title

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Abstract

We present the token economics of LIQUID, the governance and utility token for the Liquidity.io regulated digital securities exchange. LIQUID is an ERC-20 token with ERC20Votes delegation, a fixed supply of 1 billion tokens with zero inflation, and a deflationary mechanism via partial fee burn. The token serves four functions: governance voting on protocol parameters, tiered fee discounts for active traders, staking rewards funded by protocol revenue, and revenue sharing from ATS trading volume. We formalize the vesting schedule (linear with cliff, revocable for team, non-revocable for investors), prove key economic invariants (supply conservation, monotone fee discount, burn deflationary pressure), and compare the governance model with UNI, AAVE, and MKR. The design aligns long-term incentives between token holders and exchange users while maintaining compliance with securities law constraints on utility token design. This work builds on our prior results in formal verification of exchange infrastructure [1], on-chain settlement with post-quantum MPC custody [2], and the regulated ATS architecture [4].

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1 Introduction

Governance tokens in DeFi have demonstrated the viability of decentralized protocol governance. However, existing models—UNI (Uniswap), AAVE (Aave), MKR (MakerDAO)—operate in an unregulated environment where token holder rights, fee structures, and governance outcomes face no external compliance constraints.

LIQUID operates under a fundamentally different regime. The Liquidity.io exchange is a SEC-registered Alternative Trading System [4], and the LIQUID token must navigate the boundary between utility (not a security) and governance (meaningful participation). The token design addresses this by providing concrete, consumptive utility (fee discounts, staking rewards) while avoiding characteristics that would classify it as an investment contract under Howey.

This paper extends the Liquidity.io technical series:

- Formal verification of exchange infrastructure (48 Lean 4 theorems) [1].
- On-chain settlement with post-quantum MPC custody [2].
- Custody architecture and audit findings [3].
- Regulated ATS design with three-pillar architecture [4].

2 Token Specification

Definition 1 (LIQUID Token)**.** *LIQUID is an ERC-20 token deployed on Liquid EVM with the following parameters:*

$$\texttt{totalSupply} = 1{,}000{,}000{,}000 \text{ (1 billion)} \tag{1}$$

$$\texttt{decimals} = 18 \tag{2}$$

$$\texttt{inflationRate} = 0 \text{ (fixed supply)} \tag{3}$$

$$\texttt{standard} = \text{ERC-20 + ERC20Votes (OpenZeppelin)} \tag{4}$$

The entire supply is minted at genesis. No additional tokens can be created. The supply can only decrease through the burn mechanism described in Section 5.

2.1 Allocation

Category	**Tokens**	**%**	**Vesting**	**Revocable**
Treasury	400,000,000	40%	Governed release	N/A
Team + Advisors	250,000,000	25%	4yr linear, 1yr cliff	Yes
Community + Staking	200,000,000	20%	Emission schedule	No
Investors	100,000,000	10%	2yr linear, 6mo cliff	No
Liquidity Mining	50,000,000	5%	3yr halving schedule	No
Total	**1,000,000,000**	**100%**		

Table 1: LIQUID token allocation.

Theorem 1 (Supply Conservation)**.** *At any time t, the total supply satisfies:*

$$S(t) = S(0) - B(t)$$

where $S(0) = 10^9$ and $B(t)$ is the cumulative tokens burned. Since $B(t) \geq 0$ and is monotonically non-decreasing, we have $S(t) \leq S(0)$ for all t. The supply is strictly non-inflationary.

Proof. The LIQUID contract has no `mint` function. The only function that modifies supply downward is `burn`. Therefore $\Delta S = -b$ for each burn of b tokens, and the cumulative change is $S(t) - S(0) = -\sum_{i=1}^{n(t)} b_i = -B(t) \leq 0$. □

3 Vesting Mechanics

Definition 2 (Linear Vesting with Cliff)**.** *For an allocation of A tokens with cliff c (months) and total vesting period T (months), the vested amount at month m is:*

$$V(m) = \begin{cases} 0 & \text{if } m < c \\ A \cdot \dfrac{m-c}{T-c} & \text{if } c \leq m \leq T \\ A & \text{if } m > T \end{cases}$$

Category	Cliff	Total	At Cliff	Monthly After
Team	12 mo	48 mo	0	6,944,444
Investors	6 mo	24 mo	0	5,555,556

Table 2: Vesting parameters. At cliff, zero tokens vest (true cliff); linear unlock begins immediately after.

