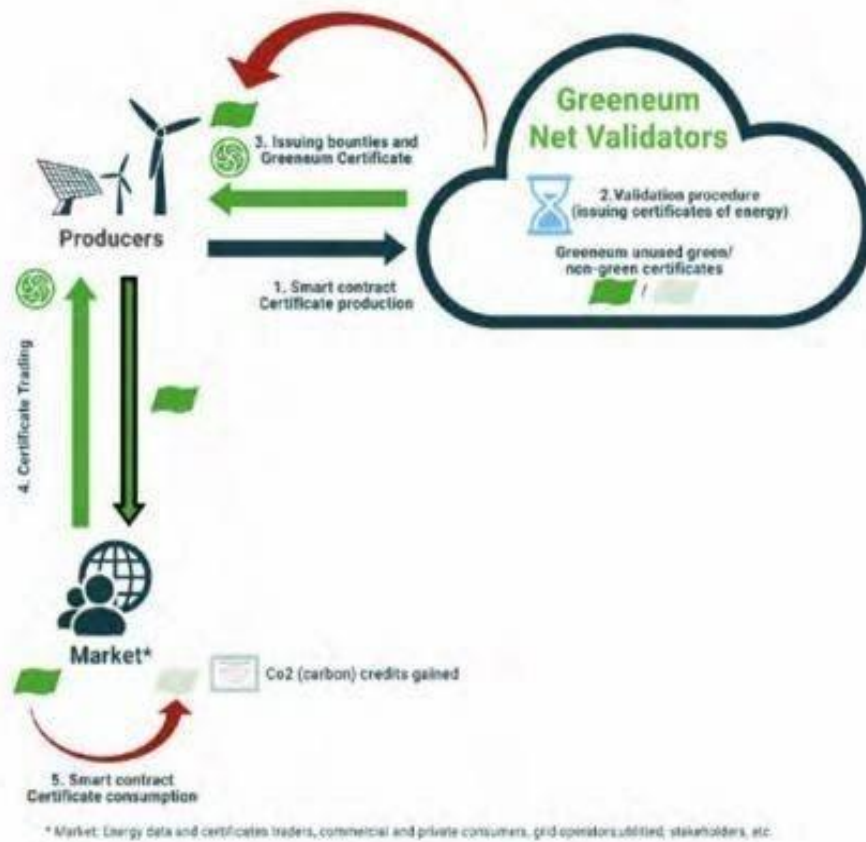
Figure 9: Used and unused EcoGain Certificate (GC) flow diagram.

4.3.2. EcoGain Network AI

EcoGain Network AI is a part of the EcoGain network that uses advanced AI technology that helps ECOG energy producers to balance between the demand and supply of energy while enabling the optimization of production, consumption, distribution, storage, and transmission of energy.

AI and Machine Learning are used to predict energy production and consumption patterns. In this model producers of energy are able to purchase intelligent analytics pertaining to energy usage. Producers and consumers can use the energy management tool to optimize their consumption behavior.
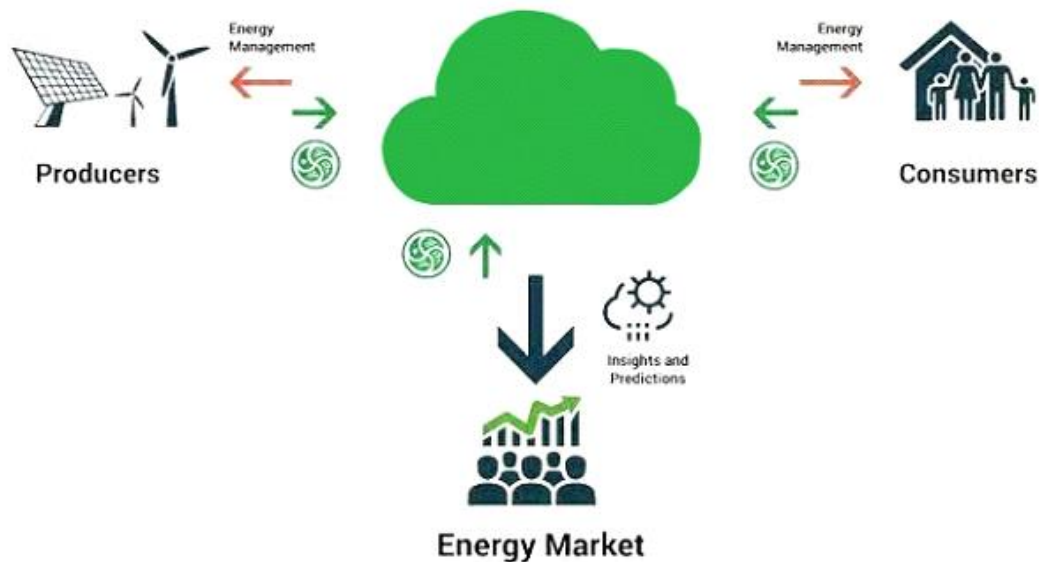
Figure 10: General flow diagram of EcoGain AI.

