Elektrik V2 Whitepaper

Abstract. Elektrik is a decentralized exchange (DEX) that enables direct peer-to-peer trading without intermediaries or reliance on centralized market makers and other entities. The DEX leverages a dynamic approach to providing liquidity as well as advanced trading features to optimize capital efficiency and facilitate sophisticated trading strategies. The protocol's unique approach to liquidity provision removes the assumption that users are experienced at manually managing their liquidity in each pool, accordingly reducing the risk of impermanent loss. Built on LightLink, Elektrik features a cost-effective and efficient trading environment. Additionally, leveraging LightLink's inherent gas station, Elektrik is able to cover gas costs for its users, enabling high-volume and high-frequency trading without the burden of excessive transaction fees.

1. Introduction

Elektrik is an advanced, on-chain DEX protocol built on the Lightlink Network. Originally a fork of Uniswap V3 [1], Elektrik has expanded and evolved to offer users an efficient and adaptable trading environment. Our mission is to provide a platform that caters to the needs of sophisticated traders and improves capital efficiency in liquidity provision, thereby contributing to the evolution of the DeFi landscape.

The current DeFi ecosystem, while innovative, presents certain limitations due to the untapped potential of automated market makers (AMMs) [2]. Existing DEXs often lack the advanced trading features that are commonly found in centralized exchanges. At the core of Elektrik, is its abstracted AMM, facilitating both direct transactions with the DEXs smart contracts whilst concurrently introducing new possibilities like iceberg orders, limit orders, stop losses, and conditional orders, providing traders with more control and flexibility in their trading strategies.

Additionally, the static nature of liquidity provision in current DEXs often leads to capital inefficiency, as liquidity is not always available where it is most needed. The abstracted nature of Elektirk's AMM further increases the platform's capital efficiency through the use of gasless rebalancing smart contracts that are called upon more frequently (given the fast blocktime of LightLink). This ensures funds are actively being utilized at the pool's price, boosting liquidity provider (LP) returns and mitigating impermanent loss (IL) [3].

This introduction to Elektrik will provide an overview of our unique approach to decentralized trading and liquidity provision, our guiding principles, and our roadmap for the future.

2. Elektrik: The Evolution of Uniswap V3

Elektrik is a transformative DEX that takes the foundational principles of Uniswap V3 and elevates them to new heights in the second version of the Elektrik protocol. While Uniswap V3 has long been and will continue to be a dominant innovator in the DeFi space, Elektrik is optimized for a growing segment of the market. This is achieved through the introduction of advanced trading features and dynamic liquidity provision (DLP) to meet the needs of experienced traders and raise the DEX's capital efficiency.

2.1. Elektrik V1

Uniswap V3's concentrated liquidity [1] was a significant advancement in the DeFi space, yet it still lacked trading features that are standard in centralized exchanges. Uniswap only facilitated direct swaps based on its $x \times y = k$ [4] AMM model, only allowing users to make trades at the current market price based on the quantities of each token in the liquidity pool's current tick [3]. Elektrik V1 will operate in a similar fashion to Uniswap V3.

2.2. Elektrik V2

Elektrik V2 will feature an abstracted AMM, heralding significant possibilities [5] to the DEX space. Although AMMs fundamentally function in a different manner to order book-based exchanges, placing single-sided liquidity within a tick, that is 1 basis point or 0.01%, adds a layer of abstraction that acts as a critical building block for complex financial transactions on DEXs. Accordingly, Elektrik is able to introduce features that provide traders with an unprecedented level of control and flexibility, enabling them to execute an array of trading strategies without relying on centralized exchanges and predatory market makers.

Beyond advanced trading features, Elektrik V2 will pioneer a DLP mechanism. This statistical and methodical approach ensures that LPs can avoid being "out of the money" as regularly; this means LPs are constantly generating fees for providing liquidity at the pool's current price. This mechanism not only enhances capital efficiency but also reduces slippage, providing a superior trading experience for users and LP experience for Elektrik's market makers.

2.3. Elektrik & LightLink

Elektrik is an integral part of the Lightlink Network [6], a layer 2 solution built on Ethereum, acting as its first DEX. LightLink offers fast and cost-effective transactions, making trading on Elektrik a seamless and efficient experience. Moreover, LightLink opens the doors to a world of possibilities for DEXs like Elektrik, including Enterprise Mode, which we will explore in more detail in the later sections of the whitepaper. This feature unlocks a wealth of opportunities for Elektrik to offer more features without the need for users to pay gas costs in the face of financially complex smart contracts.

3. Guiding Principles at the Heart of Elektrik

3.1. Decentralization: The Backbone of Elektrik

Elektrik is built on the bedrock of decentralization. Our platform operates on decentralized smart contracts deployed on LightLink, ensuring transparency, security, and resistance to censorship. Like Uniswap V2 [7] and V3, Elektrik is non-custodial, giving users full control over their assets and the ability to trade freely without any hindrances or restrictions. Elektrik does not impose any trading limits or require barriers to entry when users are executing trades. Additionally, unlike the exclusive and nearly impossible to penetrate circle of market makers, all Elektrik users are invited to act as LPs and receive yield that can be analogised to the bid-ask spread and trading fees captured by market makers. Whereas most solutions rely on off-chain or centralized components to achieve a complete trading solution, all financial instruments introduced on Elektrik V2 will be decentralized and operated by smart contracts.

Our ultimate goal is to transition to a Decentralized Autonomous Organization (DAO). This transition will further cement our commitment to decentralization, allowing for community governance and ensuring that the power and control of the platform reside with the users. The Elektrik governance model that will eventually be merged into the protocol will be unique and seek to align incentives with active, expert users that are engaged and care about the future of the DEX.

3.2. Capital Efficiency: a Critical Standard

Capital efficiency is not just a feature at Elektrik; it is a standard. We recognize that in the world of DeFi, liquidity drives markets, enabling them to thrive or compelling them to descend into an environment that is rife with high slippage and an unappealing trading experience. Accordingly, like Uniswap V3, Elektrik V2 will provide higher capital efficiency compared to its predecessors. This is achieved through our DLP mechanism. This strategy of intelligently provided liquidity automatically adjusts the range of liquidity provision based on market conditions. The exact approach is detailed in the technology section of the whitepaper. By dynamically adjusting liquidity based on regularly retrained prediction models, we can reduce slippage, improve capital efficiency, and minimize the risk of impermanent loss - a plague that has infected most DEXs.

It is important to note that this DLP mechanism supports customizability from the user, a recognition from the Elektrik team that everyone's objectives and risk parameters are inherently different. A feature core to Uniswap V3's success was the introduction of LP ranges. Elektrik V2 will support the ability to opt-in to DLP with an adjustable parameter for liquidity range, right from 100% of capital "at the money" through to a user's given distribution from the market. Moreover, the composability of DLP is designed to assuage user concerns relating to providing liquidity, likely resulting in more LPs using the mechanism; accordingly, the increased use of DLP increases Elektrik's capital efficiency.

Furthermore, there will be no requirement for LPs to strictly use DLP. Users will also be able to provide concentrated liquidity in a model akin to that of Uniswap V3. Although DLP offers higher yield for LPs and greater capital utilization for the overall DEX, the Elektrik team acknowledges that not all users will want to relinquish control of their liquidity. Hence, in Elektrik V2, features to simplify the migration of positions across the liquidity curve will be integrated to assist these LPs that independently manage the placement of their liquidity.