Proposition 1 (Revocability Asymmetry)**.** *Team allocations are revocable: if a team member departs at month m, unvested tokens $A - V(m)$ return to the treasury. Investor allocations are non-revocable: once the cliff is passed, the full schedule executes regardless of investor actions.*

This asymmetry reflects the regulatory reality: team members are insiders whose continued contribution justifies their allocation, while investors have made an irrevocable financial commitment.

3.1 Circulating Supply Projection

Month	Treasury	Team	Community	Investor	Mining	Circ. Supply
0	0	0	0	0	0	0
6	0	0	16.7M	0	4.2M	20.9M
12	0	0	33.3M	27.8M	8.3M	69.4M
24	20M	69.4M	66.7M	100M	16.7M	272.8M
36	40M	138.9M	100M	100M	25.0M	403.9M
48	60M	250M	133.3M	100M	33.3M	576.7M

Table 3: Estimated circulating supply over 48 months (pre-burn). Treasury releases subject to governance vote.

4 Governance

4.1 On-Chain Voting via ERC20Votes

LIQUID uses OpenZeppelin's ERC20Votes extension, which implements checkpointed voting power with delegation. The governance flow is:

1. **Delegation**: Token holders delegate voting power to themselves or a delegate. Undelegated tokens have zero voting power.
2. **Proposal**: Any address with $\geq$ 1% of total supply (10,000,000 LIQUID) can submit a proposal.
3. **Voting**: 7-day voting period. Quorum: 4% of total supply (40,000,000 LIQUID).
4. **Timelock**: 48-hour timelock between vote passage and execution, allowing the community to exit if they disagree.
5. **Execution**: On-chain execution of the proposal.

Definition 3 (Governance Parameters)**.**

$$\texttt{proposalThreshold} = 10{,}000{,}000 \textit{ LIQUID (1\%)} \tag{5}$$

$$\texttt{quorum} = 40{,}000{,}000 \textit{ LIQUID (4\%)} \tag{6}$$

$$\texttt{votingDelay} = 1 \textit{ day (block delay before voting starts)} \tag{7}$$

$$\texttt{votingPeriod} = 7 \textit{ days} \tag{8}$$

$$\texttt{timelockDelay} = 48 \textit{ hours} \tag{9}$$

4.2 Governable Parameters

The following protocol parameters are subject to governance:

Parameter	**Range**	**Current Default**
Taker fee (institutional)	0–10 bps	2 bps
Taker fee (retail)	0–20 bps	5 bps
Maker rebate	−5 to 0 bps	−1 bps
Burn percentage	0–100%	30%
Staking reward rate	0–20% APY	8% APY
Treasury release cap	0–5%/quarter	2%/quarter
Proposal threshold	0.1–5%	1%
Quorum	1–10%	4%

Table 4: Governable protocol parameters with safety bounds.

4.3 Comparison with Existing Governance Models

Property	**LIQUID**	**UNI**	**AAVE**	**MKR**
Supply	1B fixed	1B (inflationary)	16M fixed	Variable (burn/mint)
Voting	ERC20Votes	ERC20Votes	ERC20Votes	Custom
Revenue share	Yes (staking)	No (fee switch off)	Yes (safety module)	Yes (surplus)
Fee burn	Yes (30%)	No	No	Yes (surplus buy)
Regulatory	SEC ATS	None	None	None
Quorum	4%	4%	2%	Custom
Proposal	1%	0.25%	0.5%	Custom

Table 5: Governance model comparison.

Key distinctions:

- **UNI**: Fee switch has never been activated. UNI holders receive no protocol revenue. LIQUID activates revenue sharing from day one.
- **AAVE**: Safety module staking (stkAAVE) backstops protocol risk. LIQUID staking earns revenue share without slashing risk (the ATS does not hold user funds).

- **MKR**: Variable supply via surplus auctions and deficit minting. LIQUID has strictly fixed supply with deflationary burn.

