# Solareum

## A peer-to-peer renewable energy system

## Litepaper

MichaelNLcrypto
michaelnlcrypto@gmail.com

# Solareum: A peer-to-peer renewable energy system

Abstract: A renewable energy generation-based blockchain and a decentralized network of producers and consumers can trade renewable energy peer-to-peer on a decentralized renewable energy marketplace without intermediaries. It would allow renewable energy to be generated, used, stored, distributed, governed, and monetized in a trustless way. The decentralized renewable energy marketplace powered by smart contracts ensures that transactions are secure, transparent, and automatic. Consumers can use their coins to purchase renewable energy from the producers and transfer it automatically from their accounts to the producer's account. The marketplace allows consumers to choose the type of renewable energy they want to purchase, and they can even determine the producers' location. Producers' and consumers' dependencies on governments, energy companies, and energy network operators regarding renewable energy to meet their basic needs will be less. Instead, they are enabled and incentivized to work towards energy self-sufficiency and independence. By removing the necessity for centralized entities and intermediaries, a trustless and tamperproof renewable energy system can be created, which can be executed peer-to-peer and autonomously utilizing blockchain technology.

MichaelNLcrypto
michaelnlcrypto@gmail.com

*Solareum has come into existence to end the manipulation of energy markets. Centralized entities are trying to control forces that they do not fully control. Meanwhile, producers and consumers face the consequences of being squeezed on extortionate energy bills. The time has come to introduce a decentralized peer-to-peer renewable energy system without intermediaries to ensure that renewable energy can be, generated, used, traded, stored, distributed, governed, and monetized in a trustless way.*

*Solareum believes that ownership, control, and exploitation of renewable energy should not be fully in control of centralized entities but should be in control of producers and consumers. Energy is a basic necessity of life with an ever-growing demand as time elapses and technology evolves.*

*With exponentially rising energy costs, consumers can hardly pay their energy bills and make ends meet. Producers are struggling, trying to stay profitable, and see astronomical energy costs destroying their lives and works in front of their eyes. A world where producers and consumers are in the process of stagnation and decline will lead to a future catastrophe unfolding.*

*Most of the problems can attribute to geopolitical power plays, which resulted in an energy crisis of epic proportions, continuing until today. The problems are caused by centralized entities desperately trying to find solutions for problems they have created themselves in the first place.*

*No short-term improvement of the situation is in sight, and there are no guarantees that this situation will not persist or will repeat. More and more producers and consumers are getting in trouble. The time has come for a structural solution by introducing a decentralized peer-to-peer renewable energy system and a decentralized renewable energy marketplace.*

*We will take back control before these centralized entities offer a solution that keeps us in control again. Let us build towards a more transparent, efficient, cleaner, more sustainable future with a renewable energy system that's built for the benefit of all and serves the social interest.*

# Content

# Introduction

A renewable energy generation-based blockchain and a decentralized network of producers and consumers can trade renewable energy peer-to-peer on a decentralized renewable energy marketplace without intermediaries. It would allow renewable energy to be generated, used, stored, distributed, governed, and monetized in a trustless way. The decentralized renewable energy marketplace powered by smart contracts ensures that transactions are secure, transparent, and automatic. Consumers can use their coins to purchase renewable energy from the producers and transfer it automatically from their accounts to the producer's account. The marketplace allows consumers to choose the type of renewable energy they want to purchase, and they can even determine the producers' location. Producers' and consumers' dependencies on governments, energy companies, and energy network operators regarding renewable energy to meet their basic needs will be less. Instead, they are enabled and incentivized to work towards energy self-sufficiency and independence. By removing the necessity for centralized entities and intermediaries, a trustless and tamperproof renewable energy system can be created, which can be executed peer-to-peer and autonomously utilizing blockchain technology.

Introducing consensus mechanisms and validator principles that suit and serve the systems' utility and the general social interest will lead to an autonomous and trustless system. The system should not require excessive energy usage as a driving mechanism like Bitcoin has with its Proof of Work (PoW), which is considered an environmentally unfriendly system. Neither should the system require excessive amounts of capital to be allocated as a driving mechanism to sustain itself as Ethereum has with its Proof of Stake (PoS) which is considered a non-inclusive system. The system should primarily require renewable energy generation as a driving mechanism for sustainability and is considered both environmentally friendly and inclusive. Because renewable energy generation is still in its infancy, in transition, the system should enable producers and consumers to be selected secondarily as a validator based on their holdings percentage of the native coin. By introducing a dual dynamic validation mechanism, the main driving mechanisms of the system based on renewable energy generation and holdings percentage of the cryptocurrency, the system is future-proof. A blockchain and decentralized peer-to-peer renewable energy marketplace that focuses on what the future brings will ultimately prevail.

