



## SUNEX Network Token Whitepaper

Monetizing  
Sunshine

MARCH 2018





## SUN EXCHANGE PRESS HIGHLIGHTS

*"Sun Exchange enables people to locate their solar panels in the optimal places on the planet for the good of the owners, the energy users as well as indirectly the entire world population."*

– Forbes

*"Solar power could transform small communities around the world, but remote villages can't always scrape together the thousands of dollars required to install the requisite cells. Sun Exchange wants to change that by leveraging the hearts and wallets of hobby investors who cover the installation costs and then have their revenue trickle in for years to come."*

– TechCrunch

*"For those who want to get started investing in solar energy, either as a way to bring in a steady stream of income or to help boost the impact of solar electricity in places where it can literally change people's lives, [Sun Exchange] is helping to make it easy."*

– CleanTechnica

*"From a job creation perspective, the benefits are obvious, as the Sun Exchange platform has enabled the development and operation of four commercial -scale projects, which would have not otherwise been possible." – ESI Africa*

*"If ever a startup combined multiple cutting-edge techs into one impressive solution, it's South Africa's Sun Exchange."*

– Disrupt Africa





# TABLE OF CONTENTS

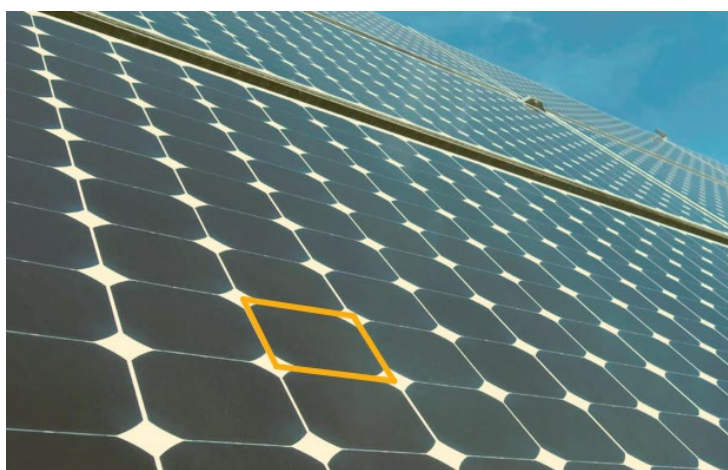
<b>1 EXECUTIVE SUMMARY</b>	<b>5</b>
<b>2 SUNEX TOKEN SALE SUMMARY</b>	<b>7</b>
FEATURES OF THE SUNEX TOKEN	7
USE OF TOKEN SALE PROCEEDS	7
DISTRIBUTION OF TOKENS	9
POST-TOKEN SALE SUNEX DISTRIBUTION RULES	9
TOKEN SALE AT A GLANCE	10
TOKEN TIMING AND SALE BONUSES	10
<b>3 THE OPPORTUNITY</b>	<b>12</b>
THE SUN EXCHANGE VISION	12
THE SOLAR OPPORTUNITY	13
SOLAR POWERING THE WORLD	13
CLOSING THE FUNDING GAP	15
MAKING SOLAR PROJECTS VIABLE FOR THE UNBANKED	16
SUN EXCHANGE'S SOLAR PROJECT INSURANCE FUND (SPIF)	16
THE SOLAR AND BLOCKCHAIN OPPORTUNITY	17
ENERGY DEMANDS OF CRYPTOCURRENCY	18
<b>4 THE BUSINESS</b>	<b>18</b>
THE SUN EXCHANGE SOLUTION	18
TARGET MARKETS	19
COMPLETED SUN EXCHANGE SOLAR PROJECTS	19
SUN EXCHANGE PROJECT PIPELINE	21
SUN EXCHANGE COMPANY TIMELINE	21
SUN EXCHANGE COMPANY STRUCTURE	23
CONSCIOUS CAPITAL & SOLAR INVESTING	23
PROJECT VETTING PROCESS	24
SOLAR POWER REVENUE COLLECTION AND PLANT MONITORING	25
SOLAR POWER PLANT MAINTENANCE	25

<b>5 SUN EXCHANGE TECHNOLOGIES</b>	<b>26</b>
SUN EXCHANGE APPLICATIONS OF BLOCKCHAIN TECHNOLOGY	26
SUN EXCHANGE PROXIMA PLATFORM	27
PROXIMA ARCHITECTURE	27
CURRENT PROXIMA FUNCTIONALITY	27
FUTURE PROXIMA FUNCTIONALITY	27
THE SUNEX TOKEN SMART CONTRACT	28
IMPLEMENTATION OF THE LOYALTY PROGRAMME ON PROXIMA	29
IMPLEMENTATION OF THE SPIF PROGRAMME ON PROXIMA	29
SECURITY ON THE PLATFORM	30
SOLARCOIN	30
 <b>6 SUNEX TOKEN FEATURES</b>	 <b>31</b>
SOLAR PROJECT INSURANCE FUND (SPIF)	31
SPIF CLAIMS PROCESS	31
THE SPIF ADMINISTRATOR	33
SUNEX TOKEN STAKING	34
SUNEX REWARDS PROGRAMME LEVELS	36
SUNEX GAMIFICATION SYSTEM	37
OPTIONAL SUNEX GIVEBACK PLAN	39
 <b>7 CORE TEAM MEMBERS AND PARTNERS</b>	 <b>40</b>
SUN EXCHANGE CORE TEAM	40
ADVISORS	41
EXTERNAL SUN EXCHANGE INVESTORS	43
AFFILIATES & PARTNERS	44
 <b>8 APPENDICES</b>	 <b>45</b>
APPENDIX 1 – SOLAR PROJECT PIPELINE AND DUE DILLIGENCE	45
APPENDIX 2 – STREAMING MONETISED SUNSHINE, USING ETHEREUM	47

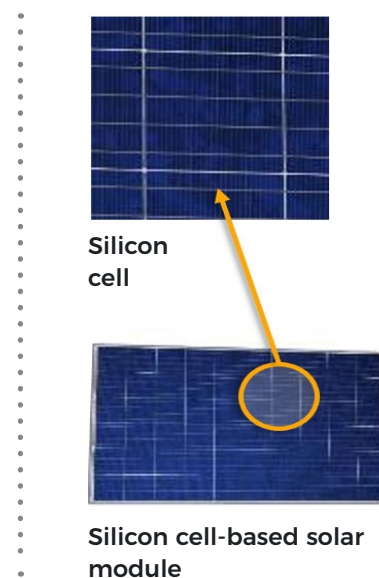
## EXECUTIVE SUMMARY

The impact of climate change has become an increasingly urgent reality. In the U.S. alone, climate-related disasters caused a record-breaking USD 306.2 billion in damages in 2017. Concurrently, for more than 1 billion people globally, lack of energy access continues to impede social and economic development, as well as basic human rights. Yet, the Earth continuously receives abundant sunshine with the power to address both climate change and energy poverty challenges. The sunlight that the Earth receives in a single hour provides enough energy to power the world for one year. For the world to develop sustainably, it must harness the full potential of that energy. However, governments alone cannot achieve the fundamental shift needed to fully transition to solar energy and away from centralised, carbon-intensive electricity systems. Real transformation requires action from empowered individuals around the globe.

Sun Exchange is a marketplace for conscious capital to build and accelerate the global transition to solar energy. The company leverages the decentralised and democratic crypto-economy to make solar power and its economic, social and environmental benefits more accessible and inclusive. Through the Sun Exchange online platform ([www.thesunexchange.com](http://www.thesunexchange.com)), anyone with an internet connection can purchase solar photovoltaic (PV) cells (see Figure 1, graphic below), and lease them to businesses, hospitals, schools and other organisations located in the sunniest regions of the planet. Solar cell owners receive lease rental payments, paid optionally in fiat or bitcoin, while offtakers enjoy the benefits of affordable clean energy.



**Figure 1** A single solar cell within a solar module that a Sun Exchange member can buy in single increments and then lease back to a project of the member's choice.



Solar cells purchased through Sun Exchange provide a unique opportunity to earn income while helping to solar power developing regions, supporting the global transition to clean power, and taking action against climate change. Sun Exchange solar cells also offer a convenient way for individuals who are new to cryptocurrency to start building cryptocurrency wealth backed by tangible assets (solar PV cells) that are managed, maintained and insured. Additionally, Sun Exchange enables cryptocurrency holders to diversify their assets and convert theoretical wealth into tangible and valuable energy-generating solar assets.

To further accelerate access to solar energy globally, and to grow its community of inspired members actively participating in the global transition to solar power, Sun Exchange is now introducing SUNEX, the native network token for the Sun Exchange platform.

SUNEX tokens will be available to the general public and existing platform members. The tokens are designed to make solar asset ownership through Sun Exchange more affordable and rewarding, while making electricity production more profitable and accessible. SUNEX tokens may be staked on the Sun Exchange platform's new Solar Project Insurance Fund (SPIF) to provide a buffer against losses from solar lease contract defaults. The SPIF provides more secure solar asset ownership opportunities for Sun Exchange members. SUNEX token benefits also include a loyalty programme which unlocks access to solar cell purchase discounts and rental bonuses, and gamification features designed to diversify and maximise impact of members' solar cell portfolios. Further details on the new SUNEX token and upcoming token sale event can be found on page 31 of this whitepaper.

The Sun Exchange Inc. is a private Delaware Public Benefit Corporation, backed by two impact venture capital funds, Network Society Ventures and Kalon Venture Partners, and three leading international business accelerators. Proceeds of the SUNEX token distribution will be utilised to further the objectives in its Charter, which states:

The Corporation's specific purposes shall be to:

(a) promote a positive effect on the environment by seeking to expand financing available for solar and other renewable energy and energy efficiency projects; (b) promote transparency by publishing through its website or in print information relating to its business operations, including a statement as to the Corporation's performance in relation to the specific public benefit purposes and (c) lead by example to improve environmental and social practices.

Sun Exchange has over 4,500 registered members, (many of whom became first-time cryptocurrency users upon signing up,) located in over 70 countries. The company has an ever-growing fleet of operating solar power plants that are sourced, built and maintained by local solar installation companies, providing a local presence at project sites.

#### IN THEIR WORDS – A SOLAR POWERED FUTURE

*"If we use our fuel to get our power, we are living on our capital and exhausting it rapidly. This method is barbarous and wantonly wasteful and will have to be stopped in the interest of coming generations . The heat of the sun's rays represents an immense amount of energy vastly in excess of waterpower...The sun's energy controlled to create lakes and rivers for motive purposes and transformation of arid deserts into fertile land..."*

– Nikola Tesla, 1915







## SUNEX TOKEN SALE SUMMARY

Through a public token sale event, Sun Exchange is introducing SUNEX, an ERC20 standard token on the Ethereum blockchain.

### FEATURES OF THE SUNEX TOKEN INCLUDE:

- Stakeable into a Solar Project Insurance Fund (SPIF). This unique token staking use case will provide default insurance to solar projects in emerging markets. Staking SUNEX in the SPIF offers up to a 20 percent return paid in SUNEX.
- Discounts and bonuses when using the Sun Exchange Platform.
- Priority access to projects.
- SUNEX tokens can be earned through using the gamified rewards programme. SUNEX is unlocked upon completing specific achievements when building a diverse and socially impactful solar cell portfolio.

### USE OF TOKEN SALE PROCEEDS

Sun Exchange will use the first USD 5.4 million in token sale proceeds for business development, taxes and token sale expenses.

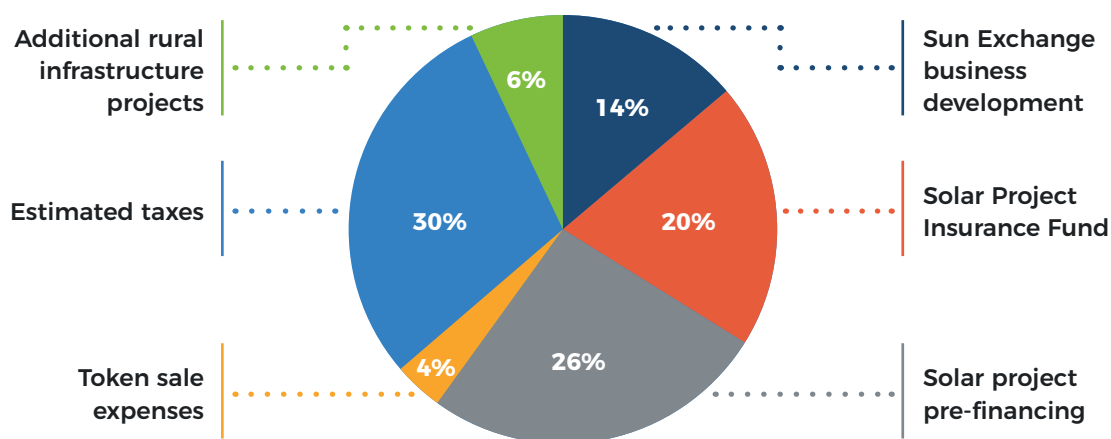
Thereafter, token sale proceeds will finance the SPIF, up to 20 percent of token sale proceeds.

