QualitaX

stETH-based Swaps using ERC-6123: now, later or never?

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ABOUT

Table of contents

Introduction

Background

Ethereum's transition from a Proof-of-Work (PoW) to a Proof-of-Stake (PoS) consensus mechanism marked a significant evolution in the network's development, resulting in a 99%[1] reduction in energy costs of processing Ethereum transactions. PoS introduces staking as a core feature, where participants, known as validators, contribute to network security by locking up their Ether (ETH) holdings. In return, they earn rewards for validating transactions and proposing new blocks.

The Ethereum staking market has grown significantly since its inception in December 2020, with 27% of all Ethereum currently staked. As of October 1, 2024, this translates to 33,289,128 ETH staked, valued at approximately $115.70 billion USD, distributed across 1,040,285 validators.
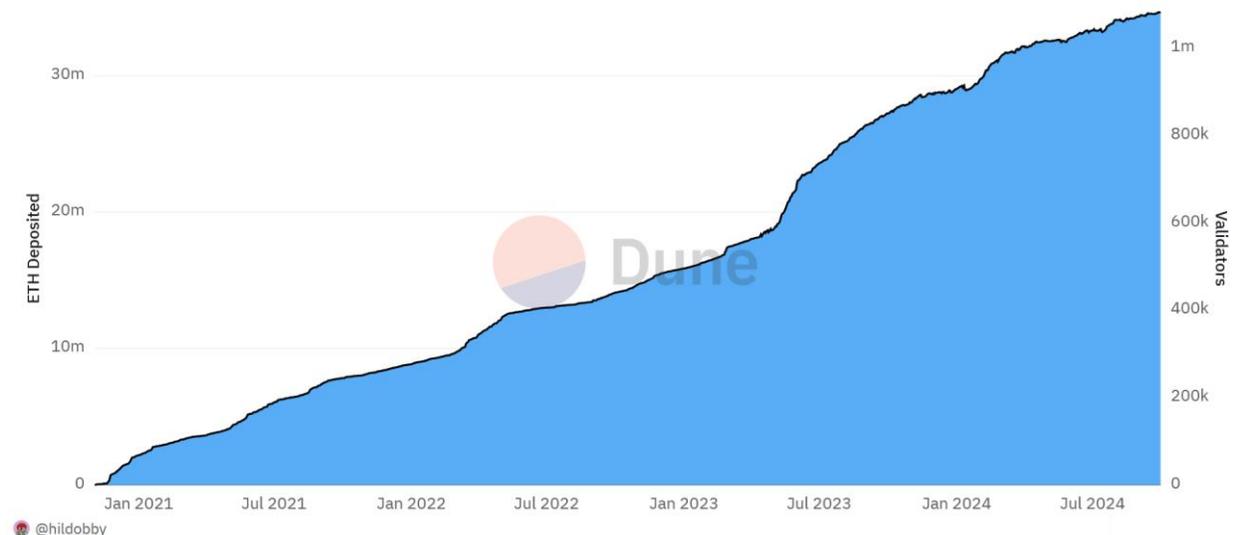
Figure 1 - Ethereum Staking Growth - Source: https://dune.com/hildobby/eth2-staking

To activate a validator node on Ethereum, stakers must lock up a minimum of 32 ETH. This stake acts as collateral to ensure honest behavior; validators can earn additional ETH as rewards but also face penalties or slashing for malicious actions or extended downtime. However, this approach presents several challenges:

1. **High Entry Barrier**: Not all participants can afford or are willing to lock up 32 ETH, which is a substantial amount given ETH's market value.

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[1] Source: https://ethereum.org/en/energy-consumption/

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2. **Lack of Liquidity**: The staked 32 ETH becomes illiquid, meaning it cannot be used for other investments or transactions until it is unstaked, which may take a considerable amount of time.
3. **Operational Overhead**: Running a validator node requires technical expertise and continuous maintenance to keep the node online and operational.

To address these issues, liquid staking solutions like Lido have emerged as viable alternatives.
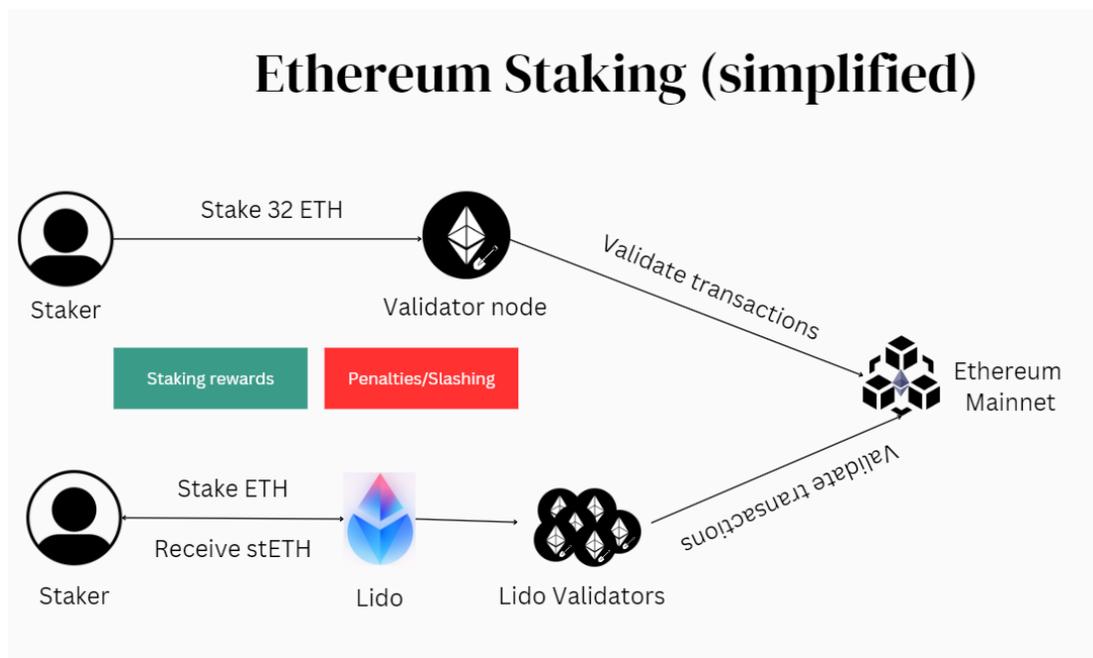
Figure 2 - Ethereum Staking Simplified

Lido is an open-source, liquid staking middleware, providing a simple way to its users to earn rewards using their digital assets. The Lido middleware connects node operators and users by allowing users to self-stake their digital assets without the need to maintain hardware. It allows users to stake any amount of ETH without the need to run their own validator nodes delivering the below benefits:

- **Accessibility**: Users can stake less than 32 ETH, lowering the entry barrier and democratizing participation in Ethereum staking.
- **Liquidity through stETH**: When users stake ETH via Lido, they receive **stETH** tokens in return. These tokens represent a tokenized version of the user's staked ETH and accumulated rewards. Unlike traditional staking, stETH is liquid and can be used across the Decentralized Finance (DeFi) ecosystem.
- **No Hardware Maintenance**: Lido middleware programmatically handles the technical aspects by delegating the staked ETH to a network of node operators. This eliminates the need for users to maintain hardware or ensure uptime.

- **Continuous Rewards**: Users continue to earn staking rewards, which are reflected in the increasing value of their stETH holdings over time.

Lido is managed by Lido DAO, a Decentralised Autonomous Organisation whose tokens have software access rights. These responsibilities include the management of: protocols parameters and upgrades, node operators, bug bounty programs and emergency measures as well as research and development and incentive management. Lido DAO accumulates protocol fees from the gross staking rewards routed through the middleware, through various mechanisms including staking rewards fee, node operator fees, fees from incentive and partnerships with other DeFi stakeholders.

At the time of writing, Lido holds almost a 30% market share of the total staking market, 70% of the LST market, with ~$30B[2] worth of digital assets staked on its middleware, of which 25%[3] are staked by institutional users. In addition, to cater to the growing needs of large-scale stakeholders, Lido Institutional was launched in August 2024 to provide an enterprise-grade touchpoint for existing and prospective custodians, asset managers, exchanges, and more in the market for liquid staking solutions.