3.3. Sophistication: Elevating the Trading Experience

In the world of DeFi, sophistication is often the missing link that separates traditional finance (TradFi) from its decentralized counterpart. At Elektrik, we aim to bridge this gap by introducing a suite of advanced trading instruments that are typically found in TradFi markets and on centralized trading hubs. This suite of features not only enhances the trading experience but also attracts larger investors who are accustomed to these instruments.

Fundamentally, the key to Elektrik V2's refined trading experience is limit orders and the financial variability they bring. Limit orders enable traders to specify the price they wish to buy or sell a token at, subsequently giving Elektrik users more control over their trades with reduced fears of the impacts of slippage on said transactions and the ability to trade with minimized "maker" fees.

The introduction of limit orders forms the financial building blocks of Elektrik V2's abstracted AMM, allowing for the consequent integration of substantially more trading instruments, including but not limited to:

- **Time-Weighted Average Price (TWAP) Orders:** Elektrik's TWAP orders allow traders to execute large orders over time to minimize the impact on the market price. Elektrik enables this through a gasless smart contract, capable of taking orders placed by users and splitting them based on the specified timeline. Subsequently, for the user's given frequency of trading, the smart contract will regularly execute individual small orders, with the price being determined by the prevailing market conditions. Finally, once the small orders are placed by the TWAP contract, the average execution price can be determined by calculating the average of the individual trade prices. An important addition to the standard TWAP features available on CEXs will be the option to scale clip size and time interval variance to reduce the risk of your order becoming an identifiable flow to others. This is particularly useful for large trades that could potentially move the market;
- **Iceberg Orders:** Designed for large trades being facilitated by Elektrik V2, iceberg orders allow users to hide the total order quantity and display only a part of it to the

market. The DEX achieves this through another gasless smart contract which holds the total quantity to be traded (the "iceberg") and metadata on the quantity that is to be displayed to the market (the "tip"). Notably, the smart contract will utilize zero knowledge circuits [8] to keep the iceberg hidden. On Elektrik, only the tip of the iceberg is displayed by placing single-sided liquidity on the abstracted AMM, much like the protocol's limit orders. Upon the displayed tip getting filled, the smart contract automatically replenishes it, ensuring the tip is always present to users; this process will continue until the iceberg has been filled. As with TWAPs, we will support clip size and price variability should the user wish to further obfuscate their trade flow. This prevents significant market impact and allows for more strategic trading;

- **Stop Losses and Take Profit Orders:** These risk management tools help Elektrik traders protect their profits and limit their losses. With respect to spot losses, traders will be able to utilize the pro-trader user interface (UI) to specify the price at which they want to sell their holdings if the price is moving down. On the technical side, an Elektrik smart contract simply places single sided liquidity in the tick(s) as a limit order at the specific price, considering the trader's slippage tolerance. Given stop losses are only effectively used when the price is above the limit order, the tokens in the liquidity tick will only be swapped on the way down, satisfying the requirements of a stop loss. Take profit orders function very similarly just in the reverse, where the limit order is set above the current price and the tokens are swapped when the liquidity pool's price is moving upwards. The technical functionality is the exact same. The smart contracts will automatically trigger or sale or purchase of tokens through a swap at a trader's specified level, and;
- **Trailing Stop Loss Order and Trailing Stop Buy Order:** These orders are fundamentally respective variants of the Stop Loss order and Stop Buy; it subsequently functions similarly to such orders on Elektrik's abstracted AMM. Instead of a fixed stop price, it uses a trailing value that adjusts as the asset's price changes. For Trailing Stop Loss orders, if the asset's price increases, the stop price rises by the trail amount - this occurs on a regular basis every 100 blocks on LightLink, on average, once per minute. However if the asset's price decreases, the stop price remains the same. When the asset's price falls to or below the stop price, the order is executed. The reverse is true for Trailing Stop Buy orders. On Elektrik, this would involve a gasless smart contract dynamically adjusting the stop price based on the liquidity pool's price movements and triggering the order execution when the adjusted stop price condition is met.

3.4. Data-Driven: Empowering Sophisticated Trading

As evident from the prior guiding principle, Elektrik is designed with the experienced trader in mind. Along with advanced trading instruments and capital efficiency, data is the final piece of the puzzle to unlocking the full potential of DEXs. Accordingly, Elektrik V2 will feature a pro-trading version of our platform that provides detailed insights into the complexities of the DEXs liquidity pools. This data-driven approach allows traders to make informed decisions based on real-time data; previously, users would need to leverage third party platforms, such as Dune Analytics, to find such data, adding time delays and lowering the value of alpha. Given the nature of the pro-version, users will need to hold or stake a certain quantity of Elektrik's native token in order to utilize the pool-based data.

3.5. Efficiency and Cost Effectiveness: Elektrik's Partnership with LightLink

As the first DEX launching on LightLink, Elektrik is able to capture and dominate its DeFi sector whilst simultaneously leveraging the benefits of the layer 2 network. Operating its smart contracts on LightLink provides Elektrik with the significant advantages of reduced transaction costs (in some cases gasless transactions) and efficient execution speeds [6]. These features create a more user-friendly trading experience, fundamentally critical for an advanced DEX.

LightLink is designed to prioritize scalability and efficiency, ensuring that the costs associated with transactions are kept low. The network's high-throughput architecture allows for more transactions to be processed within a shorter time frame, significantly reducing network congestion and increasing transaction speed. This translates into lower gas fees for users, making trading and interaction with the protocol more affordable.

Moreover, LightLink offers an 'Enterprise Mode' [6] that takes this a step further by enabling Elektrik to cover the gas fees for its users in specific scenarios. For instance, when users place limit orders or reposition their liquidity, Enterprise Mode allows Elektrik to absorb the gas costs associated with these operations. Accordingly, users can make adjustments to their limit orders (or other order types) without worrying about the additional cost. Elektrik's usage of Enterprise Mode also extends to more advanced trading tools like iceberg orders and trailing stop losses.

This is a huge advantage for users, particularly in an environment where gas fees can be unpredictably high and impact the profitability of operations. By bearing these costs, Elektrik lowers the barriers to entry, making the DEX more accessible to users who might otherwise be deterred by high and reoccuring gas fees which do not exist on centralized exchanges.

3.6. Automation and Modularity: Enabling Users to Seamlessly Execute Sophisticated Trades

Not all traders are sophisticated and aware, meaning that the majority of the protocol upgrades coming to Elektrik V2 will not be used by a large portion of the community. These are the users that are less educated to the fundamentals of limit orders or what they can facilitate. Accordingly, the Elektrik team plans to pioneer a description-based interface for trades. Once adoption of the features introduced in Elektrik V2 has occurred, a large language model (LLM) will be trained based on the modularity of the DEX's trading tools. Using Generative Pre-trained Transformers (GPT), a user will be able to describe its expectations and strategies they want to execute, and parametrise it; the bot would then translate them into orders or detailed, long-term strategies. Certain strategies could see the bot observing groups of trading pairs, strategically rebalancing and redeploying into different liquidity pools, flash-crash hunting, golden/death cross identification and more.

