SERENITY
ENERGY ON THE GO

WHITEPAPER

BLOCKCHAIN ECOSYSTEM
Serenity is bringing blockchain to the energy sector with the potential to transform how people engage with these utilities by bringing control and transparency back to the end users and offering solutions for people who have been neglected by traditional systems.

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CERTIFICATE OF GRANT

INNOVATION PATENT

Patent number: 2018101013

The Commissioner of Patents has granted the above patent on 8 August 2018, and certifies that the below particulars have been registered in the Register of Patents.

Name and address of patentee(s):
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Title of invention:
Business methodology for setting up new energy retailer based on the latest hi-tech technology on blockchain and smart contract utilization, by awarding endeavor for planet savings with carbon credits monetization, creating new green energy production facilities and developing sustainable residential Net-Zero dwellings (estates).

Name of inventor(s):
Saric, Adi and Neimar-Saric, Elma

Term of Patent:
Eight years from 22 July 2018

NOTE: This Innovation Patent cannot be enforced unless and until it has been examined by the Commissioner of Patents and a Certificate of Examination has been issued. See sections 120(1A) and 129A of the Patents Act 1990, set out on the reverse of this document.

Dated this 8th day of August 2018
Commissioner of Patents

PATENTS ACT 1990
The Australian Patents Register is the official record and should be referred to for the full details pertaining to this IP Right.
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THE CHALLENGE

Humanity is on a collision course; we will perish unless embrace different approach. We must neutralize damages caused by our negligent economy and balance our consumption with sustainable natural regeneration life cycle.

It is a moral and existential imperative! However, achieving this is challenging. At present we have inadequate tools to measure and compensate the anthropogenic impacts on nature; until now. Blockchain technology could utterly transform the world’s unsustainable economic model.

The power sector is facing a transition from a centralized structure with a small number of “large-scale” energy providers (hydro, coal, gas and nuclear) to a decentralized scenario of Distributed Energy Resources (DER), such as solar and wind.

A significant part of produced renewables is being lost because the power sector today is unable to optimally address structural transition towards renewables and decentralization.

The electricity grid must be balanced nearly precisely, meaning load on the electrical grid must match generation at any given point in time; otherwise, high-voltage or low-voltage damaging situations could occur.

The electricity operators struggling to balance electricity production and consumers demand and the marketplace lacks transparency and incentives for reduction of energy consumption. Cost of insufficiencies bears the end user paying higher energy prices.

The complexity of regulations and the cost of entry are two main reasons for the monopolies operating in energy markets globally.

On the other hand, consumers are showing a greater desire to have more control over how the energy is consumed, generated, and distributed.

There is a direct correlation between energy and building industry in respect to energy consumption and its loss.
Unfortunately, there is still a lack of common understanding of the benefits of building by passive standards.
OUR SOLUTION

Serenity is bringing blockchain to the energy sector with the potential to transform how people engage with these utilities by bringing control and transparency back to the end users and offering solutions for people who have been neglected by traditional systems.

Serenity Platform will be connected to the National Electricity Operators, providing the necessary balance between electricity production and consumers demand, responding at substation level when it is needed, making possible structural transition towards renewables and decentralization.

Energy produced locally will be traded and consumed locally, with minimal impact to the rest of existing electrical grid, avoiding high-voltage or low-voltage damaging situations and lowering the transmission loss which occurs over longer distances.

Serenity members consumers will benefit through lower price of electricity and getting a better deal for produced and exported energy. Blockchain technology and Smart Contract utilization will minimize administrative costs.

Production of renewable energy will be rewarded by Carbon Credits.

The distributed ledger architecture will provide secure and immutable proof of tokenized asset ownership and facilitate a variety of energy market transactions implemented through the set of smart contracts enabling trustless environment for all Serenity members (consumers, prosumers and operators).

It makes sense to Serenity to adapt Rapid Building System®, passive-house solutions in building industry, as early as possible and create Serenity Net-Zero energy platforms for renewable energy production.

Rapid Building System® could drastically reduce residential energy consumption in developed countries which is up to 40% of total energy use.
OUR VISION

A sustainable world, where every household is organically fitted with a renewable energy production and storage capabilities, being a small-scale energy generator connected to the distributed grid, and as a part of a shared economy monetizing their planet caring behaviour through incentives and rewards.

To disrupt current system and offer unfair advantage to our members we will develop multi-faceted blockchain based ecosystem, backed by real tangible business, facilitating promotion of sustainable living and smooth transition towards renewable energy production and DER technologies.

We want to encourage Serenity members to live sustainably, to retrofit homes to the point they become near Net-Zero buildings and generate surplus green energy from renewable resources and instantly monetize investment through Serenity platform. Serenity will build a platform where all participants and entire community are guaranteed to benefit from their participation. Surplus generated energy will be used to power Serenity Source Bitcoin mining facilities, currently much more profitable then exporting surplus energy back to grid. Serenity Source is developing DeFi “decentralized finance“ platform which will enable users to generate “passive income” by participating, borrowing, and lending Serenity, Ergon Carbon and other cryptocurrencies and earn interest from it. Goal is to become Energy Retailer for all our members and expand globally.
WHY SERENITY?

Serenity Source Pty Ltd is a company that is aiming to redefine the way we deal with energy. With a focus on the renewable energy sector, combined with the power of the blockchain, the company aims to revolutionize the energy generation and trading, monetization of carbon credits, sales, and lease of HEPEK smart oracle devices, Net-Zero residential properties, rent/sales, affiliate licensing, and Serenity DeFi platform transaction fees.

Unlike a traditional energy distribution model, Serenity’s model is to transact energy sales, surplus energy trading, and other ancillary activities over the blockchain. The Serenity platform will be connected to national electricity operators, providing the balancing demand and supply of electricity, responding at the substation level, and making possible a structural transition towards blockchain and renewables.

The company will also launch Serenity SET token, which will be backed by real world assets (energy as a commodity), and the power of the crowd and perform as governance token, used to:

- acquire access to Serenity services
- perform work on behalf of the Serenity network
- acquire reward share in Serenity revenues generated

Steady growth of Serenity membership base and utility nature of token will keep strong and constant demand and de-risk.

Contractionary Monetary Policy (token buy-back and burn operations) will guaranty Serenity value to increase.