ECOG Tokens holders are able to purchase additional AI and energy management services, this process allows for a greater balance of supply and demand in order to optimize energy assets and electricity networks. EcoGain will develop interfaces for external AI providers to improve energy management and network efficiency.

An example of solar energy prediction is shown in Figure 11. The EcoGain AI Algorithm can yield above 95% accuracy without the need for any radiation maps, instead using skymaps

and sophisticated, reliable, and secure machine learning algorithms. These algorithms are based on statistical models allowing energy validation and prediction for a typical producer and consumer. Additional information about the algorithm will be published in the technical report and media channels.
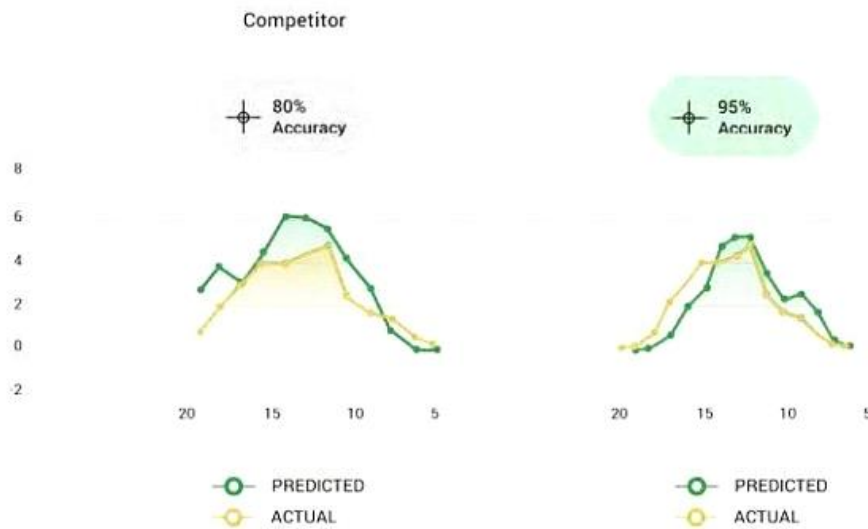
Figure 10: Comparison between a competitor (left) and EcoGain predictions algorithm for solar energy production. An accuracy of above 95% is achieved using EcoGain patented and verified algorithms.

4.3.3. Personal Energy Management

EcoGain's machine learning algorithms, together with the network signals and nodes are used for optimization. Energy producers can use these features to optimize their energy and storage

management to increase asset efficiencies. By sharing their consumption data, energy consumers are capable of automating their energy management and receive advice on how to reduce their consumption. Some of these services will be included as premium services on the EcoGain Platform and will only be purchased with EcoGain token, increasing its demand.

4.3.4. Grid Optimization

EcoGain's machine learning algorithms serve not only to perform validation of the recorded data based on history and local surrounding statistics. The main result of EcoGain Network data processing is to generate accurate predictions about the supply and demand on the electrical grid as well as other grid parameters and KPI's. Enabling every grid component to be optimized.
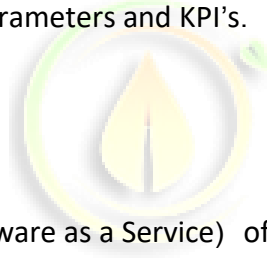
EcoGain's D-SaaS (Decentralized Software as a Service) offers a robust solution for optimization and management of micro grids and utilities. The platform allows to trade energy in the marketplace using VPP (Virtual Power Plant) software.

4.3.5. EcoGain Additional Technology

Apart from EcoPET, EcoGain is working on further customizing PET (Proof of Energy Transaction) for all other types of energy sources. EcoPET is being worked upon and will soon be released into the market. EcoGain is also offering D-SaaS, SaaS, and PaaS to various affiliates in the network.

Affiliates of EcoGain network include ECOG energy producers and consumers, grid operators, real estate asset owners, local municipalities, etc."

4.3.6 ECOGAIN Affiliates

An affiliate is a valuable member of the EcoGain network. Any of the following can become an affiliate member of EcoGain-

·   Grid operators

·   ECOG energy activists

·   Companies that produce renewable energy

·   ECOG energy distributors

·   Organizations, cooperatives, and NGOs

·   Private and public entities

·   Governments- local and state

What Does an Affiliate Do? What are the Advantages?

Ø Affiliates can bring investors to the EcoGain network and earn up to 2% commission of the invested capital.

Ø Affiliates can bring more producers and users to the network and earn up to 2% of the ECOG Tokens issued to the producers of ECOG energy.

Ø Affiliates can identify potential ECOG energy projects (solar, wind, etc.) and help them connect with the investors in the EcoGain network to earn up to 2% as commission of the total invested capital.

Ø Affiliates can bring new users, who use renewable energy and get 1% commission of their first transaction volume,

Ø Affiliates can get 10% commission of the Mwh produced (for the first year) when they bring new producers of solar energy and help them connect to the EcoGain network through EcoPETs.

The more people and projects an affiliate can bring to the network, the more the benefits they can reap while doing their bit to reduce carbon footprint and promote renewable energy.