5 Fee Model and Burn Mechanism

5.1 Tiered Fee Schedule

LIQUID holders receive fee discounts based on their holdings:

Tier	Holding (LIQUID)	Taker Fee	Discount
Standard	$< 10{,}000$	5 bps	0%
Silver	$\geq 10{,}000$	4 bps	20%
Gold	$\geq 100{,}000$	3 bps	40%
Platinum	$\geq 1{,}000{,}000$	2 bps	60%
Diamond	$\geq 10{,}000{,}000$	1 bps	80%

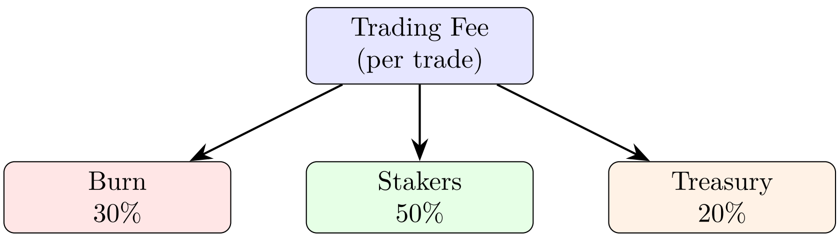
Table 6: Tiered fee schedule. Institutional accounts start at Platinum tier.

Theorem 2 (Monotone Fee Discount)**.** *For LIQUID holdings $h_1 < h_2$: fee$(h_1) \geq$ fee(h_2). Fee rates are monotonically non-increasing in token holdings.*

Proof. The tier thresholds $T_0 < T_1 < T_2 < T_3 < T_4$ map to fees $f_0 > f_1 > f_2 > f_3 > f_4$. For any $h_1 < h_2$, if h_2 qualifies for tier k (i.e., $h_2 \geq T_k$), then either $h_1 \geq T_k$ (same tier, same fee) or $h_1 < T_k$ (lower tier, higher or equal fee). In both cases, $\text{fee}(h_1) \geq \text{fee}(h_2)$. □

5.2 Fee Distribution

Trading fees are split three ways:



Definition 4 (Fee Split)**.** *For a trade generating fee F (in USDL):*

$$burn(F) = 0.30 \cdot F \quad \textit{(used to buy back and burn LIQUID)} \tag{10}$$
$$stakers(F) = 0.50 \cdot F \quad \textit{(distributed pro-rata to stakers)} \tag{11}$$
$$treasury(F) = 0.20 \cdot F \quad \textit{(protocol reserve)} \tag{12}$$

The burn mechanism operates as a buyback: 30% of fees (in USDL) are used to purchase LIQUID on the open market (Liquid DEX), and the purchased tokens are burned. This creates persistent buy pressure proportional to trading volume.

Theorem 3 (Deflationary Pressure)**.** *Let $V(t)$ be cumulative trading volume through time t, $\bar{f}$ the average effective fee rate, and $p(t)$ the LIQUID market price. The cumulative burn is:*

$$B(t) = \frac{0.30 \cdot \bar{f} \cdot V(t)}{p(t)}$$

Since $V(t)$ is monotonically non-decreasing, $B(t)$ is monotonically non-decreasing, and the supply $S(t) = S(0) - B(t)$ is monotonically non-increasing.

6 Staking and Revenue Sharing

6.1 Staking Model

Token holders stake LIQUID to earn a share of protocol trading revenue. The staking contract operates as follows:

1. **Deposit**: User stakes LIQUID, receiving a proportional share of the staking pool.
2. **Accrual**: 50% of trading fees (in USDL) accrue to the staking contract over each epoch (7 days).
3. **Claim**: Stakers claim accrued USDL rewards at any time.
4. **Withdrawal**: 7-day unbonding period prevents flash-loan attacks on reward distribution.

Definition 5 (Staker Reward)**.** *For staker i with stake s_i in a pool of total stake S_{pool}, and epoch fees F_{epoch}:*

$$R_i = \frac{s_i}{S_{pool}} \cdot 0.50 \cdot F_{epoch}$$

6.2 Revenue Projections

Daily Volume	Avg Fee	Daily Fees	To Stakers	To Burn	Annual Burn
$10M	3 bps	$3,000	$1,500	$900	$328,500
$100M	3 bps	$30,000	$15,000	$9,000	$3.29M
$500M	2.5 bps	$125,000	$62,500	$37,500	$13.7M
$1B	2 bps	$200,000	$100,000	$60,000	$21.9M

Table 7: Revenue projections at various daily trading volumes. Average fee decreases with volume due to institutional tiers.