Members will redeem and burn tokens for a right to share revenues and non-speculative profits (fractional programmable ownership) generated by Serenity renewable project developments (solar, wind, battery farms and Net-Zero real estate).
BUSINESS MODEL

The business model will suit Serenity vision and concept of distributed community. We aim to become Energy Retailer, Renewable Energy Generator and Sustainable Residential Developer, delivering residential Net-Zero dwellings (estates) and commercial facilities for renewable energy production (solar, battery, wind farms).

Revenue will be generated from:

- Energy Retail Services
- Renewable Energy Production
- Carbon Credits Monetization
- Residential Property Sales and Rental Income
- HEPEK Smart Oracle Device Sales and Lease
- Serenity DeFi Platform (ergon non-custodial decentralized finance)
- Interest on Capital Backing ERGON Tokens
- International Affiliates Licensing

Blockchain technology and Smart Contract utilization will minimize administrative costs and automate the process.

Some percent of net profits will be allocated into the funding pool used to fund Serenity community growth, building more sustainable and energy efficient estates, and new renewable energy projects.

ENERGY RETAIL SERVICES

Serenity will charge members (consumers) near wholesale electricity price (with small markup), still being able to offer cheaper electricity compared to existing retailers. This will be achieved through the access to the wholesale electricity market real-time pricing and automated blockchain enabled energy purchase micro-transactions.

Any surplus of produced renewable energy within Serenity pool will be sold on wholesale energy and carbon market and prosumers/generators rewarded with ERGON and CARBON tokens.
Serenity will always endeavor to match electricity demand for newly acquired community members with additional renewable energy production installations.

**RENEWABLE ENERGY PRODUCTION**

Serenity will fund projects related to renewable energy production (solar, wind, and battery farms), and include those resources with the rest of prosumers capabilities into syndicated Serenity Generator Platform.

Being able to synchronize all Distributed Energy Resources (DER) through blockchain and HEPEK smart oracle device control, Serenity will satisfy regulatory requirement for minimum installed capacity to be categorized as Large-Scale Electricity Generator and sell produced energy on wholesale electricity markets.

All prosumers and generators will receive ERGON tokens, a payment for renewable electricity exported to the energy grid, and CARBON tokens as a reward for lowering carbon emissions.

**CARBON CREDITS MONETIZATION**

Serenity members will be entitled to earn CARBON tokens based on two criteria:

- Household green star ratings
- Amount of renewable energy produced

CARBON token rewards will be redeemable through Serenity Platform in exchange for fiat.

Certified Carbon Credits will be sold on national or international Carbon Credit Exchanges for the best possible fiat price and CARBON tokens destroyed.
HEPEK, SMART ORACLE DEVICE SALES / LEASE

In countries with deregulated electricity market, HEPEK smart oracle device will be part of purchase lease agreement between subscribers and Serenity or other affiliated electricity retail businesses.

In countries with regulated electricity market, HEPEK smart oracle device will be sold to Utility Providers as “Smart Device with enabled prepayment capabilities”, still obtaining CARBON token as a reward to subscribers for renewable energy production. Regulated utility provider will minimize debt exposure by utilizing the electricity prepayment method and AI algorithm embedded inside HEPEK smart oracle device will help consumers to lower overall consumption by controlling smart home appliances.

SERENITY DEFI PLATFORM

Non-custodial decentralized finance is not managed by an institution and its employees — instead, the rules are written in code). This expands the use of blockchain from simple value transfer to more complex financial services using smart contracts. The code is transparent on the blockchain for anyone to audit. Participate in yield farming, borrow, and lend Serenity, Ergon, Carbon, and other cryptocurrencies to earn interest by using this platform. It automatically executes transactions if certain conditions are met – offers much more flexibility.

Lending, use of smart contracts to replace intermediaries such as banks that manage lending in the middle. Lending markets are one popular form of DeFi, which connects borrowers to lenders of cryptocurrencies. DeFi lending is collateral-based, meaning to take out a loan, a user needs to put up collateral – often ether, the token that powers Ethereum. That means users do not give out their identity or associated credit score to take out a loan, which is how normal, non-DeFi loans operate.

Yield farming and flash loans, where users scan through various DeFi pools in search of arbitrage opportunities for larger returns.

By using lending platform, as mentioned above, Serenity will enable users to generate “passive income” by loaning out their money and generating interest from the loans. Yield farming, described above, has the potential for even larger returns, but with larger risk. It allows for users to leverage the lending aspect of DeFi to put their crypto assets to work generating the best possible returns.

P2P ENERGY TRADING PLATFORM

In deregulated markets, Serenity P2P Energy Trading Platform will enable subscribers from the same sub-station zone to trade electricity directly when production meets demand. Generators (commercial wind, solar or battery farms) and prosumers, on one side selling, and consumers bidding over the tokenized price of
produced renewable energy within the Pool. Serenity will charge small transaction processing fees.

**SERENITY BAZAAR (MARKET PLACE)**

ERGON token being stable, will allow trade of goods and services between members of Serenity pool within the same trading jurisdiction. Small business being Serenity pool member could accept ERGON as payment for the goods and services provided to other Serenity pool members (e.g. holder of ERGON tokens may elect to pay for dinner by ERGON tokens in the restaurant who is Serenity member).

ERGON tokens will be redeemable through Serenity Platform in exchange for fiat. Serenity will charge small transaction processing fees.

**RENEWABLE ENERGY PROJECTS**

Serenity will use treasury pool to fund development of projects related to renewable energy production: solar, wind, and battery farms.

Members “working” for the community growth will get a chance to contribute through SERENITY redemption. Redeemed SERENITY tokens will be taken out of supply and destroyed through implementation of Contractionary Monetary Policy. Token burning will have direct impact to token velocity\(^1\) (non-speculative value of a token) increase.

Generated renewable energy will be sold on energy market. Serenity members “working” for Serenity community will be rewarded with “fractional programmable

\(^1\) non-speculative value of a token
revenue ownership\(^2\), and start to receive proportional revenue share from energy sold.

Serenity members are sharing only revenue, but not the title; execution is outsourced completely to the enforceable smart contract.

For community "workers", smart contract will guaranty reward promise fulfilled at given maturity times and under defined terms.