4.4 EcoGain Energy Trading system*

In the EcoGain energy trading system, all energy producers can be nodes on the network, this includes major and national energy suppliers and private households. All nodes are equal players while transmitting energy and receiving EcoGain payment.

The grid operator and/or utility company enables transportation and distribution of the electricity on the grid; In addition, it may or may not serve as an energy producer.

Validator nodes are any nodes on the Blockchain that execute the validation of the energy production. The validation includes profiling whether the energy source is ECOG, as well as validating the energy amount.

The contract for participating in EcoGain Energy Trading is signed between the producer and consumer. ECOG energy producers are able to receive incentives for producing validated ECOG energy. The producers and grid operators receive transaction fees on every transaction on the grid for supporting the process and allowing the distribution of electricity. Transaction fees are built into the energy pricing on the market.

The energy-token consumption and production flow diagrams are depicted in **Figure 12** below and shows the energy trading model. In this network, the Producers/Prosumers can produce energy that is verified through the EcoGain network distributed AI algorithm. The price for different types of energy is determined by the market conditions (demand and supply, weather, etc.). On the other side of the network are the consumers who are able to trade EcoGain for energy and receive ECOG NFT and carbon credits. EcoGain NFT are used to label energy transactions, accumulate carbon credits and to track available (ECOG and non-ECOG) energy in a physical grid.
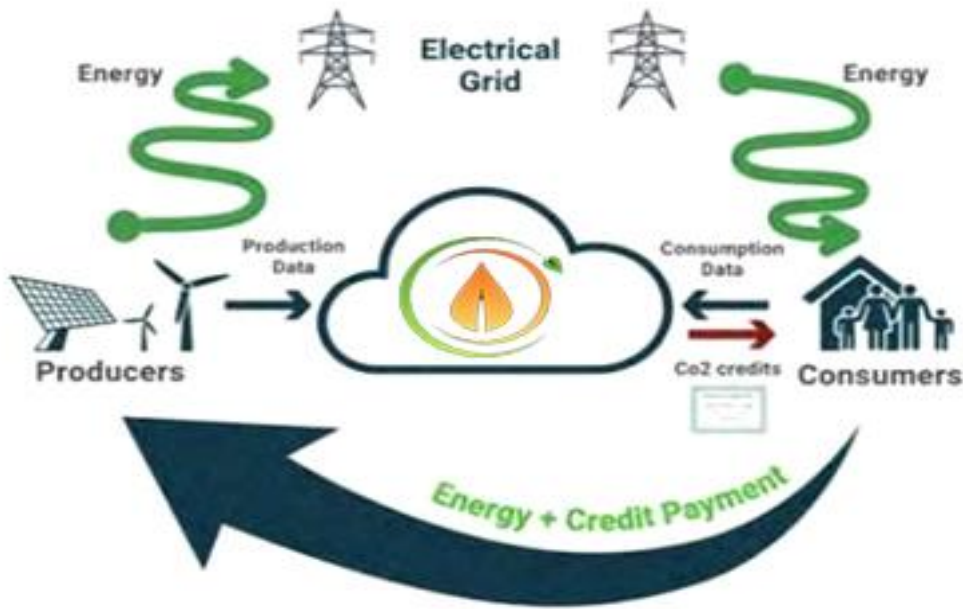
Figure 12: General outline of EcoGain energy trading flow.

4.4.1. Rewarding $ECOG

Consumers will be rewarded for saving energy (negative energy). That will help to optimize the energy network and reduce/increase consumption according to the available energy in the network. The amount of ECOG reward will be proportional to the amount of energy which was saved.

4.4.2 P2P Energy Payment System

Energy trading takes place on the electrical grid. Periodic calculations of the production and consumption conclude the amount generated by EcoGain users as well as the amount consumed by EcoGain users, and a split of payment is generated. EcoGain tokens are being transferred directly from the consumer's EcoGain wallet to the Producers EcoGain wallets, according to that split.

The utility acts as a producer in the case where the energy consumption of EcoGain consumers is higher than production, and as a consumer when the situation is in the reverse.

The EcoGain tokens are bought from the EcoGain token holders by the consumers. This can be done through an atomatic backend exchange.
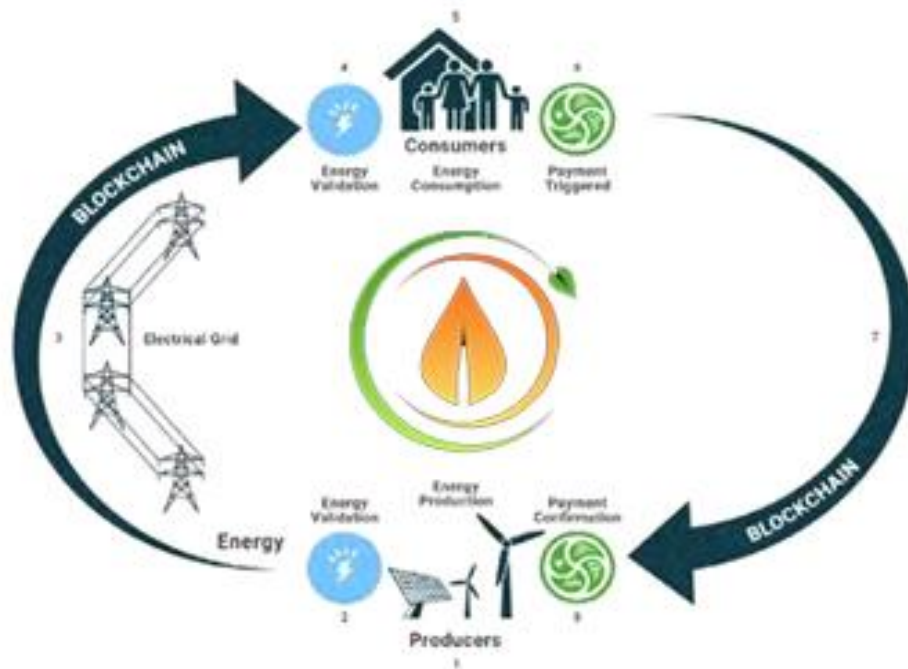
Figure 13: Flow diagram of p2p energy trading (production and consumption processes).