Remaining funds will then be divided as follows:

- **60 percent - Pre-financing construction of solar projects** to be subsequently sold on the Sun Exchange platform. This includes funding of legal, engineering, procurement and construction costs associated with new solar PV project developments. Sun Exchange is targeting the following regions for initial solar project pre-financing: Latin America, Sub-Saharan Africa, Middle East and Indo-Pacific. Each pre-financed system will have capacity no smaller than 50 KWp and typically no larger than 5 MWp in the form of mini-grids for rural electrification or grid-tied to directly power businesses and communities. No greater than five projects will be under construction or be unsold inventory at any one time. The total cost of these projects will be less than three times the previous 12 months' total value of solar cells sold on the Sun Exchange platform.
- **25 percent - Additional Sun Exchange business development**, including:
  - Marketing via social, digital and traditional media
  - Employee salaries and benefits
  - Blockchain decentralised applications (bitcoin, ethereum and lightning), managed through business-required software applications, including fiat and cryptocurrency payment infrastructure

- **15 percent – Emerging market rural infrastructure project development** for projects lacking capital to develop and scale-up into a financing-ready state. The focus will be on enabling infrastructure projects with the potential to benefit communities in emerging markets and to be profitable for distributed solar asset owners. Proceeds of the token sale will be used to catalyse and accelerate the development of these projects through its project development partners. Sun Exchange will then host these projects on our platform for financing. Eligible project categories include agricultural cold storage rooms, rural telecommunications towers and water purification. Other socially and environmentally impactful project categories consistent with the Sun Exchange business vision may be added from time to time.

SUNEX tokens are not intended to be securities. Their sale is expected to be categorised as revenue under tax accounting standards applicable to Sun Exchange. As a result, we anticipate that between 5 percent and 30 percent of SUNEX token sale proceeds will be payable for taxes due in 2018-2019.



**Figure 2** Example use of proceeds with 100 million SUNEX sold

#### IN THEIR WORDS – A SOLAR POWERED FUTURE

*"Our collective inability to secure inclusive growth and preserve our scarce resources puts multiple global systems at risk simultaneously. Our first response must be to develop new models for cooperation that are not based on narrow interests but on the destiny of humanity as a whole."*  
 – Klaus Schwab, 2017



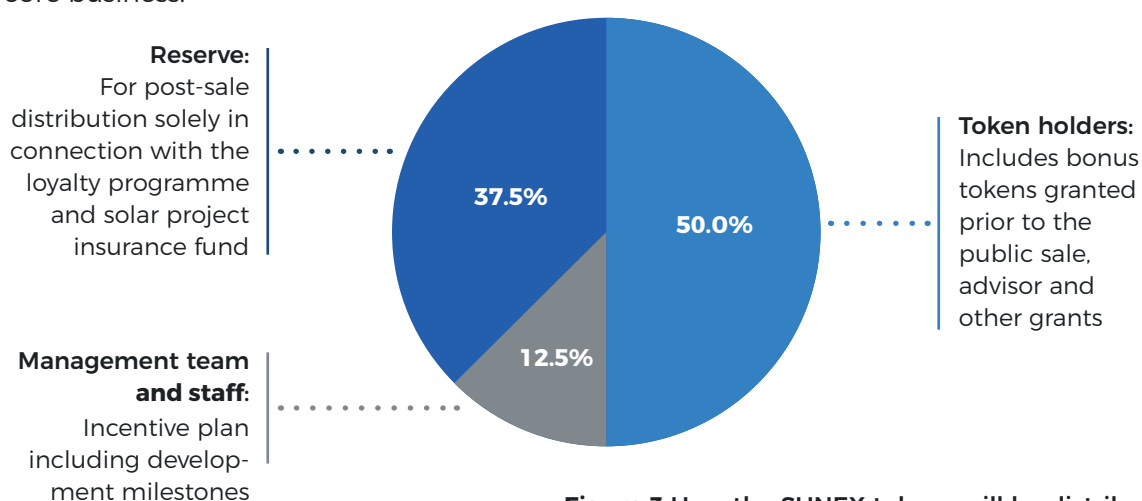
## DISTRIBUTION OF TOKENS

A limited number of SUNEX tokens are being created and will be distributed between token sale participants and Sun Exchange management and staff, and the remaining supply is to be kept in reserve for the ongoing post-token sale rewards programme. To protect against over-supply, undistributed tokens allocated for the token sale and the required number reserved tokens will be burned so as to ensure that the proportion of tokens distributed in the token sale event will be held constant at 62.5 percent of the total of SUNEX tokens (50 percent to token buyers and 12.5 percent to management).

**A maximum of 266,666,667 SUNEX tokens** will be minted to supply a multi-year programme that will result in the creation of an ecosystem of millions of Sun Exchange members unlocking hundreds of megawatts of solar energy systems.

Of this token supply:

- A maximum of 166,666,667 tokens will be distributed through a multi-stage token sale event
- A maximum of 100,000,000 tokens will be reserved for distribution to Sun Exchange members (Reserved Tokens) through the SUNEX rewards programme (see section **Post-Token Sale Token Distribution Rules**). These Reserve Tokens cannot be purchased and their issuance and circulation will be directly pegged to the growth of the Sun Exchange core business.



**Figure 3** How the SUNEX tokens will be distributed

## POST-TOKEN SALE SUNEX DISTRIBUTION RULES

SUNEX tokens allocated for the token sale can only be distributed in the token sale event. Reserved tokens for the rewards programme can only be distributed after the token sale with respect to the following activities conducted on the Sun Exchange platform:

- Purchase of USD 10.00 or more equivalent solar assets on the Sun Exchange marketplace
- Staking SUNEX tokens on the SPIF (see staking and SPIF details on pages 31)
- Purchase of solar cells in occasional special-case projects offering a SUNEX bonus<sup>1</sup>
- Taking a specific action to achieve a portfolio diversification goal according to the rules

<sup>1</sup> Sun Exchange can distribute up to 200,000 SUNEX per three-month period for Special SUNEX Token Bonus.

of the loyalty points programme (see details on page 37)

- Completing specific activities that materially benefit the Sun Exchange's business ecosystem, like peer recruitment of new buyers and achieving game challenges
- Sun Exchange will issue reserve tokens to members as they earn them through the loyalty or SPIF programs. Reserve SUNEX issuance will always correspond to an increase in the number of solar assets, growth of the Sun Exchange user base, or support of the SPIF. In this way, new supply of SUNEX potentially entering the secondary market- place will directly correspond to the growth and development of the Sun Exchange portfolio of solar and related projects, will be limited in scale, and will occur in measured steps.

## TOKEN SALE AT A GLANCE

- Website: [www.thesunexchange.com/token](http://www.thesunexchange.com/token)
- Token Pre-Sale: April 2018
- Token Sale: May 2018
- Token Sale Duration: 30 days
- Token Symbol: SUNEX
- Token Price: USD 1.00
- Accepted forms of payment: BTC, ETH, USD via credit cards

## TOKEN TIMING AND SALE BONUSES

- Private pre-sale with a 40 percent bonus until Public Pre-sale begins.
- Public Pre-sale: Starting April 2018, SUNEX tokens purchased during the pre-sale will include a 15 percent bonus.
- Public Sale: May 2018, on the first day of the Public Sale, a 10 percent bonus will apply and drop daily by 1 percent until it reaches zero.
- All of the above bonuses will end when all tokens available for bonuses (10 percent of total token sale tokens allocated during the sale) are attributed to token purchasers.

### IN THEIR WORDS – A SOLAR POWERED FUTURE

*"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that. I wish I had more years left!"*

– Thomas Edison, 1931

The following chart provides an overview of the timing and bonuses in which SUNEX tokens will be distributed to token purchasers, as well as Sun Exchange management, staff, advisors and shareholders.

CATEGORY	DETAIL	BONUS	TOKEN DISTRIBUTION TIMING
Tokens sold in token sale	Private Pre-Sale	40%	Tokens purchased for ETH, BTC, and USD: within 30 days of sale close
	Pre-Sale	15%	
	Public Sale		
	Day 1	10%	Tokens awarded as bonuses: Sale close + 180 days  EXCEPT Credit card purchases, limited to USD 2,000 and distributed at Sale close + 90 days if no charge-back claimed
	Day 2	9%	
	Day 3	8%	
	Day 4	7%	
	Day 5	6%	
	Day 6	5%	
	Day 7	4%	
	Day 8	3%	
	Day 9	2%	
	Day 10	1%	
	Day 11 onwards	0%	
Token sale tokens granted to advisors	Advisors, incentives	n/a	Up to 1-year lockup
Token sale tokens for Sun Exchange management and staff incentives	Sun Exchange management and staff	n/a	33.34% when loyalty programme operational*
			33.33% when SPIF operational* or after 1 year
			33.33% after 1 year
Tokens reserved for post-token sale distribution	Held in treasury	n/a	Allocated to cell owner through loyalty/SPIF programmes as specified in the distribution rules.

**Table 1 Token sale bonuses and timings**

\* These distributions occur when the governing smart contract receives confirmation of the first the successful execution of an event taking place for each of these features.



## THE OPPORTUNITY

### THE SUN EXCHANGE VISION

Sun Exchange envisions a world fully powered by clean energy, with decentralised ownership of the electricity-generating infrastructure.

Klaus Schwab, Founder and Executive Chairman of the World Economic Forum recently issued an urgent call, stating, “Our collective inability to secure inclusive growth and preserve our scarce resources puts multiple global systems at risk simultaneously. Our first response must be to develop new models for cooperation that are not based on narrow interests but on the destiny of humanity as a whole.”

Blockchain technology and solar energy are the perfect tools to respond to Schwab’s call. Both have the capacity to redefine the deeply dysfunctional and entrenched global systems, which increasingly create social and environmental strain. Combined, they have the power to address two of today’s most pressing sustainability challenges – energy poverty and climate change. Recognising the potential of this powerful nexus, Sun Exchange combines solar PV and blockchain technology to create a transformative framework for distributed ownership of distributed energy systems, worldwide, pioneering a new era of clean electricity access for all.

Sun Exchange offers its members solar power asset ownership opportunities that traditionally have only been available to institutional investors. Purchasing solar cells within Sun Exchange projects decentralises solar power plant ownership, ensuring that the environmental and socioeconomic issues of centralised energy supplies, inherent in the fossil fuel industries, are not replicated as the world migrates to clean energy. Sun Exchange is establishing a globally-distributed clean energy virtual transactive smart grid, giving the international community a chance to collectively own its energy sources, maximising the potential for redistribution of wealth.

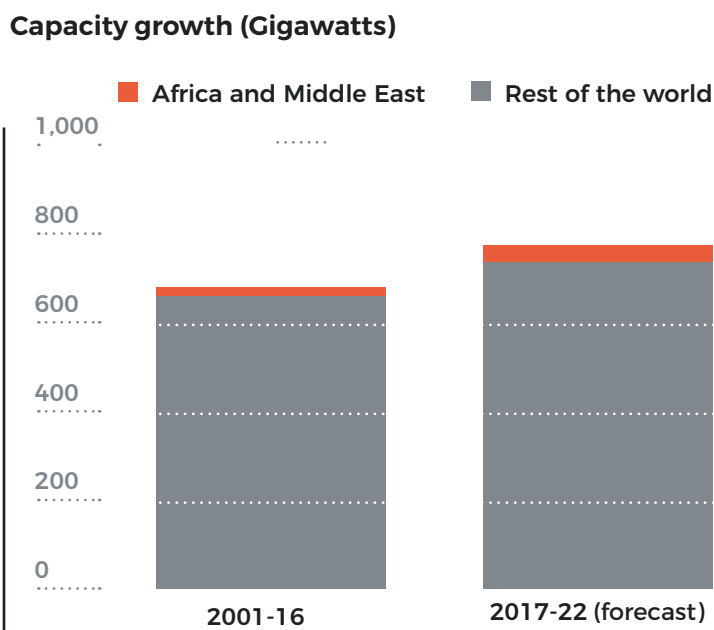
## THE SOLAR OPPORTUNITY

In 2009, around the same time that the Bitcoin genesis block was generated, commercially-viable solar PV energy emerged in Europe as a disruptor in the energy industry. In those early days, solar power prices exceeded USD 2.00 per Watt – significantly more expensive than fossil fuel and other non-renewable energy sources. Hefty solar subsidy programmes were required to incentivise businesses and homeowners to deploy solar. This came at significant cost to some countries, which went on to apply retrospective taxes. Nevertheless, the economic stimulus had the desired effect and created a boom in solar technology and manufacturing efficiency, which achieved economies of scale.

Since then, the price of solar has quickly declined. By 2016 solar energy production without subsidy across various global regions cost less than conventional fossil fuel energy production. [The International Energy Agency](#) (IEA) recently reported that in 2016, solar PV took the lead for the fastest electricity capacity growth when compared to any other fuel, beating the net growth in coal for the first time. In the past nine years, the solar energy industry built over 300GW (300,000,000,000 Watts) – equivalent to the output of 300 large nuclear power stations. At this rate of growth solar power could meet the majority of the planet's energy requirements by the end of the 21st century. The mission of Sun Exchange is to ensure that the ownership of these new energy assets is decentralised.

## SOLAR POWERING THE WORLD

While solar energy has taken off and quickly spread across the globe, it has unfortunately lagged behind in the developing regions that need it most. This includes Africa and the Middle East, where lack of access to solar project financing remains a significant obstacle.

