Net-Zero Workplace Email Through Certified Message Removal

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capstract:2611.00051v1 [cs.CY] 20 Nov 2026

Abstract

We examine a scheme that lets organizations offset workplace email through certified message removals. A removal provider sends an email to its own inbox, deletes it, and sells a certificate for the deletion. The buyer subtracts the certificate from its ordinary email inventory, while the provider's newly created message is excluded. We compare the reported balance with a closed inventory of employer and provider inboxes, and derive a stock-flow identity for both. In 1,000 synthetic 40-person offices over three periods, direct self-removal reports zero net deliveries while mean inbox stock rises by 960 messages, the same increase as without credits. When certificates are purchased from a desk using four administrative messages per transaction, stock rises by 1,670 messages at a maximum bundle size of eight, although the reported balance remains zero. A closed inventory cannot be brought to zero by any finite sequence of self-generated removals while ordinary deliveries continue. The numerical results describe the specified accounting rules and demand distribution; they are not observations of a deployed program.

CCS Concepts

• Human-centered computing → Computer supported cooperative work; • Social and professional topics → Computing / technology policy.

Keywords

email, inbox management, offsets, accounting boundaries, simulation

Reference Format:
Mara V. Delgren, and Nico S. Meren. 2026. Net-Zero Workplace Email Through Certified Message Removal. Preprint, November 20, 2026.

1 Introduction

An organization that sends less email may reduce the demands it places on employees' attention. An organization that sends the same email but deletes an equivalent number of messages from somewhere else can also report a net reduction, provided the deletions represent a reduction in messages that would otherwise have remained. The second route requires a supply of removable messages.

We study a proposed crediting system in which that supply is created by the removal provider. For each credit, a provider sends an email to its own inbox, deletes the email, and records the deletion as one unit of message removal. An employer buys the credit and subtracts it from the number of ordinary emails its employees receive. The newly created email is excluded from the employer's inventory because it was sent by the provider. The deletion is included because it has been certified.

The transaction is easy to audit: the provider can show that a message arrived and was deleted. Whether the transaction reduces the number of messages in inboxes is a different question. We compare the reported inventory with a boundary that includes the provider's inbox and the messages exchanged to purchase credits. We also consider a stricter rule under which every email generated to produce a credit must itself be offset. This rule cannot be satisfied by a finite number of self-generated removals when ordinary email continues to arrive.

The paper uses a stock-flow model and simulated offices. It does not describe a deployed certification program. In 1,000 simulated offices over three periods, a direct self-removal scheme reports zero net deliveries while the mean inbox stock rises by 960 messages. A credit desk that arranges purchases by email also reports zero, while stock rises by 1,670 messages. Both figures are consequences of the specified accounting rules and demand distribution, not estimates of workplace behavior.

2 Background

2.1 Email as stock and flow

Email serves as a record and task-management system as well as a channel for new communication. Whittaker and Sidner's study of email overload described inboxes holding outstanding tasks and partially processed messages [5]. A count of stored messages is therefore not a direct measure of interruption or work. Mark et al. found differences in reported stress and effort when people performed interrupted work in a laboratory setting [3], and Kong et al. found that senders and recipients can assess organizational bulk email differently [1]. We use inbox stock as an accounting unit, not a proxy for the value or burden of every message.

The economics of attention has also motivated charges for sending email. In experiments reported by Kraut et al., postage changed sender behavior, although recipients did not use postage as the expected signal of importance [2]. Our proposed system places the unit of exchange at the other end of the message lifecycle: the employer buys evidence of a deletion rather than paying for a delivery. We hold ordinary demand fixed to isolate the accounting effect.

2.2 Project credits and boundaries

In project accounting, a claimed reduction is evaluated against what would have occurred without the project. The Greenhouse Gas Protocol's project standard discusses baselines, additionality and secondary effects as distinct accounting questions [6]. It does not define credits for email. We borrow the distinction between a project action and its net effect, then apply it to a system in which both can be counted exactly. The initial supply of messages in an inbox is observable; the provider can also observe how many messages it creates solely for deletion.

Transaction costs matter for transferable rights and can affect the allocation reached by trading [4]. In the system considered here, the purchase of a removal may itself require messages. Those messages matter to an inbox-stock inventory even when their content is necessary for the market to operate.

3 Accounting Model

3.1 Inbox boundary

Let X_t be the number of messages in all inboxes inside a specified boundary at the end of period t, including the provider's inbox. A message is counted when it is delivered to an inbox, whether read or unread. Moving it out of that inbox is a removal from the stock. We do not claim that moving a message to a trash folder destroys it or saves storage. A copy delivered to each of three recipients counts as three deliveries; all simulated messages have one recipient.