4.4.3 Additional energy trading models

In addition to the energy trading system described above, two additional energy trading models are possible on the EcoGain energy trading platform.

• Commercial energy trading between end users, consumers, and producers has been fully described. Energy companies also trade energy among themselves. The EcoGain energy trading system enables such trading as well, where the specific contracts and trading models will be defined and adjusted according to the specific cases and needs.

• Personal P2P energy trading: The general EcoGain P2P energy system is a community contract between all participating members on the same electrical grid. Consumers are getting ECOG electricity continuously without any extra effort and producers are selling their energy without having to look for a specific buyer. In addition to that, the EcoGain system enables a personal and confidential contract between specific consumers and producers selecting each other from the network. The details of the contract such as duration and prices will be determined between the two parties. More implementation notes will be available in the future.

4.4.4. Demand Response

Demand response is a temporary measure to meet grid peaking capacity requirements. Purchasing peaking power can be expensive on the wholesale market because of the difficulty to satisfy demand. Lately, utilities are seeking to automate demand response processes and offer their industrial, commercial and residential customers value-added services within their demand-side management programs.

Since demand response is a form of power generation, it can be used as a cost-effective way to reduce the need to purchase expensive wholesale power from inefficient forms of peaking generation.

Utilities are also increasingly relying on demand response tools, such as the Siemens Demand Response Management System (DRMS), for their cost- effectiveness and relatively short implementation times.

By integrating EcoGain's energy prediction software with the Distributed Energy Resource Management System (DERMS), energy producers can make accurate hourly predictions of energy production.

4.5. Mathematical Overview

Energy optimization problems are often-due to their underlying technical and physical processes- nonlinear and nonconvex, and some of the control decisions are of discrete nature. An appropriate mathematical modelling leads to large mixed- integer nonconvex problems which usually cannot be solved by standard solvers. Uncertainty regarding supply and demand is another challenge that has to be taken into account. For foresighted decision support we develop forecast models for supply and demands. Moreover, the behavior of other market participants may also have an impact. Therefore, models feature both stochastic and game- theoretic components.

In this section we introduce the mathematical calculations for the energy trading flow. Energy trading is done per the local electrical grid. Total transmitted and consumed energy are calculated periodically for the specific grid, and includes the total volumes of all EcoGain users on that grid.

4.5.1. Producers payment

The periodic payment for the producer is a function of the electricity transmitted to the grid, the type of energy, and the times of transmission, where every energy type has different market prices in different hours. Without loss of generality, we refer to the higher resolution of continuous data, where the transmission can be constant over periods of time, when the data resolution is lower.

For Grid G, such that Producer P is connected to grid G:

$$P.Epay[period] = \int_{period} P.Eamount(t) * G.Eprice(type, t)dt \quad (3)$$

where is the energy type produced by the producer. We assume here for simplicity that each producer produces a single type of energy, if this is not the case, a sum over the different types is applied to the equation.
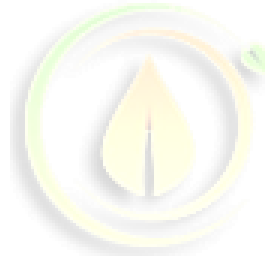
4.5.2. Consumer payment

The periodic payment to be paid by the consumers is calculated based on their own consumption during the period and the total production on the grid for that period. Since different energy types have different prices in different times, the relative amounts are needed.

Total production on grid G, for time t, per energy type

$$G.Eamount(type, t) = \sum_{P||P \in G, P.Etype=type} P.Eamount(t) \quad (4)$$

We assume that the total production of EcoGain users equal the total consumption of EcoGain users, where Grid operator serves as a producer or consumer in the case of inequalities. So that

is also the total consumption of energy of that type for that time. The entire electricity in the grid for time

$$G.Eamount(t) = \sum_{types} G.Eamount(type, t) \quad (5)$$

Where the sum is over the different energy types.