Theorem 4 (Staking APY)**.** *If the LIQUID market cap is M, the staking participation rate is ρ (fraction of supply staked), and annual fee revenue is R, then the staking APY is:*

$$APY = \frac{0.50 \cdot R}{\rho \cdot M}$$

At $1B daily volume, $200K daily fees, $50M staked LIQUID market cap, and 30% staking rate: $APY = 0.50 \times 73M/(0.30 \times 50M) = 243\%$*. Realistic equilibrium: higher staking rate compresses APY until marginal stakers are indifferent.*

7 Token Value Accrual

LIQUID accrues value through four mechanisms:

1. **Supply reduction**: Fee burn permanently removes tokens (Theorem 3).
2. **Revenue sharing**: Staking yield provides a discounted cash flow floor for token valuation.
3. **Utility demand**: Fee discounts create rational demand from active traders who hold LIQUID to reduce costs.
4. **Governance premium**: Control over protocol parameters (fee rates, treasury allocation) adds a governance option value.

Definition 6 (Fundamental Value Floor)**.** *Modeling LIQUID as a perpetuity on staking revenue:*

$$P_{floor} = \frac{0.50 \cdot R_{annual}}{r \cdot S(t)}$$

where r is the discount rate and $S(t)$ is circulating supply. At $1B daily volume ($R = \$73M/yr$), $r = 15\%$, and $S = 500M$ tokens: $P_{floor} = 0.50 \times 73M/(0.15 \times 500M) = \$0.487$ per token.

7.1 Volume Sensitivity

Daily Vol.	Annual Rev.	To Stakers	P_{floor}	FDV
$10M	$1.1M	$548K	$0.007	$7.3M
$100M	$10.9M	$5.5M	$0.073	$73M
$500M	$45.6M	$22.8M	$0.304	$304M
$1B	$73M	$36.5M	$0.487	$487M
$10B	$548M	$274M	$3.65	$3.65B

Table 8: Volume sensitivity analysis. P_{floor} assumes $r = 15\%$, $S = 500\text{M}$, 50% to stakers. FDV $= P \times 1\text{B}$.

8 Liquidity Mining

5% of total supply (50M LIQUID) is allocated to liquidity mining over 3 years with a halving schedule:

Period	Emission (LIQUID)	Daily Rate
Year 1	25,000,000	68,493
Year 2	12,500,000	34,247
Year 3	6,250,000	17,123
Remaining	6,250,000	Governance-directed

Table 9: Liquidity mining emission schedule. Remaining allocation directed by governance vote.

Mining rewards are distributed to liquidity providers on the Liquid DEX across approved pairs (LIQUID/USDL, LQDTY/USDL, SecurityToken/USDL). The reward distribution uses a gauge-voting mechanism where LIQUID stakers vote on the allocation of mining rewards across pools.

Proposition 2 (No Net Inflation)**.** *Liquidity mining distributes tokens from a pre-minted allocation, not newly minted tokens. Combined with the burn mechanism, net circulating supply change per epoch is:*

$$\Delta S_{epoch} = E_{epoch} - B_{epoch}$$

where E is the mining emission and B is the burn. When daily burn exceeds daily emission, the token becomes net deflationary even during the mining phase.

9 Security and Compliance Considerations

9.1 Howey Test Analysis

The LIQUID token is designed as a utility token, not a security. Under the Howey test, a security requires: (i) investment of money, (ii) in a common enterprise, (iii) with expectation of profit, (iv) derived from the efforts of others.

LIQUID addresses each prong:

- **Consumptive utility**: The primary use is fee discounts and governance voting—direct consumptive benefits, not passive returns.
- **Decentralized governance**: Protocol parameters are controlled by token holder votes, not management decisions.