For Serenity community it will mean ability to develop infrastructure, generate more renewable energy “in-house” and reduce need to purchase additional electricity on wholesale energy markets.

**NET-ZERO RESIDENTIAL PROPERTY DEVELOPMENTS**

Serenity will design and build residential developments and single dwellings by utilizing Rapid Building System®, perfect platform to build passive homes, when equipped with integrated solar panels, batteries and HEPEK smart oracle device such houses will become Net-Zero dwellings.

Rapid Building System® is a holistic construction design which conforms set of Passive House design principles:

- Thermal Insulation
- High Energy Performance Windows
- Mechanical Ventilation Heat Recovery
- Airtightness
- Thermal Bridge Free Construction
- Integrated PV roof panels

Such dwellings will be platforms for the renewable energy production in prosumer mode (energy self-sufficient residential property with capability to export to grid any surplus of generated electricity).

\(^2\) Investors are sharing only revenue, but not the title; execution is outsourced completely to the enforceable smart contract.
Serenity will invite members to participate in the growth of Serenity ecosystem through **liquidity staking** and **fractional ownership** of revenue produced by renewable energy resources.

Also, for initial developments, Serenity will invite and empower Serenity members to access the property market by easy and affordable investments through fractional ownership of a high-value tangible assets like luxury smart Net-Zero Real Estate or Solar farm developments.

With fractional property investment, the cost of a property is divided into shares, so called **Fractals**.

These **Fractals** are then sold to investors. Investors receive income from rent charged on the property and can also get capital returns on the property when it is sold, or they sell their **Fractals**. The cost of the **Fractals** will rise or fall proportionate to the change in the value of properties.

Unlike a property syndicate, fractional property investment offers high liquidity. This means investors can cash out their investment at any time by selling their **Fractals** on Serenity platform for SERENITY tokens.

Newly built Serenity Net-Zero homes or estates will be sold or preferably rented. Serenity tenants will pay rent and electricity with fiat. For tenants redeeming SERENITY, rent will be at discounted rates.
For such a development, depending on speed of electric cars adoption, Serenity might incorporate electric vehicle charging stations or Bitcoin mining units, near Net-Zero dwellings and other industry relevant businesses, enabling Serenity members and property owners’ additional stream of revenue.

Redeemed SERENITY tokens will be taken out of supply and destroyed which will add to SERENITY token market value.

INTERNATIONAL AFFILIATES LICENSING

Global Serenity community will require Energy Retailer service to be provided under different trading jurisdictions. Serenity will partner with other business who are keen to implement our business model and utilize blockchain technology Serenity is currently developing.

Our expansion plan will be implemented through licensing affiliated business and partners. Successful candidates should be capable to run Energy Retail business and to stake defined amount of SERENITY tokens.
MEMBERSHIP

Serenity community will consist of prosumers, consumers, generators, and community workers (Fractional Programmable Revenue Owners).

To access Serenity services every member will need to open an account with Serenity, subject for KYC verification process, and deposit SERENITY tokens into Security Bond smart contract, equivalent to price of average monthly energy consumption expressed in SERENITY, at the time of the subscription. SERENITY tokens will be frozen for the period until subscription contract expires. After expiration of subscription contract, SERENITY tokens will be returned to member wallet.

Community workers are volunteers ready to surrender their SERENITY tokens as pledge of support to the community network development. In return Serenity will reward “workers” with gift in form of fraction in revenue generated from projects.

Holders of SERENITY tokens will gain additional passive income stream, as the prediction is that SERENITY token will have constant growth because it is backed by demands for services of real business and real assets like energy, carbon credits and tangible Net-Zero property developments, which is much different than other crypto tokens operated so far. Large stakeholders will be periodically rewarded by interest accumulated.

Prosumers will be awarded with ERGON token whenever electric energy is exported to the grid and additionally with CARBON token if energy produced is from renewable energy source.
**TOKEN ECONOMY**

Serenity will utilize a three-token model, each token will be ERC-20 compliant.

**VIRTUAL COMMODITY**

Energy is the commodity which can be tokenized and treated as Virtual Commodity, backed by real-world, tangible assets.

**SERENITY TOKEN (MAIN TOKEN)**

SERENITY is not a proprietary payment currency; It is utility and work token used as a right to:

1. perform work on behalf of the Serenity community network
2. acquire access to Serenity Energy Retailer services
3. obtain additional electricity discounts
4. acquire fractional ownership in Serenity revenues generated from Serenity renewable projects

It will be valued at a *multiple* of the operating cash flows that the system generates rather than as a *fraction* of revenues paid for services provided.

Scarce tokens combined with a useful service can create massive value for token holders and the company. Work tokens are tokens that gives users the right to contribute work to a decentralized network or DAO (whether on blockchain level or smart contract level) and earn in exchange for their work.

Serenity model is based on assigning rewards based on Serenity members’ staked tokens. In the world of crypto, staking refers to the reward you receive for supporting a network or token by holding the token or running a node.

The **SERENITY** token will fuel Serenity’s blockchain based economy and facilitate access to Serenity Platform, allowing global platform interoperability. Total token value should grow super-linearly relative to transaction throughput.

Serenity affiliates will need to acquire and surrender appropriate amounts of SERENITY tokens to become network provider services.

Members (Community workers) will redeem and burn tokens for a right to share revenues and non-speculative profits (fractional programmable ownership) generated by Serenity renewable projects (solar, wind, battery farms and Net-Zero real estate).

Price manipulation through crypto market speculations will be minimized as only 40% of total token supply will be offered for sale through upcoming ICO.

Contractionary Monetary Policy (token buy-back and burn operations) will guaranty Serenity value to increase.
TOKEN DISTRIBUTION

A fixed number of SERENITY tokens (500,000,000) is pre-mined for the upcoming sale.