With due observance of the principles described, we introduce the consensus mechanisms Proof of Generation (PoG) and Delegated Proof of Generation(DPoG). The validator mechanisms select nodes based on the amount of renewable energy generated and the holdings percentage of coins that producers and consumers are structurally owning and holding within the system. Since a system's adoption is crucial for success, the drive behind the system will contain several methods. A dual dynamic validation mechanism will enable a transition. As renewable energy generation validation increases, the share of validation through ownership decreases. The same rule applies to the vice versa situation. The dual dynamic validation system will act like a fall-back mechanism that automatically balances to ensure that validation capacity is always sufficient.

The future utility of the coin will be access to the renewable energy system, purchasing renewable energy on the decentralized renewable energy marketplace, and having access to its applications and peripheral systems. The utility will create additional incentives to hold the native coins within the system.

The principles, mechanisms, and incentives will drive and secure the system. The proposed system will contribute to a more sustainable, efficient, and transparent blockchain and energy system and will be a step of importance toward a cleaner, more sustainable future. The validator mechanisms select nodes by utilizing a random verifiable function (RVF) to ensure solely validators themselves know they are validators. It will drastically increase security and lower the possibility of attacks on nodes. The validator mechanism will feature an elastic validation principle, which means that the criteria to become a validator as a node increases as market capitalization decreases and, inversely, will decrease as market capitalization increases. It is comparable to the difficulty mechanisms implemented in other blockchains and will be used to keep the system accessible and inclusive.

There is implemented a weighting coefficient into the system for selecting validators. Generated renewable energy measured in Kilowatt hour (KwH) (2), holdings percentage of the total supply (1), and loyalty to the system (1) will be taken as input for selecting validators. In the case of the factor generated renewable energy measured in Kilowatt hour (KwH), a rule will apply that the more renewable energy generated, the more difficult it will become to mine coins within the system. The difficulty will reflect the other factors to ensure the competitiveness in mining methods stays in balance. The difficulty adjusts in epochs, which means it will happen with an increment of a yet-to-be-determined amount of blocks to ensure a predictable and steady pace of block generation within the blockchain, which results in a predictable mining process. The system will select nodes to validate based on two separate mining categories to ensure both producers and holders of the coin can become a validator and guarantees that one will not be outpacing or eliminating the other category in the future.

By creating these dynamics within the system, all network participants can earn even if they decide not to generate renewable energy. The main goal is to decentralize and tokenize renewable energy. The premise is rewarding users. Active system participants who secure the blockchain and contribute to a more sustainable energy system are rewarded additionally for their efforts. With energy being the system's primary utility and use case, which is, and always will be in demand, there is a valid reason for the system to exist now and in the future. A fee is charged based on best efforts to prevent spam, which serves as an extra incentive for individuals to run a node and validate within the blockchain. Validators will receive rewards for their work, which consist of rewards that come with validating blocks within the blockchain. Additionally, validators receive fees paid by system users when they validate individual transactions.

Before the blockchain and the peer-to-peer renewable energy system are delivered, receiving rewards will be based on producers and consumers holding the token on the Ethereum blockchain. Utility for the Ethereum blockchain project will be on a roadmap, developed and delivered, and will create incentives for the Ethereum token. Rewards within the Ethereum project phase will come from an auto-mining consensus protocol, which initiates and executes automatically by the Solidity contract. Initially, 60% of the total supply will exist, leaving 40% of the total supply to be auto-mined and rewarded to holders within the Solareum project. Holders will receive rewards proportionally according to the percentage of their holdings. The mining process will have similarities to the Bitcoin mining process and includes halving principles and tampering phases. The difference with the Bitcoins mining mechanism is that mining for this system completes within eighteen months instead of the year 2140. More detailed information is available in the chapter tokenomics of this lite paper. The auto-mining mechanisms and principles, in time, will transition to a system where generating renewable energy by producers, holding the native coin on the blockchain, and earning energy rewards by producers will be taken into the equation for determining who will be a validator and gets rewarded by the system.

