Many thanks to the author, @equanimiti, and special thanks to Lido DAO Analytics contributors for the awesome analysis on slashing and operational risks.

Motivation

- While slashing and operational risk mitigation should be a core part of node operator management strategies for the DAO, there is additional benefit to codifying a surplus strategy that can effectively backstop the solvency of the protocol beyond any operational risk mitigation node operators can undertake

- To execute on this goal, DAO token holders would need to determine an optimal surplus allocation strategy in line with its priorities

- This document provides a framework for how Lido DAO could think about its surplus management and puts forward an initial set of proposals and discussion points:

- Reserve ~0.13% of circulating stETH (~11k ETH) as a liquidity buffer

to minimize withdrawal delays to approximately 0 for the average withdrawal size. As a reminder, stETH is always non-custodial - the buffer is about making withdrawals faster for users only, at a manageable opportunity cost to the DAO.

- Reserve ~0.315% of circulating stETH (~25k stETH) as a last-line backstop against slashing and operational risk

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Source: https://dune.com/steakhouse/lido-safu

Introduction

Lido DAO token holders could support a surplus strategy with sustainable, long-term impact in mind. A generalized allocation framework such as the below (source) may be a useful starting point for the discussion.

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In analyzing the capital allocation of 1,400 large cap public companies across the US and Europe, the researchers found that reinvesting in organic growth was by far the highest ROI form of capital allocation.

DAOs are obviously distinct from corporations – not only are they organized differently but they usually have goals unlike any corporate objective. For e.g. Lido DAO has ratified a vibe alignment to [Make staking simple, secure, and decentralized](#)). But we can nonetheless draw from the historic allocation outcomes of companies to offer interesting insights into how token holders could structure their priorities as it relates to the surplus.

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Surplus priorities for the DAO (in decreasing order of impact) could be generically described as follows in order of priority:

1. Reinvest in organic protocol development initiatives or grants (highly impactful)

2. Right size surplus structure (moderately impactful through risk mitigation)

3. Unwind residual surplus (generally neutral to potentially negative impact)

Grant requests and similar proposals are currently scoped out, budgeted and decided on by token holders, in response to requests enacted by external third-parties or token holder sub-committees (such as [LEGO](#), or [reWARDs](#)/LOL). Therefore, for the purpose of this proposal, we are interested in 2 and 3 (i.e. provided there is surplus post reinvestment, optimizing Lido's surplus structure and thinking about potential surplus unwinds).

Lido DAO's illustrative balance sheet

Lido DAO's balance sheet as of Aug 1, 2023 is shown below.

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Source: https://dune.com/steakhouse/lido-safu

The above balance sheet is illustrative in nature–neither the protocol nor the DAO control the assets or the liabilities in a traditional sense. However, the view is useful as a way of demonstrating the integrity of the protocol for stakeholders such as stETH holders.

As a quick summary (at time of writing):

- stETH in circulation is matched by staked ETH and the omnibuffer (essentially a "working capital" account consisting of execution layer rewards, the withdrawals vault and the deposit buffer).

- In addition, Lido DAO has 39,717 ETH worth of stETH in surplus assets, including 5,581 stETH set aside as a static slashing provision and an additional surplus of 34,136 (this is being incremented by protocol income and staking rewards).

Any protocol that routes user Ether to coordinate activities involving a level of risk (such as staking) ought to consider liquidity and slashing and operational resilience as part of balance sheet management.

A) Liquidity

The purpose of this section is to discuss the merits and parameters of a potential liquidity buffer to increase withdrawal liquidity for stETH users. Should the DAO set aside capital to enhance the withdrawal experience? If so, by how much?

Lido stETH holders can redeem stETH for ETH in one of three ways:

1. Via withdrawals through the omnibuffer, immediately provided there is enough ETH

2. Via withdrawals through validator exits (unique among liquid staking protocols to offer this possibility)

3. Via AMMs/CEX's (with some slippage + fees)

The fee drag of 3) and the time delay of 2) are primarily outside of the protocol parameter's control. However, Lido DAO has the capacity to affect its ETH buffer size based on what level of user service the token holders want to aim for.

The current state: The omnibuffer as mentioned above can be thought of simplistically as a "working capital" account. At the moment, there is no protocol parameter capturing a specific liquidity target for users wanting to withdraw.

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The analytics team has previously done a study of the expected withdrawal time based on the likely size of the omnibuffer. The conclusion was that in most cases, withdrawals through the buffer should be quicker than those of a vanilla Ethereum staker. In fact, since Shapella, because user deposits have outpaced withdrawals (i.e. Ethereum's rising staking ratio), the omnibuffer has been remarkably effective at expediting withdrawals. Only ca.7% of withdrawal requests since May 2023 have been met via direct Beacon chain withdrawals, with the rest being routed through the omnibuffer. However, this is unlikely to be the case when the Ethereum staking ratio reaches equilibrium and new deposits into the protocol slow.