- 2% of pre-mined tokens will be available for presale, stage 1
- 3% of pre-mined tokens will be available for presale, stage 2
- 5% of pre-mined tokens will be distributed through Air Drop, Bounties, Referrals, and Marketing
- 35% of pre-mined tokens will be available for sale
- 40% of pre-mined tokens will be held in Treasury
- 15% of pre-mined tokens will be held by Founders and Core Team

5 These tokens will be sold at 20% discount
7 These tokens will be sold at 10% discount
10 Tokens will be mainly used for Contractionary Monetary Policy (token buy-back and burn operations) and Liquidity planning and control. Tokens will be used to incentivize new members to join Serenity and for business partnership arrangements
11 25% of these tokens will remain time-locked for each period of 6, 12, 18 and 24 months
ERGON (UTILITY PAYMENT TOKEN)

The ERGON token is a currency for energy trading, a **stable payment token**, designed to provide blockchain security, trustless transaction immutability, to protect members from crypto market fluctuation and maintain a steady energy price. As a stable payment token, ERGON is pegged to the local currency and **backed by actual fiat deposits** in the currency of local trading jurisdiction.

Serenity members can pre-purchase ERGON by fiat or crypto deposits and obtain right to consume energy. Prosumer and generators can earn ERGON as a reward for production of renewable energy exported to the grid.

ERGON token will be created when Serenity member deposit fiat, crypto, or through blockchain provable production of renewable energy, and redeemed by Serenity member either for fiat, or worth of energy consumed, denominated in currency of local trading jurisdiction.

International currency exchange rates will be applied.

E.g.

- 1 ERGON = 1.00 AUD worth of energy for Australian energy market
- 1 ERGON = 1.00 EUR worth of energy for EU energy market
- 1 ERGON = 1.00 YEN worth of energy for Japanese energy market

Serenity Platform will exactly map trading jurisdiction in which ERGON token was created\(^\text{12}\).

Internal conversion between SERENITY and ERGON to compensate for difference in energy prices on different markets will allow Serenity members trade of energy produced in one and consumed in another trading jurisdiction trough Serenity international affiliate businesses.

ERGON token being stable, will allow trade of goods and services between members of Serenity pool within the same trading jurisdiction. Small business being Serenity pool member could accept ERGON as payment for the goods and services provided to other Serenity pool members (e.g., holder of ERGON tokens may elect to pay for dinner by ERGON tokens in the restaurant which is Serenity member within same jurisdiction).

ERGON token can be redeemed for fiat, SERENITY, or energy supply through Serenity Platform.

In some instances, member (electricity consumer) can earn ERGON tokens by lowering or shifting energy consumption because local grid operator, e.g., small municipality or a private microgrid operator, can incentivize the relieving of stressed areas of their grid during different times. Network participants contribute to the network benefit.

\(^{12}\) GPS embedded in HEPEK device, Oracle mechanism and KYC verification process
CARBON (UTILITY AWARD TOKEN)

CARBON is **stable token** created as a reward for CO2e reduction through blockchain provable production of renewable energy and **backed by price of Carbon**. Carbon Credits, being data-driven and dependent on multiple approval steps are the perfect candidate for a digital currency as they exist separately from the physical impacts to which they correlate.

In the event of redemption, the redeemed CARBON tokens will be taken out of supply and destroyed.

**USE OF TOKENS**

**SERENITY, ERGON** and **CARBON** tokens will be traded on Serenity DeFi Platform. **SERENITY** token will facilitate access to Serenity services and will be main investment vehicle for renewable energy projects within Serenity ecosystem. **SERENITY** redemption will be automated and performed only by registered HEPEK smart oracle device or in the process of acquiring the fractional programmable revenue share through token surrender community events.

**ERGON** token is a Serenity currency for energy trading, stable reward for CO2e reduction through blockchain provable production of renewable energy payment token for purchase goods and other services available to Serenity community in Serenity Bazaar.
Purchased **ERGON** tokens will be used to load registered HEPEK smart oracle device wallets.

**CARBON** token is created and rewarded for CO2e reduction through blockchain provable production of renewable energy.

**SERENITY TOKEN REDEMPTION**

Occasionally, SERENITY redemption programs will permit Serenity members to redeem SERENITY tokens, offset Serenity Retail markup and obtain allowance to trade electricity with Serenity at near wholesale prices.

For instance, Serenity members may have option to redeem up to 1000 SERENITY tokens to offset markup cost and obtain allowance of up to 1,000 kWh of electricity, available to Serenity in the jurisdiction in which the member resides, at the time such electricity is purchased (consumers), or sold (prosumers, generators) by the redeeming member.

After the redemption allowance is exhausted consumer will continue to pay the regular Serenity price.

When periodic redemption limit is reached, member will no longer be able to redeem more SERENITY tokens until next redemption period start.

In the event of redemption, the redeemed SERENITY tokens will be taken out of supply and destroyed.

Serenity redemption will be automated, performed only by registered HEPEK smart oracle device. Separate Redemption smart contract will control redemption process in different regions and jurisdictions.

Redemption limits and frequency will depend on size of member base and revenue obtained. With member base increase, limits will relax, and total redeemable amount of energy will rise as well.

**ERGON AND CARBON TOKEN REDEMPTION**

Any Serenity member holding ERGON or CARBON tokens is free to redeem them for SERENITY or fiat at any time.

At the time of redemption, the redeemed ERGON or CARBON will be assigned a timestamp by the redemption contract and taken out of supply mechanism after EIP 661\(^\text{17}\).

**PAYMENT CHANNELS**

Due to the high frequency of transaction settlements, the Serenity will utilize bi-directional payment channels to handle transaction processing.

\(^{17}\) burn some number of tokens to unlock certain rewards
To pay for energy, HEPEK, smart oracle device, opens a payment channel with Serenity by depositing ERGON to Serenity smart contract.

In case when HEPEK smart oracle device reports energy production, ERGON token will be minted and allocated to the member’s account/wallet.

The payment channel is off-chain verification where two (or more) connected parties perform multiple transactions without broadcasting them to the network. Instead, once users close the channel, the final balance is mined and added to the blockchain in one go. Only two transactions with blockchain will be required, one to open channel and one two close it. Such approach makes payments fast, scalable and private with minimal network fee (gas).

When channel is closed, energy wholesale cost and Serenity fees will be deducted from member’s account/wallet.

```
contract Channel {

    address public channelSender;
    address public channelRecipient;
    uint public startDate;
    uint public channelTimeout;
    mapping (bytes32 => address) signatures;

    function Channel(address to, uint timeout) payable {
        channelRecipient = to;
        channelSender = msg.sender;
        startDate = now;
        channelTimeout = timeout;
    }
}
```

THE SERENITY TOKEN TREASURY

Contractionary Monetary Policy (token buy-back and burn operations) together with maintaining the token velocity will help Serenity value to increase\(^\text{18}\).