These trading approaches will then be transformed into code, calling smart contracts as required to enable users to achieve the trades they desire, without the financial knowledge to do it independently. This opens up the opportunities and adoption of Elektrik V2. A more broad range of individuals will be capable of leveraging Elektrik's trading functionality - the only requirement, they can describe their desired trade in a clear fashion. Notably, a feature like this would not be available at the launch of Elektrik V2, instead would be integrated further into the DEX's existence.

4. Elektrik Protocol Parameters

4.1. Swap Fees

Like Uniswap, Elektrik DEX implements a three-tier fee structure, allowing for three independent pools for each pair of tokens. These tiers are 1%, 0.3%, and 0.05%. This system is designed to provide flexibility and empower the creators of liquidity pools to choose the fee tier that aligns with the characteristics of the underlying assets in the pool. Notably, a single pool can feature multiple fee tiers, a flexibility that further tailors to the dynamics of the underlying assets.

Having different assets placed in various fee tiers allows liquidity providers to strategize their participation based on their risk tolerance. For instance, assets that are known for higher price volatility, such as an altcoin/altcoin pair, and therefore potentially higher risk, can be positioned in the higher fee tier of 1%. The higher fee compensates for the increased risk that comes with providing liquidity for volatile assets.

On the other hand, assets that have lesser volatility, like a stablecoin/stablecoin pair and thus lower risk can be placed in the lower fee tier of 0.05%. As these assets are more stable, liquidity providers are not exposed to significant price swings and therefore do not require as high of a fee to compensate for risk.

This variable fee structure essentially offers liquidity providers the flexibility to manage their risk-reward ratio, encouraging them to contribute liquidity in a manner that aligns with their individual risk profiles. It incentivizes participation by compensating providers adequately for their risk, promoting a healthier and more diverse liquidity environment on Elektrik.

4.2. Liquidity Provider Fees

For each transaction facilitated by a pool, if an LP is "at the money", that is, they provided liquidity at the price of the trade, they will receive a clip of the trade size, much in the same way that traditional market makers generate profits. Given the nature of DLP, intelligent LPs that utilize the automatic rebalancing smart contracts will likely receive fees for every transaction in the pool they are providing liquidity in. The fee is received by the LP is determined by a number of factors, including:

- The fee-tier of the pool that the trade is occuring in
- The proportion of an LPs liquidity in the current tick that tokens are being swapped through
    - LPs liquidity in the current tick
    - Total LP liquidity in the current tick

However, LPs do not receive 100% of the LP fee determined by the factors outlined above; they rather earn 50% with the other 50% being distributed elsewhere for the holistic benefit of Elektrik. To account for the fees loss on behalf of LPs, an emission schedule has been carefully designed to ensure that the position of a market maker on Elektrik is more profitable than on competing exchanges. The emissions schedule and the distribution of the other 50% of trader fees not paid to LPs are elaborated upon in the tokenomics section of this whitepaper.

5. The Technology that Powers Elektrik's Unparalleled Capital Efficiency and Advanced Trading Instruments

To reach the standards that we expect Elektrik to achieve, many technology upgrades, optimizations and considerations are required. Elektrik V2 can only be achieved with the combination of an abstracted AMM, artificial intelligence (AI), reinforced learning (RL) and dynamic smart contracts. The concoction of these ingredients creates a capital efficient DEX that can allow for a plethora of trading instruments with minimal slippage irrespective of their financial complexities.

5.1. Dynamic Liquidity Provision

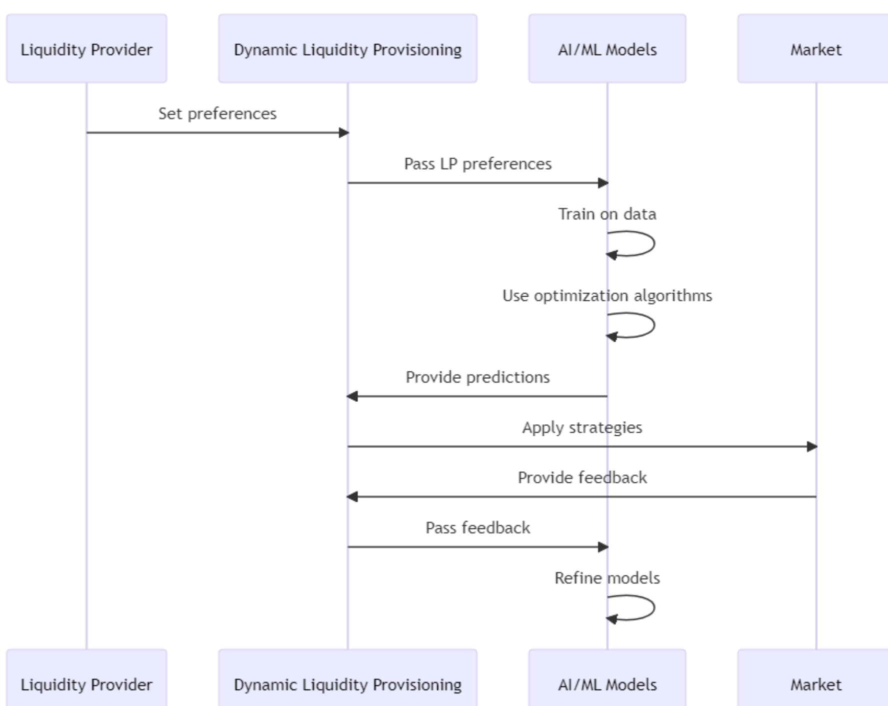
5.1.1. Fundamentals of Dynamic Liquidity Provision

The DLP mechanism is at the cornerstone of Elektrik's unique value proposition and bestows the DEX with the ability to provide substantially greater capital efficiency than other exchanges currently live. At a high level, after a certain epoch of blocks propagated on the LightLink network, liquidity will shift based on predictions made by the DLP mechanism, based on the requirements of the LP. These rebalances are prioritized before swaps are facilitated by any Elektrik pool, ensuring that LPs are "at the money" prior to trades occurring in every block.

Typically, AI and machine learning (ML) models have failed to prove their effectiveness in the rapidly changing, evolving and volatile cryptocurrency market. This is because following a significant event, such as the collapse of a large exchange or the demise of a dominant blockchain, the data points that were used to train the AI become less relevant.

Accordingly, the neural network [9] that has been trained for DLP is dynamic by nature, adjusting to market conditions and ensuring relevance over time by retraining the model and pruning historical, less important data. The DLP mechanism is trained on prevalent data from various sources, internal and external to Elektrik - respective examples include pool-based data points and token prices on exchanges that often facilitate price discovery. Other areas of information that the agent will be trained on include on-chain data like volume transacted, open interest (OI) on dominant cryptocurrencies, past performance of tokens against the other, the cost-effectiveness and efficiency of competing ways to sell out of tokens and more.

Similarly, the intelligent liquidity provisioning mechanism continuously learns from new data and data-based feedback from liquidity providers. It iteratively refines its AI and ML models, optimization algorithms, and decision-making processes to improve performance over time. This learning process ensures that the mechanism stays updated with the latest market trends and provides liquidity providers with increasingly accurate and relevant insights.