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As Lido DAO's surplus grows, token holders are in a position to go a step further to ensure that stETH holders' withdrawal experience is as seamless as possible. Near instant withdrawals would enhance convenience, particularly in relation to centralized staking provider options. To that end, we can model a target liquidity buffer based on the level of service (high/medium/low) Lido DAO token holders believe would be suitable for stETH holders.

Methodology: We calculate target liquidity buffers for high/medium/low scenarios by assuming a level of withdrawal requests and subtracting the expected liquidity in the omnibuffer. We rely on the historic distributions of these variables as input.

Historic Data (to July 31, 2023):

Daily Withdrawal Request

% of ETH staked with Lido

Lido EL Rewards

APR

Min

0.00%

Min

0.36%

Max

7.03%

Max

7.30%

Median

0.05%

Median

1.54%

Mean

0.17%

Mean

1.86%

68th percentile

0.09%

68th percentile

1.88%

95th percentile

0.24%

95th percentile

4.34%

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(Note the distributions of daily withdrawals and EL Rewards both have a heavy right skew due to the large stakers for the former and MEV for the latter. The corollary is that their mean > median.)

Source: https://dune.com/queries/2475298, https://dune.com/LidoAnalytical/lido-execution-layer-rewards

Model assumptions:

Target Liquidity

Daily Withdrawal Request

(-) EL Rewards

(-) CL Rewards

(-) Deposits

(=) Target Liquidity Buffer

High

95th percentile

Median

Deterministic

None

?

Medium

Mean

Mean

Deterministic

None

?

Low

Median

Mean

Deterministic

None

?

Result: Though the numbers fluctuate, but it would seem that at current stETH levels, aiming for "medium" liquidity to withdrawers would involve upping ETH in the buffer to ~11k (0.13% of total stETH) or ~18k for "high" liquidity (0.21% of total stETH).

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Source: https://dune.com/queries/2814917

Of course, there is an opportunity cost of enabling a better stETH user experience, specifically the drag on staking rewards from the incremental ETH retained in the buffer. Below is a sensitivity table showing the lost staking rewards on an annualized basis to the protocol at varying levels of the liquidity buffer and staking yields.

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In time, the direction of travel ideally would be to programmatically implement a dynamic liquidity buffer as some percentage of the total amount of Ether routed through Lido. For the purpose of the initial conversation, we invite the DAO to discuss the following proposal.

Recommendation: Maintain a minimum liquidity threshold of 10k ETH, which would be roughly in line with the "medium" target level (~0.13% of deposits). This would provide instant 1:1 stETH withdrawals on average at a manageable opportunity cost to the protocol. A reasonable rebalancing frequency could be further refined.

B) Last-line Slashing and Operational Risk

Recap: Ether staked through the Lido protocol is subject to slashing and other operational risks, as with any other Ethereum validator. To guard the protocol against the impact of potential long-tail slashing events, Lido DAO token holders previously

approved the purchase of expensive slashing insurance that cost ~25% of the DAO's annual protocol fees. In July 2021, Lido DAO token holders elected to stop buying the cover and [voted](#) instead in favor of exploring self-cover. The analytics team subsequently conducted an [examination of offline and slashing risks](#), which concluded that self-cover could be a reasonable alternative to mitigate solvency risk.

Quantifying slashing & offline risk for self-insurance: The analytics team's model has since been updated using two different states of the network: current and predicted state after the 60k validators queue is resolved.

General Data	Current state	After queue
Total staked	23,782,515	23,782,515
Lido deposited	8,250,118	8,250,118
Total active validators	743,232	803,938
Lido active validators	240,513	257,816
Others active validators	502,719	546,122
Avg lido effective balance	32	32
1 year rewards (assume 50 ETH daily)	18,250	18,250

By this analysis, the below scenarios are the most probable outcomes with increasing levels of severity. In the most extreme case where 100% of a single big operator's validators are slashed, probabilistically ~0.098% of the Ether routed through the Lido protocol could be at risk. This damage could hypothetically be covered by Lido DAO's 1-year income pre operating expenses. Note this calculation is based on only the existing Curated Node Operator Registry, without restaking and other possible solutions which would increase risks and APR, and without DVT/permissionless staking. Progress on both fronts will bring with them new opportunities for decentralization but also new slashing and operational risks, which will need to be accounted for in time.