ETH Deposited to BeaconChain through Lido middleware
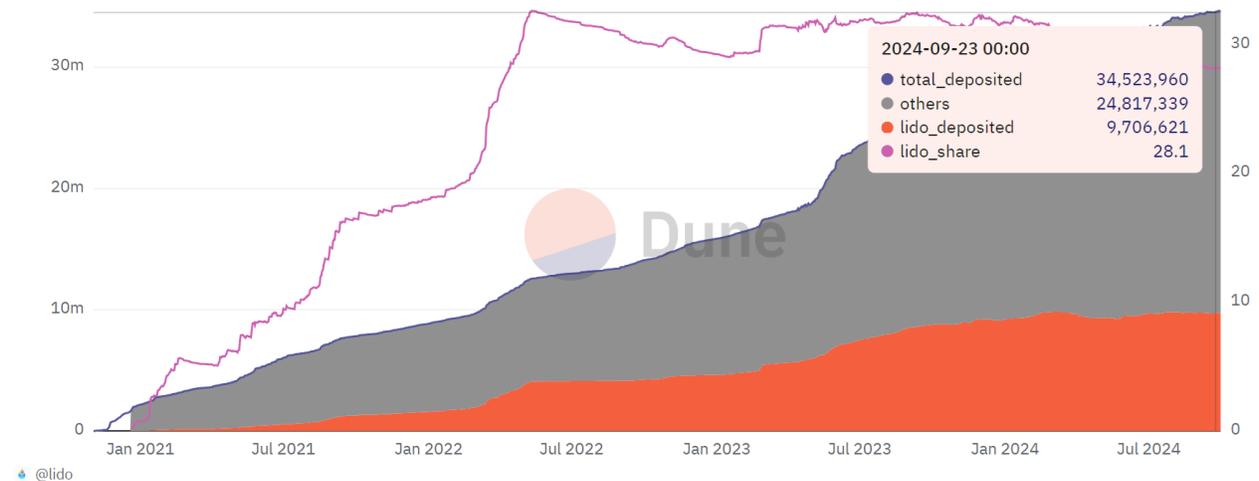

Figure 3 - ETH Deposited to BeaconChain through Lido middleware- Source:
https://dune.com/LidoAnalytical/Lido-Finance-Extended

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[2] As of 2024-11-12
[3] Source:https://blockworks.co/news/lido-offering-white-glove-staking-service

Rank	Compare	Name	1d Change ⇕	7d Change ⇕	1m Change ⇕	TVL ⇕
1	☐	Lido 1 chain	-0.28%	+0.79%	+7.02%	⊘ $25.733b
2	☐	Binance staked ETH 2 chains	-0.31%	+7.96%	+25.48%	⊘ $3.727b
3	☐	Rocket Pool 1 chain	-0.33%	+0.57%	+7.86%	⊘ $3.306b
4	☐	Jito 1 chain	-0.48%	+8.60%	+21.71%	⊘ $2.076b
5	☐	Mantle Staked ETH 1 chain	-1.77%	-0.95%	+3.82%	⊘ $1.293b

Figure 4 - Liquid staking TVL Rankings - Source: https://defillama.com/protocols/Liquid%20staking

As the staking ecosystem evolves, staking rate derivatives such as Ethereum staking rate swaps are starting to emerge. In March 2024, FalconX, a digital asset prime brokerage and derivatives service provider completed the first fixed-floating swap[4]. The two participating firms in the swap are Multicoin Capital, a thesis-driven investment firm, and Parataxis Capital, a multi-strategy investment firm. In May 2024, Nonco, a digital assets trading firm specializing in institutional and professional investors, has completed its first fixed-floating swap[5]. Bastion Trading, a systematic trading firm, structured and priced the transaction. Twinstake announced another industry milestone with the "first swap transaction by a staking provider on the CESR"[6]. Other relevant news include CESR enables fixed-rate yield solutions launched by Luganodes[7], Rho Protocol[8] and Dexponent[9] launching their respective institutional on-chain rate markets using CESR.

But what are Ethereum staking rate swaps exactly?

Ethereum staking rate swaps are a new financial derivative product that allows two counterparties to exchange cash flows based on the rate of rewards generated by staking Ether (ETH) in Ethereum's proof-of-stake (PoS) consensus mechanism. It enables one counterparty to receive the variable (floating) staking rewards associated with Ethereum staking, while the other party receives a different predefined rate—typically a fixed rewards rate.

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[4]https://www.prnewswire.com/news-releases/falconx-completes-the-first-ethereum-staking-rate-swap-using-cesr-302086222.html
[5]https://www.prnewswire.com/news-releases/nonco-and-bastion-trading-complete-ethereum-staking-rate-swap-using-cesr-302160161.html
[6] https://www.twinstake.io/news/twinstake-executes-first-swap-by-a-staking-provider-using-cesr-rate
[7] https://www.luganodes.com/blog/luganodes-adopts-cesr/
[8]https://www.rho.trading/blog/the-first-liquid-staking-rates-market-for-cesr-is-launched-by-rho-labs-with-nonco-making-the-inaugural-trade
[9] https://dexponent.com/press-release

Figure 5 - Ethereum staking rate swaps

Use cases for this instrument include hedging against staking rewards rate volatility, speculating on future staking rewards, and managing risks within the growing digital assets ecosystem.

Purpose and scope of the research

The purpose of this research is to assess the demand, benefit and risks of an Ethereum staking rate swap product within the Lido ecosystem and with the following characteristics:
1) using Lido stETH APR as a benchmark rate
2) using stETH as collateral and settlement asset
3) managed as a smart derivative contract (SDC) using ERC-6123.

Lido stETH APR as a Benchmark Rate

The Lido Staked Ether (stETH) APR is the native rate within the Lido ecosystem, and therefore should be considered the de-facto rate for structuring financial products like swaps as it would offer clarity and consistency for ecosystem participants. The Lido stETH APR directly reflects the specific annualized rewards rate from ETH staked through Lido, providing a more accurate and relevant measure of rewards for Lido users compared to the broader and less tailored rate such as CESR.

However, is it suitable as a benchmark for financial derivatives? Several factors need to be discussed such as market acceptance in regards to its composition, calculation methodology and governance. Also, present and future regulatory considerations related to financial benchmark regulations, such as the EU Benchmarks Regulation (BMR) or equivalents in other

regions. Understanding these factors is important in order to determine if Lido stETH APR can serve as a credible foundation for staking rate derivatives for non-retail stakeholders.

stETH as Collateral and Settlement Currency

stETH, Lido's liquid staking derivative token, represents staked ETH and accrues staking rewards over time. Using stETH (Lido's staked ETH token) as a collateral and settlement asset provides several advantages. stETH is highly liquid, widely integrated across DeFi, and naturally represents staking rewards accrual.

Yet, risks such as liquidity fluctuations, price deviations between stETH and ETH, and the potential impact of market volatility must be considered. Additionally, using stETH as a settlement asset ties the swap directly to Lido's staking infrastructure, meaning that any disruptions or governance changes in the Lido protocol could affect the swap's value and settlement processes. Understanding these risks is crucial for institutional stakeholders considering stETH as a robust and reliable collateral and a settlement asset for Ethereum staking rate swaps.

Ethereum staking rate swaps as smart derivative contract using ERC-6123

ERC-6123 is an Ethereum Virtual Machine (EVM)-based standard for creating and managing the lifecycle of Smart Derivative Contracts (SDCs). ERC-6123 is designed to remove counterparty credit risk, a significant concern in traditional over-the-counter (OTC) derivatives trading, and aims to bring the benefits of decentralization to the traditional derivatives market. Ethereum staking rate swaps based on the ERC-6123[10] standard could represent a significant advancement in OTC derivative trading - offering a more streamlined and automated approach to managing swap execution, settlement, and margin management and therefore leading to greater accessibility and composability for DeFi applications and users. For more information about ERC-6123, please refer to our deep dive "ERC-6123: Rethinking Financial Derivatives" :https://www.qualitax.io/erc6123

In addition, understanding technical, infrastructure and market readiness factors is crucial to determine if there is an ecosystem to support regulated smart derivatives that meet institutional standards for trading and risk management.

The following section will briefly describe our methodology for assessing the feasibility, market demand, and implementation considerations of Ethereum staking rate swaps in the Lido Ecosystem, focusing on three key components: stakeholder engagement across the institutional ecosystem, market and technical research of benchmark requirements and smart contract implementation, and synthesis of findings to provide actionable recommendations.

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[10] https://eips.ethereum.org/EIPS/eip-6123

Methodology

Our research methodology was designed to comprehensively assess the demand, benefits, and risks associated with Ethereum staking rate swaps using the Lido stETH APR as a benchmark and stETH as collateral. We employed a mixed-method approach, combining stakeholder engagement with desk research to gather both primary and secondary data. The research process was conducted in three phases: stakeholder demand analysis, market research and technical analysis and recommendations.

Stakeholder Demand Analysis

We identified key stakeholder groups relevant to the Lido Institutional ecosystem and potential users of staking rate swaps:

Institutional End-Users	Liquidity Providers/Market Makers	OTC Desks
Lido DAO	Lido Operators	Regulators and Legal Advisors

- **Institutional End-Users:** Such as custodians, ETH ETFs/ETPs issuers, asset managers, exchanges, and hedge funds are potential primary users of Ethereum staking rate swaps. The demand from this group is the key factor influencing the market's viability and growth.

- **Lido Operators**: Their activities provide the Lido stETH APR benchmark used in these swaps. Their support and cooperation are crucial for integrating staking rate swaps and managing them via ERC-6123 within the Lido ecosystem.

- **Liquidity Providers/Market Makers and OTC Desks:** Ensuring market liquidity and efficient trading of staking rate swaps. Their participation facilitates smoother transactions and tighter bid-ask spreads, making the market more attractive to other participants.

- **Lido DAO**: responsibilities include the management of the Lido middleware and its ecosystem: protocols parameters and upgrades, node operators, bug bounty programs and emergency as well as research and development and incentive management.

- **Regulators and Legal Advisors:** critical role in ensuring that staking rate swaps and their management via ERC-6123 comply with existing laws and regulations. Their guidance helps mitigate legal risks and fosters a trustworthy environment for all market participants.

For each stakeholder group (except regulators and legal advisors), we created a target list of specific entities and individuals to engage with. This list was curated based on market prominence, relevance to the Lido ecosystem, and potential interest in Ethereum staking rate swaps.

Then, we conducted meetings with representatives from various stakeholder groups. These engagements were structured to gather feedback on the following key areas:

- General perspective on Ethereum staking rate swaps
- Views on using Lido stETH APR as a benchmark rate
- Opinions on using stETH as collateral and settlement currency
- Potential impact on institutional demand for Lido middleware
- Perceived risks and concerns
- Questions and areas requiring further clarification

Market and Technical Research

Alongside stakeholder engagements, we conducted comprehensive market research to understand the current state of staking rate derivatives, benchmarks, and market infrastructure.