During a period, B ordinary deliveries arrive, S self-addressed project messages arrive, and H administrative deliveries arrange and confirm purchases. The provider moves R_s project messages out of its inbox; R_b messages already present at the beginning of the study are removed from other inboxes. The stock identity is

$$X_t - X_{t-1} = B + S + H - R_s - R_b. \tag{1}$$

All quantities are nonnegative integers. The identity counts a message on arrival and on removal. It does not require the two events to occur at different times within the period. For the self-removal project, each generated message is removed within that period, so $S = R_s$.

3.2 Certification rule

The proposed certificate records one credit for each verified deletion. A buyer retires one credit against one ordinary delivery. The reported balance is

$$L = B - R_s - R_b. \tag{2}$$

This ledger omits project deliveries S and administrative deliveries H. They are outside the buyer's declared ordinary-traffic inventory, even though the associated removals can be purchased. No financial price is modeled: the purchase is a transfer of a unique, non-reusable certificate from the provider to the buyer. Each removal is certified once and each certificate is retired once. The discrepancy below does not depend on double-selling a credit.

If there are enough certificates to set $R_s + R_b = B$, the buyer reports $L = 0$. Substitution into Eq. (1) gives

$$X_t - X_{t-1} = S + H. \tag{3}$$

Thus the reported zero can coexist with a positive stock increase equal to the omitted deliveries. When all credits come from self-generated messages, $S = R_s = B$ and $R_b = 0$: inbox stock rises by $B + H$ even though the ledger is zero. The result is an identity, not an empirical estimate. It does not say that a real offset program would use this rule.

3.3 A closed inventory

Suppose instead that the reporting boundary includes ordinary, project and administrative deliveries and credits every removal once. With self-generated removals only, the closed balance is $B + S + H - R_s$. Since $S = R_s$, it equals $B + H$ regardless of the number of project messages. Generating another self-addressed message and deleting it adds one delivery and one removal. It cannot reduce the closed balance.

This observation rules out a finite self-removal certificate chain for positive $B + H$. If a provider tries to offset its own project delivery with a second self-generated removal, the second project delivery enters the same inventory and also needs an offset. The argument assumes no independent removal of pre-existing messages and no reduction in ordinary demand. An actual backlog deletion or a prevented ordinary delivery would change the balance.

3.4 A worked example

Consider a period with eight ordinary deliveries and no administrative messages. A provider sends itself eight new messages and deletes all eight. The employer retires the eight certificates and reports zero. Across employer and provider inboxes there were sixteen deliveries and eight removals, so stock increased by eight. If instead eight pre-existing messages are removed and no project messages are generated, stock does not increase during the period. Table 1 compares these two kinds of certificate with the uncredited baseline.

Table 1: One-period accounting for eight ordinary deliveries. The backlog case assumes eight pre-existing messages available for removal. Self-removal credits are made by sending and deleting eight new messages.

Rule	New mail	Removals	Reported	Stock change
No credit	8	0	8	8
Backlog removal	8	8	0	0
Self-removal	16	8	0	8

4 Simulation Design

4.1 Office and demand

We simulate 1,000 independent offices for three periods each. Each office has 40 employees and an initial aggregate backlog of 480 messages. In each period, 20 employees independently draw

ordinary delivery counts uniformly from the integers 0 through 5; the other 20 draw independently from 10 through 17. The expected total is 320 ordinary deliveries per office-period. All employees' new ordinary messages remain in inboxes through the end of the simulation, except where the backlog-removal scenario removes messages that were present at the start.

These demands are constructed to show variation in sender volumes. They are not estimated from organizational records. They do not react to the price of certificates, inbox size, or the policy. We do not model mail sent outside the boundary, attachments, forwarding, response chains, or an employee's decision to read a message. The initial backlog is an aggregate stock; its messages are assumed eligible for removal in the backlog scenario.

4.2 Policies

Every policy sees the same demand draws in a given office. We compare four rules:

- **No credit.** Ordinary messages arrive; none is removed.
- **Backlog removal.** Up to one initially present message is removed per ordinary delivery. Once the initial 480 messages are exhausted, no further removals are available. This benchmark assumes that all such deletions are additional and has no administrative traffic.
- **Self-removal.** For each ordinary delivery, one new self-addressed message is delivered to a provider inbox and removed. Each removal produces a retired credit; there is no trading traffic.
- **Credit desk.** The same self-removal project supplies credits, but each employee buys credits from a desk in bundles of up to q. Each completed purchase generates four additional single-recipient administrative deliveries: a request, an acceptance, a certificate notice, and a receipt. The number of transactions in a period is $\sum_i \lceil d_i/q \rceil$, with zero transactions for zero demand. Each administrative message remains in an inbox at the end of the period. No administrative message or project delivery is included in the buyer's reported balance.