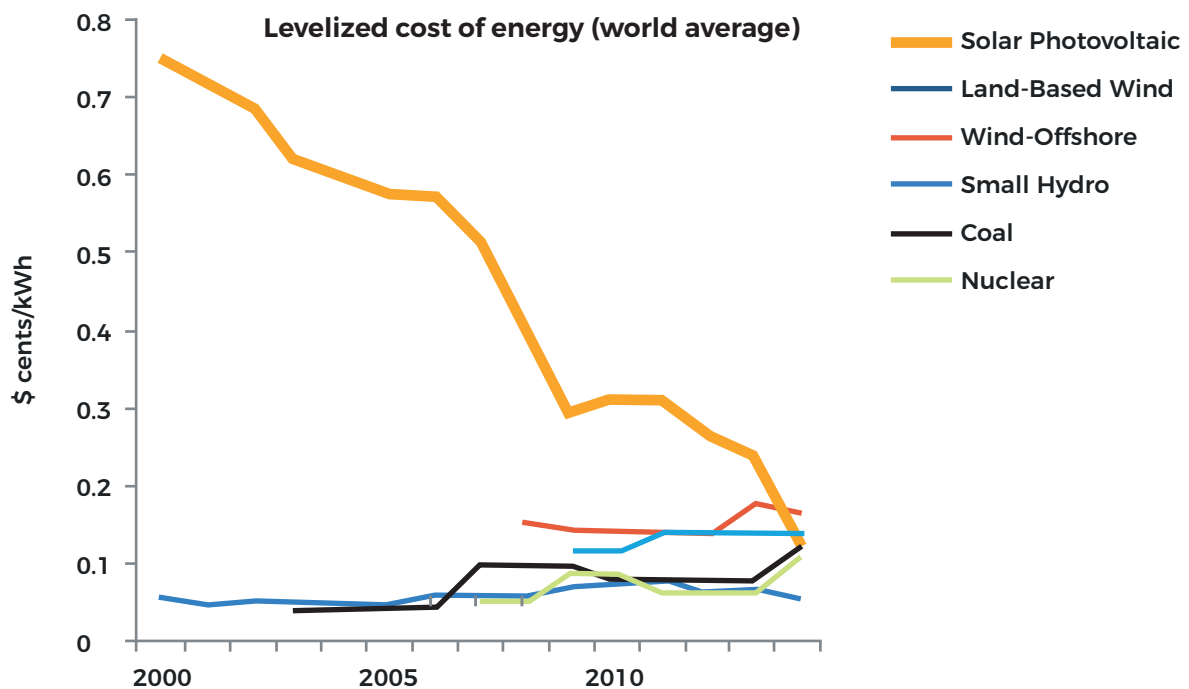


**Figure 4** Solar installations in Africa and Middle east compared to rest of the world are lagging far behind despite there being an abundance of sunshine in these regions.  
Source: Guardian graphic | IEA

Roughly 1 billion people globally (a great majority in developing markets ) still lack access to electricity . Coincidentally , most emerging markets struggling with energy access occupy the areas of the planet with the greatest abundance of sunshine. IEA research published in 2017 confirmed that decentralised energy systems , and primarily solar, offer the lowest -cost option for electrification across Sub-Saharan Africa. This means that beyond offering an attractive, clean and practical alternative for energy capacity development , solar also unlocks critical socioeconomic development, improving education, healthcare, safety and human rights conditions across emerging markets.

Furthermore , many countries with optimal solar conditions such as the United Arab Emirates , Saudi Arabia and China , have quickly recognised the cost benefits of solar power and are rolling out programmes to incentivise solar and achieve autonomy of energy supply. For example, in Dubai the government has set official goals of sourcing 25 percent of its energy supply from renewables by 2030, and 75 percent by 2050.

As fossil fuel prices rise in response to dwindling supplies , and the cost of solar and related technologies continue to fall, solar energy will progressively meet a greater proportion of the planet's energy requirements. The latest [New Energy Outlook](#) report from Bloomberg New Energy Finance states, "Solar is already at least as cheap as coal in Germany, Australia, the U.S., Spain and Italy. The levelised cost of electricity from solar is set to drop another 66 percent by 2040. By 2021, it will be cheaper than coal in China, India, Mexico, the U.K. and Brazil as well."



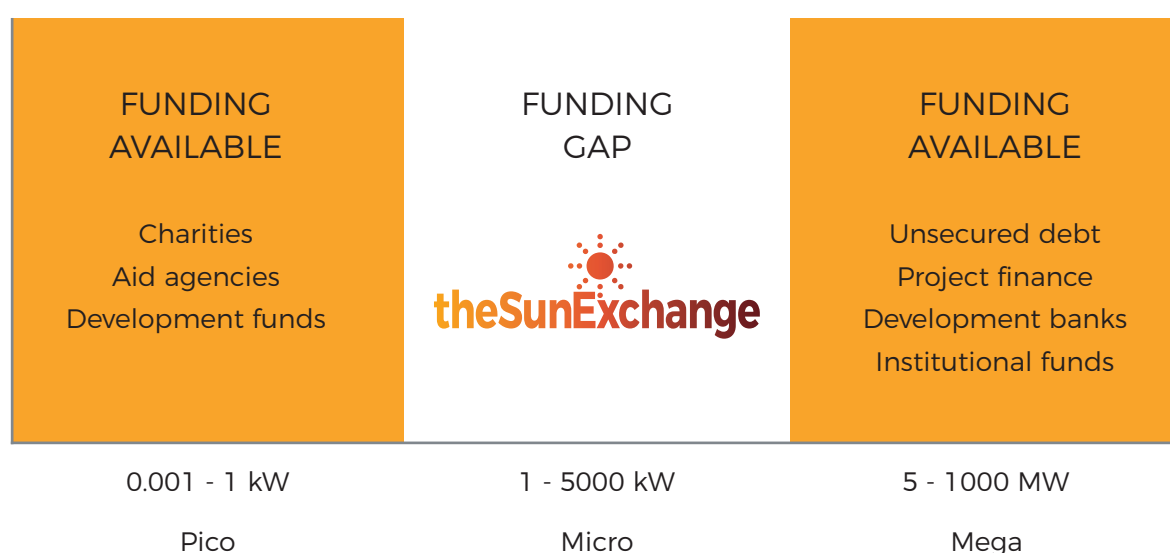
**Figure 5** Levelized cost of solar compared to other energy sources is now lower than fossil fuels as a global average.

Source: OpenEI, Transparent Cost Database



## CLOSING THE FUNDING GAP

Sun Exchange focuses on funding small to medium commercial and community solar projects for small to medium businesses, organisations and mini-grids, with projects ranging from 50 KWp to <5 MWp in capacity. These projects represent a promising market that is largely untapped, primarily because traditional solar financiers prefer to fund larger portfolios of solar projects or centralised utility-scale solar plants.



**Figure 6** Sun Exchange closes the funding gap for small to medium sized commercial and industrial scale solar energy systems in emerging markets.

This leaves smaller systems, such as those needed to power schools, hospitals, farms, remote communities and small businesses, without access to solar power. Together with these projects, there often exist opportunities to develop additional valuable infrastructure such as small water purification plants, agricultural produce refrigeration systems, telecommunications connections, and others. This type of capital expenditure – for socially impactful commercial, industrial and community infrastructure for productive use – falls into a funding gap worldwide that is most pronounced in emerging markets.

Sun Exchange has established an international network of major solar installation companies and project developers that specialise in identifying and building these small- to medium-scale commercial solar plants. Their on-the-ground sales teams identify and present projects to Sun Exchange for due diligence and if deemed suitable, is then hosted on the Sun Exchange platform. In this way, Sun Exchange leverages local knowledge, experience and skill to realise valuable solar cell micro-purchase and micro-leasing opportunities in targeted markets with ideal locations for solar panels. The result is a democratised solar sharing economy that creates new bonds between distributed owners and solar power offtakers in socially responsible projects that whilst being profitable, are typically overlooked by financial institutions.

## MAKING SOLAR PROJECTS VIABLE FOR THE UNBANKED

Traditional solar funds do not invest in projects that present levels of uncertainty in revenue or where offtakers are not “banked,” as is the case for many rural communities in developing regions. Consequently, community scale mini-grids are often left unfunded, despite their lucrative potential. This results in communities spending more on diesel fuel and kerosene rather than on solar energy, despite the proven health and economic benefits of solar.

Sun Exchange offers a democratic solution to funding these projects by making them more attractive and secure. The new Sun Exchange SPIF, into which SUNEX tokens can be staked, is the world’s first default insurance fund for previously unbankable solar projects in emerging markets. With default insurance in place, more capital will flow into projects with the potential to improve millions of lives.

## SUN EXCHANGE’S SOLAR PROJECT INSURANCE FUND (SPIF)

Despite the company’s thorough approach to due diligence assessments for all potential solar electricity offtakers, when working with small organisations in developing markets over 20-year contracts, it is impossible for Sun Exchange to entirely eliminate all risk. While all Sun Exchange offtakers to date have proven reliable, the company strives for continuous innovation to create the most secure financial environment possible for solar asset owners on the Sun Exchange marketplace.

The Sun Exchange Solar Project Insurance Fund (SPIF) is a key enabler in the company’s efforts to bridge the funding gap for small commercial and industrial solar projects in developing markets. Cash proceeds from the token sale will provide initial SPIF seed funding, which will in turn be invested in U.S. Treasury bills and other short-term sovereign debt. This will create a dedicated collateral pool to protect solar cell owners against project defaults during their 20-year lease contract lifetimes. In addition to the fiat currency collateral, Sun Exchange will solicit SUNEX token stakes, and additionally allocate a number of reserved tokens to a buffer bonus pool, which together can be additional sources for insurance claim expense payments, and can replenish the SPIF fiat currency collateral pool.

### IN THEIR WORDS – A SOLAR POWERED FUTURE


*“Mainstream microfinance reaches hundreds of millions of people today, which re- quired a system of controls to be built at the village -level. I think solar will follow this path, to create a decentralised market of electricity of the future.”*

– Danny Kennedy (PV Magazine), Advisor, Sun Exchange; Renowned clean-tech entrepreneur, environmental activist, author; Co-founder, Sungevity and Powerhouse

## THE SOLAR AND BLOCKCHAIN OPPORTUNITY

While solar and blockchain technologies have quickly advanced in parallel throughout the last decade, their combined potential is just starting to be realised. Sun Exchange is at the nexus of that innovation and value creation.

Several new blockchain solutions for the energy industry have emerged in the last two years. However, despite slight variations in their approach and targeted geographies, most current providers focus on enabling peer-to-peer energy trading. This model is prone to regulatory barriers and very challenging to scale internationally. In contrast, Sun Exchange employs a completely unique application for blockchain, focusing on the creation of new energy generation capacity with distributed international ownership, using a universally permissible leasing structure.

		BLOCKCHAIN P2P ENERGY TRADING PLATFORMS
Decentralises Energy Systems	✓	✓
Improves Energy Systems Efficiency	✓	✓
Energy Infrastructure Ownership	✓	✗
Business Currently Operational	✓	✗
Rewards Programme	Coming soon	✗
Supports Established Crypto-currencies	✓	✗
Existing Global Customer Base	✓	✗

**Figure 7 Attributes of Sun Exchange vs Energy Trading platforms**

P2P energy trading platforms work in markets where there is surplus energy to be traded. Sun Exchange focuses on markets where there is a shortage of energy, where energy generating infrastructure needs to be built in the first instance. Sun Exchange is the platform for enabling decentralised ownership and getting new clean energy infrastructure built. Put simply, energy trading platforms like kWhCoin and PowerLedger deal with energy, Sun Exchange deals with the underlying energy generating assets. We consider the latter to be more scalable and prone to less regulatory barriers. In off-grid solar systems, energy needn't even be traded, but there will always be a need for enabling asset ownership. In cases where there is energy surplus and regulatory support, P-2P energy trading platforms can be utilized as a 2nd layer on Sun Exchange projects.

Together with its energy trading-focused peers, Sun Exchange is leveraging blockchain to create a virtual transactive grid through which clean energy value can move unimpeded across national borders.

*Further details on Sun Exchange applications of blockchain technology can be found on page 26.*

## ENERGY DEMANDS OF CRYPTOCURRENCY

Just as solar has democratised the supply of energy, cryptocurrency has the potential to dramatically increase financial inclusion and level the playing field for capital-raising and investment. However, there are costs. Cryptocurrency mining is now one of the fastest growing industries in the world, and its energy demand is massive. According to the [Digiconomist Bitcoin Energy Consumption Index](#), at the current trajectory, by 2019 bitcoin alone may require as much energy as the whole of the Netherlands. To ensure the sustainability of the industry and minimise negative environmental impact, energy for crypto mining must be derived primarily from clean, renewable and low-cost sources. Sun Exchange recognises this as an unprecedented opportunity for owners of the energy generating assets for cryptocurrency mining and believes that, through decentralised ownership, entire communities can benefit.

## THE BUSINESS

### THE SUN EXCHANGE SOLUTION

Sun Exchange was developed directly in response to the urgent global need for continued proliferation of clean, decentralised energy, and to harness the opportunity presented by the parallel developments in solar and blockchain technologies.

The Sun Exchange marketplace enables individuals and organizations across the globe to buy solar cells and lease them to be installed in commercial and industrial solar projects and mini-grids in Africa the Middle East, and soon Latin America, South East Asia and India. Solar cell owners earn rental income directly from their solar assets, which are installed into projects that bring solar power to emerging markets.