In conclusion, the concept of a blockchain featuring environmentally friendly consensus mechanisms and inclusive dual validator principles based on renewable energy generation and structurally holding the token within the blockchain has to potential to revolutionize blockchain technology in general. The consensus in politics, businesses, and society is that energy from renewable origin is preferable and energy from fossil fuels is not.

A peer-to-peer decentralized renewable energy marketplace has the potential to revolutionize the energy industry and will create a more sustainable future. By utilizing blockchain technology, it is possible to create a decentralized network of renewable energy producers and consumers and a peer-to-peer marketplace for trading renewable energy. The concept benefits producers and consumers and contributes to a cleaner, more sustainable energy system. The peer-to-peer renewable energy system will offer several advantages over the traditional centralized energy system. It will be more transparent, as consumers will have direct information about their energy source. It will also be more secure, as blockchain technology ensures that transactions are tamperproof. It will be more sustainable, as it would incentivize the production of renewable energy and reduce the need for fossil fuels.

# The problem

Blockchain technology has been created to decentralize everything but has not yet worked out as envisioned and intended. While decentralization is the goal and is happening, we can conclude that centralization is shifting to other areas because of the way the technology initially has been designed and created. Blockchain technology has dependencies regarding energy usage or permanent allocation of capital. The dependencies manifest themselves when it comes to securing the system, incentivizing participants, and is used to reward participants for support. Participants support the system by running a node, which allows them to validate transactions and blocks within the system. Validating transactions and blocks results in participants receiving mining rewards in the form of coins and securing the system by validating. System users pay fees in transactions distributed to participants validating.

Validation and mining processes based on energy usage and permanent capital allocation require more and more energy usage and capital allocation to sustain the system. The general approaches and rules are that the more energy gets used or the more capital allocated by participants, the more validation power and capacity a participant has, and the more rewards received by those individual participants. The approaches are detrimental to the environment and are non-inclusive when looking at it from a participant's perspective. Traditional energy and capital systems and markets are susceptible to manipulation by centralized entities, resulting in the creation of a system being dependent on these centralized entities. It makes the current systems unreliable for supporting, validating, and securing them. Traditional energy and capital systems are centralized because of the way they are created at their cores and controlled by central entities. Energy from fossil fuels still is the most important source of generation and is detrimental to the environment. We need to use fossil fuels for better purposes, given their scarcity. We are wasting precious resources in unnecessary ways. The traditional energy system has its limits to the amount of energy it effectively delivers because of infrastructural reasons. Demand keeps increasing because of technological advancement.

The traditional energy system is not easily scalable and extendable because it mainly resides underground. We should not burden the infrastructure when it is not necessary. Centralized energy systems are outdated and do not offer the capabilities that decentralized renewable energy system offer. For example: "Decentralized generation, distribution, management, governance, sharing, exchanging, trading, or monetizing renewable energy generation by individuals." Centralized traditional energy systems do not offer capabilities to capitalize and monetize renewable energy-generated revenue without going through centralized systems and are not spendable for other services and goods at will. The result is that producers and consumers of renewable energy have excess supply and need to deliver back to the traditional energy system. Producers and consumers face imposed settlements and taxes, cannot be influenced, and are forced upon them and created by these centralized entities.

Instead of delivering back to the traditional fossil fuel energy-based system, they could validate the Solareum blockchain with it to generate revenue. This revenue does not have to go through centralized systems of centralized entities.

- Blockchain technology is dependent on energy usage and permanent capital allocation for securing the system and for incentivizing participants to support;

- Blockchain technology stimulates the centralization of energy usage and permanent capital allocation because of these dependencies and incentives;

- Participants within blockchains support and secure blockchains by becoming a node, which results in participants becoming a validator within the system. Participants are validating transactions and blocks by energy usage or by permanently allocating capital;

- Traditional energy and capital systems and markets are susceptible to manipulation by centralized entities, which results in making blockchain technology and blockchains indirectly dependent on these centralized entities;

- Due to the traditional energy and capital systems and markets being susceptible to manipulation, utilizing centralized systems based on energy usage or permanent allocation of capital is an inherently unreliable method for supporting, validating, and securing a system;

- The currently existing traditional energy and monetary system are based on a monopolistic and centralized structure regarding capital and energy supply, generation, distribution, management, governance, and monetization;

- The traditional energy system is mainly based on creating energy out of fossil origin, which is detrimental to the environment. We can use fossil fuels for better purposes, given their scarcity.