And the amount for each consumer for a specific type is calculated evenly by the proportion of that type in the grid for that time

$$C.Eamount(type, t) = \frac{G.Eamount(type, t)}{G.Eamount(t)} * C.Eamount(t) \quad (6)$$

The consumer payment equation for period is then

$$C.Epay[period] = \sum_{types} [\int_{period} C.Eamount(type, t) * G.Eprice(type, t)dt] \quad (7)$$

With this we generate a report for each consumer, with details about the periodic consumption cut to different energy types used over the period, with the average relative payments.

5. EcoGain Team

The co-founders of EcoGain (EcoGain.io) are also the co-founders of GreenGain (greengain.co.il) but these are two independent projects that complete and support each other.

EcoGain team, mentors and advisors are a collection of experts in a variety of areas such as smart contracts and Solidity, different Blockchain environments, IOT for renewable energy engineering, data science, machine learning and AI.

EcoGain team welcomes to the Network all community members to support and benefit from our mission.   The development activities and communication channels will be managed from Telegram and EcoGain website.   All three co-founders are experienced and passionate entrepreneurs.

•   **Saimon Gelfer** (CEO) A passionate leader with first class communication skills and a long track record of successfully management.   Sam is educated to a very high level, with extensive knowledge of all current economic, social and regulatory issues.   An inspiring and motivational manager with first-rate interpersonal skills and the ability and passion to develop the vision of any company he manages. He is able to push performance improvement whilst at the same time delivering growth.   Possessing vast managing directorship and CEO experience he will always ensure that clear objectives and expectations are delivered and maintained. With experience of 20 years in Developing new markets Cutting costs Relationship management General management Business Plans International Business development Financial acumen Increasing sales

•   **James Miller(CTO)** as Partner in firm after merger, initially chartered to manage client relationships.   Within 3 months assumed oversight of IT and Technology Group, with full responsibility for technical direction and strategy for company and its clients.   Stepped into Acting Finance Director role after departure of CFO, with additional responsibility for operations

and HR. Reporting directly to Board of Directors, oversaw $5M operating budget and staff of 25.

Worked closely with CTOs/CIOs of client companies.

Core Team members

- Nidal ahmad   Accountant
- Hanns joger   ENGINEERING
- Deepz CR   Blockchain Specialist
- Vinumon   Full Stack Developer
- Gary Hemington   Marketing Adviser
- Sara roskilde   Digital Marketing
- Dorian Jean   Digital Marketing
- Tareq Alsarraf   Adviser

All of EcoGain's team members who are listed above are passionate in renewable energy and blockchain technologies. Our advisory board and team of experts include known Blockchain experts and leaders, such as the team at wings. ai, Virtual Growth and more. During this time, we have developed and tested some of the product, learned to integrate and validate energy data and worked with key players from the energy space. New experts and supporters are joining our team and an updated list can be found in our website (EcoGain.io). Full bios can be found also in LinkedIn or given by request.

6. EcoGain ECOG Tokens

EcoGain platform allows the members of the network to own and trade EcoGain tokens at our global marketplace. Contributors can purchase EcoGain tokens and support the development and deployment of EcoGain platform. The details about the ICO tokens distribution and funds usage is detailed in this chapter.

6.1 EcoGain Tokens

Full Name	**Eco Gain**
Symbol	**ECOG**
Decimal	**18**
Network	**Binance Smart Chain**
Total Supply	**10,000,000,000 $ECOG**
Transaction Fee	**0 (No Tax)**
Contract	**coming soon…**

TOKEN ALLOCATIONS

25%
Seed Round - 5%
Private Sale - 15%
Public Sale - 5%

25%
Exchange listing - 20%
Company Reserve - 5%

15%
Liquidity & Reserve

5%
Advisors

20%
Team - 10%
Ecosystem - 10%

10%
Stacking, Marketing
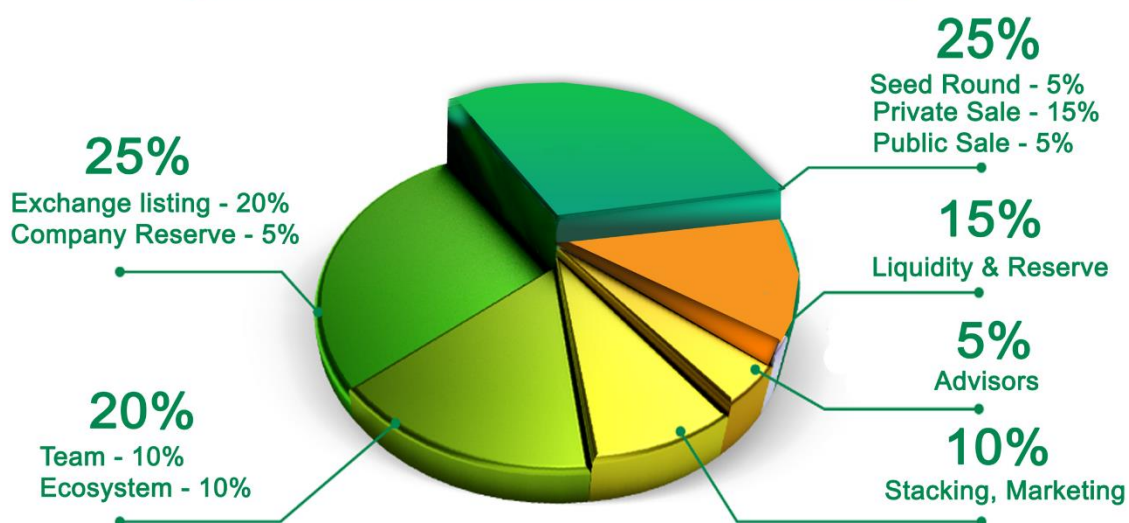
$ECOG PRIVATE SALE PRICE LIST