Our technical research focused on the practical implementation of Ethereum staking rate swaps using ERC-6123, evaluating smart contract architectures, oracle solution, and settlement mechanisms. We also assessed existing market infrastructure to understand integration requirements, technical constraints, and potential implementation challenges.

Analysis and Recommendations

We analyzed the collected data and synthesized the findings from stakeholder engagements with insights from our market and technical research to develop a comprehensive understanding of:

- Benefits and opportunities across different stakeholder groups
- Risks, pain points, and concerns
- Potential solutions and considerations for addressing identified issues

Based on our analysis, we evaluated our initial hypotheses regarding the demand for and feasibility of implementing Ethereum staking rate swaps within the Lido ecosystem. Drawing from our synthesis and interpretation of the data, we formulated a set of recommendations for:

- Addressing identified challenges and concerns
- Capitalizing on opportunities
- Guiding the potential implementation of Ethereum staking rate swaps within the Lido ecosystem

Ethereum Staking Rate Swaps Market

Market Size

It is currently very difficult to estimate the size of the Ethereum staking rate swap market. Based on our research and engagement with various stakeholders, we believe that the current market for Ethereum staking rate swaps is barely nascent and is being developed along two distinct tracks - institutional and retail - each with different requirements and characteristics.
On the institutional side, the publicized OTC deals are most likely to have been short duration (3 months maximum) with low six figure digits nominals.

This could be driven by factors such as market development strategy
● Gauging actual market demand through small-scale transactions
● Testing counterparty appetite and engagement
● Evaluating inbound queries and market feedback
And, experimental testing phase
● Understanding and validating pricing models and risk management frameworks
● Testing operational workflows and settlement mechanisms
● Establishing trust and credibility in a nascent market by demonstrating successful execution and settlement of smaller trades before scaling up

In contrast, protocols like IPOR provide permissionless Ethereum staking rate swap markets on Ethereum Mainnet and Arbitrum, offering more standardized products like 28, 60, and 90-day swaps with up to 500x leverage, referencing their version of the Lido Staking Rate Index. IPOR's approach emphasizes accessibility and transparency for DeFi users and providing immediate (albeit small) liquidity through automated market making, prioritizing accessibility, capital efficiency, and integration with existing DeFi protocols.
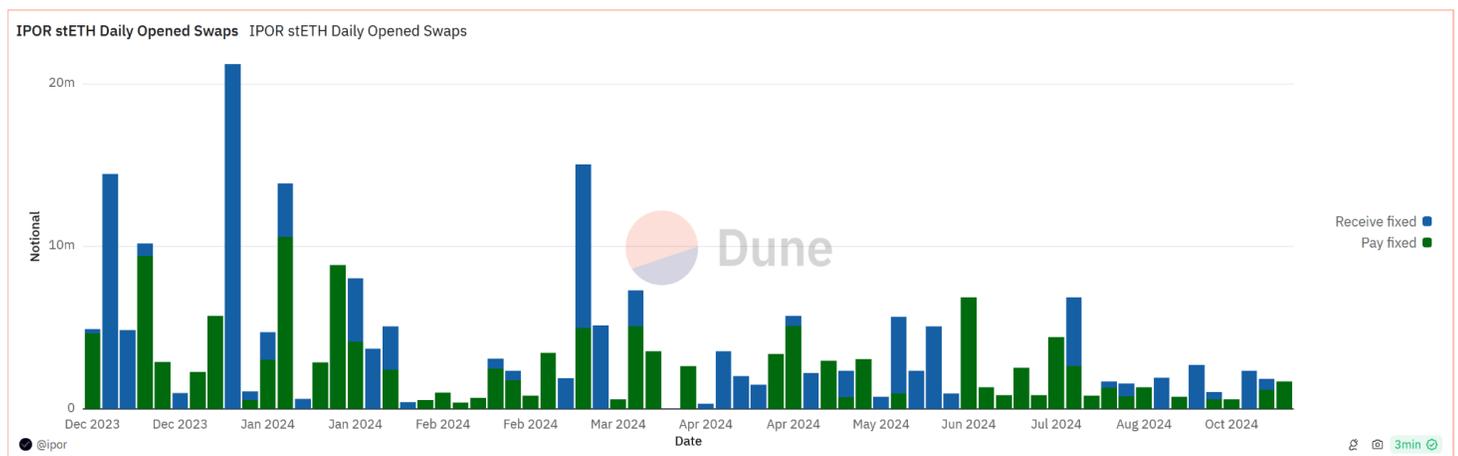

Figure 6 - IPOR stETH Swaps on Ethereum - Source: https://dune.com/ipor/ipor-swaps

Open Date	Open Link	Chain	Asset	Tenor	Maturity Date	Close Date	Close Link	Direction	IPOR Index	Fixed Rate	Notional	Collateral
2024-01-03 13:02	[🔗]	Ethereum	stETH	60	2024-03-03 13:02	2024-03-03 13:03	[🔗]	Receive fixed	4.76%	4.49%	$21,216,647.22	$42,433.29

Figure 6 shows that the notional values have been varying significantly over time, with some months seeing higher activity, and a peak in January 2024. After the initial spike in early 2024, the market activity generally declines but has been remaining active throughout the year, with smaller peaks occurring in March and July 2024.
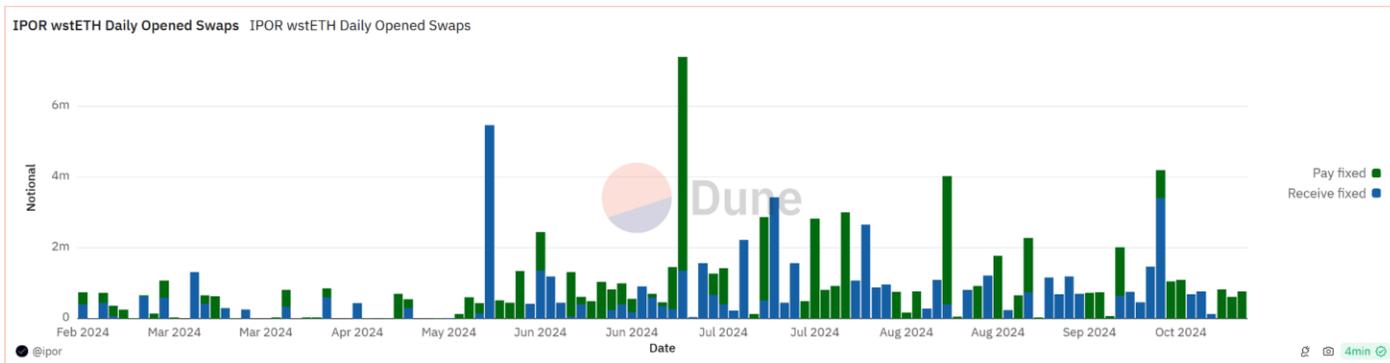

Figure 7 - IPOR wstETH Swaps on Arbitrum - Source: https://dune.com/ipor/ipor-swaps

Overall, the Ethereum staking rate swaps market (institutional and retail) is still in its very early stages with relatively modest volumes, characteristic of a market that has not yet achieved consistent adoption and/or traction and regular trading activity.

Term structure

In traditional finance, there are key components that compose standardized term structures: official benchmark rates, fixed trading tenors, market makers providing regular quotes for these tenors, standardized ISDA documentation, deep liquidity across different maturities, and reliable price discovery mechanisms. However, the Ethereum staking rate swaps market currently lacks these fundamental elements.

There are no official nor widely accepted term structures for Ethereum staking rates, and no standardized tenors or market conventions have emerged. Most trading activity is limited to sporadic over-the-counter (OTC) transactions between sophisticated counterparties, with no price transparency or centralized nor decentralized reporting. The absence of established market makers has resulted in fragmented liquidity and inefficient price discovery. This nascent market's immaturity is further highlighted by the lack of consensus on key parameters such as benchmark rate calculation methodologies.

However, recent initiatives are emerging to establish standardized term structures for Ethereum staking rates. For instance, Treehouse Labs is developing the Decentralized Offered Rates (DOR)[11] consensus mechanism - a panel-driven rate submission system aimed at creating an Ethereum Staking Rate (ESR) Curve. This involves market participants like Selini Capital, a crypto-native trading firm, contributing research-based staking rate forecasts to help form reliable benchmarks for future Ethereum yields. The DOR framework represents a step toward market maturity, attempting to mirror traditional finance's benchmark rate-setting mechanisms while adapting to DeFi's unique characteristics.

In the absence of a term structure, term rates must be derived using instruments like Ethereum staking rate dated futures. One approach is through looking at data from Ethereum staking rate futures markets such as the one recently launched by Rho Protocol[12] that allows trading of staking rate futures across various maturities. This enables the construction of a synthetic yield curve for pricing, risk management, and forecasting.

Another approach could be to consider stETH markets on Pendle protocol. One could argue that they provide valuable insights to help structure swaps with different maturities, aligning with desired exposure and duration management strategies.

Figure 8 - Source - https://app.pendle.finance/trade/markets?search=steth

Indeed, the variation in PT yields (e.g., 3.529% for 26 Dec 2024 vs. 4.576% for 30 Dec 2027) helps establish a staking rate yield curve for Ethereum. This yield curve is crucial for pricing swaps across different maturities and determining duration-specific returns.
The data from Pendle demonstrate how tokenized staking rate components (YT and PT) can provide a foundation for an Ethereum staking rate swap market. By using YT for floating yield exposure and PT for fixed-rate exposure, a structured staking rate swap market could emerge, offering stakeholders a way to hedge against or gain exposure to staking rate fluctuations on the Ethereum network.