A solar cell is the base unit of a solar panel. Each solar panel includes either 60 or 72 cells, and each Sun Exchange solar project may use up to 1,200,000 cells. Sun Exchange raises capital for solar projects by selling the underlying solar cells through crowd-sales hosted on its online platform ([www.thesunexchange.com](http://www.thesunexchange.com)). During the crowd-sales, members can purchase the optimally-located solar cells for under USD 10 per unit. Members who purchase solar cells can also track cells' real-time performance through their Sun Exchange dashboard. By enabling members to buy into solar projects in increments of a single cell, Sun Exchange makes solar project ownership dramatically more accessible and inclusive than previous models reserved only for accredited investors.

- Solar cells purchased through Sun Exchange are automatically leased to the project offtaker chosen by the buyer, typically under 20 year contract. Offtaker lessees may include hospitals, small businesses, schools or other small-to-medium organisations. Solar cell lease prices track changes in local energy prices and inflation to ensure long-term value. Offtakers benefit from affordable clean electricity for no upfront cost and pay for the solar electricity consumed, which in turn reduces costs and consumption from grid connections, diesel generators, and other non-renewable energy sources.

To enhance international appeal and ease of use, Sun Exchange accepts crypto-currencies as a payment currency for solar cells and optionally distributes fiat-based solar lease rental in bitcoin. Bitcoin payments are now implemented in all of Sun Exchange's four operating projects in South Africa.

In addition to running and managing solar crowd-sales and lease agreements, Sun Exchange performs in-depth evaluations of the commercial viability of each solar PV project before qualifying it as a good candidate for a crowd-sale. Sun Exchange services include solar project co-design with Engineering, Procurement and Construction (EPC) firms, generation of solar equipment leases and related legal contracts and solar energy lease rental collection and distribution over the term of each lease contract.

Sun Exchange applies a 10-15 percent margin to the cost of the solar projects it hosts and earns a 2.5 – 5.0 percent servicing charge on all revenues collected from solar energy projects.

## TARGET MARKETS

Sun Exchange targets two key audience groups, which it identifies and defines as follows:

- **Solar power offtakers** : These are the organisations that use the solar cells owned by Sun Exchange solar cell purchasers (members). Sun Exchange targets optimal solar power markets across the globe where businesses, schools, hospitals, communities, and other organisations require access to solar equipment for their energy needs. Core markets, such as Sub-Saharan Africa, are chosen for their potential to generate exponential growth by raising funds from distributed sources, for distributed solar energy systems. To select project areas that can create dependable value for all parties in a transaction, Sun Exchange considers project financial and engineering factors, in addition to macroeconomic and regulatory factors.

- **Solar cell purchasers / members** : This includes individuals and small and large organisations around the globe who purchase solar cells through the Sun Exchange platform to be leased and installed at offtaker sites. The only requirements to buy into a solar project are an internet connection and approximately USD 10, making solar plant ownership more affordable and inclusive than previously imaginable.



## COMPLETED SUN EXCHANGE SOLAR PROJECTS

To date, Sun Exchange has focused on enabling solar projects in South Africa, one of the sunniest countries in the world. South Africa is an emerging and industrialised nation with large and increasing demand for energy. Its electricity infrastructure is outdated, almost entirely coal-powered and owned and operated by a state-owned monopoly. These factors have made South Africa an ideal test bed to roll out the Sun Exchange micro-lease model. In terms of climate change mitigation, solar cells installed in South Africa offset four times the greenhouse gas emissions than those installed in Western Europe.

The first Sun Exchange project was for Stellenbosch Waldorf School in South Africa's Western Cape, which became the first solar power plant in history to be financed from cryptocurrency. Sun Exchange has now financed four fully-operational solar projects across South Africa. All of these solar power plants are meeting or exceeding their electricity production and rental income generation forecasts.

The following Sun Exchange-financed projects have been completed in the last 18 months:

PROJECT NAME	APPLICATIONS	NUMBER OF CELLS	TOTAL SYSTEM COST	NUMBER OF OWNERS	DATE INSTALLED
Stellenbosch Waldorf School	Education	3,461	~USD 30,000	30	August 2016
Kal Tire	Sustainable Manufacturing	10,380	~USD 60,000	105	January 2017
Centre for the Rehabilitation of Wildlife (CROW)	Animal Welfare	3,780	~USD 40,000	88	April 2017
Knysna Elephant Park	Animal Conservation	13,248	~USD 80,000	140	October 2017



**Figure 8** The solar facility powering Kal Tire is comprised of over 10,000 solar cells owned by Sun Exchange members located around the world.



## SUN EXCHANGE PROJECT PIPELINE

Through its network of solar installation partners, Sun Exchange continually builds its pipeline of solar projects, which now exceeds 150 MW (detailed in Appendix 1). All pipeline projects meet the required criteria of powering ethical and responsible businesses, organisations and communities.

Solar project types that Sun Exchange members can look forward to seeing include:

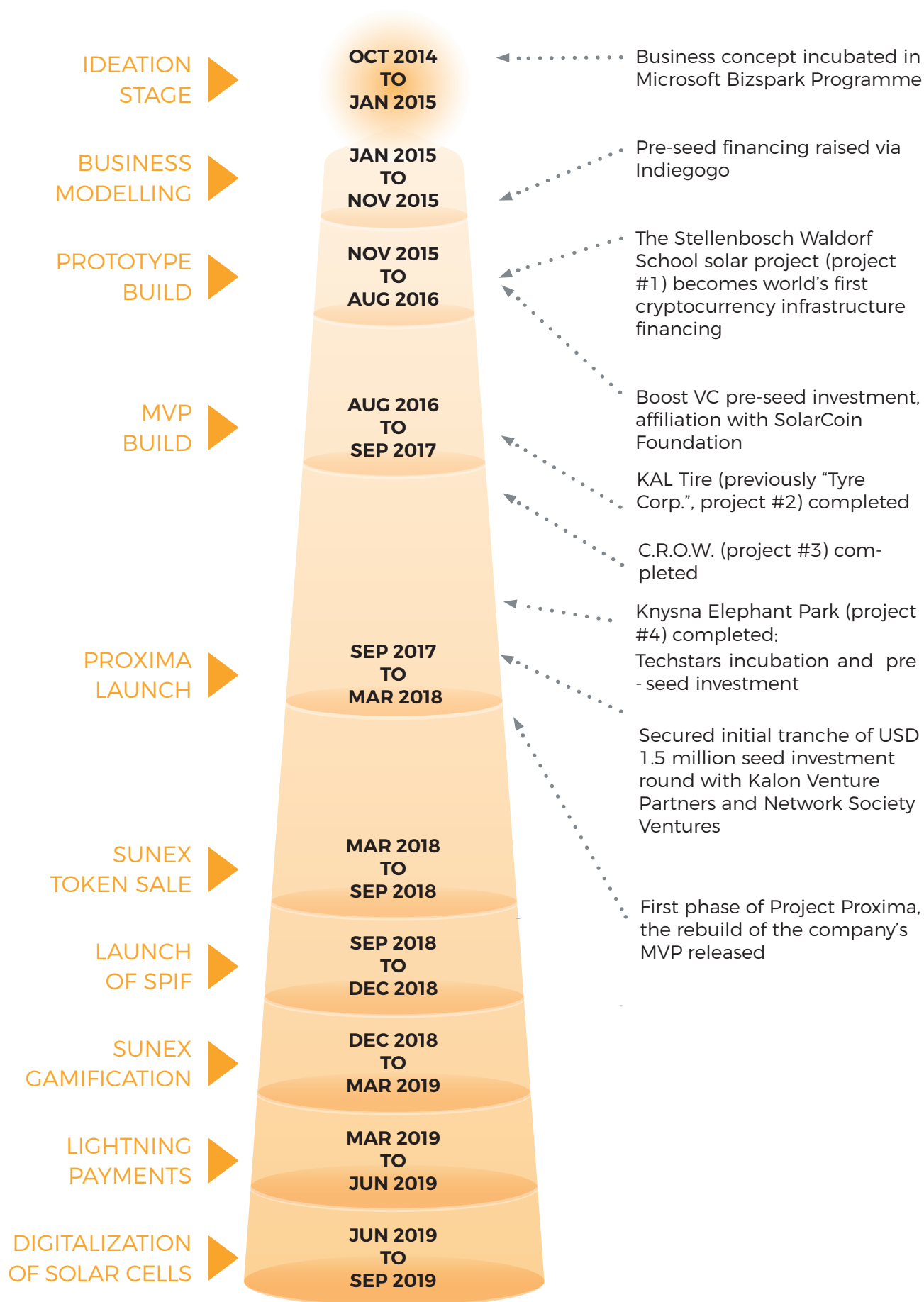
- Schools and universities
- Mini-grids in both rural and suburban settings
- Water desalinisation plants
- Hospitals and care homes
- Animal welfare and conservation centres
- Hydroponic and aquaculture farms
- Agricultural cold storages and packing houses
- Cryptocurrency mines
- Mineral extraction mines and processing facilities
- Factories and offices
- Server farms
- Mobile telecommunication towers
- Recycling facilities

Not only do Sun Exchange projects have a positive social and environmental impact, they are also engineered to be technically and economically reliable and stable sources of income for solar cell owners. Although Sun Exchange projects have variable lease rates and returns can vary from initial estimates, Sun Exchange sets a minimum target of 10 percent internal rate of return (IRR) in projects' local currency on the purchase price of the solar equipment, based on reasonable estimates at the time.

## SUN EXCHANGE COMPANY TIMELINE

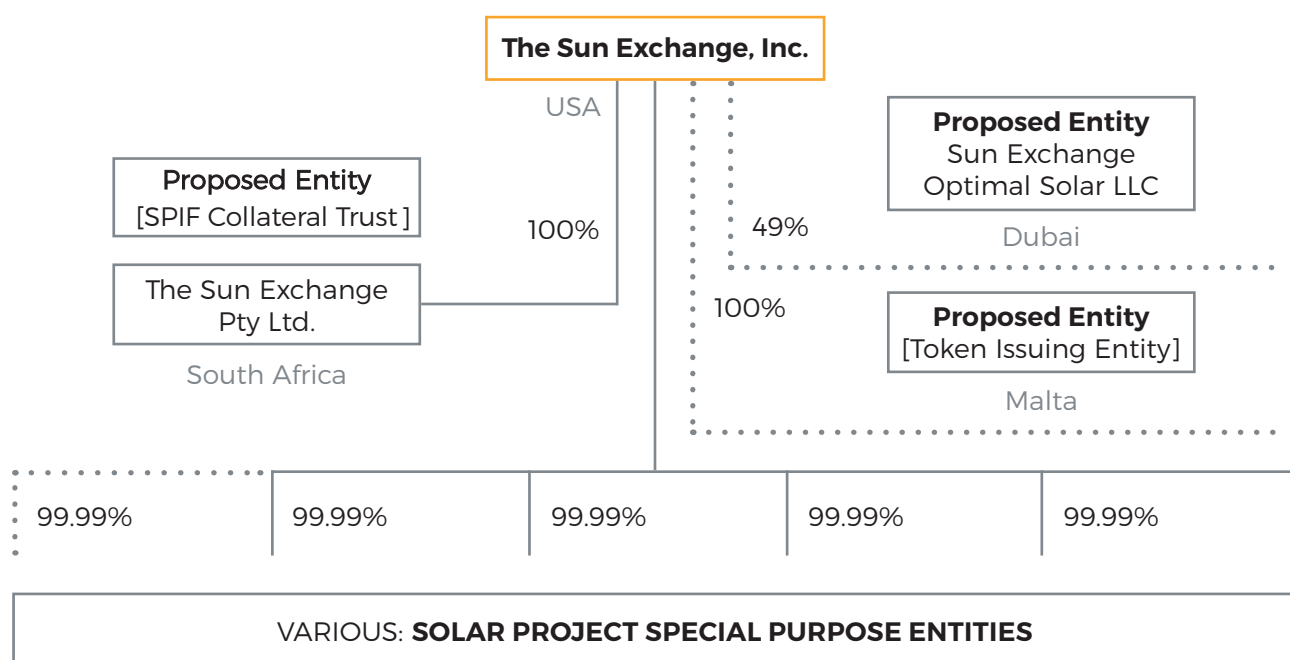
Founder and CEO, Abraham Cambridge, was inspired to start Sun Exchange in 2014 after moving to South Africa and noticing the lack of solar industry despite perfect solar conditions. The missing piece was access to finance, and bitcoin solved that problem. Sun Exchange was launched on Indiegogo in 2015, and three months later TheSunExchange.com, a “buy-to-lease solar panels marketplace”, was born.

The following page shows highlights and key events in the history of Sun Exchange.



**Figure 9** Timeline of Sun Exchange development since its inception in 2014.

## SUN EXCHANGE COMPANY STRUCTURE



**Figure 10** Sun Exchange company structure

### Scalability and Distribution

Sun Exchange began operations in South Africa in 2015. Today, the company has members in over 70 countries around the world.

Sun Exchange has established an international network of solar installations partners, with a view to host solar projects on multiple continents and in both hemispheres. Over time, this will provide customers with portfolio diversification opportunities and enable them to earn monetised sunshine streamed in real-time during every hour of every day, all year round.

Sun Exchange continuously develops and grows its global installation partner network with well established and reputable Engineering, Procurement and Construction (EPC) companies. For example, Soventix, a German-headquartered solar installation company operating throughout the globe with pipeline exceeding 1 GWp has partnered with Sun Exchange for enabling commercial and industrial projects. All our (EPC) partners appoint experienced local teams of installers and conduct the ongoing Operation and Maintenance (O&M) of projects.