Moreover, this dynamic approach to making markets on Elektrik employs various optimization algorithms, including genetic algorithms [10], reinforcement learning [11], and gradient-based approaches. Likewise, the mechanism continuously monitors real-time market conditions, asset prices, and liquidity demands. It incorporates this information into its decision-making process, allowing it to adapt and adjust the liquidity provisioning strategies to maximize returns and minimize risks.

The model is not monolithic but instead is modular; the exact functionalities of the DLP approach to making a market can be customized by an LP to form their objective function. Given the fact that different LPs may have individual intents and preferences, the DLP mechanism allows users to select their risk tolerance levels, target returns and other relevant criteria. Given the optimizations and gasless nature of the DLP smart contracts, liquidity will be inserted and rebalanced on a per user basis. The AI model will analyze the LPs preferences, using this information to understand the provider's desired outcomes and tailor the DLP optimization process accordingly.

Elektrik's DLP strategy involves hedging bets by placing liquidity at a wider range across the virtual curve and weighting these provisions based on the AI's predictions for the price at a certain tick from one block to the next. This strategy is designed to be adaptable and responsive to market shifts, ensuring that despite the optimizations as well as the concentration of liquidity, there will always be funds along the virtual curve for trades to be facilitated.

5.1.2. The Substructure of Dynamic Liquidity Provision: Reinforcement Learning

Delving deeper into Elektrik's dynamic approach to liquidity provision, RL forms the very foundations of the mechanism, enabling it to succeed and propel the DEX's capital efficiency levels. RL is an AI technique that operates by using trial and error to learn optimal actions in a given environment.

In the context of liquidity provision, the problem statement is considering a combination of factors like maximizing returns and minimizing risks, as well as constraints and preferences, how can DLP maximize an LPs objective function and hence yield? The RL framework formulates the liquidity provisioning problem as a Markov Decision Process (MDP) [12], consisting of:

- **States:** States represent the current market conditions, including asset prices, trading volumes, and other relevant variables.
- **Actions:** Actions correspond to the decisions made by the liquidity provider, such as adjusting liquidity allocations, rebalancing portfolios, or modifying fee structures.
- **Transition Probabilities:** Transition probabilities define the likelihood of transitioning from one state to another based on the liquidity provider's actions.
- **Rewards:** Rewards quantify the desirability of the outcomes based on the liquidity provider's objective function, preferences, and constraints. The rewards can be positive for desirable outcomes (such as high returns) and negative for undesirable outcomes (such as high risk or underperformance).

RL algorithms balance exploration, which involves taking the approach of trying new actions to discover better strategies, and exploitation, which involves leveraging learned knowledge to make optimal decisions. This balance between exploration and exploitation is achieved through techniques like Epsilon-Greedy [13] or Thompson sampling [14]. The RL training is an iterative process where the agent continuously updates its policy based on feedback, learning from its experiences and refining its decision-making over time.

Once the RL agent has been trained, it can be tested and evaluated using historical data or simulated environments to assess its performance against the liquidity provider's objective function and constraints. By applying RL algorithms, Elektrik's DLP mechanism can learn and adapt to changing market conditions, identify optimal liquidity provision strategies, and balance constraints and preferences specified by the liquidity provider's objective function. This enables the mechanism to find solutions that maximize the liquidity provider's yield in an autonomous, decentralized and dynamic manner.

5.2. Sophisticated Trading Instruments

As previously mentioned in the Elektrik whitepaper, the DEX's intricate trading tools are facilitated through its abstracted AMM, which allows users to utilize limit orders. While AMM-experienced traders are able to place limit orders on Uniswap V3, Elektrik V2's goal is to support the seamless and non-complex usage of advanced trading tools for all market participants via its pro-trader interface. Unlike protocols that leverage off-chain systems to store pending limit orders and hence descend into the realms of centralization, Elektrik enables traders to action limit orders on-chain. This is achieved through single-sided liquidity and dynamic smart contracts that pull liquidity once the idle liquidity has been swapped out.

If an Elektrik trader wants to purchase TokenA with TokenB between the prices of P_L and P_U, they will place liquidity in the form of purely TokenB in the ticks that range from P_L to P_U. When the value of TokenA, priced in TokenB trends up towards P_L or down towards P_U, the TokenBs in each tick will be replaced with TokenAs. In typical liquidity pools, when a token is swapped for the other token in the pair, the new tokens remain on the virtual curve. However, in the Elektrik limit order model, whenever tokens are swapped, the newly received tokens that were either bought or sold (in the form of a swap between two tokens), are removed from the liquidity curve without gas.

This model enables users to specify the price at which they would like to purchase or sell tokens - the base criteria for limit orders. With this in mind, Elektrik creates the building blocks to treat the abstracted AMM as an order book. This heralds the dawn of substantial variability in the types of trading instruments that can be merged into Elektrik's features. Examples of possible advanced trading tools that can be integrated have been noted in the whitepaper. Notably, all these tools are built on the base layer of Elektrik's limit orders.

5.3. Data-Driven Pro-Trader Interface

The pro-trader interface of Elektrik is a powerful tool that brings a new level of sophistication to decentralized trading through the provision of granular pool-based data. It is designed to empower traders with a visualized wealth of data and insights, enabling them to make informed decisions and execute trades with precision. The interface is built on the premise that data is the lifeblood of effective trading.

The data provided in the pro-trader interface is meticulously collected from the LightLink network, ensuring that it is accurate, reliable, and live. This data is then processed and visualized in a user-friendly format, making it easy for traders to interpret and act upon. The interface is designed to be intuitive and easy to navigate, allowing traders to quickly access the data they need without having to sift through unnecessary information. Notably, given the amount of graphs and data points presented on the pro-trader user interface (UI), traders will have the ability to customize what they see, enabling users to optimize the visualized data for their trading style.

Fundamentally, the goal is to provide a seamless user experience that allows traders to focus on what they do best: efficiently finding alpha (without the use of delayed third party platforms) and executing profitable trades.

The Pro-Trader Interface is not just about providing data; it is about providing the right data. Elektrik understands that different traders have different needs, and that's why the interface offers a wide range of data points, including but not limited to:

- **Total Value Locked (TVL) by Token, by Pair and by Price:** Elektrik provides historical TVL over time, broken down by individual tokens and pairs. This allows traders to understand the liquidity available in different pools, how it has evolved and if there is a trend to allocate in whole numbers, offering front-running opportunities.
- **Trading Volume by Fee Tier:** Elektrik offers insights into the trading volume categorized by different fee tiers. This data can help traders understand the trading activity and liquidity conditions across various fee tiers.
- **Token Pair Prices Compared Over Time:** Elektrik allows traders to compare the prices of different token pairs over time. This can help them identify trends and patterns in the market, enabling them to make more informed trading decisions.
- **Impermanent Loss in Pool Over Time:** Elektrik provides data on the impermanent loss experienced in different pools over time. This can help liquidity providers understand the risks associated with providing liquidity and traders aware of which pools typically move in price the most, causing more IL.
- **Pool Share by Liquidity Providers:** Elektrik provides data on the share of each pool owned by different LPs. This can help LPs understand their relative position in the pool and accordingly the share of the pool fees they will receive.
- **Volume of Buys vs Sells Per Pool:** Elektrik provides data on the volume of buy and sell orders in each pool. This can help traders understand the market sentiment and make informed trading decisions.
- **Loss Versus Rebalancing (LVR) Metrics:** Elektrik's Pro-Trader Interface will display LVR data for various liquidity pools. This metric helps traders gauge potential losses due to price volatility, enabling them to make informed decisions and manage risk more effectively.
- **Price Slippage Per Pool:** Elektrik provides data on the price slippage experienced in each pool. This can help traders understand the impact of their trades on the market price and subsequently adjust the size of their trades.