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[11] https://docs.treehouse.finance/protocol/dor/introduction
[12] https://www.rho.trading/blog/the-first-liquid-staking-rates-market-for-cesr-is-launched-by-rho-labs-with-nonco-making-the-inaugural-trade

Market Liquidity

A key concern consistently raised during our stakeholder engagements was the ease of entering and exiting Ethereum staking rate swap positions. Currently, for institutional participants and Lido operators, trades most likely would have to be executed through bilateral agreements, requiring manual counterparty discovery and negotiation. In discussions with prospective liquidity providers and market makers, they indicated that to make markets effectively, positions would need to reach minimum notionals in the double-digit millions (USD). Their indicated pricing suggests spreads of around 20 basis points for the entire duration of the trade (approximately 2 basis points daily for a 10-day period) as the current market rate. While these size requirements and spreads reflect the nascent state of the market, our understanding is that they are open to exploring arrangements where they could help cover initial liquidity provision costs for interested counterparties to help bootstrap market activity.

However, as mentioned previously, it does not seem that the current trades are meeting the nominal size requirements so participants looking to enter or exit positions must rely on bilateral negotiations with counterparties. This creates additional operational overhead and potentially longer execution timeframes, as each trade requires finding a matching counterparty, negotiating terms, and establishing necessary trading agreements. The lack of a deep centralized or decentralized liquidity pool or consistent market-making activity means that position management becomes more challenging. This situation is likely to persist until trading volumes increase substantially enough to attract dedicated market makers and support more efficient price discovery and liquidity provision.

Future Market Development

Our engagement with stakeholders surfaced a general lack of awareness about Ethereum staking rate swaps. For most participants interviewed, including sophisticated institutional players and Lido operators, this was their first exposure to the concept. While they quickly grasped the potential utility and mechanics given their familiarity with traditional interest rate swaps, the novelty of the product in the digital asset space was evident. This knowledge gap highlights the nascent state of the market and suggests significant educational and marketing efforts will be necessary to drive adoption. The limited awareness also explains the current modest trading volumes and sporadic activity, as many potential users are still in the process of understanding how these instruments could fit into their operations or investment strategies. This finding indicates that market development is not just constrained by liquidity limitations, but also by the need to build basic product awareness among key market participants.

Yet, as the most established proof-of-stake blockchain with the largest institutional adoption to date, Ethereum's staking rate has the potential to become the benchmark "risk-free" rate for the entire digital asset space. This could mirror how LIBOR and then SOFR function in traditional markets, serving as a reference rate not only for DeFi applications but also for other blockchain

networks (i.e offering higher staking yields to compensate for additional risk relative to Ethereum staking rate).

In fact, despite the lack of awareness, when presented with the concept, the feedback was overwhelmingly positive, with stakeholders expressing a clear interest in Ethereum staking rate swaps. Many viewed the potential for such products to meet their hedging, yield enhancement, risk management and fixed yield product development needs over the next 12-18 months as particularly promising. This initial positive feedback for the use cases signals that institutional participants and Lido operators are willing to explore and potentially adopt these products, paving the way for broader market engagement.

In that context, an Ethereum staking rate swaps market could continue to evolve, with staking rate swap becoming a valuable instrument in the digital asset space. As a result, driving further volume and liquidity as more participants recognize its utility. Moreover, institutional players could leverage these swaps as part of broader investment or product development strategies creating a more robust and mature ecosystem for staking-related financial products.

Now that we have provided some market context, the following section will address the outcomes of our research in assessing the demand for an Ethereum staking rate swap product
1) using Lido stETH APR as a benchmark rate
2) using stETH as collateral and settlement currency
3) and managed as a smart derivative contract (SDC) using ERC-6123.

Lido stETH APR as an institutional benchmark

A consistent theme in our institutional stakeholder discussions was that the development of a robust Ethereum staking rate swaps market fundamentally depends on the establishment of standardized benchmarks. These institutions, drawing from their experience in traditional fixed income markets, emphasized that a reliable benchmark is crucial for market development as it provides a common reference point for pricing, risk management, and contract settlement. Their feedback highlighted specific requirements for what constitutes a credible benchmark.

From an institutional stakeholder's perspective, there are three key considerations 1) Does the benchmark include MEV 2) What are other market participants adopting 3) Regulatory considerations.

With or Without MEV

An Ethereum staking rate benchmark designed to exclude MEV (Maximal Extractable Value) is likely to be more stable than the Lido stETH APR for several reasons. MEV rewards are

inherently volatile because they depend on network conditions, such as transaction volume, gas fees, and the presence of arbitrage opportunities. These factors are highly variable, making MEV unpredictable and subject to sudden fluctuations. Since MEV introduces a highly variable component to the overall staking yield, excluding it would make the benchmark less sensitive to short-term market dynamics.

As an example, during the Yen Carry Trade Unwind[13], LIDO's APR spiked from its typical range to 9.90%.
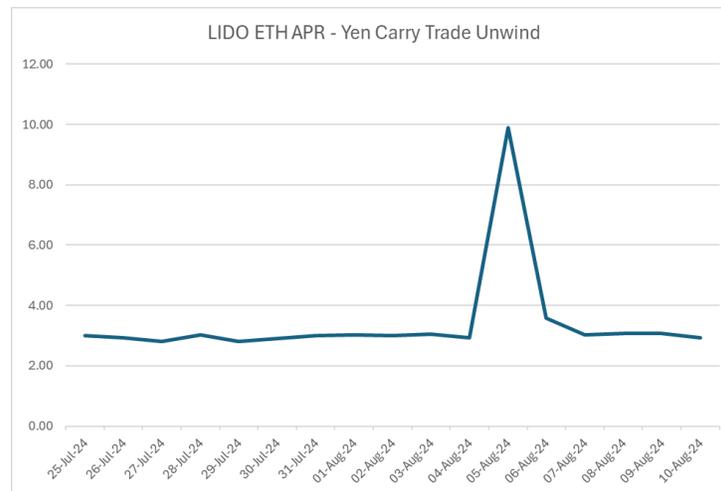
Figure 9 - LIDO ETH APR - Yen Carry Trade Unwind

For market participants involved in rate swaps, especially fixed-rate receivers, these sharp increases in the floating rate can result in substantial settlement payments.

For fixed-rate receivers, volatility introduces the risk of paying large, unforeseen settlements. In a high-volatility event, like the one observed during the Yen Carry Trade Unwind, the fixed-rate receiver might be locked into an unfavorable position where they must pay out significantly higher amounts than anticipated.

For this reason, some institutional stakeholders have clearly expressed the view that for institutional use, a more stable and predictable benchmark is preferred for risk management and yield forecasting.

Market Adoption

In our publication "A Primer: Ethereum Staking Rate Benchmarks"[14] covering the emerging space of standardized measures for Ethereum staking rewards, including the CF ETH Staking

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[13] https://www.dlnews.com/articles/markets/the-japan-yen-carry-trade-size-and-why-it-matters-to-crypto/

[14] A Primer: Ethereum Staking Rate Benchmarks: https://docsend.com/view/hwrwvvmy5ehz2dwb

Reward Rate (ESRR), the MarketVector™ Figment Ethereum Staking Reward Reference Rate (STKR), the Compass Staking Yield Reference Index Ethereum (STYETH), CoinDesk Indices Composite Ether Staking Rate (CESR) and Lido Ethereum APR but also the upcoming Decentralized Offered Rates (DOR) framework from Treehouse.

The availability of so many Ethereum staking rate benchmarks has implications in terms of competition, adoption, market positioning and market fragmentation. Due to the very nascent nature of the space, there is no evidence of market dominance . However, it is important to note that there have been many recent press releases related to the CoinDesk Indices Composite Ether Staking Rate (CESR) denoting a deliberate effort to establish CESR as a de-facto benchmark for Ethereum staking rate. In the future, it could be the case that the market will develop for multiple benchmarks providing different use cases. So far, no benchmark to rule them all yet but with CESR potentially emerging as a front-runner.