## CONSCIOUS CAPITAL & SOLAR INVESTING

Sun Exchange has a differentiated competitive position in the conscious capital and solar investing market. Although solar crowdfunding providers exist, its unique revenue model, approach and technology enable Sun Exchange to offer direct ownership of the solar generation assets themselves. Sun Exchange is purpose built for cryptocurrency payments, significantly simplifying global transactions and reducing administrative costs.

Most solar crowdfunding providers focus on projects in developed nations, while Sun Exchange focuses on increasing the volume of solar capacity in developing markets with optimal solar conditions and a critical demand for power. The company's focus on the underserved small commercial and industrial solar sector is also unique. Additionally, the Sun Exchange crowd sale approach makes direct solar assets ownership dramatically more accessible and affordable. Typically, the entry cost for solar energy investing is around USD 10,000. By reducing the minimum entry cost to <USD 10, Sun Exchange reduces the barrier to solar asset ownership by three orders of magnitude!

## PROJECT VETTING PROCESS

Today, the company has solar cell owner-members in over 70 countries. Solar energy projects hosted on the Sun Exchange marketplace undergo thorough technical and economic review by an in-house team of passionate and experienced solar engineers who apply industry standard due diligence methodologies. This process gives Sun Exchange and its members confidence that projects presented in the Sun Exchange marketplace will operate reliably and generate long-term value. As part of the due diligence process, the company also reviews each offtaker's historical financial performance and makes an independent assessment of its potential to meet financial obligations under the solar lease contract terms.

The following is a summary of some of the project technical and financial factors Sun Exchange evaluates in connection with its extensive due diligence process (detailed in Appendix 1 on page 45):

- Forecast energy generation and offtaker usage using historical data, proposed system specifications
- Analyse macro economic factors such as historical energy cost inflation and CPI data
- Confirm the availability and cost of insurance for equipment and third party liability
- Evaluate the EPC/installer and Operations & Maintenance (O&M) company counterparty risk
- Assess local utility and financial regulations
- Confirm local (crypto) currency exchange availability, currency convertibility
- Using quantitative and qualitative tools, assess offtakers' ability to meet lease obligations, leveraging historical financial information, site visits, meetings or calls with offtaker management
- Evaluate lease and other relevant contract terms

Sun Exchange performs these evaluations on a best-efforts basis to provide attractive projects on its platform. However, it is important to understand that each solar cell owner makes an independent purchase decision and bears the associated risks.

## SOLAR POWER REVENUE COLLECTION AND PLANT MONITORING

All solar power plants hosted on Sun Exchange are directly monitored in frequent (generally 15-minute) intervals via the inverters or data loggers on the solar plants. The solar data feed is provided to Sun Exchange members online on their dashboard. This data feed is the “oracle of truth” on solar production and determines the cost to the offtaker of the solar power plant. While lease payments are currently transferred on a monthly basis, Sun Exchange is developing capabilities that will enable real-time micro-payments on the Lightning Network.

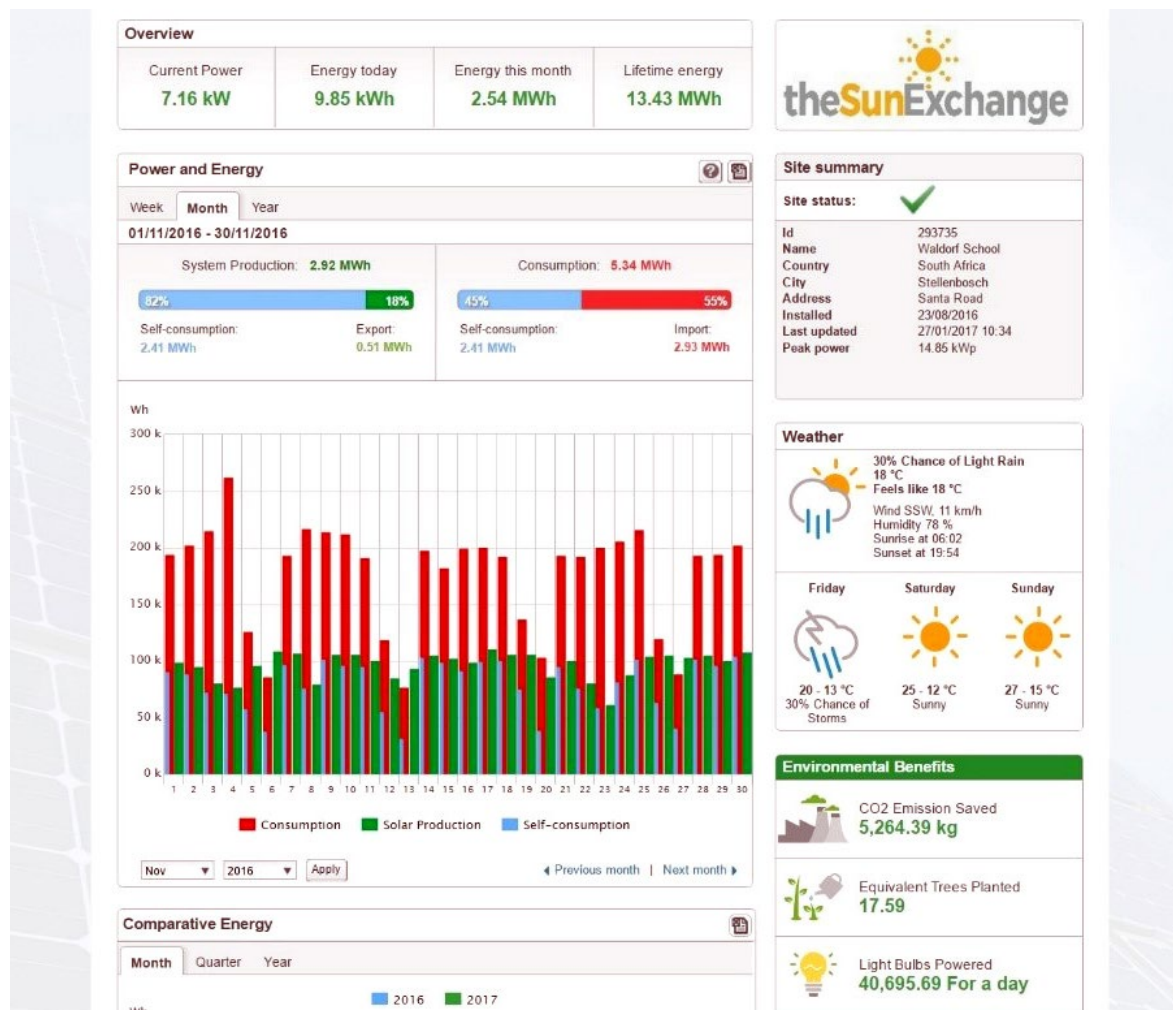


Figure 11 Sun Exchange’s dashboard provides a live data stream from members’ solar cells

## SOLAR POWER PLANT MAINTENANCE

Each solar power project has a maintenance reserve fund built from a portion of the revenue of the solar energy sales. The fund is used to compensate O&M contractors who are appointed to maintain and supervise plant performance. In most cases the O&M provider is also the EPC provider for the project. All key hardware components of each solar energy plant have manufacturers' warranties in place which cover the cost of hardware replacement in the event of a fault. Solar plants are insured with third-party insurance companies against fire, theft, damage and third-party liability. The soon-to-be-implemented Solar Project Insurance Fund will provide a buffer against losses from solar lease contract defaults.

## SUN EXCHANGE APPLICATIONS OF BLOCKCHAIN TECHNOLOGY

The main components of blockchain technology Sun Exchange integrates are:

**1. SUNEX Tokens:** The new Ethereum ERC20 token for use on the Sun Exchange marketplace. The token includes staking capabilities to support a new solar project insurance fund for developing markets. SUNEX also functions as loyalty points for Sun Exchange customers, encouraging good buying behaviour through diversification of risk across project types and geographies.

**2. Cryptocurrency payments:** Blockchain-based digital currencies provide an optimal payment alternative for Sun Exchange transactions across borders. Starting with the first Sun Exchange project in March 2016, Sun Exchange has accepted bitcoin, Ether and SolarCoin, as well as fiat currency, in payment for solar cells. The company also offers members the option to receive monthly solar project rental payments in bitcoin, even if they purchased their cells in fiat currency. Earning cryptocurrency whilst owning the underlying solar asset appeals to more risk averse individuals looking to enter into the cryptocurrency ecosystem. Sun Exchange is also working towards implementation of Lightning Network and other side chain technologies to reduce transaction costs and increase payment frequencies.

**3. Smart Contracts & IoT Sensors :** Sun Exchange makes the measurement of energy production and the subsequent distribution of income secure and cost-efficient as possible. Solar cell ownership is managed by Ethereum smart contracts, and financial information is pulled from relevant cryptocurrency blockchains and from trust accounts for fiat currencies. Solar production data is gathered from inverters and data loggers at solar installations via online gateways, and Sun Exchange also plans to install IoT meters at the production sites in the near future. Member account balances are updated as often as production data is received from the solar installations, and payments to cell owners are made in near real-time. Deployment of the Lightning Network is planned for the near future and will enable real-time micro-payments as solar cells generate electricity. An early version of this work was [demonstrated at the BlockChain Africa conference](#) in March 2017. For more detail see 'Streaming monetised sunshine' in Appendix 2 below.

**4. Solar Project Insurance Fund (SPIF) Smart Contracts :** Sun Exchange will develop ( using Token Sale proceeds ) an Ethereum smart contract that will accept SUNEX as stakes against the SPIF which will function as insurance against lease defaults by offtakers. Although the SPIF will be collateralised with fiat cash and cash -equivalent government securities, the staked SUNEX can be a source from which to replenish SPIF collateral used for insurance claim expenses. After the smart staking contract is developed, Sun Exchange will develop an Ethereum smart contract to manage aspects of the SPIF claims process which will increase automation, trustlessness and transparency of the insurance claims process.



## SUN EXCHANGE PROXIMA PLATFORM

Project Proxima (named after the next-nearest star to the Earth) was started in the third quarter of 2017 to replace and extend the capabilities of the previous Sun Exchange Minimum Viable Product (MVP) platform. The MVP was a lightweight sales website, backed by multiple, complex manual processes that managed the business and held the business data sufficient to support the first four Sun Exchange solar projects.

Sun Exchange has developed Proxima in the following stages to manage technical risk, provide customers with information, and improve automation:

1. An SQL database was developed, with one consistent and reliable source of the truth.
2. A customer dashboard was developed to allow members to see the detail of their solar cells' performance, and to request pay-outs of accumulated lease income in their account wallets.
3. Proxima is being used to market and fund the crowd-sales for Sun Exchange solar projects and the MVP website will be replaced. Once this happens, Sun Exchange will re-style and re-launch the full website.

## PROXIMA ARCHITECTURE

Proxima is a node.js application with a react.js front end.

The application interfaces to the bitcoin and Ethereum nodes. Sun Exchange uses the bitcoin node to manage bitcoin transfers between Sun Exchange and its members. Sun Exchange will use the Ethereum node to run smart contracts for the upcoming IoT interface (see details below). The application also interfaces with bitcoin exchanges to perform real-time exchange to and from fiat currency where required.

## CURRENT PROXIMA FUNCTIONALITY

Proxima is the chief point of contact between Sun Exchange and its members. Through this platform, members can view past and future projects, and buy into projects that have solar cells available for sale. Members may pay these purchases in fiat currency or cryptocurrency. They may also spend funds that have accumulated in their Sun Exchange digital wallet through lease payments from previous projects. The dashboard holds wallets for members to conveniently store accumulated fiat, bitcoin, SUNEX and SolarCoin.

## FUTURE PROXIMA FUNCTIONALITY

Proxima development will continue with enhancements to support the Sun Exchange product roadmap. This includes:

- A secondary market to allow members to trade their solar cells on a peer-to-peer basis.
- Meters at each solar plant to provide near real-time performance data to members who own solar cells in projects. Earnings will stream continuously to customers' wallets based on the solar production of the solar plant. (Sun Exchange has experimented with using

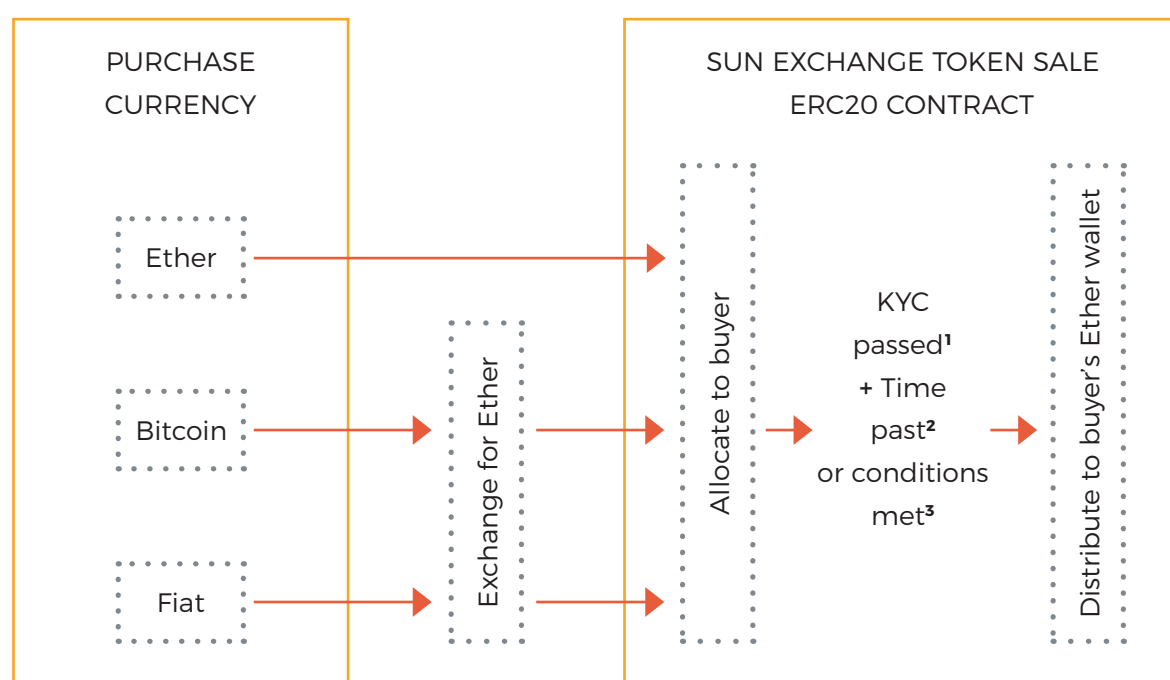
an Ethereum blockchain to manage this process. See further information on “Streaming monetised sunshine, using Ethereum” in Appendix 2).