Serenity will route collected fees from each closed payment channel through the publicly visible smart contract to make public information about Serenity liquidity.

Tokens will be mainly used for Contractionary Monetary Policy (token burn operations) and liquidity planning and control, and to incentivize new members to join Serenity and for partnership arrangements with affiliated businesses.

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\(^{18}\) Investors must be aware that burning a cryptocurrency is by no means a guarantee that the value of the remaining tokens will increase. Regardless of how many tokens there are, value is always dictated by supply and demand, or how much investors are willing to pay for a cryptocurrency. Just because there are less in circulation does not mean that potential buyers will be willing to pay more for those that still exist.
HEPEK SMART ORACLE DEVICE
HARNESS OF ENERGY POWERED BY ENCRYPTED KIT

KEY FEATURES
Serenity is developing HEPEK, smart oracle device, secure smart energy meter and blockchain-enabled gateway, which empowers prosumers, generators and consumers to become part of Serenity decentralized community.

To activate HEPEK and enable electricity service, members will need to purchase ERGON tokens (credit card or direct debit facility) by using Serenity app or web portal. HEPEK will automatically open Payment Channel, off-chain verification where two (or more) connected parties perform multiple transactions without broadcasting them to the network. Instead, once users close the channel, the final balance is mined and added to the blockchain as one transaction within block. Only two transactions with blockchain will be required, one to open channel and one two close it. Such approach makes payments fast, scalable, and private with minimal network fee (gas).

While ERGON balance is above low threshold, HEPEK will allow electricity consumption by enabling the smart meter, paying via a payment channel at each billing cycle in real-time. Members will be able to top-up ERGON tokens deposits inside HEPEK wallet at any time.

The smart energy broker role will be achieved through implementation of machine learning and AI cloud-based capabilities. Daily, weekly, monthly, seasonal patterns in electricity consumption and production will be analyzed in real-time in conjunction
with wholesale spot prices and demand-response events to optimize usage, minimize cost and maximize profit for all Serenity members.

This appliance is integrated with the local electrical installation and connection to the Internet and GPS. HEPEK smart oracle device will measure indoor and outdoor temperature, battery level, electricity inflow and outflow and communicate with the blockchain.

**BLOCK DIAGRAM**

![Block Diagram Image]

Distributed blockchain mechanism in Energy Trading Mode and Green Production Rewards (Deregulated energy markets)

Distributed blockchain mechanism in Pre-Paid mode and Green Production Rewards (Regulated energy markets)

20 June 2021  Serenity Blockchain Ecosystem
IOT CONTENT DELIVERY NETWORK

To handle the diverse number of smart oracle device, coupled with requirements such as an ultra-low latency for certain use cases, the prioritization of each device, and corresponding requirements for IoT applications, Serenity will deploy secure, scalable, available, and high-performance solutions across their networks—from the device to the applications in data centers.

IoT Services Delivery: Potential Logical Model

Azure Blockchain Workbench proposed architecture
HEPEK REGISTRATION

Each manufactured HEPEK will have its identification number registered in Registry Smart Contract.
Only registered gateways will be allowed to report readings and send transactions. The device identification number will be stored to an address created by Serenity on Ethereum blockchain.

A shipped gateway must be registered by the member using same HEPEK identification number. After registration finished, HEPEK will begin signing messages from secure hardware enclave and behave as a self-sufficient entity registered with Serenity and owned by the member.

**HEPEK USAGE**

Wholesale electricity market must be balanced nearly precisely, meaning load on the electrical grid must match generation at any given point in time; otherwise, high-voltage or low-voltage damaging situations could occur. Independent system operators have created different markets to achieve grid balance, incentivizing different parties. Some of the largest are predictive, real-time and demand response.

Energy storage, batteries, are the best resource to be controlled by HEPEK in real-time. Serenity members with given access to the wholesale market real-time pricing and energy storage available can benefit the most and generate revenue from temporal energy arbitrage. Buying electricity when cheaper and selling it back or consuming when energy is expensive.

On demand-response markets, consumers who have flexibility in their loads are incentivized to shut down those loads for a short period and lower demand. Access to this is another opportunity for Serenity members to react to dynamics of demand response market and if HEPEK is configured to do so, it can turn off AC and broadcast bid through Serenity to demand response market generate another revenue stream.

Also, HEPEK will regulate indoor temperature through monitoring peak and off-peak periods by selecting a time when electricity is cheaper to cool down home just before the time when peak pricing kicks in and save even more.

By connecting more IoT enabled appliances to HEPEK, the device will be able to make more smart consumption decisions.
TYPICAL CONFIGURATIONS

Case 1: Consumer Mode

Member only consumes electricity from the grid; no installed solar panels or batteries:

1. Serenity member purchases ERGON tokens which will be redeemed for right (credit) to consume electric energy.
2. After purchase authorized Serenity Smart Contract will increase ERGON token supply and send ERGONS to HEPEK wallet and top up consumer’s balance with new created ERGON tokens.
3. Hepek opens payment channel with Smart Contract and while ERGON balance is positive smart meter is enabled and household can use the grid electricity.
4. Automatic payment options will be optional.

Case 2: Prosumer Mode

Prosumer is a consumer capable of exporting electricity, a part consumer – a part generator. Prosumer has installed either solar panels or batteries or both. Prosumer can top-up his ERGON token balance, similar like consumer, to pay for electricity consumption from the grid when there is no sunlight, or its batteries are empty. Prosumer’s account will be awarded when renewable energy exported to the grid. Serenity will broadcast DEMAND event to all prosumers. Hepek exports generated renewable energy in response on DEMAND even exporting energy straight from invertors either by converting solar or draining the batteries. If DEMAND is not active, all solar produced energy should be used to recharge the batteries or to run household appliances.

Hepek executes smart contract passing

- Energy reading IN
- Energy reding OUT
- Battery LEVEL

Smart Contract creates ERGON tokens and assigns them to prosumer’s account.

Case 3: Generator Mode

Generator is commercial member running solar/wind farm and producing renewable energy only.

For such a member’s DEMAND will be always active, solar produced energy will be exported to the grid.