5.4. Unlocking LightLink’s Enterprise Mode

Under the hood, LightLink’s Enterprise Mode operates like a gas station [6], where the enterprise running the protocol tops up the funds each month to cover transaction fees for users. This is facilitated through unique smart contracts, either ERC-20 or ERC-721, depending on the application. Each enterprise client gets a single smart contract whitelisted on LightLink. At the start of every month, the enterprise running their protocol on the layer 2 pays a fixed fee based on a tier structure. This fee equates to a quota, which covers the gas fees that users on that platform would normally incur when executing transactions.

Although built for enterprises, the existence of an in-protocol gas station unlocks many opportunities for DeFi protocols with smart contracts that facilitate complex financial transactions. Indeed, Enterprise Mode enables Elektrik to absorb the gas costs associated with specific transactions, for example, the placement and withdrawals of limit orders, or the execution of TWAP and iceberg orders.

In addition, the ability to abstract transaction fees away from users further opens up more possibilities for synergies between Elektrik and LightLink. As the first DEX live on LightLink, there are many aligned interests between Elektrik and the layer 2 it is deployed on, particularly around the growth of the DEX - which trickles down to the underlying network. It is likely that LightLink gives Elektrik a threshold for the amount of gas it will cover related to the cost of calling these complex smart contracts. Elektrik intends to make full use of LightLink's gasless smart contract functionality and the composability it brings in the future.

6. Under the Hood of the $ELTK Tokenomics

6.1. Overview of the Value of DeFi Tokens

Integrating tokens into DeFi protocols has never been a challenge for protocols; finding utility for them, however, have proved to be challenging. Many protocols seek to derive value from governance, fee distributions or the performance of the platform itself (an inaccurate, speculative and inconsistent measurement). Fundamentally, most finance-focused protocols do not require a token to exist as the product being facilitated by the application's smart contracts are independent of the fungible token that has a trading value. However, given the competitive nature of DeFi whereby each protocol is directly fighting for on-chain liquidity, tokens have found their place in the market; bootstrapping the growth of protocols.

DEXs, and other DeFi applications, misuse tokens with unsustainable inflation schedules, airdrops with little planning and opportunities for early investors to dump tokens onto more recent purchasers. Nonetheless, few models, including Curve's vote escrowed (ve) tokenomics model [15], OlympusDAOs (3,3) model [16] and Andre Cronje's combination of the two with the ve(3,3) model [17], found their market fit by meticulously designing emissions around game theory, incentives and long-term sustainability. The final evolution of these tokenomics designs, the ve(3,3) model, is a token system where locked tokens decrease emission impact, increase holders' proportionate holdings, and enable voting on incentivized pools, accordingly aligning the motivations of holders and the protocol. Alterations to this model are required to fit the specific niche that the protocol is building in.

6.2. $ELTK Token Economy

Elektrik is one such protocol leveraging the base design of the ve(3,3) model, and as noted above, making the necessary changes to adapt to the environment it finds itself in; the first liquidity-focused application launching on a new blockchain. As such, ensuring liquidity stickiness and fair fee distribution is a priority, guaranteeing all incentives are aligned such that a positive flywheel can be created, benefiting the overall LightLink ecosystem.

6.2.1. Token Structure

Like all veTokenomics models, Elektrik will have a dual token design, with one token representing the fungible token and another representing a non-fungible position of a user's voting power the tokens they initially locked.

Elektrik's tokens include:

- **$ELTK:** The native ERC-20 token for the Elektrik protocol. It acts as the base utility token used within the system.

- **$veELTK:** An ERC-721 token in the form of a non-fungible token (NFT) and is created when $ELTK holders vote-escrow (lock) their tokens. The amount of $veELTK received is proportional to the lock period, with longer lock periods resulting in more $veELTK.

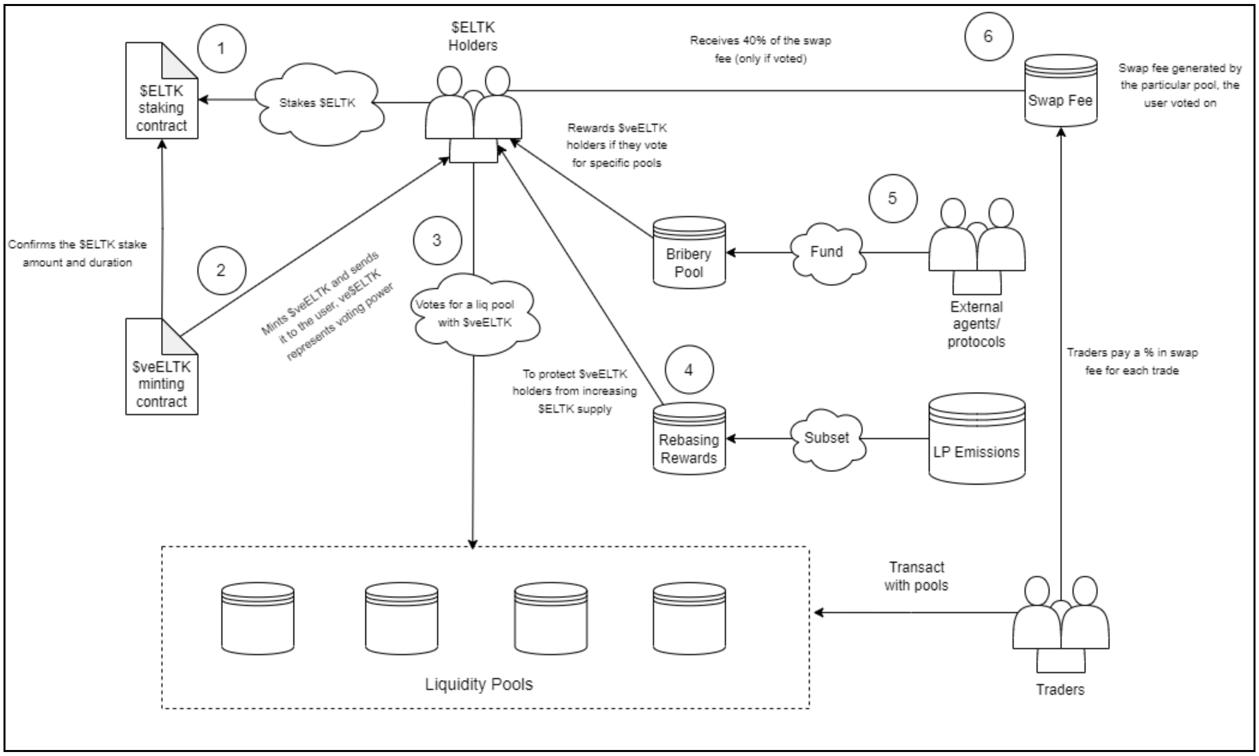
6.2.2. Vote-Escrow Mechanism

Elektrik introduces a vote-escrow mechanism that rewards long-term token lockers with increased voting power and rewards, thereby promoting token stability and discouraging rapid sell-offs. This mechanism also indirectly enhances liquidity pool stickiness, as the $veELTK holders' influence on emissions distribution attracts more liquidity, increasing the pool's depth and reducing trade slippage.