Regulatory Considerations

Serving as a benchmark for institutional derivative products comes with regulatory considerations and requirements. Additional transformations of the data may be required to ensure that the Lido stETH APR rate aligns with EU Benchmarks Regulation (BMR) and equivalent regulations in other jurisdictions, in order to be used as a reference rate. Although issued by a software protocol in a programmatic and automated manner, there may still be some regulatory uncertainty regarding the suitability of such reference rates for use in regulated financial derivative products, such as swaps, which merits further evaluation from a legal perspective.

stETH as collateral and settlement currency

stETH as collateral in DeFi

As per figure 10, 29.39% of the total stETH supply is currently supplied as collateral which indicates a high level of confidence in stETH as a collateral asset within the DeFi community. Also, a 11.19% increase over the past 6 months suggests that stETH's appeal as a collateral asset has been growing, likely due to its liquid nature and staking rewards accrual.
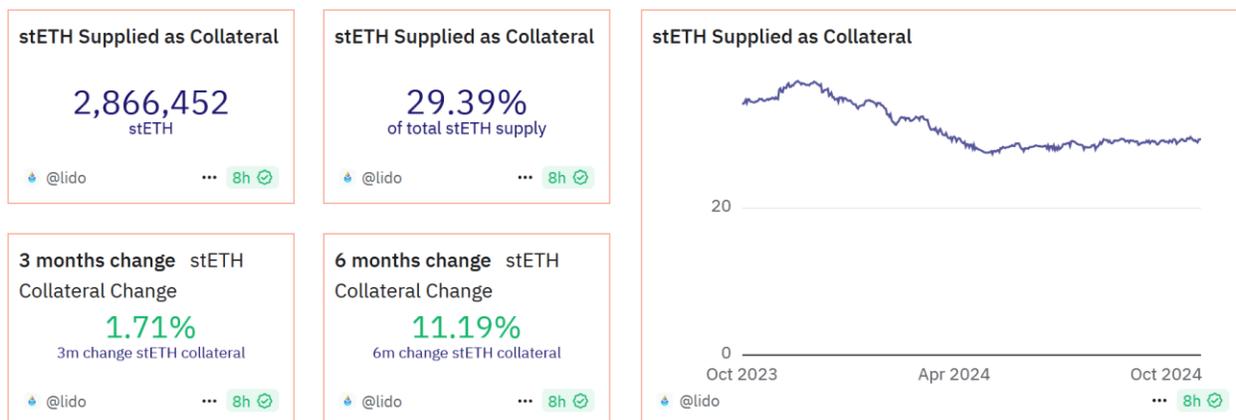
Figure 10 - Source: https://dune.com/lido/wsteth-as-collateral (31.10.2024)

stETH, unlike stablecoins like USDC, accrues staking rewards over time, which adds an additional rewards component. While this offers a potential rewards advantage, it also introduces complexity because the collateral value is subject to both the price of ETH and the staking rewards rate. This makes Ethereum staking generally harder to manage for USD-denominated investors, as stETH's value fluctuates with Ethereum's price and is also influenced by staking market conditions.

Unlike ETH, which only fluctuates based on price, stETH accrues staking rewards continuously, increasing its effective value over time. This accrued value helps offset potential price declines in ETH, making stETH relatively less risky than ETH alone from a USD-denominated investor's point of view. The rewards component provides a "buffer" effect, so if the ETH price drops, stETH retains slightly more value due to the accumulated staking rewards.

Using stETH as collateral or a settlement currency offers a middle ground between the stability of USDC and the volatility of ETH. It is less exposed to price volatility than ETH because of its value accrual from staking rewards, but more volatile than USDC due to its price exposure to ETH and reliance on staking rewards. Therefore, the choice of collateral or settlement currency depends on risk tolerance, market conditions, and the need for yield versus stability in a specific Ethereum staking rate swap trade.

stETH for Institutional DeFi products

Using stETH as collateral or a settlement currency for Institutional DeFi products such as staking rate swaps does come with a different risk profile compared to using ETH or stablecoins like USDC. Institutional stakeholders are bound by regulatory requirements. Therefore the choice of collateral and settlement currency has to meet regulatory expectations, mitigate risk, and ensure operational stability. Many regulatory frameworks require collateral assets to meet specific reporting and custody standards. For interest rate swaps or other contracts where predictable cash flow is needed, using USDC as a settlement currency will likely become a de-facto standard and offers lower settlement risk from a USD-denomination perspective.

In directional or reward-seeking environments, stETH might be favored due to its staking reward accrual, which provides additional rewards and can help meet financial targets. This makes stETH suitable in scenarios where reward accrual strategies are prioritized.

In addition, using stETH as a settlement asset introduces some unique implications regarding currency risk exposure in scenarios where counterparties need to measure cash flows in USD.

stETH is inherently tied to the value of ETH. Therefore, when using stETH as a settlement currency, both parties are exposed to ETH-USD exchange rate volatility. If ETH's price drops significantly against USD, the value of any stETH-based settlement amount will decrease in USD terms, potentially leading to losses or reduced returns for counterparties whose liabilities are denominated in USD.

Lastly, there is the risk of the stETH/ETH market price deviating. Our stakeholder engagement revealed varied perspectives on protocol and price risks associated with using stETH as collateral and a settlement currency. Some stakeholders expressed concerns about potential stETH-ETH price divergence, which could impact contract valuations and settlements. However, Lido operators and DeFi-native institutions offered a different view, pointing to historical data showing that significant depegging events have been rare and, when they occur, are typically short-lived. They emphasized that stETH's design as a liquid staking token inherently maintains a close correlation with ETH, and that past divergences were mainly driven by temporary market dislocations during extreme events.

Figure 11 - Source: https://dune.com/queries/3301517/5529782
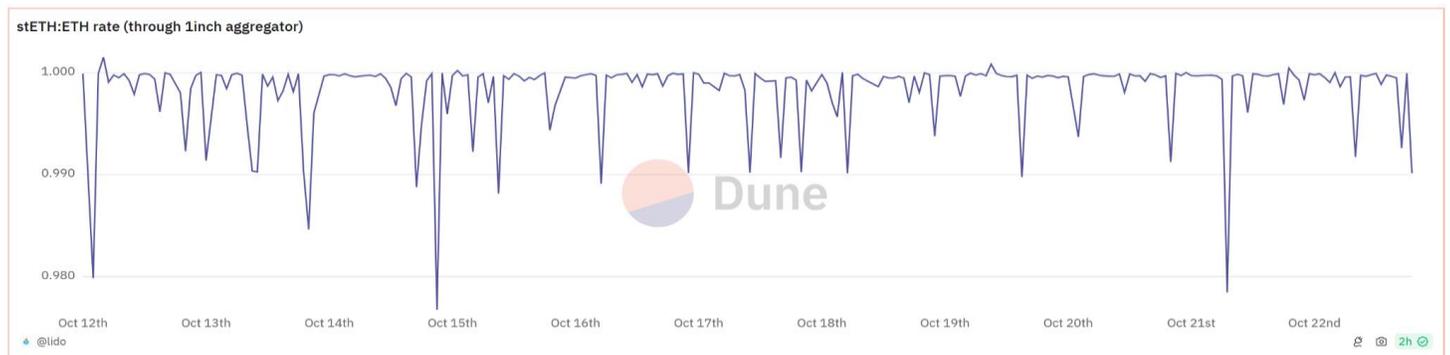
It's important to differentiate between price divergence due to liquidity factors and price divergences due to solvency factors. When market conditions turn illiquid, such as when the Ethereum withdrawal queue extends over several days, the likelihood of a price deviation from par increases. This is mitigated, as observed by market participants above, by ample demand from investors eager to acquire stETH at any price under par, thus rapidly closing any fleeting price deviations.

With respect to solvency, stETH's design inherently mitigates solvency concerns. Although the likelihood of a sustained and correlated slashing event is not zero, operational risks idiosyncratic to node operators are far more likely. By providing access to a large number of underlying node operators, this idiosyncratic risk is substantially diversified, especially when compared to centralized staking providers that only offer exposure to 1-3 node operators and thereby substantially increase counterparty risk exposure for investors. From an institutional perspective, concentrated counterparty risk is highly undesirable and stETH is a suitable mitigant.

Several stakeholders also noted that they already manage stETH-ETH basis risk through their existing operations and consider it a manageable risk rather than a significant barrier. Additionally, new DeFi primitives, such as Cork Protocol[15]'s on-chain CDS' are being developed to allow investors to hedge and trade the risk of peg deviations, offering an innovative solution for managing the stETH-ETH basis risk more effectively.

stETH Liquidity

stETH liquidity has not been raised as a concern during our stakeholder engagement. At the time of writing, there is around $567 million worth of liquidity across decentralised markets. Just on Ethereum mainnet, stETH's order book can regularly clear in excess of hundreds of millions of dollars at under 10bps price impact or lower. stETH has also started establishing deep liquidity in OTC desks, centralized exchanges such as Bybit or regulated venues such as OKX, which makes it easy to convert or use in swaps and other DeFi transactions. This liquidity ensures that counterparties in the swaps market can execute trades efficiently, without the risk of significant price impact.
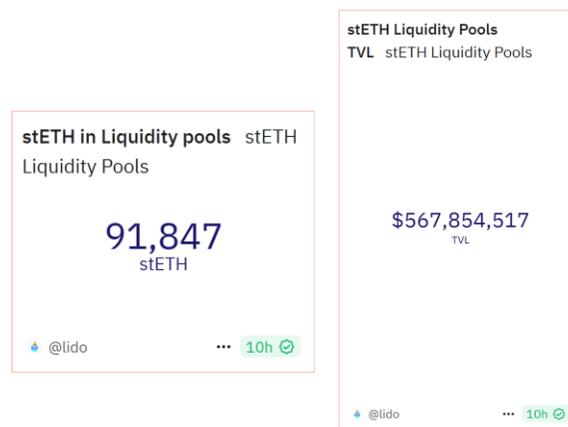

Figure 12 - Source: https://dune.com/lido/wsteth-liquidity

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[15] https://www.cork.tech/

Ethereum staking rate swaps as smart derivative contract using ERC-6123

During the course of our research, while most participants were already discovering the concept of Ethereum staking rate swaps as a financial product, the introduction of ERC-6123 as a technical standard added another layer of complexity. None of the stakeholders we engaged with were aware of this specification, which meant discussions had to cover both the financial mechanics of the product and its technical implementation simultaneously. This dual novelty - combining a new financial instrument with a new technical standard, while also introducing the concept of standardized Ethereum staking rate benchmarks - however did not appear overwhelming to most market participants.

Contrarily, they expressed enthusiasm and a desire to know more, understanding the potential for Ethereum staking rate swaps to offer both a valuable risk management tool and an opportunity for new product development to the benefits of their end-customers. Participants saw the combination of ERC-6123 with the evolving staking benchmarks as a pathway toward greater transparency and automation in the OTC digital asset derivatives market.