- A gamified loyalty programme, utilising the SUNEX token, will be implemented to reward members for purchases in Sun Exchange projects and performing actions that collectively benefit the Sun Exchange community.
- A Solar Project Insurance Fund (SPIF), utilising the value of the SUNEX token, will insure against default risk.

The Proxima dashboard will be frequently updated to create a hub for members to interact, supervise their solar ownership, track asset performance and identify upcoming solar project opportunities.

## THE SUNEX TOKEN SMART CONTRACT

The token is sold via a website and allocated and distributed using via an ERC 20 Solidity contract on the Ethereum network. The business process and contract functionality are summarised below:



**Figure 12** The SUNEX token smart contract process

### 1. KYC passed

If the buyer does not attempt or pass KYC, their ETH will be returned to their ETH Wallet

### 2. Time past

Buyers - Within 30 days after close of event, except for credit card purchases

Advisors - 30 days after close of event, or up to a year

Management - a year after close, except if,

### 3. Conditions for distribution

Loyalty scheme launched - one third of management tokens can be released early

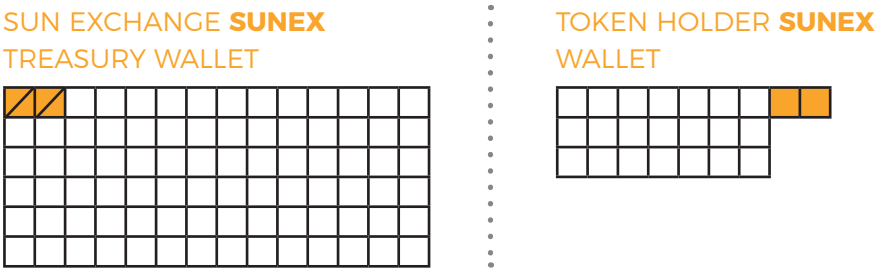
SPIF scheme launched - one third of management tokens can be released early

# IMPLEMENTATION OF THE LOYALTY PROGRAMME ON PROXIMA

The loyalty scheme will be launched on Proxima and will use the SUNEX Reserve Tokens in the Sun Exchange Treasury to reward cell buyers. At launch, existing cell owners will be issued from the treasury to current cell owners who meet the rewards criteria.

Afterwards, loyalty tokens will be issued on new cell purchases. The diagram below shows this in a simplified manner.

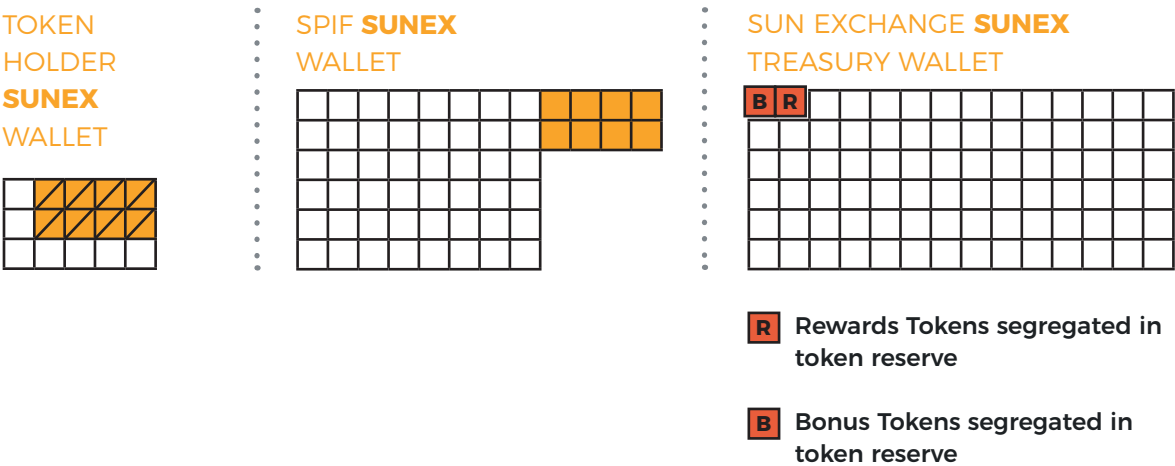
**Figure 13: Member buys cells - receives loyalty SUNEX and discounts if already holding SUNEX**



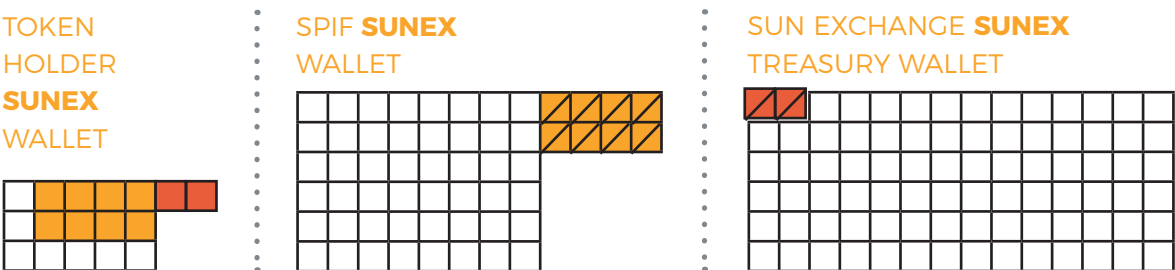
# IMPLEMENTATION OF THE SPIF PROGRAMME ON PROXIMA

The SPIF programme will be administered by Proxima as follows:

**Figure 14: Member commits SUNEX to SPIF – SUNEX allocated to SPIF wallet and Staking Bonus and Staking Reward SUNEX earmarked in treasury**



**Figure 15: End of staking – member receives his SUNEX back plus bonus and reward SUNEX**



## SECURITY ON THE PLATFORM

### Site Security

- Sun Exchange exposes its websites interface over HTTPS.
- All sensitive transactions and password changes on the system are secured by using a two-factor authentication process.
- Sun Exchange uses Amazon Web Services (AWS) as a hosting provider and leverages its infrastructure for site security, data security, data redundancy, and data backups.
- No clear text passwords are saved to the Sun Exchange database.
- Bitcoin purchases completed on our website are made using a hierarchical deterministic (HD) process. The private key at the root of these addresses will never be exposed to a networked machine and is generated in such a way that no single person would be able to regenerate it.

### Operational Security

- All passwords are held using LastPass (password manager service for businesses) and access is strictly controlled.
- Sun Exchange follows AWS security best practices for our cloud infrastructure.
- Access to sensitive documentation is managed through Google Drive.

### Security Roadmap

- Bitcoin funds held on behalf of customers are to be stored in offline cold storage, multisig wallets, with a float of the funds to be held in a multisig wallet for quick transactions without exposing the funds to theft.
- Fiat funds are to be held in escrow accounts which will be appropriately audited.
- Sun Exchange is currently developing a security policy to be enforced by all staff which will be reviewed every six months. The company will undergo a full third-party security audit to ensure security is ironclad.

## SOLARCOIN

SolarCoin (SLR) is a digital currency created by the SolarCoin Foundation as a universal subsidy and reward for the generation of solar energy, "air miles for solar generation ." One SLR coin is issued for every 1 MWh of solar energy produced . As an affiliate of the SolarCoin Foundation, Sun Exchange claims these SLR coins on its members ' behalf. As a free bonus, additional to accumulated SUNEX tokens and lease rental earnings , these air-dropped SLR coins are allocated on a pro-rata to members ' wallets provided through the Sun Exchange platform.



## SUNEX TOKEN FEATURES

### SOLAR PROJECT INSURANCE FUND (SPIF)

Soon after the close of the SUNEX token sale, Sun Exchange will establish the Solar Project Insurance Fund (SPIF) to safeguard Sun Exchange solar cell owners against solar project defaults. Proceeds from the token sale will be converted to fiat currency cash and cash-equivalent collateral and placed in a trust; this will be available to pay future claims expenses, including equipment relocation expenses and partial compensation to solar cell owners for value lost due to equipment write-off. In addition to the fiat currency collateral, a number of staked SUNEX tokens plus tokens allocated from the token reserve will be an additional source from which to pay insurance claim expenses, and to replenish the SPIF fiat currency collateral pool.

The SPIF will be collateralised with cash and securities as described below, with up to 20 percent of the total proceeds raised in the token sale, subject to prior provision for taxes, payment of token sale fees and expenses, and a minimum of USD 3 million for Sun Exchange business development expenses. When the token sale ends, certain Ether and bitcoin token sale proceeds will be converted to USD, and together with USD token sale proceeds, will be invested in U.S. Treasury bills. Thereafter, as required to hedge currency risk for certain projects, it may be converted to solar project local currencies and invested in liquid sovereign short-term debt. All interest on the collateral, and insurance premiums deducted from solar project rentals, will be added to the total SPIF collateral and reinvested as above.

In the event of a project default, the SPIF can also take possession of and liquidate SUNEX tokens from the Staking Bonus Pool and previously staked SUNEX tokens. Please refer to the SUNEX Token Staking section below for details.

All Sun Exchange solar projects will be insured by the SPIF, according to the following terms:

**Total SPIF Collateral** is the USD equivalent market value of cash and short-term government bond investments that can be sold to cover present and future claims on the SPIF, as determined by the SPIF Administrator in its reasonable judgement.

Each project has a **Project EPC Contract Value**, which is a project's pre-tax total procurement and installation USD equivalent cost, as determined by the SPIF Administrator in its reasonable judgement.

Each project has a **Project Insurance Limit**, which is the lesser of (i) Total SPIF Collateral times 0.1, and (ii) Project EPC Contract Value times 0.2, less (iii) the cumulative amount of all previously Approved Claims for that project.

Each project has a **Project Portfolio Weight**, which is (i) its Project Insurance Limit, divided by (ii) the sum total of all Project Insurance Limits covered by the SPIF.

Each project has an insured value, the **Project SPIF Insured Amount**, calculated as (i) its Project Portfolio Weight times (ii) the lesser of (a) Total SPIF Collateral and (b) the sum total of all Project Insurance Limits covered by the SPIF.

For any project, **Project SPIF Collateral** is cash and liquid assets included in the Total SPIF Collateral, with USD equivalent market value equal to the Project SPIF Insured Amount. In consideration of currency hedging requirements, the SPIF Administrator will determine in good faith which particular assets and cash in the Total SPIF Collateral should constitute Project SPIF Collateral for a project.

To cover claims expenses for a project, the SPIF Administrator may liquidate Project SPIF Collateral, sufficient to provide a cash amount that is the lesser of:

- (i) total USD equivalent amount of insurance claim expenses for the project
- (ii) Project Insurance Limit, or
- (iii) Project SPIF Insured Amount

at the time a claim on SPIF is approved.

The calculation method ensures that no project represents greater than 10 percent of the Total SPIF Collateral, and that each project can be insured to a maximum of 20 percent of its Project EPC Contract Value. The Project SPIF Insured Amount can vary with the market value of the Total SPIF Collateral, which may rise or fall under various market conditions in future.

All projects will pay to SPIF an insurance premium (SPIF Premium) of 0.05 percent multiplied by its Project SPIF Insured Amount on the first business day of each calendar month. All SPIF Premium is added to the Total SPIF Collateral to cover costs of insuring the solar projects. A project that fails to pay the SPIF Premium for any six months in a 12-month period, but has not defaulted on a lease contract, will cease to be covered by the SPIF.

## SPIF CLAIMS PROCESS

If an energy offtaker lease contract default occurs and (i) the solar equipment is unrecoverable, cannot be resold or reused, or (ii) the solar equipment must be removed from the defaulting lessee's physical location, relocated and re-installed at a new lessee's location, then any solar cell owner in the relevant project or the **SPIF Administrator** (initially, Sun Exchange) may make a claim to the SPIF on behalf of all of the solar project's solar cell owners.

A claim should include the claim amounts and currencies, and the proposed uses of any approved claim amounts, including the proportion of the amount to be allocated to project-related expenses and the proportion of the amount to be paid out to solar cell owners. Sun Exchange will arrange a vote among relevant solar cell owners to validate the claim



proposal (**Validated Claim**). Sun Exchange will investigate the facts related to validated claim terms, then approve or deny claims in its sole and reasonable discretion (**Approved Claims, Denied Claims**). Relevant solar cell owners may also vote to appeal Sun Exchange claims decisions via arbitration. Approved Claims will be denominated in USD, as determined by the SPIF Administrator in its reasonable judgement.