$ELTK holders can choose to lock their tokens for a period of up to 4 years, which gives them $veELTK tokens in return. The longer the lock period, the more $veELTK tokens they receive, thus incentivizing long-term staking. The quantity of $veELTK also represents a user's voting power in the Elektrik protocol. The more $veELTK a user holds, the more influence they have in distribution of ELTK emissions. When converting $ELTK to $veELTK, the following function is used:

$$\$veELTK\_received \ = \ \$ELTK\_amount \times (1 - \frac{remainingLockPeriod}{maxLockPeriod})$$

$veELTK holders can vote on the distribution of $ELTK emissions to various liquidity pools during each week - an epoch. The amount of $ELTK tokens each pool receives is proportional to the number of votes that pool gets. Once a voter has voted for a particular pool, the vote can only be changed in the next epoch. To incentivize the active participation of the governance of the protocol as it relates to emissions, voters are rewarded with a 40% share of the trading fees collected from the pool they voted for. As such, LPs in that pool receive 50% of the trading fees, with 40% going to voters and 10% to the Elektrik protocol, as well as $ELTK emissions if they lock up their NFT that represents their liquidity position.



6.2.3. The Bribery Flywheel

The use of "bribes" as external rewards that can be added by anyone to incentivize voting on specific liquidity pools is an innovative feature that is expected to result in more active participation in governance. Bribing will be an open market operation where someone with the sufficient funding to gain and attract enough voters to vote for their pool, can do so regardless of the intent. This creates competition with the market eventually achieving equilibrium when only those pools that are generating real value to the protocol and its users will receive bribes.

Notably, however, this feature needs to be monitored and regulated to prevent manipulation or unhealthy competition. Prior to the establishment of a DAO, the protocol will take on this role, ensuring bribes can only be added to particular pools that are whitelisted. These bribes will then be distributed to the voters of that specific pool, proportionate to their votes in that pool in that epoch. To determine the pools that are to be whitelisted, the Elektrik team will use the following guiding categorical criteria:

- **Trading Volume:** The trading volume that has been facilitated by the pool. If it is comparatively high to other pools on a regular, daily basis, the pool is likely to be whitelisted.
- **Liquidity in the Pool:** The liquidity placed by Elektrik users in the specific pool. Pools that have and retain comparatively high liquidity in the smart contracts underpinning the specific pool, it is likely to get whitelisted.
- **Minimum Number of Traders:** The number of users that are actively making trades by swapping tokens with the pool. Given the ease of wash-trading on DEXs, an important consideration is the minimum average number of traders that are interacting with the pool's smart contracts over a period of time. A higher number of unique traders results in the pool being more likely to get whitelisted.

- **Minimum Number of LPs:** The number of users that are providing liquidity to the pool. This acts as a check and balance on pools that have a small cabal of LPs who are seeking to unethically collude to increase the pool numbers to get whitelisted. A higher number of LPs and hence lower average amount of liquidity provided renders the pool more likely to be whitelisted.
- **Time Since Pool Creation:** The amount of time that has passed since the introduction of this liquidity pool. Acting as the final check, there will be a dynamic minimum time in existence for a pool to satisfy before it is considered for a bribery whitelist.

6.2.4. $ELTK Emissions

The Elektrik protocol employs a hybrid model for liquidity mining incentives, utilizing a piecewise function for emissions. For the initial six months, emissions are fixed, with 1.8 million $ELTK tokens, representing 1.8% of the total token supply, allocated to incentivize users. These tokens are evenly distributed in each epoch. Following this period, emissions become proportional to network activity, including TVL and volume, at the start of each epoch. Each epoch spans a week, a duration that balances meaningful participation and exploitation prevention, while maintaining engagement and responsiveness to market fluctuations. Notably, to further align incentives and ensure the stickiness of liquidity, users providing liquidity on Elektrik will only receive emissions allocated to that pool if they lock their LP tokens up for a period of time.

As mentioned, the emissions allocated in each epoch are distributed among LPs and $veELTK holders as a rebase to account for the inflation relating to voting power. The rebasing formulas are expanded upon in the subsequent section. The total emissions distributed to LPs can be determined by the following formula:

$$totalPoolEmissionsPerEpoch = totalAllocatedEmissionsPerEpoch - rebasingAmount$$

The proportion of emissions that a particular pool receives is proportional to the total votes it receives, represented by:

$$poolSharePerEpoch = totalPoolEmissionsPerEpoch \times \frac{poolVotes(\$veELTK)}{totalVotes(\$veELTK)}$$

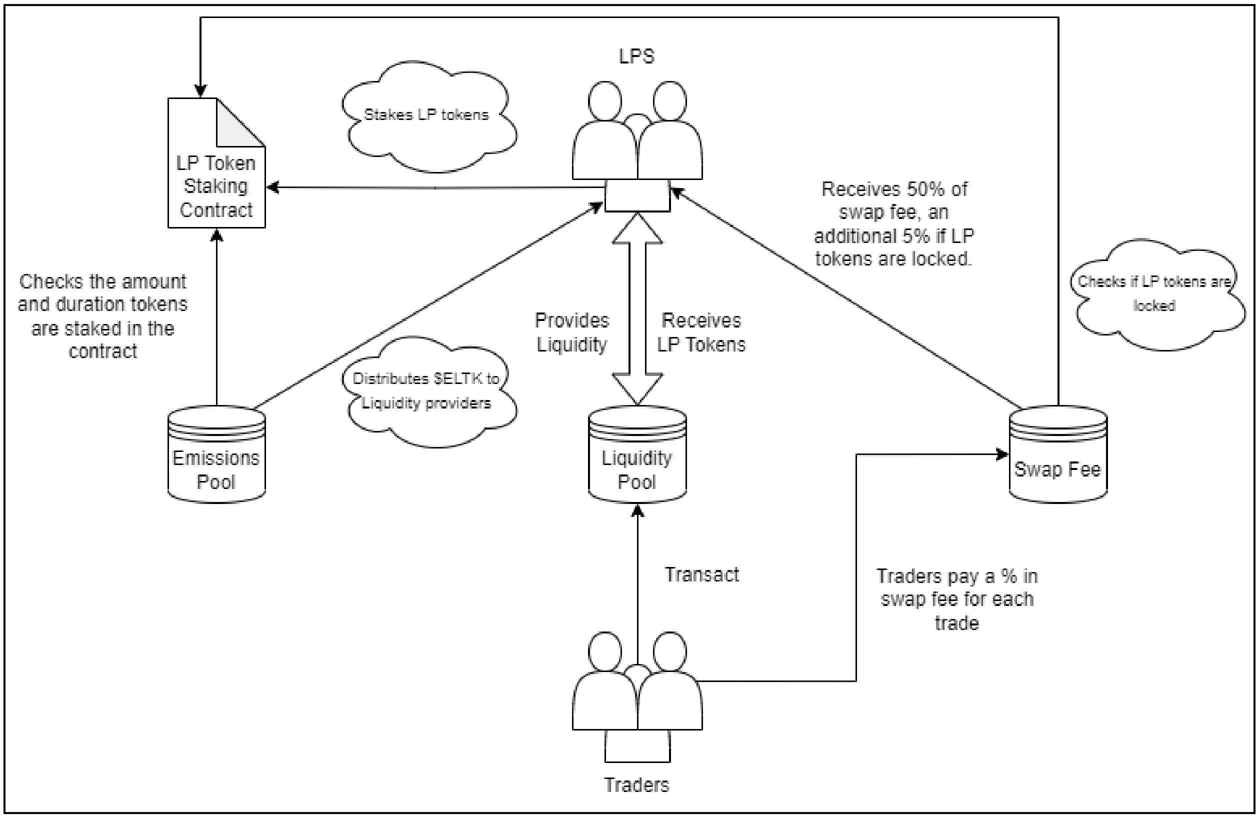
In the above equation, the pool's share of emissions in each epoch is determined by the ratio of votes directed to the specific pool to the overall $veELTK voted in the specific epoch, multiplied by the total emissions paid out to liquidity pools. Total pool emissions per epoch is initially set to bootstrap the growth of the vote escrowed token economy that underpins the Elektrik DEX.