However, it is important to note that these are still very early days. The feedback we received was based on a relatively short engagement period, which, while encouraging, is not sufficient to fully gauge long-term demand or commitment to advancing to the next steps. A far longer engagement period, with deeper, ongoing conversations and more comprehensive testing, will be required to properly assess the genuine market appetite and the potential for widespread adoption. The initial positive response is an indicator that the concept of Ethereum staking rate swaps as smart derivative contracts is not seen as a far-fetched or unachievable idea, but a thorough, longer-term data driven market validation is needed to move beyond conceptual enthusiasm to real, actionable market development. This early enthusiasm shows promise, but sustained interest and commitment will be critical in converting it into tangible progress.

Operational and Technical feasibility

The operational and technical feasibility of implementing Ethereum staking rate swaps varies across the three models: OTC off-chain, OTC with on-chain execution, and fully decentralized. OTC off-chain swaps are feasible and well established, relying on OTC trading desks to facilitate trades between counterparties. However, they often involve high operational costs, longer settlement times, and counterparty credit risk. Moving trade lifecycle management on-chain post OTC off-chain execution, enhances market transparency (without necessarily revealing identities of counterparties) and automation, leveraging blockchain and smart contracts technologies to streamline settlement and reduce counterparty credit risk.This approach does introduce new challenges such as gas fees and the need for secure, reliable oracles. Fully decentralized Ethereum staking rate swaps eliminate intermediaries entirely,

using smart contracts and Automated Market Makers (AMMs) to manage trades, margin, and settlement. While this boosts efficiency and transparency, it increases risks related to regulatory compliance, smart contract security, on-chain liquidity, and oracle accuracy, making it technically feasible but riskier without strong risk management tools.

OTC off-chain Ethereum Staking Rate Swaps

Over-the-Counter off-chain interest rate swaps are a long-established mechanism for managing interest rate risk in financial markets. In this model, trades are negotiated and executed privately between counterparties, with all settlement and clearing handled by traditional centralized financial infrastructure. Although highly effective in terms of structure and regulatory familiarity, OTC off-chain swaps face challenges related to post-trade settlement and reconciliation, operational costs, counterparty risk, and limited transparency.

OTC with on-chain Execution Interest Rate Swaps

OTC with on-chain execution of interest rate swaps represents a hybrid model that combines the traditional over-the-counter trading process for trade agreement and execution with the benefits of blockchain technology. In this model, the negotiation of swap terms is still done off-chain, following the typical bilateral negotiation process between counterparties. However, the post-trade execution and settlement processes are handled via smart contracts on a blockchain, bringing increased transparency, automation, and operational efficiency. This setup offers a middle ground between completely off-chain and fully decentralized systems, addressing some of the inefficiencies of legacy systems while maintaining certain centralized elements.

Below is an analysis of the operational and technical feasibility of this approach.

Operational Feasibility of OTC with On-Chain Execution

Trade Negotiation and Execution: Similar to traditional OTC off-chain swaps, trades are negotiated bilaterally between counterparties and OTC desk off-chain. This negotiation process involves defining key swap terms such as the notional amount, fixed or floating interest rates, payment frequency, and contract duration. The parties can communicate via email, phone, or electronic trading platforms.

Once the terms are agreed upon, the trade is executed on-chain using smart contracts. These smart contracts act as the enforcement mechanism, automating the lifecycle events of the swap–such as interest payment, collateral updates, and settlement– without the need for manual intervention.

On-Chain Execution Settlement: After the off-chain negotiation, the trade is executed on-chain by deploying a smart contract on a public or private blockchain network. This smart contract serves as the escrow for the swap, ensuring that both parties comply with the agreed terms. Critical components such as interest rate calculations, collateral management, and payment schedules are pre-programmed into the smart contract.

Key operational processes include:

- **Collateral Posting**: Both counterparties are required to deposit collateral (margin) into the smart contract. The smart contract ensures that the collateral is adjusted in real-time based on the market conditions, similar to how a central clearing counterparty would manage margin in traditional OTC swaps.
- **Payment Automation**: The smart contract automates the payment process, ensuring that fixed and floating payments are calculated and settled on the specified dates without the need for human oversight. Payment amounts are based on real-time interest rate data, often obtained from oracles (external data feeds providing real-world information to the blockchain).
- **Real-Time Settlement**: On-chain execution enables near-instantaneous settlement and reduces settlement risk. Since the transaction is handled by the smart contract, there is no need for manual reconciliation or long delays associated with traditional settlement systems (T+1 or T+2). The smart contract automatically distributes payments based on the terms of the swap at predetermined intervals.
- **Risk Mitigation via Smart Contracts**: By placing execution and settlement on-chain, this model significantly reduces counterparty credit risk. With on-chain execution, this risk is mitigated because the smart contract automatically enforces the terms, including collateral requirements and payments. Additionally, because the contract is self-executing, margin calls and liquidations (if needed) are handled without human intervention. If one party's collateral falls below a predefined threshold, the smart contract can automatically trigger a liquidation or margin call, requiring additional funds to be posted to maintain the position. This reduces the operational burden associated with margin management in the traditional OTC model.

Regulatory Compliance and Transparency: OTC with on-chain execution introduces greater transparency while still allowing for private negotiation and reporting of trades. On-chain activity, even on permissioned blockchain networks, leaves an immutable audit trail, which enhances regulatory transparency. Regulators can gain access to the on-chain data to verify compliance with reporting requirements, but the identity of counterparties and sensitive trade details can still be protected through privacy-preserving technologies when required.

However, the regulatory landscape surrounding the use of blockchain for derivatives trading is still evolving. Depending on the jurisdiction, using smart contracts for clearing and settlement may require additional regulatory approvals, and some centralized entities may still need to be involved.

Technical Feasibility of OTC with On-Chain Execution

Blockchain Infrastructure: The technical feasibility of OTC on-chain execution hinges on the choice of blockchain infrastructure. Both public blockchains and permissioned blockchains are potential candidates. Within the context of this research, Ethereum Mainnet (factory) and Polygon or Arbitrum for ERC-6123 are potential candidates for contract deployment.

Smart Contracts: Smart contracts are the backbone of the on-chain execution process. These contracts are programmed to enforce the terms of the swap, including calculating floating rates, handling collateral, and making payments. The code of the smart contract is immutable once deployed, which increases the reliability of the system but introduces risks–errors in the contract code or vulnerabilities could result in lost funds or incorrect execution of the swap.

The complexity of the Ethereum staking rate swaps requires sophisticated smart contract logic. The contract must handle not only the basic payment flows but also edge cases like early termination, collateral adjustment, and changes in interest rates. Therefore, developing robust, secure smart contracts is critical to ensuring the smooth functioning of the system.

Oracles and Real-Time Data Feeds: Once of the critical technical components of on-chain execution is the use of oracles. Since the floating leg of an Ethereum staking rate swap depends on external benchmark rate, oracles are necessary to feed accurate, up-to-date rate information to the blockchain.

Oracle accuracy and security are key concerns. If an oracle is compromised or provides incorrect data, the swap execution could be faulty. This introduces oracle risk, where the reliability of the swap depends on the integrity of the external data feed. Solutions such as decentralized oracles reduce the risk of single point of failure by aggregating data from multiple sources.

Key Advantages of OTC with On-Chain Execution

- **Automation and Efficiency**: Smart contracts automate the entire lifecycle of the swap, reducing the need for manual intervention in margin management, payments, and settlement. This reduces operational overhead and error compared to fully off-chain systems.

- **Reduction of Counterparty Risk**: With smart contracts automatically enforcing the terms of the swap, there is less reliance on counterparties fulfilling their obligation. This mitigates counterparty risk and ensures more reliable performance.

- **Transparency and Auditability**: The use of blockchain provides an immutable and accessible record of all transactions.

- **Real-Time Settlement**: On-chain execution allows for near-instantaneous settlement and collateral updates.

- **Cost Reduction**: By automating key processes and reducing reliance on intermediaries, on-chain execution can lower transaction costs, although this benefit can be offset by fluctuating gas fees in public blockchain environments.

Key Challenges and Risks of OTC with On-Chain Execution
- **Smart Contract Vulnerabilities**: While smart contracts automate the trade execution process, they are only as good as their code. Vulnerabilities in the code can be exploited, leading to losses, incorrect execution, or manipulation of the swap terms.

- **Oracle Risk**: The reliance on oracle to feed external interest rate data into the smart contract introduces a risk of incorrect or manipulated data. The entire swap could be executed incorrectly if the oracle fails to provide accurate information.

- **Gas Fees and Scalability**: On-chain execution, especially on public blockchains like Ethereum, can be hindered by high gas fees and slow transaction times during periods of congestion. These issues can increase operational costs and delay settlements, reducing the appeal of using blockchain solutions.

- **Regulatory Uncertainty**: the use of blockchain and smart contracts in derivatives markets is still a relatively new concept, and the regulatory environment is not fully defined. Financial institutions may face hurdles in obtaining approval for on-chain execution, particularly if it involves significant deviation from established centralized processes.

Fully Decentralized Ethereum Staking Rate Swaps

Fully decentralized Interest Rate Swaps represent the most radical shift from traditional financial systems, utilizing decentralized finance (DeFi) platforms built entirely on public permissionless networks. In this model, all elements of the swap, from trade initiation to settlement and margin management, are executed on-chain through smart contracts without intermediaries.. Decentralized platforms use Automated Market Makers (AMMs) or peer-to-peer (P2P) mechanisms, enabling users to engage in swaps in a trustless, transparent environment. However, fully decentralized systems introduce unique risks, including smart contract vulnerabilities, liquidity issues, and regulatory uncertainty.