- The traditional energy system has its limits in regards to the amount of energy it can deliver because of infrastructural reasons and faces an ever-growing demand;

- The traditional energy systems' infrastructure is not easily scalable or extendable because it is mainly residing underground;

- It is not possible to share, exchange, trade, or monetize generated renewable energy in a decentralized way within the traditional energy system;

- Revenue generated out of generating renewable energy cannot be capitalized on without going through centralized systems and are not spendable at will for other services and goods;

- Fossil fuel-based energy is prone to risks unable to be controlled by society. Prices of fossil fuels-based energy are susceptible to geopolitical stability and many other factors;

- In the case of generating renewable energy as an individual producer, having an excess supply of renewable energy, and delivering that energy back to the traditional energy system, producers are being faced with settlements and taxes which cannot be influenced and are being forced upon producers and consumers by these centralized entities;

- It is not possible to capitalize on renewable energy generation-based revenue without that revenue going through the centralized systems of these centralized entities;

# The solution

Solareum as an Ethereum token project
- o Tokenomics
  - Supply
  - Auto-mining and distribution
  - Halving principles
  - Compound interest
  - Taxes
- o Utility

Blockchain-agnostic solar farms

Blockchain-agnostic peripheral equipment
- o Solar panels and modules
- o Charging poles and modules
- o Energy storage units and modules

Microgrids

Peer-to-peer decentralized renewable energy marketplace

Solareum: Renewable energy generation-based blockchain
- o Solareum digital currency
- o Proof of Generation consensus mechanism
  - Transaction validation
  - Block validation
  - Block verification and confirmation
- o Delegated Proof of Generation consensus mechanism
  - Network, validators, and nodes
  - Network
  - Nodes
  - Dual validation mechanism
  - Elastic validation mechanism
  - Incentives
  - Rewards and fees
  - Auto-mining consensus
  - Conclusion

The lite paper summarizes the project's solutions to understand globally what the project is all about. A more extensive whitepaper will provide detailed explanations, process flow charts, and supporting documentation of all solutions. More information will follow after launching the project.

# Token allocations

Max supply: 100 million (SRM) (100% total)

       Initial supply allocation: 60 million (SRM) (60%)
       Auto-mining rewards: 40 million (SRM) (40%), distributed to holders

Initial supply allocation: 60 million (SRM) (60% of total supply)

       Total initial supply: 60 million (SRM) (100% on launch)

UNISwap: 15 million (SRM) (25%)
Private sale: 9 million (SRM) (15%), vested 40% initial, 60% within three weeks linear (daily)
Public sale: 15 million (SRM) (25%)
CEX/DEX: 6 million (SRM) (10%), vested 10% init. , 90% 12m linear (monthly)
Marketing & partnerships: 9 million (SRM) (15%), vested 10% initial, 90% 12m linear (monthly)
Team: 6 million (SRM) (10%), vested, 10% init. , 90% 12m linear (monthly)

Total circulating supply at launch: 20.700.000 (SRM):
 - 2.1 million Solareum-owned tokens for the benefit of CEX listings, marketing, partnerships, and rewarding team members are allocated and;
 - 18.6 million investor-owned tokens are allocated.

Total locked supply at launch: 39.300.000 (SRM):
 - 15.0 million tokens locked for creating an (SRM/ETH) liquidity pair and;
 - 18.9 million tokens locked for the benefit of CEX listings, marketing, and partnerships, the team of which 1.89 million tokens will be distributed to Solareum to the respective wallets monthly and;
 - 5.4 million tokens are locked to distribute tokens to private sale investors on a daily linear basis within three weeks.

The CEX/DEX (Central exchanges, Decentralized exchanges), marketing and partnerships, and team allocation wallets do not receive auto-mining rewards.