In the case of Approved Claims, for (i) above, the SPIF can pay to solar cell owners up to the Project SPIF Insured Amount. In the case of (ii) above, the SPIF can cover all costs associated with the physical removal, relocation and installation of the original equipment, plus purchase of required new equipment, up to the Project SPIF Insured Amount. Notwithstanding that the Project SPIF Insured Amount may be greater, in all cases the maximum amount payable under any claim cannot exceed the sum of (a) realised value of Project SPIF Collateral and (b) realised value of Project Forfeited Tokens, after completion of the secondary market sales described below.

When an Approved Claim must be paid, Sun Exchange will arrange for the sale of sufficient collateral, not exceeding that project's share of the Total SPIF Collateral (the Project SPIF Collateral) to cover the Approved Claims. The SPIF Administrator will sell U.S. Treasury bills, local currency bonds or both in the secondary markets on a best efforts basis, up to the smaller of the claims amount or Project SPIF Insured Amount.

To further support payment of SPIF claims expenses, and to replenish its funds, the SPIF will gain an amount of SUNEX from the pool of reserved bonus tokens and previously staked SUNEX tokens, sufficient to cover approved claims (the Project Forfeited Tokens). Sun Exchange will arrange for the sale of the Project Forfeited Tokens in the secondary market, on a best efforts basis, in an orderly way.

The combined proceeds of the liquidated Project SPIF Collateral and the Project Forfeited Tokens will first be allocated to pay the entire claims expense, and any remaining proceeds will be added to Total SPIF Collateral and can be invested as described above. None of the Project Forfeited Tokens will be returned to holders that staked SUNEX tokens.

## THE SPIF ADMINISTRATOR

The SPIF Administrator (initially, Sun Exchange) will manage the SPIF for an annual fee of 0.5 percent multiplied by the Total SPIF Collateral, payable in monthly instalments (**SPIF Administrator Fee**). Administrative duties include management and investment of SPIF collateral, provision of certain information as an oracle to smart contracts in connection with the SUNEX staking and insurance claims processes on the Ethereum blockchain, sale of forfeited SUNEX and Project SPIF Collateral in the secondary market, collection of SPIF Premium, investigation of project insurance claims, determination of insurance claims as approved or denied, and other duties as may be required. SUNEX token holders can vote to change the SPIF Administrator with a qualified substitute.

## SUNEX TOKEN STAKING

The SUNEX token has been designed to be staked into a Solar Project Insurance Fund (SPIF) to enable SUNEX token holders to play an active role in the solar electrification of the planet by providing generalised, portfolio-level support for all Sun Exchange solar projects.

Each time Sun Exchange completes financing for a new solar project, it will announce the project's total pre-tax procurement and installation cost (Project EPC Contract Value) and the Project SPIF Insured Amount to be covered with new stakes. The SPIF Administrator will then solicit SUNEX holders to stake tokens on the SPIF. As stakes accumulate, a number of reserved tokens will be segregated to create (1) a Staking Bonus Pool to provide a protective buffer to SUNEX token stakers against forfeiture of their staked tokens, and (2) Staking Rewards for future pay-out to SUNEX stakers.

As each SUNEX stake is confirmed, the SPIF Administrator will cause 21.6667 percent times the Holder Staked Units to be segregated from the general pool of reserved SUNEX tokens:

- 10.9200 percent times Holder Staked Units, a portion of which will be distributed monthly as Staking Rewards in future
- 10.7467 percent times Holder Staked Units to be allocated to the **Staking Bonus Pool**, a pool of SUNEX tokens that will be used to settle insurance claims before Holder Staked Units may be forfeited
- If there are no portfolio defaults and all segregated tokens are distributed, the SUNEX staker will earn an effective 20 percent annual return in SUNEX tokens

Thereafter, if the SPIF must pay Approved Claims, it can force sufficient number of SUNEX (Project Forfeited Tokens) to move to the fund, first from the Staking Bonus Pool, and second from the pool of staked SUNEX tokens. The SPIF Administrator can then, on the fund's behalf, liquidate the forfeited tokens in the secondary market, as needed, to pay claims expenses.

To obtain the Project Forfeited Tokens, the fund will first take SUNEX from the Staking Bonus Pool (**Project Forfeited Bonus Tokens**). To the extent the balance of Project Forfeited Bonus Tokens is less than Project Forfeited Tokens, each staker will forfeit a number of tokens equal to:

- (1) the staker's Holder Stake Weight multiplied by
- (2) the lesser of
  - (a) Project Forfeited Tokens less Project Forfeited Bonus Tokens
  - (b) Sum total of Holder Staked Units

Project Forfeited Tokens are the total number of SUNEX tokens that should be sold to cover the Approved Claim payable by the SPIF, at the time it is approved, as the SPIF Administrator determines using the SUNEX market price at that time. If the insurance claim cannot be fully covered, the Project Forfeited Tokens will be the entire balance of staked tokens.

Every time a stake is accepted from any SUNEX token holder, and each time a token holder forfeits tokens as described above, a smart contract will record:

- (i) Current number of the holder's staked SUNEX (**Holder Staked Units**)
- (ii) Equivalent USD value of Holder Staked Units (**Staked Value**) as calculated by the SPIF Administrator
- (iii) **Holder Stake Date and Time**
- (iv) **Holder Stake Expiry** - Equivalent to Stake Date and Time + 395 calendar days)
- (v) **Holder Stake Weight** - The ratio of the Holder Staked Units to the sum of all Holder Staked Units
- (vi) **Available Holder Stake Bonus** – balance of the Staking Bonus Pool times Holder Stake Weight

At the time of its Stake Expiry, if the SPIF Administrator is soliciting token stakes, a previously-staked SUNEX token will have priority over other tokens to be re-staked.

Staking Rewards and Staking Bonuses will be paid to SUNEX stakers:

- Each holder's stake will earn monthly **Staking Rewards** at a rate of 0.84 percent times Holder Staked Units, as calculated at 12:00 GMT on the first calendar day of each month by the SPIF Administrator, or on the Holder Stake Expiry Date, whichever is earlier. Staking Rewards will be distributed from the SPIF staking smart contract on that same day.
- **Staking Bonuses** will be distributed to each staker on the Holder Stake Expiry date. Each SUNEX staker will receive an amount that is the balance of the Staking Bonus Pool times his Holder Stake Weight.
- At each Holder Stake Expiry date, SUNEX tokens segregated from the general pool of reserved SUNEX tokens that were neither forfeited to the fund nor distributed to the SUNEX staker will return to the general reserve pool

## IN THEIR WORDS – A SOLAR POWERED FUTURE

*"The intersection of the exponentially growing technologies of solar photovoltaics and blockchain are fundamental to the profound transformation that we will witness as we build a global 21st century civilisation".*

– David Orban, Advisor, Sun Exchange; CEO, Network Society Ventures;  
Managing Partner; Pioneering investor in Ethereum ICO, 2017

## SUNEX REWARDS PROGRAMME LEVELS

Sun Exchange has established a SUNEX rewards programme with user levels named after different stages of star formation. The highest user level is “Ra,” named after the ancient Egyptian sun god. The more SUNEX a Sun Exchange member owns, the higher they progress through the tiers and the more valuable their benefits become

The top ‘Ra’ user level is achieved either by:

1. Obtaining 1 million SUNEX tokens (which can be purchased in the token sale for USD 1 million) or,
2. Accumulating a spend of USD 10 million in solar assets purchased through Sun Exchange.

The 12 reward levels, which can be achieved through cumulative solar cell purchases and earned bonuses, are shown in the following table:

LEVEL	SUNEX	LEASE BONUS (PERCENT)	PURCHASE BONUS (PERCENT)	PRIORITY
Ra	1,000,000	+1.5	+5	1
Super Nova	100,000	+1.0	+2	2
Hyper Giant	50,000	+0.8	+1.5	3
Super Giant	10,000	+0.7	+1.0	4
Bright Giant	5,000	+0.6	+0.8	5
Giant	1,000	+0.5	+0.6	6
Dwarf	500	+0.4	+0.5	7
Sub-Dwarf	100	+0.3	+0.4	8
Proto-Star	10	+0.2	+0.2	9
Fission	5	+0.1	+0.1	10
Molecular Cloud	1	Base Lease	No Bonus	11
Hydrogen	0	0	0	0

**Table 2** SUNEX membership tiers and benefit levels.

## SUNEX GAMIFICATION SYSTEM

Accruing SUNEX beyond the token sale has been gamified to increase interactive engagement with the platform. It is designed to guide members towards making smart decisions and building a diverse and socially-impactful portfolio of solar assets as well as rewarding them for supporting the Sun Exchange ecosystem.

The table below provides an overview of achievements when using Sun Exchange and the amount of SUNEX tokens rewarded:

**Table 3 SUNEX Gamification Achievements**

CATEGORY	ACHIEVEMENT	REWARD
Change Agent	Donate a portion of solar cell lease income to charity	1 SUNEX
<b>Referral Rewards</b>		
Champion	Every one new sign-up to Sun Exchange who purchases at least one cell	0.5 SUNEX
Evangelist	Every 10 new sign-ups to Sun Exchange who purchase at least one cell each	10 SUNEX
Sun Exchange Angel	Every 100 new sign-ups to Sun Exchange who purchase at least one cell each	100 SUNEX
<b>Ownership Volume Rewards</b>		
Watt	Own a single cell or more	0.5 SUNEX
Decawatt	Own 10 cells or more	1 SUNEX
Hectowatt	Own 100 cells or more	10 SUNEX
Kilowatt	Own 1,000 or more cells	100 SUNEX
Super-Kilowatt	Own 10,000 cells or more	1000 SUNEX
Ultra-Kilowatt	Own 100,000 cells or more	10,000 SUNEX
Megawatt	Own a megawatt of cells	100,000 SUNEX
Gigawatt	Own a gigawatt of cells	1,000,000 SUNEX
<b>Power Generation Rewards</b>		
Pedestrian	Generate the first kWh	1 SUNEX
Cyclist	Generate the first MWh	10 SUNEX
Motorist	Generate the first GWh	100 SUNEX
Light Speed	Generate the first TWh	1,000 SUNEX

CATEGORY	ACHIEVEMENT	REWARD
<b>Regional Diversification Rewards</b>		
Endless Summer	Own solar cells in both the Northern and Southern Hemispheres	10 SUNEX
Eternal Sunshine	Own solar cells in sufficient time zones to generate solar power 24 hours a day	1 SUNEX
African Sun	Own a solar cell located in Africa	1 SUNEX
European Sun	Own a solar cell located in Europe	1 SUNEX
Asian Sun	Own a solar cell located in Asia	1 SUNEX
North American Sun	Own a solar cell located in North America	1 SUNEX
South American Sun	Own a solar cell located in South America	1 SUNEX
Australian Sun	Own a solar cell located in Australia	1 SUNEX
Global Sun Harvester	Own solar cells across all continents	10 SUNEX
<b>Infrastructure Diversification Awards</b>		
Electrifier	Solar power a micro-grid	10 SUNEX
Fabricator	Solar power a factory	1 SUNEX
Digger	Solar power a commercial mine	1 SUNEX
Crypto Miner	Solar power a crypto mine	1 SUNEX
Educator	Solar power a school	1 SUNEX
Healer	Solar power a hospital	1 SUNEX
Connector	Solar power a mobile telecoms tower	1 SUNEX
Ecologist	Solar power a wildlife conservation project	1 SUNEX
Green Thumb	Solar power a farm or agricultural project	1 SUNEX
H2O	Solar power a water purification and sanitation project	1 SUNEX
Jack of all Trades	All of the above	10 SUNEX

Members can achieve up to five of all of the above medals and, if five are acquired, each the following happens:

CATEGORY	ACHIEVEMENT	REWARD
<b>SUNEX Gold Awards</b>		
Light Bringer	Solar power five micro-grids	100 SUNEX
Chief Industrialist	Solar power five factories	10 SUNEX
Gold Rusher	Solar power five commercial mines	10 SUNEX
Satoshi	Solar power five crypto mines	10 SUNEX
Scholar	Solar power five schools	10 SUNEX
Nightingale	Solar power five hospitals	10 SUNEX
Communicator	Solar power five mobile telecoms towers	10 SUNEX
Attenborough	Solar power five wildlife conservation projects	10 SUNEX
Ceres	Solar power five farms or agricultural projects	10 SUNEX
Nemo	Solar power five water purification and sanitation projects	10 SUNEX
Master of All	All of the above	100 SUNEX
Power of Ra	Achieved all awards	10,000 SUNEX

## OPTIONAL SUNEX GIVEBACK PLAN

Token sales are often criticised for excessive unutilised capital. Sun Exchange aims to hold the highest standard of responsibility in token sale conduct through an optional SUNEX Giveback Plan. Sun Exchange believes that supporters of its mission who purchased tokens should not be financially penalised if Sun Exchange is unable to successfully deploy all of the token sale proceeds. Through the SUNEX Giveback Plan, if part of the token proceeds go unused within a reasonable (e.g. 36 month) timeframe, Sun Exchange may choose to return to early contributors the amount equal to the fiat value they contributed during the token sale event. Details of this plan are still under consideration and more information will be announced to Sun Exchange members in the future.