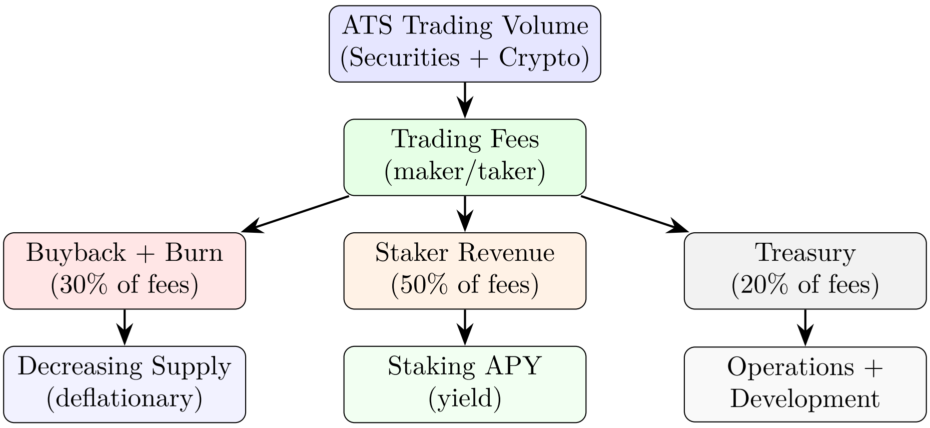
- **Active participation**: Staking rewards require active staking and claiming; they are not automatically distributed.
- **Burning and utility**: The burn mechanism reduces supply based on protocol usage, not management efforts.

9.2 Smart Contract Security

The LIQUID token contract and governance contracts undergo:

1. Formal verification of supply invariants (Lean 4) [1].
2. Third-party audit (in progress).
3. OpenZeppelin Governor, ERC20Votes, and TimelockController as battle-tested base contracts.
4. Timelock on all governance actions (48-hour delay).

10 Protocol Revenue Model



Theorem 5 (Volume-Value Coupling). *Under the revenue sharing model, LIQUID token value is positively correlated with ATS trading volume. Specifically, the fundamental value floor P_{floor} is a linear function of annualized daily volume V_{daily}:*

$$P_{floor} = \frac{0.50 \cdot 365 \cdot \bar{f} \cdot V_{daily}}{r \cdot S(t)}$$

This creates a direct incentive alignment: token holders benefit from exchange growth, and exchange users benefit from token-based fee discounts.

11 Comparison with Traditional Exchange Tokens

Property	**LIQUID**	**BNB**	**FTT**	**CRO**	**HT**
Supply type	Fixed + burn	Fixed + burn	Fixed + burn	Fixed	Fixed + burn
Fee discount	Yes (tiered)	Yes (25%)	Yes (tiered)	Yes	Yes (tiered)
Governance	On-chain	None	None	None	None
Revenue share	Yes (staking)	No	No	Partial	No
Regulated venue	SEC ATS	No	No (defunct)	No	No
Burn source	Trading fees	Profit-based	Revenue	Revenue	Revenue

Table 10: LIQUID vs. centralized exchange tokens. LIQUID is the only token with on-chain governance AND regulated venue revenue sharing.

12 Risk Factors

1. **Volume risk**: Low trading volume reduces staking rewards and burn pressure, potentially compressing token value.
2. **Regulatory risk**: SEC reclassification of LIQUID as a security would require restructuring governance and distribution.
3. **Smart contract risk**: Despite formal verification and audits, undiscovered vulnerabilities could affect token mechanics.
4. **Concentration risk**: Treasury (40%) and team (25%) hold 65% at genesis; vesting mitigates but does not eliminate concentration.
5. **Governance capture**: A whale acquiring >4% could force quorum unilaterally. The timelock provides a 48-hour exit window.

13 Conclusion

LIQUID provides a governance and utility token designed for a regulated securities exchange, combining the proven mechanics of DeFi governance (ERC20Votes, on-chain proposals, timelock execution) with the compliance constraints of a SEC-registered ATS. The fixed supply with fee-driven burn creates deflationary pressure proportional to exchange usage, while staking revenue sharing provides a fundamental value floor tied to trading volume.

The model addresses the three failures of existing exchange tokens: (i) BNB/HT lack governance, (ii) UNI lacks revenue sharing, and (iii) FTT lacked regulatory oversight. LIQUID combines all three within the formally verified infrastructure of Liquidity.io [1, 2, 4].

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