ALLOCATION	Token Allocation	Selling Price	Fund Raise	TGE % of Token Supply	Vesting Period(M)	Vesting Release
Seed Round	500,000,000	$0.0040	$2,000,000.00	20%	5	Monthly
Private Round 1	300,000,000	$0.0055	$1,650,000.00	20%	5	Monthly
Private Round 2	300,000,000	$0.0060	$1,800,000.00	20%	5	Monthly
Private Round 3	300,000,000	$0.0065	$1,950,000.00	20%	5	Monthly
Private Round 4	300,000,000	$0.0070	$2,100,000.00	20%	5	Monthly
Private Round 5	300,000,000	$0.0080	$2,400,000.00	20%	5	Monthly
Public Sale	500,000,000	$0.0100	$5,000,000.00	100%	0	-

TOTAL	$16,900,000.00

Private sale: 25% allocation of the token supply that will be offered for sale to the public.

Investors can buy $ECOG before price increase on each stage.   Unlock on Token Generation
Event.

$ECOG TOKEN VESTING SCHEDULE

ALLOCATION	ALLOCATION TOKEN	% OF TOTAL SUPPLY	TGE % OF TOKEN SUPPLY	CLIFF (M)	VESTING PERIOD (M)	VESTING RELEASE POST CLIFF
Seed Round	500,000,000	5%	20%	0	5	Monthly
Private Sale	1,500,000,000	15%	20%	0	5	Monthly
Public Sale	500,000,000	5%	100%	0	0	-
Liquidity	15,000,000,000	15%	70%	0	0	-
Stacking	1,000,000,000	10%	0%	0	0	Varies
Ecosystem	1,000,000,000	10%	0%	6	36	Varies
Exchanges	25,000,000,000	25%	0%	0	0	Varies
Advisors	500,000,000	5%	0%	6	48	Quaterly
Team	1,000,000,000	10%	0%	12	48	Quaterly
TOTAL	10,000,000,000	100 %				

EcoGain will issue $ECOG Tokens to the global supporters and members in the network.   A
complete listing of the token allocation will be publicly available very soon.

EcoGain will be an Binance-based token of utility and value. Tokens are a digital asset, bearing value by themselves based on their underlying assets, properties and/or rights. ECOG Tokens are used to get access to the EcoGain platform and purchase different services such as energy management, forecasting system, CO2 credits, ECOG NFT, etc. The token will allow global distributed trade for all energy stakeholders and will incentivize the transition to renewable energy.

Binance was selected as the platform for the token as it enables us to easily create very complex systems with very little entry costs. Binance based tokens rely on the well-established Binance infrastructure, benefiting from accessibility:

• Security and predictability compared to building and running an independent blockchain network

• Use of robust and well supported clients (Binance- based token can be managed with official Binance clients)

• High liquidity (interchangeable with other Binance- based tokens or Ether)

• Easier listing on exchanges with infrastructure already in place

• Binance smart contracts enable a very transparent and secure way of profit sharing among the token holders.

• Machine learning and AI are integrated to reliably create, maintain and trade energy and renewable data and for energy network optimization.
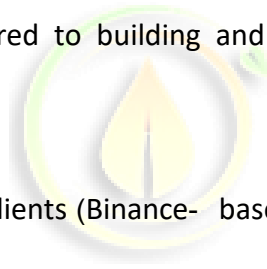
The team is constantly working on creating a better platform using blockchain technology. New developments will be regularly made and the platform will be upgraded to offer the best to the members. For example, should a new platform have more advantages for EcoGain, it is possible in the future these could be used in place of the Binance network. This would of course be after much consideration, vetting and community input.

6.2 ECOG Tokens

EcoGain NFT can be exchanged to buy ECOG Tokens in the marketplace. ECOG Tokens are similar to BTC and are created on BEP20 of Binance blockchain. ERC-721 framework refers to non-fungible tokens (NFT).

NFTs are a type of crypto asset which is not interchangeable with each other and brings scarcity to the digital world. All fiat currencies are fungible. (In simple terms, a dollar can be interchanged with another dollar).

ECOG Tokens are created and allotted to the owners on the blockchain using decentralized apps. They can be sold and bought (transaction) on the platform but cannot be interchanged with one another. ECOG Tokens can be used in the ECOGAIN global marketplace to make various purchases.

6.3 Connecting Different Blockchain Technologies

A fast blockchain alone is not enough to develop decentralized apps. It requires supporting infrastructure to make the blockchain network usable and accessible by members in the network.

EOS.IO is open-source software by Block.one that provides the basic infrastructure to developers who can further build on it as per their requirements.