Smart Contract creates ERGON tokens and updates generator’s wallet.
ROADMAP

PHASE 1: Q1 2020 – Q1 2021

HEPEK Prototype

This phase will be used for rapid improvement to Serenity software and hardware components. Before developing the software, Serenity will need a stable hardware prototype of the HEPEK smart oracle device to ensure the development environment will remain constant. This prototype should come from a production process that is at least scalable to a few thousand devices.

During this phase, Serenity will hire three hardware engineers to finalize the first production hardware device. CTO will oversee the HEPEK prototyping, testing, and production.

Content Delivery Network

Before making upgrades to the HEPEK client, Serenity needs to establish a process where HEPEK software will fetch updates from the server, which will be critical to streamline later upgrades and enable fast iterations. The software team will spend much of this phase developing a content delivery network (CDN) - this will mostly be on the server side. The software team will also build the plumbing (remote logging and debugging) for the HEPEK client to operate regardless of which environment is chosen.

Updates to the Client

The phase 1 will see rapid development of the client. Serenity will hire two additional software engineers, primarily for development of the client. This client will have bare minimum functionality (signup, open payment channels, withdrawals).

The software team will also spend more time on the REST API of the Serenity service, which will be similarly limited in functionality. The end of phase will be marked by a v1.0 release on the releases page of the HEPEK client.

Net-Zero Display home

Serenity will build Net-Zero display home with HEPEK operational logging energy related data onto blockchain and implementing electricity handling control. Serenity will use Rapid Building System®, hire assembly specialists and anticipate having display home assembled within 4 weeks towards the end of phase 1.

PHASE 2: Q1 2021 – Q1 2022

Rolling out retail energy business in targeted regions. During this period, Serenity will establish a single utility in a targeted region and sign up 5,000+ customers. These customers may be given SERENITY tokens in promotional events and which will be automatically redeemed for the right to purchase electricity at wholesale prices.

First Retailer License

Serenity will begin this phase by applying for energy retailer license in a deregulated market within Australia. At the time of writing this, no market has been selected, but the target markets have been narrowed down to a short list.

Serenity will need to contract with a marketer who is familiar with marketing utilities.
Scalable Hardware Production

After reaching a v1.0 of the Serenity HEPEK client, Serenity will establish an improved production process for the hardware. This process will need to scale to 100,000 devices and will require at least two full-time manufacturing engineers to ensure Serenity can meet production quotas.

More Customers

During phase 2 Serenity will acquire 1-3 more targeted regions ensuring the process is scalable. Long-term, Serenity hopes to open many services worldwide, and this is only possible if with a sufficiently streamlined expansion process. Serenity will need to contract with several more marketers who are familiar with the respective local regions.

Once Serenity has acquired enough customers, it will begin utilizing ERGON liquidity (ERGON is created when customers make deposits or export energy to the grid). This step will introduce a new revenue stream (from generalized state channel fees) and make Serenity more efficient (migrating simple, custom payment channels to the Raiden network) presenting Serenity platform as a hub for stable token (AUD) commerce. Payment channels and the Raiden network will be a big step in facilitating the mass adoption of the Ethereum network for payments.

CTO will oversee the software team’s phased migration to the Raiden hub. Serenity will bring in subject-matter expertise from Ethereum community in making a smooth transition.

Better Decisions from More APIs

During this phase, Serenity will allow optional API data feeds to send encrypted information to the HEPEK smart oracle device enabling better decision-making and more efficient energy usage. Serenity will need to scale its software team to develop the client, expand the API, create an SDK, and make the web system more scalable. Phase 2 will be marked by a v2.0 release of the Serenity HEPEK client.
PHASE 3: Q1 2022 AND BEYOND

This Phase will be the final phase during which Serenity will globally expand its energy retail network and sign up many more customers. At this point, Serenity must have a scalable process in place to facilitate this expansion.

Hardware Production Scalability

During this phase, Serenity will need to establish a production process to allow for millions of devices to be manufactured. This process must be extremely scalable and will require a significant ramp-up in hiring hardware engineers and process managers. Because Serenity will likely need to contract with multiple hardware manufacturers, it is crucial for the HEPEK to be built from sufficiently commoditized parts.

HEPEK AI Optimization

With the client software at v2, Serenity will now dedicate much of its software development time to optimizing HEPEK decision-making by designing better artificial intelligence to leverage incoming API data from sufficiently abstracted data feeds. The scope will require scaling the software team to include data scientists and AI experts. Up-scale will likely happen in several stages, and at that time Serenity will probably draft an updated roadmap.

International Expansion

While Serenity will be forming many more utilities in Australia, it will also look to expand globally in targeted regions which will require growth of the strategy team, which is overseen by CTO.

STRUCTURE OF REVENUES
FOUNDERS, CORE TEAM AND ADVISERS

FOUNDERS

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PARTNERS

- Rapid Building System
- GABC
- Energy Web Foundation
- Blockchain Chamber of Commerce
- MiRAK
- Credits
- SOAP Engineering
- Lokalize
- Visa Global Logistics
- Visa
- Volcà
- Trust Wallet
- House Africa
APPENDIX

THE ENERGY SUPPLY CHAIN

A brief overview of the present situation in relation to energy distribution and the challenges. If the readers are accustomed with the subject, they may skip this section. Presently, energy services can be divided into generation, transmission, distribution, and retail.

GENERATION

Generation is electricity production by commercial scale energy producers. Historically these producers have been classified into hydro, fossil-fuel or nuclear based power plants.

Recently, large alternative energy production facilities are considered as a “energy generators” too.

TRANSMISSION

Transmission is moving of high-voltage electricity over long distances, usually from powerplants (generators) to consumer networks (distributors).

DISTRIBUTION

Distribution is moving of electricity from the transmission (high voltage) network to the consumers. Distributors operate lower-voltage electrical lines.

RETAIL

Retail (energy utility) business sell the electricity to the consumers. Retailers are responsible for administering and billing consumers.

In regulated markets, the energy supply chain operates as a single, vertically integrated monopoly. In deregulated markets there is market segmentation and more competition, so each role in the supply chain must be operated by a separate entity.