## CORE TEAM MEMBERS AND PARTNERS

### SUN EXCHANGE CORE TEAM

#### ABRAHAM CAMBRIDGE

##### **Founder & CEO**

Abraham is a serial energy entrepreneur with more than 10 years of deep experience in the solar industry. He originated the concept for a powerful foreign direct investment model for commercial and community scale solar projects. He is a cryptocurrency enthusiast and renowned thought leader in solar and crypto, delivers keynote speeches around the world, and is frequently quoted. His academic background is in climate change science and solar energy.

#### LARRY TEMLOCK

##### **Co-founder & CFO**

Larry manages financial activities for the Sun Exchange group of companies as well as the legal, accounting, and deal structuring matters of the Sun Exchange solar projects. He has over 25 years of experience with debt capital markets origination, securitisation, leveraged finance, and financial engineering.

#### LISA LYHNE

##### **COO & Acting CTO**

Lisa has over 30 years of experience running operations, developing software, building businesses, and managing highly technical projects, and has been a founder at several software start-ups. She has significant knowledge in blockchain and smart contract development. At Sun Exchange she runs the technical team and oversees business operations overall.

#### MORWESI RAMONYAI

##### **Chief Commercial Officer**

Morwesi is a social entrepreneur and the solar project developer and rural electrification specialist for Sun Exchange. She founded Borena Energy Solutions, a renewable energy solutions company that is entirely black woman owned. She has extensive experience in information systems, IT risk management, computer auditing, business management and corporate governance, but her passion is bringing a socially-responsible and ethically viable framework to renewable energy projects.

#### LOURENS COETZER

##### **Vice President of Engineering**

With over 20 years of diverse experience in the software development sector and a growing expertise in blockchain, Lourens is a powerful asset within the decentralised, token-enabled global economy. Lourens has worked on everything from call forecasting AI components and credit bureau software to mobile network protocol converters and performance testing tools, but one of his greatest strengths is his ability to lead teams in diverse domains.

## ANTHONY STONEFIELD

### Head of Venture Development

Anthony is a serial tech entrepreneur and venture capital and venture development expert who has founded many tech start-ups around the globe and raised millions of dollars in angel, seed and venture capital. He has led specialised projects internationally for several Fortune 500 companies, but his unique talent is connecting powerful investors with high-value start-ups and guiding start-ups through hypergrowth.



**Figure 16** The Sun Exchange Team and Investors

## ADVISORS

### DAVID ORBAN

CEO of Network Society Ventures, Chairman of Network Society Labs; pioneering investor in Ethereum ICO; founder of SingularityU Italy Summit

### MICHAEL TERPIN

Founder & CEO of Transform Group and advisor for ICO Box; industry pioneer and advisor, leading marketing strategies for over 40 token sale events

### RICHARD TITUS

Managing Partner of ARK ICO Advisors; 20 years of executive leadership in digital transformation businesses; adventurer and raconteur

### **DANNY KENNEDY**

Managing director of California Clean Energy Fund; cleantech entrepreneur, environmental activist, author; co-founder of Sungevity, and of the Powerhouse solar-tech incubator

### **GIL SPERLING**

Co-Founder and CTO of Popimedia

### **DAVID PROVENZANI**

Founder and CEO of Dubai Solar Schools; board member of the Association of Architects of Bologna, Italy

### **GAVIN MARSHALL**

Technologist and left-field thinker; founder of sharebit.io and consultant at Blockchain Academy; formerly head of innovation at Mxit, Africa's first major mobile social media channel and pioneer of mobile payments

### **THIERRY SCHANG**

Technology advisor and Executive in Residence at Plug and Play Tech Center, Sunnyvale. Former VP of Engineering at TIBCO Software, Inc.

## EXTERNAL SUN EXCHANGE INVESTORS

### KALON VENTURE PARTNERS

Kalon Venture Partners is the disruptive technology VC fund led by the most dynamic and well-experienced team in the South Africa tech VC space. Kalon invests in post-revenue startups whose entrepreneurs are solving African problems with the potential to scale into global markets. Kalon believes you will achieve a ripple effect of smart returns if you create as much non-financial as financial value.

<https://www.kalonvp.com/>

### NETWORK SOCIETY VENTURES

Network Society Ventures (NSV) seeks to invest in disruptive technology-based companies that are leading the transformation from the post-industrial age to The Network Society. NSV is focused on making investments in the sectors that constitute the Eight Pillars of Change promulgated by the Network Society Project, of which Energy is one target sector. NSV believes that delivering an effective response to climate change dictates a rapid transition to an economy based on renewable energy. This requires the establishment of a decentralised, reliable and resilient power grid.

<http://netsoc.vc/>

### TECHSTARS

Techstars is the worldwide network that helps entrepreneurs succeed. Techstars Ventures is the venture capital arm of Techstars; it has USD 265 million under management and it is currently investing out of its third fund (USD 150 million). Techstars provides accelerator portfolio companies with access to financial, human and intellectual capital to fuel the success of their business.

<https://www.techstars.com/>

### BOOST VC

Boost VC invests in pre-seed startups making sci-fi a reality. Boost VC runs the No. 1 virtual reality and No. 1 blockchain accelerator. They believe that Blockchain is one of the largest technological breakthroughs in the past many decades.

<https://www.boost.vc/>

### POWERHOUSE

Powerhouse is an Oakland, California based co-working space and seed fund that houses and invests in intelligent energy entrepreneurs building software-enabled solutions for the clean energy industry. Since inception, Powerhouse has hosted over 50 startups and organisations and celebrated 5 acquisitions.

<https://powerhouse.solar/>



## AFFILIATES & PARTNERS

### BLOCKABLE

Blockchain design and smart contract development.

### BARCLAYS BANK

Sun Exchange and Barclays Bank are engaged in trialling innovative funding models for solar projects on the African continent.

### SOVENTIX

Founded in 2007 and headquartered in Germany, Soventix is one of the world's leading solar engineering and installation companies with operations across emerging markets. Sun Exchange is co-operating with Soventix for solar installation across Africa.

### SOLARCOIN

Sun Exchange is the affiliate of the Solar Coin Foundation for SolarCoin claims being made for projects in Africa.

### TRANSFORM PR

Leading PR and marketing agency for the token offering “industry” with over 36 of the top token sales serviced.

### NETWORK SOCIETY LAB

Venture Development firm for NSV portfolio companies, including token sale management.



## **APPENDIX 1** **- SOLAR PROJECT PIPELINE AND DUE DILIGENCE**

Sun Exchange is building a robust pipeline of solar project financing opportunities. Partners and project details have been evaluated as viable and attractive to key parties, across diverse industries and geographic regions. This pipeline is continually being developed. The table below is a snapshot at the time this document was published.

SUN EXCHANGE SOLAR PROJECT PIPELINE				
Sector	Project Type	Project Cost (USD)	Capacity (kWp)	Country
Education	Schools	110,000	110	South Africa
Education	Schools	140,000	100	South Africa
Agriculture	Dairy Farm	700,000	450	Morocco
Commercial & Industrial	Commercial	40,000	30	South Africa
Tourism	Hotel Accommodation	50,000	25	South Africa
Education	Schools & Universities	50,000,000	50,000	UAE
Commercial & Industrial	Industrial	5,000,000	5,000	UAE
Commercial & Industrial	Commercial	25,000	10	South Africa
Off-Grid	Community Micro-Grid	70,000	7000	Lesotho
Off-Grid	Rural Telecoms Towers	5,800,000	500	Africa
Business	Solar Farm	38,000,000	40,000	Japan
Education	Zambia School	300,000	100	Zambia
Off-Grid	Community Micro-Grid	300,000	100	Zambia
Commercial & Industrial	Industrial	110,000	110	India
Commercial & Industrial	Solar Farm	22,000,000	11,000	Burundi
Commercial & Industrial	Commercial	28,000,000	20,000	Zimbabwe
Off-Grid	Community Micro-Grid	300,000	150	Zambia
Commercial & Industrial	ANRE/ Government PPA	1,500,000	1,000	Moldova
Education	University	100,000	100	Kenya
Education	Schools	300,000	100	Swaziland
Agriculture	Farm	2,000,000	2,000	Nigeria
Commercial & Industrial	Commercial	60,000	68	South Africa
Commercial & Industrial	Commercial	320,000	300	South Africa
Off-Grid	Community Micro-Grid	1,000,000	1,000	Puerto Rico
		<b>156,225,000</b>	<b>139,253</b>	

The aim of the Sun Exchange due diligence of a project is to provide a reliable technical assessment that supports the decision to host the project on the Sun Exchange online platform and offer the solar cells to the membership.

The review of each new project is mainly based on the following topics:

- **Site Assessment:** The external conditions that may affect the suitability of the proposed design for the site are assessed, which are important for specification of equipment, construction progress or which may result in operational disruption. Some of the conditions that are analysed include the site, the weather or the impact of shadings.
- **Independent Energy Assessment:** An energy assessment is undertaken based on the irradiation at the site, the technical specifications of the plant and the site-specific constraints. Industry standard software is used for the simulation. The different losses affecting the plant are based on the design of the plant and pragmatic assumptions supported by know-how and research of the engineers. The outputs of the assessment are the long-term estimate, the different probabilities of exceedance based on the uncertainty analysis of the project and project lifetime production.
- **Technology Review:** The main equipment of the plant is reviewed in order to identify any potential risks derived from the technology and any associated impact on the expected life or the performance of the plant. The review is focused on the PV module, inverter and racking system selected for the project and include the assessment of the manufacturers, the technical parameters based on the datasheets and independent measurements and contractual conditions.
- **Design Review:** The design proposed for the plant is reviewed in order to verify it complies with the main electrical and mechanical restrictions considering the site-specific conditions. The review is based on but not limited to the design documentation like layout, single line diagram, equipment datasheets and geotechnical studies.
- **Permitting Review:** The review is focused on the required authorisations, licenses and permits for the construction and operation of the plant from a technical point of view.
- **Project Agreements Review:** EPC and O&M contracts are viewed from a technical point of view. Special focus is considered for the scope of work, schedules, equipment and project warranties, liquidated damages, fees, terms, commissioning procedures as well as adequacy of contractors.

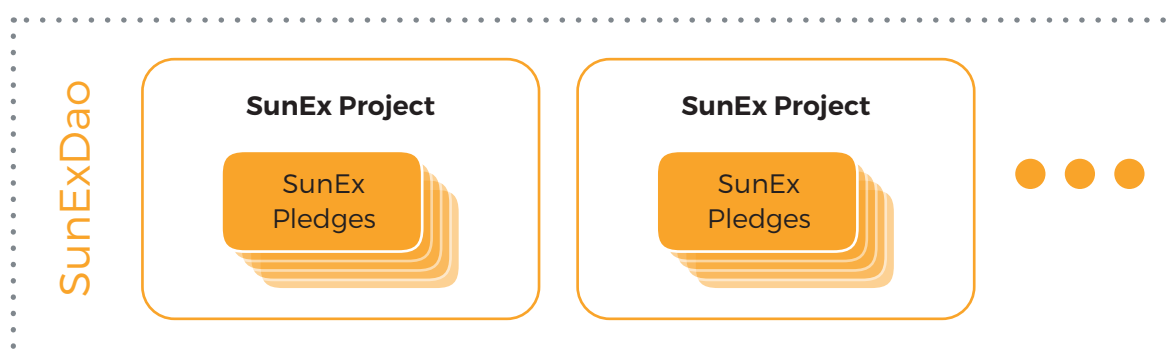


## APPENDIX 2

### - STREAMING MONETISED SUNSHINE, USING ETHEREUM

Sun Exchange aims to integrate meters on-site at solar projects with members' wallets in order to "stream monetised sunshine" directly to their wallets, leveraging the blockchain. Sun Exchange has created a concept demonstrator while exploring a potential solution that would work in a trustless manner, in real time.

The basic structure consisted of three contract types: the SunExDao contract, SunExProject contracts, and SunExPledge contracts.



**Figure 12** The SUNEX DAO will allow automated solar lease rental payouts

Only one instance of the SunExDao contract is deployed to bootstrap the system. The SunExDao contract can create and deploy SunExProject contracts onto the blockchain. It can also list the projects that it owns.

SunExProject contracts:

- Accept pledges (what Sun Exchange refers to as "ordering cells")
- Accept payments for generated electricity
- Manage project lifecycle

When a SunExProject accepts a pledge, it creates and deploys a SunExPledge contract onto the blockchain. The SunExPledge contract will hold the pledge funds until project is fully funded, at which time the SunExProject contract will convert to a funded state and funds will be transferred from the pledges to the owning SunExProject contract.

When a SunExProject receives funds from the consumer of the electricity it would then immediately distribute the payment to the SunExPledge contracts that belongs to it. At this point the funds in the SunExPledge contracts would belong to the members that made the pledges.

A public version of the contracts and the JavaScript to use them can be found at: <https://github.com/The-Sun-Exchange/TheSunExchangeDAO/blob/master/src/contracts/sunExPledge.ts>

## LEGAL DISCLAIMER

This whitepaper constitutes a technical description of the anticipated creation and issuance of SUNEX tokens. It is not intended to serve any other purpose. In particular, it does not constitute a prospectus of any sort, and it is not an offer to sell, or a solicitation of offers to buy, any securities or investment of any sort. This whitepaper does not pertain in any way to any offering of securities in any jurisdiction. Nothing in this whitepaper is intended to establish or create any representation, commitment, undertaking, promise or contract on the part of Sun Exchange to any party. This whitepaper is presented “as is” and for information purposes only, and without warranties of any kind, express or implied.

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