EcoGain uses one such software to include storage, query services, and APIs as a part of the blockchain network. From storing the information of affiliates to facilitating them in exchanging information, connecting their systems with EcoGain products using APIs, EOS.IO protocol is used to support the process.

6.4 Atomic Swaps and ECOG Tokens Trading

Cryptocurrency is created for specific blockchain and cannot be traded with another cryptocurrency as they are not compatible. While this has been a drawback of a blockchain, experts are intent on finding a solution.

Atomic Swaps can be termed as one such solution. Known as an atomic cross-chain swap, this is a method to trade one type of crypto with another while eliminating the risks caused due to market volatility.

EcoGain uses Binance blockchain to create and trade ECOG Tokens. Atomic Swaps has been used to help members in the network who want to exchange ECOG Tokens for other cryptocurrencies. Atomic Swaps donot need any third-party entity. It directly allows P2P transactions for producers to trade ECOG NFT, Carbon Credits, and ECOG Tokens in our marketplace.

Binance blockchain has the specified requirements (Raiden) which support Atomic Swaps and allows members to exchange and trade ECOG Tokens. Atomic Swap between EOS and BSCblockchains is possible and is also being used by a decentralized crypto exchange.

In the same way, EcoGain also allows producers who own ECOG Tokens to exchange them for other cryptocurrencies or to make purchases in the global marketplace. ECOGAIN believes in staying up to date and constantly upgrading the network with the latest developments to ensure the best for the various producers, prosumers, users, investors, and others in the EcoGain network.

Summary

EcoGain is a distributed and decentralized platform that contains different services for energy market stakeholders worldwide. EcoGain leverages cutting edge disruptive technology, including blockchain and machine learning, to create an unparalleled reliable, comprehensive and potentially unlimited data and energy trading platform. EcoGain technology is powering the energy market's transition from a centralized and non-renewable approach to a distributed and a sustainable model which will allow for continued economic and technological growth.

EcoGain will work with leading energy information and monitoring partners on energy, protocols for data transmission, security, and integrity. Partners will be used to reach as many consumers as possible for the network. We are in discussions with partners at this time and will be releasing public notifications as details are finalized. Part of our strategy includes a business development team tasked with analyzing and penetrating the various world energy markets.

The EcoGain token is used to get access to the EcoGain network to trade for energy, data, products and services. Energy producers around the world will be more incentivized and could trade their energy P2P with consumers. Consumers, private, and public companies (or other entities) could reduce their carbon footprint using the EcoGain certificate system.

EcoGain's architecture and design is not only global, anonymous, and secure but also can be customized to different markets and use cases. Therefore, the EcoGain solution can overcome regulation issues, price fluctuations and security issues to create a more stable energy market. EcoGain is the ultimate global answer to energy security issues in the age where cyber-attacks can completely paralyze a market or a country.

Utility companies, grid operators, and users alike can obtain real time energy tracking while global trade markets can benefit from such accurate and real time data. Smart predictions, insights and forecasts will be taken to a new level with our proprietary technology.

EcoGain has a global ECOG community that is acting to create a clean energy market, a global ECOG community, a global energy data platform, energy market distribution and democracy energy security and pseudonymity. Ultimately, through the EcoGain platform, stakeholders in the energy marketplace will be able to drive efficiencies, save millions and impact the global renewable energy marketplace.

Future usability of the EcoGain network for the different needs in the energy market will be published at the media channels and coming white papers of EcoGain Network.

We invite everyone interested in helping with this project to get involved on our Telegram chat or social media. In the coming days we will be releasing more detailed information regarding our token sale and advise everyone to stay posted for updates.

Nature and our planet's ecological systems have no borders, walls, or Visas. Not only are our economic systems highly dependent on each other but we share the same natural resources, breath the same air, enjoy the same Sun, drink from the same water, and eat from the same soil.

EcoGain develops a sustainable ecosystem that will guarantee that future generations will have the resources they need and human society has the tools to coexist with our environment.

EcoGain is suggesting a ECOG revolution using the BlockChain technology and financial drive.