Residential electricity retail price is in constant rise. Traditional energy retailers Gross retail margin has increased as well. The biggest risk for current retailers is usually the wholesale cost of electricity generation - electricity spot prices fluctuate every five minutes (the basic interval for trading on the NEM). Spot prices are determined in real-time based on some combination of electricity demand volume, generation capacity available and fuel type composition (e.g., a mix of wind, coal and gas). Part
of the premium that they put on electricity usage charges has to do with the risk that they take.

The chart gives a simplified example of electricity prices from the grid vs electricity prices from a solar system on a $/kWh basis (assuming a conservative 3% average annual inflation rate) and how grid electricity rates increase over time (assuming 4% electricity price inflation per year) vs how solar PPA rates might increase (assuming a solar escalator of 2.5% annually). Solar rates stay well below the grid rates. While the current real-life retail rates may fluctuate, they would have to drop very low to be more cost-effective than the solar PPA rates in this scenario.⁴⁰

DEREGULATED ENERGY MARKETS

In deregulated markets, energy retailers (utility companies), buy electricity at wholesale prices and sell it directly to consumers. Retailers are responsible only for metering and billing. About 50% of the cost of retail electricity is used to pay for the electrical energy. The other half goes for administrative, marketing, risk management, and bad debts, plus loss in electricity transmission.

RENEWABLE SOLUTIONS

Renewable energy solutions are much more efficient and environmentally friendly. Typically, produced energy is used by household and any excess generated will be sold back to the grid. For a household sustainable solution, when deployed at significant scale, introduces severe technical challenges how to balance stability of the electrical grid designed only to feed in energy, but not handle energy feedback into the electrical grid, causing overvoltage and potential infrastructure damages.

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Solar energy generated during the day, but the peak demand is in the evening. Therefore, power plants must adjust electricity production as soon as sunlight exposure changes, which is not efficient and adds additional burden on power plants and energy distribution. Improvements in energy storage capabilities and drop in production cost make batteries economically viable.

Rapid Building System®

The Rapid Building System® is built faster from start to finish because the most of prefabricated construction is completed under state-of-the-art factory-controlled conditions including fully fitted, plumbing, electrical conduits, windows, doors and rendered external components. When construction panels arrive on site, they are ready to be positioned on the foundation and assembled in just a few days.

Much like a LEGO set, these parts are designed to ‘click’ together, saving much time due to weather and scheduling issues that always seem to arise with traditional construction. Timesaving is saving of money.

Rapid Building System® is a holistic construction design conforms set of Passive House design principles:

- Thermal Insulation
- High Energy Performance Windows
- Mechanical Ventilation Heat Recovery
- Airtightness
- Thermal Bridge Free Construction
- Integrated PV roof panels

Passive houses are the most efficient buildings offered on the market achieving hyper-efficiency through the design and implementation of highly insulated building envelopes. The building envelope is extremely tight, which minimizes thermal heat loss or gain and thereby maintains an almost constant temperature inside the house all year round.

The definition of a passive house is however independent of climate conditions: “A passive house is a building in which re-heating solely guarantees thermal comfort or re-cooling the volume of fresh air required for satisfactory air quality without using circulating air.”

Temperature balance in a Passive House is provided primarily through passive heat from the sun. However, Passive Houses may be designed the way that incremental warmness from human occupants, appliances or indoor lighting can provide the heat they need.

Given that passive house standards will be required for all new houses in the future and bear in mind that energy prices are set to increase even further, it makes sense to choose passive-house solutions as early as possible.
BUILDING ENERGY PERFORMANCE

The building performance monitored over one year has shown the primary energy demand of the Conventional House and Passive House were 169.85 kWh/(m²a) and 64.11 kWh/(m²a) while the annual average indoor temperature of the two properties maintained at 17.7°C and 22.0°C, respectively. The results indicate the reduction of space heating demand is by about 80% in favor of Passive built.

Low-energy houses that have an annual heating demand of between 50 and 70 kWh/m²a are becoming the norm in new constructions. In many countries, components for passive houses are available off the shelf.

There is a debate about the additional costs incurred when building a passive house. In general, building passive houses are around 10 percent more expensive than an “average” house. Most of the extra costs arising from construction elements, such as the thicker insulation, better windows and a ventilation system that will occasionally require new filters. On the other hand, annual heating/cooling drastically reduced your electrical bill, and you will not need to install a conventional cooling or heating system.

Given that passive house standards will be required for all new houses in the future and bear in mind that energy prices are set to increase even further, it makes sense to choose passive-house solutions as early as possible.

PASSIVE HOUSES

Passive houses are the most efficient buildings offered on the market. Many passive houses have been built all over the world, and many more will follow in the coming years. Passive Houses achieve their goal of hyper-efficiency through the design and implementation of highly insulated building envelopes. The building envelope is extremely tight, which minimizes thermal heat loss or gain and thereby maintains an almost constant temperature inside the house all year round.

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Comparison of building performance between Conventional House and Passive House in the UK
Xinxin Liang, Yaodong Wang, Mohammad Royapoora, Qibai Wub, Tony Roskillya
Sir Joseph Swan Centre for Energy Research, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK
School of Materials and Energy, Guangdong University of Technology, Guangzhou, 510006, China
Indeed, Passive Houses are designed to function like a Thermos bottle.

The definition of a passive house is however independent of climate conditions: “A passive house is a building in which re-heating solely guarantees thermal comfort or re-cooling the volume of fresh air required for satisfactory air quality without using circulating air.”

Temperature balance in a Passive House is provided primarily through passive heat from the sun. However, Passive Houses may be designed the way that incremental warmness from human occupants, appliances or indoor lighting can provide the heat they need.

The figure often quoted concerning passive houses is annual heating demand, which may not exceed 15 KWH/m²a (or 1.5 liters of fuel oil per square meter). This figure was initially calculated for climate conditions in Germany.

Fresh air is exchanged mechanically using a ventilator or a heat pump.

While maintaining a comfortable temperature, the Passive Houses can reduce energy costs associated by heating by as much as 90 percent.

NET ZERO-ENERGY HOUSE AND BEYOND

Can a Passive House also be net-zero?
Can a Net-Zero house also be Passive?
Sure! However, the two things are NOT the same.

The essential differences between the Passive and Net-Zero building are:
Passive Houses are focused on achieving the minimum amount of energy use required to heat and cool a house (up to 90 percent less than a standard home of similar size).