Slashing & Offline Risks	Current state		
Scenario	total_loss	loss_offline	

Scenario	total_loss	loss_offline	loss_slashed	% of deposits	% of 1Y rewards
Single big operator, 100% validators offline for 7 days	104	104	0	0.001%	0.57%
Single big operator, 30% validators slashed, 100% validators offline for 7 days	2506	233	2273	0.030%	13.73%
Single big operator, 100% validators slashed	8112	533	7579	0.098%	44.45%

After queue

Scenario	total_loss	loss_offline	loss_slashed	% of deposits	% of 1Y rewards
Single big operator, 100% validators offline for 7 days	100	100	0	0.001%	0.55%
Single big operator, 30% validators slashed, 100% validators offline for 7 days	2497	224			

2273

0.030%

13.68%

Single big operator, 100% validators slashed

8093

514

7579

0.098%

44.35%

Quantifying other operational risks for self-insurance: Beyond offline penalties and slashing, Ether routed through the Lido protocol faces other operational risks. The analytics team has specified two additional scenarios which reflect risks emanating from the concentration of client and server type (see data [here](#)).

- Consensus layer client risk: 37% of Lido validators use Prysm. Despite greater client diversity compared to the Ethereum network itself (46%), a hypothetical critical bug in Prysm - assuming it takes 2 days to fix - could result in a loss of 0.209% of total Ether routed through the protocol.

- Infrastructure risk: 48% of all Lido validators use public cloud. If all cloud providers (such as AWS, GCP, etc) refused to provide infrastructure to Lido node operators- assuming it takes 3 days for node operators to transfer their validators to new infrastructure - 0.008% of total Ether routed through the protocol would be at risk.

Other Operational Risks

Current state

Scenario

total_loss

loss_offline

loss_slashed

% of deposits

% of 1Y rewards

36% are offline for 2 days (Prysm critical bug)

17219

17219

0

0.209%

94.35%

48.3% offline for 3 days (Infra risk)

682

682

0

0.008%

3.74%

After queue

Scenario

total_loss

loss_offline

loss_slashed

% of deposits

% of 1Y rewards

36% are offline for 3 days (Prysm critical bug)

18476

18476

0

0.224%

101.24%

48.3% offline for 3 days (Infra risk)

731

731

0

0.009%

4.00%

This list of potential operational risks is non-exhaustive and the evaluation of other material risks could be included down the road (e.g. risks related to geographic/jurisdictional concentration or poor execution layer client diversity).

Recommendation: The provision for slashing could be defined dynamically once a day or once a week based on the amount of Ether routed through the protocol. Its role is to capture a realistic probabilistic amount of Ether that could be at risk at any given time for a broad range of risks. With a simple linear combination model, the slashing and operational risk self-insurance limit would come out to 0.315% (=0.098%+0.209%+0.008%) of total Ether routed through the protocol. At time of writing that would work out to 25,608 stETH rather than the current [slashing provision](#) (5,581 on August first).

Putting it all together

- Stacking the above-mentioned priorities and comparing against the current protocol surplus may seem to suggest there could be some "unallocated" surplus (indicated in green) beyond providing expedited withdrawals and self-securing the protocol

- However, Lido DAO's operational risks are not very well-understood at this stage, especially true as the protocol is set to undergo node operator diversification

- As such, it seems prudent to retain as much "unallocated" surplus as possible for the time being, at least until there is a wider rollout of the new staking router modules

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- As such, it seems prudent to retain as much "unallocated" surplus as possible for the time being, at least until there is a wider rollout of the new staking router modules

- Eventually, protocol's reserve management could be automated. For instance, EasyTrack motions like selling or moving stETH might halt if they risk dropping the reserve below the programmed threshold

- In any case, this should only serve as a starting point to think about liquidity and slashing / operational risk exposures and mitigants

- This model would have to be refined when staking router modules with collateral requirements for validators get approved by governance, as they will reduce the risk exposure to the DAO surplus and could reduce the amount of operational and slashing risk reserve required

- Other reserves that we have not considered but could be possible include reserves for ecosystem grants, education initiatives or other broadly positive proposals such as the [Launchnodes Impact Staking proposal](#), passed recently by DAO token holders

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DAO Discussion Points & Next Steps

1. Should the DAO use this framework for reserving its surplus for various core constraints, notably liquidity and slashing?

2. Should the DAO consider automating a liquidity reserve to expedite withdrawals?

a. Should the threshold be defined as per the above, i.e. initially 10k unstaked ETH?

1. Should the DAO consider a formulaic method for reserving a provision for slashing and other risks in the DAO's provision for slashing wallet (prior to identifying other meaningful risks)?

a. Should the threshold be initially defined as per the above, i.e. 0.32% of total deposits or 25,608 stETH

1. What other risks should the protocol be conscious of and allocate surplus against?

2. Should token holders include impact and ecosystem grants in a hypothetical reserve approach to the DAO surplus?