# Tokenomics

Initial supply: 60 million (SRM)
Auto-mining: 40 million (SRM)
Max supply: 100 million (SRM)

## Auto-mining consensus protocol and distribution

The auto-mining consensus protocol and distribution principles use rebase mechanisms in a predetermined controlled way to realize controlled supply expansion at a fixed rate. Introducing such an auto-mining consensus protocol results in a contract that rebases and distributes tokens at a fixed interval and enables the provision of APY to investors regardless of the trading volume. The rebase and distribution of mining rewards happens every 12 hours. After every 60-day interval, APY gets halved by the contract. The mechanism is comparable with bitcoins' halving events. The supply can only increase by rebase and not decrease by rebase, which programmatically is determined within the contract. The LP holder does not receive mining rewards. The reason for not letting the LP holder receive mining rewards is to keep the liquidity pool and base balanced. It will start with 25% of the initial supply as determined in the token allocations and end with 15% of the total supply because mining rewards do get distributed to other holders. The protocol features mechanisms similar to Bitcoins' halving principles. Mining rewards distribute to holders based on the percentage of their holdings. The contract initially pre-mines 60% of the total supply. By pre-mining, it can allocate for other purposes. The contract mines the remaining 40% tokens in a controlled way through the auto-mining consensus protocol within fixed intervals, a predetermined timespan, which halves APY automatically based on the protocol's logic. The protocol guarantees a token allocation for future project goals and growth. The protocol ensures that holders will not pay fees for receiving rewards and simultaneously provides a reward mechanism that is not dependent on volume.

## Halving principles

While the protocol enables the project to provide an even distribution of tokens within a predetermined time and at a predetermined rate, halving principles create scarcity as time elapses. At the beginning stage of the project, there will be a 500% APY, which halves every 60 days. At an APY of ~0.50%, all tokens are in circulation. It will take 540 days from launch to reach that APY. Mining rewards cease to exist, and utility has created new incentives for investors to hold.

## Compound interest

Because investors get distributed ongoing mining rewards, there is compound interest. The longer an investor holds more tokens an investor will accumulate, independent of volume. Holdings percentages will stay relatively the same because everyone shares equally in this distribution. In absolute terms, the investors will have more tokens. This approach creates APY and incentives for investors to hold.

# Taxes

Besides the mining rewards, a 5% tax will be charged on both buys and sells. For transferring, 0% tax gets charged. The tax consists of automatic liquidity-adding at 3% and development & marketing at 2% initially. The percentage can change based on the projects and their investors' needs. The solidity contract contains code that determines that the auto LP adding tax and the development & marketing tax combined can never exceed 5% but that the tax allocations can shift. For example (changing auto LP by adding tax to 4% and changing the development and marketing to 1% is allowed, respectively 4% and 2% are not allowed because then tax is > 5%). There is a flexible tax in a controlled and limited way. The auto LP-adding feature will ensure continued future growth for investors and allows big investors to enter as time elapses. When looking at it, the effective net tax applied that does not immediately but indirectly benefit investors is 2%. The proposed tax structure offers certainty and safety for investors and allows the project to leave the contract un-renounced while having flexibility. An un-renounced code contract is necessary because of the future utility.

Buy (5%)
3% to auto LP adding
2% to development and marketing

Sell (5%)
3% to auto LP adding
2% to development and marketing

Transfers (0%)

# Private sale

Solareum will execute a private sale for committed investors looking for longer-term investments. Solareum conducts a 100 ETH private sale capital raise, representing 15% of the initial supply. The private sale will offer a 17% discount compared to the public sale and launch price. At a later stage, Solareum will give participants additional perks on future services and products on top of this 17% private sale discount. Participants are bound to a vesting scheme. Initially, investors will have access to 40% of the private sale tokens deposited to the participants' wallets immediately following Solareums' launch. The remaining 60% gets deposited within the three weeks following on a daily linear basis.

Private sale details:

90,000 (SRM) = 1 ETH
Minimum Input: 0.1 ETH
Maximum Input: 2.5 ETH
Hard capitalization: 100 ETH

# Public sale

Solareum will execute a public sale for investors who aspire to be early adopters of the Solareum project. Solareum executes a 200 ETH capital raise. Investors are not bound to a vesting scheme like is the case with private sale investors, but in turn, will not be eligible for the discount of 17% and later to be announced additional perks.

Public sale details:

75,000 (SRM) = 1 ETH
Minimum Input: 0.1 ETH
Maximum Input: 2.5 ETH
Soft capitalization: 150 ETH
Hard capitalization: 200 ETH

# Conclusion

In conclusion, the concept of a blockchain featuring consensus mechanisms and validator principles based on renewable energy generation and a peer-to-peer decentralized renewable energy marketplace has the potential to revolutionize the energy industry and create a more sustainable future. By utilizing blockchain technology, it is possible to create a decentralized network of renewable energy producers, consumers, and a peer-to-peer marketplace for trading renewable energy. The concept benefits producers and consumers and contributes to a cleaner, more sustainable energy system.