What is a Net-Zero Building?
A Net-Zero building is designed to produce as much energy as it uses in a year.

The New Buildings Institute defines a Net-Zero or zero energy building as a “building that uses no more energy over the course of a year than it produces from on-site renewable sources.”

net-zero-energy house harvests energy via small wind turbines or integrated solar panels on the roof or using biomass for additional space heating. The building envelope and the heating and ventilation systems are incredibly efficient and optimized for renewable energy advantages.
net-zero-energy dwelling uses no dirty energy produced by fossil fuels and is carbon neutral and most efficient one even produces energy, making them positive energy buildings. When energy generated from renewable energy sources exceeds own building’s energy consumption, any surplus energy may be exported back to the utility grid. This is known as net metering.

The excess energy production offsets later periods of excess demand, resulting in an energy consumption of zero.

CERTIFICATION AND CARBON CREDITS

Corporations and individuals demand environmentally viable solutions to tackle complex issues of global economy and human impact on the natural resources.

After the Kyoto Protocol international treaty and state commitments to reduce greenhouse gas emissions, in 2015, global leaders came together again to negotiate the Paris Climate Agreement, where they committed to reduce emissions and address climate change. While Kyoto protocol maintained strict difference between the developed and the developing nations in terms of emission reduction targets, Paris Agreement made all the nations under UNFCCC to voluntarily commit on their own domestic emission reduction targets.

CARBON OFFSET

Commercial term Carbon Offset is assigned as a value to a metric ton of greenhouse gas emissions.

By purchasing Carbon Offset you are helping to fund a project that will either reduce or sequester one metric ton of carbon emissions from the atmosphere in another location.

Because of purchasing a Carbon Offset from a third party you are effectively ‘offsetting’ some or all your carbon emissions.

OFFSETS, CREDITS AND PERMITS

Terms carbon credits, offsets, and permits can be confusing. Essentially, carbon credits and offsets are the same, both being equal to one metric ton of GHG emissions. Differences are in their interpretation relate to the various scenarios in different carbon markets.

The difference is that a permit means that permit holder has the right to pollute up to a certain level. Carbon credit or offset is a certificate stating commitment to reduce carbon emissions on behalf of the owner of the credit or offset.

VOLUNTARY VS COMPLIANCE CREDITS

Currently the two main types of credits available in the market are voluntary credits (such as GS VERs) and compliance credits (such as CERs). Within these two main types are more than a dozen different international carbon standards and programs. Commercially, it is essential to understand the different programs, markets, and mechanisms before getting involved in carbon trading or buying offsets. When doing
this, buyers should pay careful attention to the carbon market’s region and requirements that they are interested in.

**ELIGIBLE OFFSETS UNDER NCOS**

The National Carbon Offset Standard in Australia is based on a rigorous and transparent framework, reinforced by international standards and tailored to the Australian context.

The requirements of the Standard are essential for certification under the Carbon Neutral Program.

The following offsets are eligible under NCOS:

- Gold Standard VERs (GS VERs)
- Verified Carbon Units (VCUs)
- Voluntary Emission Reductions (VERs)
- Certified Emission Reductions (CERs)
- Removal Units Under Kyoto (RMUs)

Carbon offsets certified under national or international standards such as:

- National Carbon Offset Standard (NCOS)
- Gold Standard
- Verified Carbon Standard (VCS)

**CARBON NEUTRAL CERTIFICATION FOR BUILDINGS**

Carbon neutral certification against the National Carbon Offset Standard for Building can be pursued through:

- NABERS Energy
- Green Star – Performance Carbon Neutral Certification for Buildings

For certified Buildings, the Carbon Neutral Certification Trademark is available. It provides a legitimate stamp of approval that a building has met all the requirements and provides further opportunities to demonstrate climate commitments to stakeholders.

The projects and offset units are verified by independent auditors through internationally recognised standards.

**CARBON CREDITS – CASE STUDY**

<table>
<thead>
<tr>
<th>House Size: 200m²</th>
<th>Standard House (KWH/m²a)</th>
<th>Passive House (KWH/m²a)</th>
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</thead>
<tbody>
<tr>
<td>Yearly Consumption</td>
<td>400</td>
<td>10</td>
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<tr>
<td>Solar Roof Generation</td>
<td>91.25</td>
<td>91.25</td>
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<tr>
<td>5kW PV, 10 hours daily per m²</td>
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<tr>
<td>Surplus Solar Generated</td>
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<tr>
<td>Carbon Neutral Credits for House</td>
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<td>390</td>
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<tr>
<td>Total Credits</td>
<td>-</td>
<td>471.25</td>
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<tr>
<td>---------------</td>
<td>---</td>
<td>--------</td>
</tr>
<tr>
<td>Annual Credits for House</td>
<td>MW/a</td>
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<tr>
<td>Energy</td>
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<tr>
<td>CO2e (0.35156 kg for 1KWH)</td>
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<td>Feed in grid (20.54 cents per KWH)</td>
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<tr>
<td>Total Reward</td>
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<td>$1257</td>
</tr>
</tbody>
</table>

**MACHINE LEARNING AND AI**

Artificial Intelligence as concept of machines being able to carry out tasks in a way that we would consider smart, and Machine Learning is a current application of AI based around the idea that we should be able to give machines access to data and let them learn for themselves. Serenity will use AI to learn about member energy usage patterns and accordingly preemptively act to minimize cost of energy consumption and optimally utilize energy production.

**BLOCKCHAIN AND SERENITY ECOSYSTEM**

All the information stored on blockchain is permanent and immutable as every computer engaged in the network has a copy of the record to ensure it. Blockchain concept and implementation introduce a secure and immutable way to keep publicly provable track of asset ownership. Despite many trying, the collective power of all these computers is greater than the world’s most powerful computers combined.

A user is in full control of his digital assets. These digital assets can be traded for other assets or used as payment for other goods or services through authorized transactions. Within Serenity Ecosystem Energy and Carbon Credits are tokenized.

Implementation of accounting layer will be through utilizing smart contracts and SERENITY Token to fuel blockchain. A token is a smart contract with the minimum set of functionalities defined by ERC-20 community standard on Ethereum. The token can be moved from user to user, from user to smart contract and vice versa in a single transaction or by opening the payment channels.