Traditional Swaps vs Swaps using ERC-6123

The table below compares and contrasts how traditional OTC Ethereum staking rate swaps and ERC-6123-based swaps differ in settlement, risk management, flexibility, transparency, automation, and regulatory compliance.

Aspect	Traditional Swaps	Swaps Using ERC-6123
Structure	Traditional off-chain over-the-counter (OTC) financial swaps.	New on-chain financial swaps. It could be over-the-counter (OTC) or not.
Settlement	Settlements are managed bilaterally by the counterparties, often through OTC backoffice teams . Most likely manual.	Settlements, trade execution, and lifecycle management are automated through smart contracts.
Flexibility	Counterparties can negotiate flexible terms and customize the contract, but changes require mutual agreement and manual updates.	The contract is deterministic with predefined lifecycle phases. Any trade modifications or customizations must be implemented through new contract logic.
Risk Management	Counterparty credit risk is inherent, as the agreement relies on the financial stability and trustworthiness of the counterparties.	Counterparty risk is minimized by the smart contract's automated enforcement of settlement terms i.e. deterministic protocol that guarantees settlement based on the predefined agreement.
Transparency	Often opaque, with terms and performance visible only to the counterparties and relevant intermediaries. Market pricing is less transparent.	Counterparties' identities are kept private. Trade is transparent, with terms and settlement data recorded on-chain. All market participants can view the trade's state and settlement history on-chain.
Automation	Limited automation; most processes, including settlement and margin calls, are manual or facilitated by intermediaries.	Fully automated lifecycle management, from trade inception to settlement and termination, driven by smart contracts.
Legal and Regulatory Compliance	Subject to traditional regulatory frameworks and compliance requirements, which vary by jurisdiction. Requires adherence to OTC derivative regulations.	Subject to traditional regulatory frameworks and compliance requirements, which vary by jurisdiction. If OTC, then requires adherence to OTC derivative regulations.
Termination	Dispute resolution typically involves	Disputes and termination are

and Dispute Resolution	negotiation, arbitration, or legal action between counterparties. Termination may require manual intervention.	managed programmatically, with pre-agreed terms and conditions encoded into the smart contract, ensuring consistent and objective execution.

Risks of Ethereum Staking Swaps using ERC-6123

While Ethereum staking rate swaps using ERC-6123 offer many benefits like automation, reduced counterparty risk, and operational efficiency, they also come with risks, particularly if executed within a public permissionless environment.

1. Smart Contract Risks

Smart contract risks refer to the potential software vulnerabilities or bugs within smart contract code that could be exploited by malicious actors. Once deployed, any flaws or security weaknesses can result in unintended behavior, financial losses, or disruptions in executing the contract's intended functions.

- **Bugs and Vulnerabilities**: ERC-6123 relies on smart contracts. If there are bugs, security vulnerabilities, or design flaws in the smart contracts, they can be exploited by malicious actors, potentially resulting in loss of funds or disruption in contract execution.
- **Inflexibility**: Once a smart contract is deployed, it cannot be easily changed. This could create issues if market conditions or regulatory requirements change and the contract is no longer fully compliant or operationally viable.

2. Oracle Risks

Oracle risks refer to the vulnerabilities and challenges of using external data sources or oracles to inform smart contract decisions. Oracles bridge blockchain systems and the outside world, feeding real-time data (such as price feeds, event outcomes, etc.) into smart contracts.

- **Data Dependency**: Ethereum staking rate swaps using ERC-6123 depend on external data sources (oracles) for accurate reference rates, pricing and settlement. If the oracle providing data for staking yields or valuation is compromised or malfunctions, it could lead to inaccurate calculations and settlement disputes. These data compromises could

be in the form of price oracle issues whereby incorrect data is passed onto the smart contract or validator oracle issues whereby misreporting a validator's slashing history or reliability, causes users to swap into positions tied to risky or unreliable validators.

● **Oracle Attacks**: Oracles are susceptible to attacks where inaccurate data is fed into the smart contract, leading to incorrect execution of the swap, potentially causing financial losses. Typically these are possible in the form of Flash Loan attacks whereby an attacker momentarily manipulates market prices or liquidity conditions to influence oracle data, allowing them to execute favorable swaps or they create market manipulation by either delaying or changing oracle data feed.

● **Oracle Downtime or Failure:** If an oracle experiences downtime or failure, staking swaps could be delayed or disabled altogether. This might result in failed or incomplete swaps, leaving market participants stuck without any clear information about their staked positions or swapped ETH or possibly lead to unfavorable outcomes if users initiate swaps based on outdated or incomplete data from a non-functional oracle. This risk can be reduced by considering decentralized oracles that use a decentralized network of validators to validate and provide data on-chain.

3. Liquidity Risks (tradeable mode)

Liquidity risks refer to the challenges that arise when there is insufficient market depth to support large trades without causing significant price disruptions. Low liquidity can lead to wide bid-ask spreads, making it difficult for participants to enter or exit positions efficiently. This may result in higher trading costs and reduced market stability.

● **Market Depth**: As Ethereum staking rate swaps and ERC-6123 are relatively new, the market for these instruments may lack sufficient liquidity in the early stages.

● **Limited Adoption**: The success of ERC-6123-based swaps depends on wide adoption by market participants. If adoption is limited, the market may suffer from liquidity constraints, making it difficult for participants to engage with the product efficiently.

● **Price Slippage:** While trying to swap staked positions there is a possibility of price mismatch between the nominal value of staked assets and their market value, especially during high volatility events which can lead to settlement mismatch.

4. Regulatory Risks (tradeable mode)

Regulatory risks involve the potential for changes in laws or regulations that could impact the legality, compliance, or operation of native on-chain derivatives. As regulatory frameworks for decentralized finance (DeFi) and blockchain-based derivatives are still evolving, market participants may face legal uncertainties, potential restrictions, or increased compliance burdens that could limit the development and adoption of these financial products.

- **Uncertain Regulatory Landscape**: There is a risk that regulators may impose restrictions or new compliance requirements that could affect the legality or viability of Ethereums staking rate swaps using ERC-6123, particularly for institutional participants.
- **Jurisdictional Differences**: The decentralized nature of ERC-6123-based swaps makes it difficult to adhere to specific national regulations. Different jurisdictions may impose varying rules regarding the execution and settlement of these derivatives, leading to compliance challenges.
- **Market Manipulation: Given the difference in abilities of sophisticated actors in this emerging space, there is a potential for market manipulation targeting non-technical end users leading to difficulties in executing fair priced and profitable swaps.**

5. Technical Infrastructure Risks

Technical infrastructure risks refer to the potential disruptions in the underlying blockchain network, such as congestion, high gas fees, or network changes or outages.

- **Network Congestion (applicable mostly to public permissionless networks)**:
- **Gas Costs**:
- **Custodial Risks:** Given that the wallets used for storage of margining funds (funds used to account for variation or margin) cannot be changed. This presents a substantial risk should the custodial bank be unable to access the wallet or lose access resulting in swap default.

Assessing potential impact to the Lido Ecosystem

The need for an Ethereum staking rate swaps market would likely emerge from a combination of institutional demand for yield risk management and hedging tools, the desire for predictable yields, growing institutional staking participation, and the drive for benchmark development in staking yields. As we mentioned earlier, while this market is still nascent and likely to develop, market participants expect growth within a 12-18 month horizon, though timing remains uncertain.

If this market does develop, it would have a significant impact on the Lido Ecosystem, largely shaped by the distinct needs of institutional participants versus other participants.

Potential Increase in Institutional Staking

Our primary assumption was that Lido's scale and first-mover advantage would position the Lido stETH APR well to be the primary benchmark within the Lido ecosystem and outside. However, as discussed in section "Lido stETH APR as an institutional benchmark" , it is not likely to be the case due if the benchmark composition is defined including the MEV component. A "clean" rate excluding MEV would likely be preferred by institutions for fixed-floating rate derivatives.

However, this would not necessarily impact the use of stETH as collateral and settlement currency. In fact, the benchmark rate determines the swap's cash flows, while stETH's qualities as a liquid and well-integrated Ethereum-backed asset make it appealing as collateral in DeFi products. In section "stETH vs ETH vs Stablecoins" we discussed that the choice of stETH as collateral or settlement currency will be driven by regulatory considerations. Institutional stakeholders which operate in regulated settings would leverage Ethereum staking rate swaps for risk management and "stability" purposes. Such stakeholders have a different risk profile than yield-seeking participants operating in DeFI. The question is therefore whether, stETH as a collateral and settlement currency would be attractive for Institutional (DeFi) products and institutional participants.

In September 2024, the announcement that Wintermute[16] started supporting stETH as collateral for OTC trading signals a significant step forward for both Lido and the broader Ethereum ecosystem. Traditionally, stETH is primarily utilized in DeFi, but Wintermute's support is a reflection of stETH's continued expansion and utility in institutional markets. This endorsement by a prominent market maker adds further credibility to stETH as a viable asset for institutional-grade trading, which could pave the way for more integration with other OTC desks and trading platforms.

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[16] https://blog.lido.fi/wintermute-enables-collateral-support-of-steth/

Offering stETH as collateral provides an attractive option for the unstaked ETH sitting on institutional balance sheets, potentially encouraging more of it to be staked. This would be further accelerated by the fact that major institutional and qualified custodians such as Fireblocks[17], Ceffu[18] and Taurus[19] who have already added custody and staking support for stETH.