7 List of Figures

8 List of Tables

9 References

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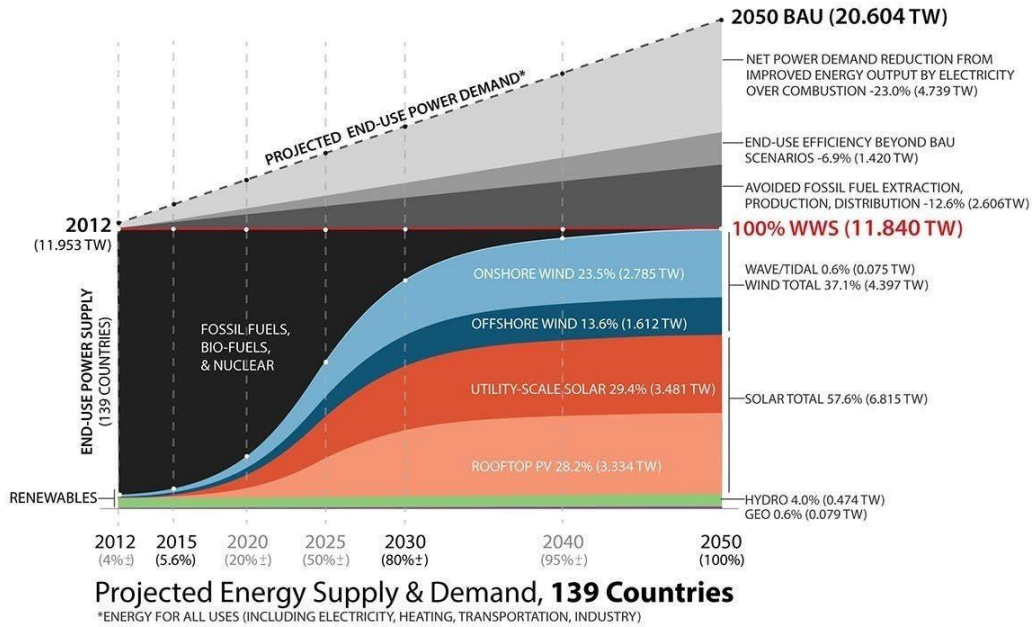
Figure A2: Energy Trends in the California (Top) and 100% ECOG USA scenario (Bot).

14 https://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf

Under a 100% renewable scenario based on these numbers, millions of jobs would be created. Consider that 3.9 million construction jobs and 2 million operational jobs at renewable energy plants would outpace 3.9 million jobs lost from the traditional energy sectors.

30.9% onshore wind

19.1% offshore wind

30.7% utility-scale solar photovoltaics (PV)

7.2% rooftop PV

7.3% concentrated solar power (CSP) with storage

1.25% geothermal

0.37% tidal/wave

3.01% hydroelectricity
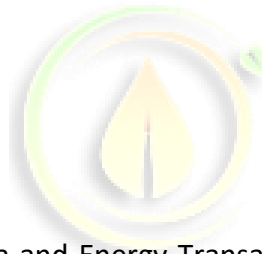
Appendix

Detailed proposed procedure of Data and Energy Transaction on the EcoGain Network. Note that actual trading of energy is subject to local regulations and will not be available to all jurisdictions until regulations are updated. ECOG incentive and Data trading will be available globally unless prohibited.

B.1.1. Data Transaction Reporting Production/Consumption:

1. Produced/Consumed electricity data is sent to EcoGain global blockchain for validation.

2. If validation is accepted:

    a. Sender receives EcoGain Data Bounty for publishing their energy data.

    b. If validated as ECOG the producer receives EcoGain NFT, which can be traded for ECOG Tokens.

      c. Validators pay EcoGain validation fee.

3. If validation rejected:

      a. System/account is being checked.

      b. Validators receive EcoGain validation fee.

B.1.2. Collecting Production Data

There are several ways for data to be collected, each with different time resolution and accuracy confidence, and each will receive a varying EcoGain data bounty.   The main three levels are:

1. System registration -   with proved parameters of Address, Type, Capacity.

   In this level production is estimated and payments are the lowest.

2. Inverter data -   according to device.

   This is near real time true production values and rewarded higher.

3. EcoGain IoT -   recording additional live environmental parameters.

   This level has highest confidence and data resolution and will grant maximum EcoGain tokens.

B.1.3. Collecting Consumption Data

There are several ways for data to be collected, each with different time resolution and accuracy confidence.   The main three levels are:

Monthly bill - with lowest resolution and lowest EcoGain payments.

Smart meter - enabling consumer rewards for smart energy decisions, see Rewarding $ECOG section

EcoGain IoT - enabling energy data and bounties for energy information

B.2.1. Energy Consumption Transaction

1. Electricity is consumed from the electrical grid.

2. Consumed electricity is sent to the Blockchain consumption smart contract for validation.

3. If validation is accepted:

   a. Consumers pay EcoGain electricity payment for the electricity.

   b. Consumer receives the EcoGain Certificate profiling different types of energy usage and gains EcoGain carbon credits.

   c. Utility receives EcoGain distribution and service fee.

   d. Validators receive EcoGain tx fee.

4. If validation is rejected:

5. Consumer's account is being checked.

6. Validators receive EcoGain tx fee.

B.2.2. Energy Production Transaction

1. Electricity produced on the energy grid

2. Produced electricity data is sent to the blockchain for validation.

3. If validation is accepted:

Producer receives EcoGain electricity payment for the electricity.

Producer receives EcoGain Data Bounty for publishing the data.

If validated accepted as ECOG - Producer receives EcoGain payment for their certified ECOG

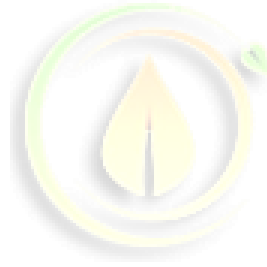energy, and a copy of the EcoGain Certificate, which was sold to the consumers.

Utility receives EcoGain distribution and service fee.

Validators receive EcoGain validation fee.

4. If validation is rejected:

Producer's system is being checked.

Validators receive EcoGain validation fee.

DISCLAIMER