Further, it is important to note that not all LPs are treated equally with respect to the emissions they receive from the pool they are providing liquidity in. The majority of veTokenomics models fail to emphasize the stickiness of liquidity whilst concurrently balancing the centralization risk of large LPs building their own flywheel from injecting the majority of the liquidity earlier than other LPs. Subsequently, Elektrik uses a new model which incentivises LPs to lock up liquidity for a variable amount of time by locking the NFT token they receive that represents their liquidity position; the longer a user locks their token, the greater the share of emissions they obtain per epoch. To determine an LP's share of the emission, the following formula is used:

$$LP\_share = \frac{amountLocked \times timeUntilUnlock}{totalLocked \times totalTimeUntilUnlock}$$

Once the user's share of the emissions in the liquidity pool has been determined with approach outlined above, an individual LP's rewards per epoch can be determined by the following:

$$LP\_revenuePerEpoch \ = \ LP\_share \times totalPoolEmissionsPerEpoch$$



6.2.5. Rebasing Through Emissions to $veELTK Holders

The rebasing mechanism is meticulously engineered to safeguard the voting power from dilution as the total token supply escalates. This strategy preserves the relative influence of early adopters and committed users, fostering sustained engagement within the platform. In conventional terms, rebasing can be perceived as a subtle safeguard against inflation, designed to protect lockers of $ELTK from the increase in $ELTK circulating supply instigated by liquidity mining emissions.

The allocation of rebasing is implemented to counterbalance the dilution of voting power as the emission of more $ELTK occurs. A rebase is executed weekly (each epoch), during which $veELTK holders are granted additional $ELTK tokens. This allocation is proportional to the LP emissions during each epoch and the ratio of $veELTK to $ELTK supply; the formula to determine the rebase emissions is as follows:

$$rebaseAmount \ = \ (\frac{\$veELTK\_totalSupply}{\$ELTK\_totalSupply})^3 \times 0.5 \times emissionsAllocation$$

The term $(\frac{\$veELTK\_totalSupply}{\$ELTK\_totalSupply})^3$ is the cube of the ratio of the total supply of $veELTK to the total supply of $ELTK. The cubing operation is used to amplify the differences in the ratio. If the ratio is greater than 1, cubing will make it larger, and if it is less than 1, cubing will make it smaller. This means that the rebase amount will be larger if there is a greater proportion of $veELTK relative to $ELTK, and smaller if there is a lesser proportion. Further, the constant factor 0.5 determines the scale of the rebase. The larger this factor, the larger the rebase amount will be, and vice versa. This factor is used to control the magnitude of the rebase amount, guaranteeing it is comparatively smaller than the liquidity emissions for overall price stability.

The product of these terms gives the rebase amount, which is the number of $ELTK tokens distributed to $veELTK holders. This mechanism is designed to counteract the dilution of voting power as more $ELTK is emitted, rewarding the $veELTK holders proportionally to the emissions and the ratio of $veELTK to $ELTK supply. On the assumption that those who receive $ELTK rebasing emissions lock their takes, this model ensures that the voting power of $veELTK holders is preserved, encouraging continued participation in Elektrik.

6.2.6. Distribution of Fees

On every direct swap with the AMM (that is, not trades powered by Elektrik's limit orders) the trader is charged a fee based on the tier of the pool they are interacting with. These fees will be distributed among LPs, $veELTK holders and the protocol itself. The protocol takes a standard 10% of the swap fee. LPs will receive 50% of it (regardless of the liquidity lock), and remaining 40% will be distributed among $veELTK holders that voted to the particular pool.

6.2.7. Ecosystem Participant Reward Summary

In summary, there are four categories of ecosystem participants that receive rewards:

- **LPs that do not Lock LP Tokens:** These users receive 50% of swap fee facilitated by the pools they are providing liquidity in
- **LPs that Lock LP Tokens for a Fixed Term:** These users receive $ELTK emissions each epoch as well as 50% of the swap fee facilitated by the pools they are providing liquidity in
- **$veELTK Holders that do not Vote to Direct Emissions to a Pool:** These users receive $ELTK based on the rebase amount per epoch
- **$veELTK Holders that Vote to Direct Emissions to a Pool:** These users receive $ELTK based on the rebase amount per epoch, as well as 40% of the accumulated swap fees of that pool (throughout the span of that epoch) as well as bribes if applicable

6.3. Additional Token Utilities

As well as the incentive based latticework of $ELTK's tokenomics, additional utility modules have been integrated into the token's design. These utilities seek to further create long-term value for $ELTK, thereby increasing the weight of the flywheel generated by the token's vote escrowed economy.

6.3.1. Access to the Pro-Trader UI

The usage of Elektrik's smart contracts will not be restricted to any users. Accordingly, any user can freely swap, utilize DLP and the DEX's advanced trading features mentioned throughout the whitepaper. However, in relation to the pro-trader UI offered by Elektrik, outlined in section 5.3., there will be a requirement for a time-based value of $ELTK tokens held or locked (for $veELTK) to access this feature. The collection, storage, presentation and visualization of the pool data for the pro-trader mode results in on-going, exponential costs for the Elektrik team.

These costs are balanced out by the positive impact on the $ELTK token generated by the demand to utilize the UI.

6.3.2. Lower Fees on Elektrik Trading Products

Like a company which charges for the use of its services, for the specific smart contracts developed by Elektrik that leverage our abstracted AMM, a 1 basis point charge (0.01%) will be levied against users. Comparatively, this 0.01% charge is lower than the fee taken by Elektrik's centralized counterparts (which typically take 2-5 basis points on their trading products) and will be used to fund future development of the protocol.