Lower APY for Lido Operators

Institutional adoption of stETH as collateral could encourage more staking, increasing Lido's total staked ETH and associated fees. Without institutional usage, Lido may experience slower growth in protocol fees and reduced demand for stETH issuance, which could limit Lido's revenue expansion over time. At the same time, an increased staking participation from institutional players would lower the APY as rewards are distributed over a larger staked base. For Lido operators, this would mean a lower APY per validator due to the growing staked ETH supply.

This dynamic could be mitigated by a rise in MEV activity and transaction fees tied to broader Ethereum network adoption. Lido operators benefit from periods of high transaction volume and arbitrage activity, which boost staking rewards despite broader adoption potentially lowering APY. In scenarios where network conditions are highly active, the MEV-inclusive Lido stETH APR could remain competitive, sustaining higher returns for Lido operators. For Lido operators, MEV is a valuable source of additional returns because it enhances the staking rewards they earn.

However, there are ongoing ecosystem discussions around fairness of validator rewards and recent developments in MEV-focused infrastructure and protocol upgrades across Ethereum aiming to create a fairer and more transparent market for MEV, potentially reducing opportunities for extractable value to spike unpredictably. As those development progress (i.e. MEV-burn[20] etc), MEV-driven volatility could reduce over time for operators. While this would lead to a more stable staking rate environment (and therefore making the Lido stETH APR potentially more attractive to be used as a benchmark rate in derivative products), it would also negatively impact per-validator returns because MEV as a supplemental reward source could diminish.

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[17] https://www.fireblocks.com/blog/fireblocks-x-lido-institutional-bringing-liquid-staking-to-the-fireblocks-network/

[18] https://www.ceffu.com/blog/ceffu-partners-with-lido-to-offer-cold-storage-liquid-staking

[19] https://www.taurushq.com/blog/taurus-and-lido-enable-steth-custody-and-staking-amid-demand-from-banking-and-corporate-clients/

[20] Ethereum Mechanism Design: MEV, MEV Burn, Execution Auctions: https://www.youtube.com/watch?v=4O8jRVT2Vqc , https://ethresear.ch/t/in-a-post-mev-burn-world-some-simulations-and-stats/17092

A question here is whether increased institutional activity and associated benefits (higher TVL, more trading, deeper liquidity) can offset the combination of lower base APY and changing MEV landscape for operators.

This could be answered by weighing the quantifiable and qualifiable benefits of institutional adoption—like higher TVL, deeper liquidity, and new revenue streams—against the expected trend in MEV-based yields and diluted APY.

Potential Increase in TVL and Protocol Fees

As we previously mentioned, the Ethereum staking rate swaps market (and more broadly, staking rate swaps markets) are not sufficiently developed (i.e. there are no sufficient data points and trends), to quantify an expected net impact on Lido's TVL and protocol fees.

If such markets do emerge, the key considerations would be around Lido's competitiveness both in terms of staking rewards (including protocol fees remaining competitive) and stETH utility.

If Ethereum staking rate swaps use stETH as a collateral asset, more institutions might stake ETH with Lido to obtain stETH, increasing Lido's TVL. This could result in a virtuous cycle where staking demand rises as staking rate swaps gain popularity, boosting the TVL.

As Lido DAO accumulates a percentage of staking rewards, higher TVL directly translates into higher revenue from protocol fees.

TVL Stability and Liquidity Risk

For market participants able and willing to use stETH as collateral, fluctuations in the swaps market could introduce volatility to Lido's TVL. In a highly volatile environment, significant stETH liquidations might affect Lido's on-chain liquidity. High demand for stETH as collateral could drive users to redeem stETH back to ETH, particularly during market downturns, impacting Lido's liquidity management and potentially causing protocol instability.

In all cases, if an Ethereum staking rate swaps market emerges but Lido does not capture the increase institutional adoption and strategically position the use of stETH as collateral in institutional transactions, it could lead to a challenging environment for the Lido Ecosystem.

Conclusion

Working hypothesis invalidated

The purpose of this research was to assess the demand, benefit and risks of an Ethereum staking rate swap product within the Lido ecosystem and with the following characteristics:
1) using Lido stETH APR as a benchmark rate
2) using stETH as collateral and settlement currency
3) managed as a smart derivative contract (SDC) using ERC-6123.

We aimed to validate or invalidate the working hypothesis that stETH-based Ethereum Staking Rate Swaps can provide significant value to the Lido ecosystem, benefiting stakeholders staking with Lido.

At this stage, the first working hypothesis has been invalidated. The usefulness of Lido stETH APR as underlying in staking yield swaps is limited so far. The critical factor is the inclusion of MEV that causes short spikes in volatility. MEV depends on inherently volatile network conditions, such as transaction volume, gas fees, and the presence of arbitrage opportunities. This can create unexpected and unintended erratic behavior of cash flows. The composition of an ex-MEV index could contribute to further adoption of a Lido benchmark and significantly contribute to the operational stability of derivatives based on such a benchmark.

The assessment of stETH's usefulness as collateral and settlement currency produced mixed results. stETH ranges in the middle between the alternatives USDC and ETH. On the one hand it lacks USD-denominated exchange rate stability USDC, on the other hand staking rewards allow another source of income compared to ETH and the accrual of such rewards can provide a buffer against a declining ETH price. stETH as collateral and settlement currency is suitable in directional yield-seeking environments. The risk of a stETH-ETH price divergence seems broadly understood, as Lido operators and users are willing to accept or manage this risk. We have no indications that a lack of liquidity is regarded as a limitation to stETH's use as collateral, quite the contrary.

Most stakeholders were not familiar with the use of smart derivative contracts. They showed enthusiasm to further explore this technology to allow easier adoption of staking yield swaps as a new product. The transparency, degree of automation and relative ease of counterparty risk management are appreciated. We discussed three alternatives: fully off-chain, partially on-chain and fully on-chain versions. Of these the partially on-chain solution presents the most accessible short term solution as it allows the exploitation of the efficient lifecycle management while maintaining better control and regulatory compliance in the pre-trade and execution stages of a transaction. The longer shot of fully decentralized swaps needs the comprehensive

ex-ante assessment of the various risks that such a completely automated version without any intermediaries incurs.

To conclude, while there are use cases and potential benefits to Ethereum staking rate swaps as an instrument to gain synthetic exposure, hedge risks or develop new fixed-yield solutions, there is no present demand for stETH-based Ethereum Staking Rate Swaps.

Recommendations

Based on our research findings, we are providing four recommendations for Lido regarding Ethereum staking rate swaps. These recommendations reflect the market's nascent state, stakeholder feedback across the Lido ecosystem, and the need to balance institutional market development with existing ecosystem sustainability. They focus on maintaining Lido's market leadership while taking a measured approach to market evolution, emphasizing data-driven decision making and comprehensive stakeholder impact assessment. The recommendations are designed to position Lido strategically for future market development while managing risks and preserving optionality in this emerging market segment of staking rates derivatives.

Monitor Staking Rates Derivatives Market Development

The staking rates derivatives market (including the Ethereum staking rate swaps market) is in its infancy, with limited clarity on demand, liquidity, and regulation. By monitoring market developments, Lido can stay ahead of trends, competitor offerings, and shifts in institutional interest. This approach will allow Lido to identify if and when it should adapt its offerings, such introduce as introducing an ex-MEV version of its benchmark rate to capture growing demand from institutional stakeholders. Key metrics to track include Ethereum staking rate swaps nominal size, trading volumes (both OTC and on-chain), the number and type of active participants (e.g., ETF issuers, hedge funds, asset managers, exchanges), and product structures and terms being offered.

Consider ex-MEV Lido stETH APR for DeFi institutional products

There is a valid concern from institutional players about the volatility that MEV (Maximal Extractable Value) introduces to an industry reference rate. Introducing an ex-MEV Lido ETH APR could provide a more stable and predictable benchmark, without impacting Lido's broader ecosystem and making it more attractive for institutional products that prioritize stability and reliability. Monitoring competitor benchmark adoption rates and clear institutional demand signals will provide insights into if and when the market reaches a level of maturity that warrants further actions and investment from Lido in this space.

Measure and monitor impact of growing institutional adoption on Lido Operators and Solo Stakers rewards

As institutional adoption of Lido middleware grows, it may affect the rewards distribution within the ecosystem, particularly for Lido operators and solo stakers. Monitoring this impact ensures that Lido can address any negative externalities, such as reward dilution or excessive centralization, and make adjustments if necessary.

If it is not already the case, it could be valuable to agree metrics to track the effects of institutional staking on the reward structure for operators and solo stakers, such as changes in APR, market share, and decentralization levels. Regularly publishing these findings in a transparent report would help maintain community trust and allow for data-driven adjustments to policies or incentives.

Further research appropriateness of stETH for institutional derivatives

Further research into stETH's appropriateness for institutional derivatives is warranted given emerging market signals and stakeholder feedback. While stETH has demonstrated strong fundamentals with $567M in DeFi liquidity and growing institutional support (evidenced by Wintermute's recent collateral integration and custody solutions from Fireblocks, Ceffu, and Taurus), several critical areas require deeper investigation for institutional derivative applications including settlement risk profile, regulatory considerations and market dynamics. Prioritizing engagement with institutional stakeholders who have existing stETH exposure or custody capabilities would be beneficial, as their practical experience would provide valuable insights for derivative applications.

QX

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