However, for certain traders that purchase or receive tokens such that they reach a threshold of $ELTK, hence receive the status of a large holder, we would anticipate larger trade sizes. To accommodate for the impact of 0.01% fees on a user's profitability, wallets with this status will receive reduced trading fees based on a reverse exponential curve. The minimum fee that a trader will face when utilizing Elektrik's limit order capabilities is 0.5 basis points - equivalent to 0.005%.

6.4. $ELTK Allocations

As highlighted in section 6.2., $ELTK is utilized for incentives within the Elektrik ecosystem, accordingly is core for the longevity and sustainability of the platform as well as ensuring that the DEX generates a positive flywheel with respect to liquidity.

A total of 13.54% has been allocated to investors in the seed 1 (pre-seed) and seed 2 (seed) rounds. Investors have been carefully selected to ensure they understand the fundamentals of the veTokenomics model such that rather than instantly selling when tokens become liquid, they see the opportunity in locking said tokens up for $veELTK tokens. Nevertheless, 4.17% of the total $ELTK supply will go to pre-seed investors with a short cliff of 6 months and linear vesting period of 12 months, resulting in their tokens quickly becoming usable in the Elektrik economy. The final 9.38% of tokens for investors in the seed round will be linearly vested for 18 months after a 12 month cliff.

Combined, the team and advisors will receive 25% of tokens. However, these tokens will unlock over a long horizon such that the broader team's long-term incentives are aligned with that of the community. In relation to the team allocation, a total of 22% of $ELTK's total supply will be locked in the cliff period for 12 months and subsequently linearly vested over 18 months. Advisors will have the same cliff and vest terms as the team.

Additionally, for the long-term survival and runway of Elektrik, 20% of $ELTK will go to the treasury over a period of 48 months (linear unlock) to fund the operational expenses of the company.

Incentives are critical to the growth of blockchain-based applications, and accordingly have been allocated 20% of the total supply of $ELTK. These tokens will be distributed to holders of $veELTK as a rebasing fee determined by the algorithm listed in section 6.2.5., as well as to liquidity pools based on proportions of votes from holders of $veELTK. Notably, this means that all of these tokens, 20 million $ELTK, will go directly to the hands of the participating members of the community over time. These tokens will unlock monthly over 48 months.

Finally, to support the Elektrik community and align incentives, the remaining 21.46% of all $ELTK tokens have been allocated to ecosystem funds. The tokens in the ecosystem funds allocation will go to the community through a number of verticals, including an airdrop, grants, bug bounties, sponsoring events and the ambassador program. Though not heavily explained in this whitepaper, a core feature of Elektrik's go-to-market strategy is its unique airdrop approach.

The $ELTK airdrop will take place over 4 interwoven phases, each of which focuses on its own key vertical of the DEX. The design of the airdrop will be released in the coming months. To ensure the airdrop can successfully attract sticky users who do not simply dump tokens and cease interacting with the protocol.

Buckets	**Percentage**	**Amount**	**Initial Vesting (%)**	**Cliff (Months)**	**Issuing (Months)**
Pre-Seed	6.67%	6,666,667	20	3	12
Private Round	5%	5,000,000	20	3	12
Seed	15%	15,000,000	25	6	12
LBP	4.44%	4,444,444	100	0	0
Airdrop	4.00%	4,000,000	25	0	18
Team + Advisors	19.00%	19,000,000	0	6	18
Treasury	20.00%	20,000,000	10	0	48
Ecosystem Funds	25.89%	25,888,889	25	0	48
Total	**100.00%**	**100,000,000**			

7. Elektrik's Roadmap

Elektrik's journey is set to commence with a rigorous phase of development and testing of the Elektrik protocol on the LightLink testnet. This crucial stage is designed to ensure the robustness and reliability of the protocol before it is opened up to users. To encourage active participation and valuable feedback, Elektrik plans to launch an 'incentivised testnet'. This strategy is aimed at fostering a community of early adopters who will contribute to the refinement of the protocol.

Upon successful completion of the testing phase, Elektrik will transition to live operations with the launch of its mainnet. This significant milestone will mark the beginning of Elektrik's journey in the DeFi landscape. To incentivize users to provide liquidity to and trade on Elektrik, these actions will be incentivised within the first phase of the $ELTK airdrop. As well as this, the Elektrik team is committing over US$ 2 million to liquidity pools on the DEX to bootstrap its growth and enable the platform to facilitate low slippage trades at launch. Following the protocol launch on mainnet, Elektrik's business development team will ramp up, focusing on partnerships and collaborations with the enterprises live on LightLink.

The next stepping stone for Elektrik is the launch of Elektrik V2 - the protocol which will integrate the majority of the novel features explored throughout this whitepaper. Initially, the Elektrik V2 smart contracts will undergo a meticulous audit, before entering into testnet and subsequently, mainnet. In this stage of Elektrik's evolution, the pro-trader interface, advanced trading instruments and DLP mechanism will be unveiled to the protocol's users. Accordingly, upon Elektrik V2's mainnet launch, the DEX will reach new levels of capital efficiency and usability for a broad range of trades - from retail users to whales and sophisticated traders.

Consistent with Elektrik V2 going live is the token generation event (TGE) of $ELTK. This will introduce the aforementioned tokenomics and token utility modules into the ecosystem, yielding significant benefits to Elektrik's ecosystem - namely the vote escrowed tokenomics model. Simultaneously, the first phase of the ELTK airdrop will end, distributing tokens to users of Elektrik V1 (testnet and mainnet) as well as Elektrik V2 (testnet). From here, the protocol will progress to the second phase of the airdrop which emphasizes liquidity provision with extra incentives for the usage of DLP.

Once Elektrik V2 has been live on LightLink for a number of months and has seen positive traction, the DEX will look to go cross-network by launching on another layer 2 protocol. This will be in order to mitigate single points of failure on behalf of Elektrik and to attract new communities. To prevent the fragmentation of liquidity that DEXs often experience when launching on other blockchains or networks, Elektrik will design and develop purpose-driven bridges that utilize synthetic assets temporarily issued on both networks. Through this approach, Elektrik will be able to offer cross-network liquidity, further increasing its capital efficiency.

As Elektrik expands across networks and builds a more engaged community, it will gradually transition into a Decentralized Autonomous Organization (DAO). This shift will be guided by a well-researched governance methodology, drawing inspiration from democratic governance models as well as the need to reconcile uncertainty, dependence and opportunism. The move towards decentralization will enable the core Elektrik team to streamline operations while leveraging the insights and votes of the community for decision-making.

8. Conclusion

We have introduced Elektrik, a DEX designed to provide advanced trading features and dynamic liquidity provision features. By leveraging the power of reinforcement learning and blockchain technology, Elektrik offers a solution to the limitations of traditional DEXs, enabling sophisticated trading strategies and efficient capital utilization. The platform's unique approach to liquidity provisioning, combined with its data-driven pro-trader interface, allows for a superior trading experience. As Elektrik continues to evolve, it will integrate a vote escrowed economy through its tokenomics, incentivising sticky liquidity provision and equitable revenue share models across its ecosystem. The DEX has clear plans to transition into a DAO, further decentralizing its governance and fostering a community-driven ecosystem. Elektrik's design and roadmap underscore its commitment to advancing the DeFi landscape.

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