The desk knows each employee's demand before the period begins, charges no monetary price, and always has sufficient project capacity. We count neither unsuccessful trades nor setup notices. Purchases do not create obligations to purchase further credits for administrative messages in the reported-ledger scenarios. The closed-inventory analysis above considers that alternative separately.

4.3 Computation and outcomes

The simulation draws the low-demand group first, then the high-demand group, using Python's standard-library pseudorandom generator with seed 20261120. Each policy updates its own inbox stock from Eq. (1). For each office we record gross deliveries, certified removals, the reported balance and the change in the full stock from its initial value. We vary the maximum bundle size across 1, 4, 8 and 16 credits.

Results are means across offices. Ranges use the 25th and 975th ordered values among the 1,000 offices and describe variability under the stipulated demand distribution. They are not confidence intervals for real organizations. We use the same ordinary demand within each office to make comparisons paired.

5 Results

5.1 Credits and stock

Table 2 reports totals over all three periods. The mean office receives 960.0 ordinary deliveries. Without credits, its stock rises by that amount. Backlog removal retires all 480 initially present messages, so its stock rises by 480.0. Its report equals the stock change because no project or administrative deliveries are omitted in this benchmark. It achieves a zero report in the first period, but the initial backlog cannot support that result indefinitely.

Self-removal retires 960.0 credits, one for each ordinary delivery, and reports zero in every simulated office. It also produces 960.0 project deliveries. Gross deliveries double to 1,920.1, and stock rises by 960.0, the same as without credits. The difference between the rounded components and the rounded total reflects rounding of means.

Table 2: Three-period mean deliveries and stock change in 1,000 synthetic offices. The credit desk uses bundles of up to eight. Stock change is measured across all employee and provider inboxes.

Rule	Gross mail	Removed	Reported	Stock change
No credit	960.0	0.0	960.0	960.0
Backlog removal	960.0	480.0	480.0	480.0
Self-removal	1,920.1	960.0	0.0	960.0
Credit desk	2,629.8	960.0	0.0	1,669.7

The desk introduces a further 709.7 administrative deliveries on average. Its reported balance remains zero because the administrative messages and the project deliveries are outside the buyer's ledger. The full stock increases by 1,669.7, with a central simulated range of 1,603 to 1,739. This is 709.7 above the no-credit condition in the same offices.

Figure 1 shows the accumulation across periods. In the backlog benchmark the mean stock change is zero at the end of the first period and 159.5 after the second; by then the old backlog has been exhausted. In the two self-removal scenarios the reported balance is zero in each period even as the stock rises.

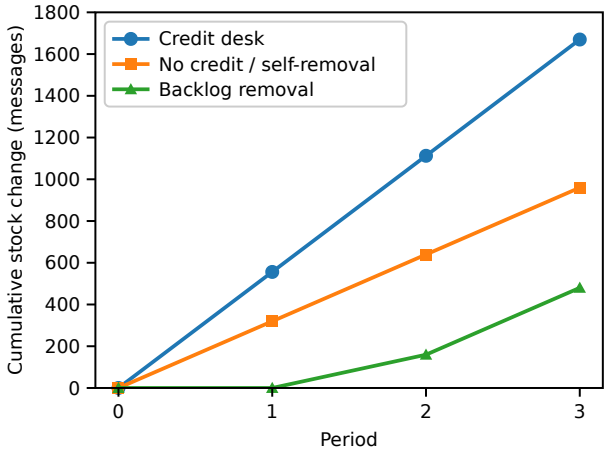


Figure 1: Mean cumulative change in inbox stock from the beginning of the study. The self-removal and no-credit lines coincide. The credit desk uses a maximum bundle of eight.

5.2 Purchase size

The number of administrative deliveries depends on how many credits can be transferred per purchase. Figure 2 holds demand and project removals fixed and changes the maximum bundle size. With single-credit purchases, every ordinary delivery leads to four administrative deliveries. Mean three-period gross mail rises to 5,760.2, and stock rises by 4,800.2. With bundles of sixteen, gross mail is 2,389.8 and stock rises by 1,429.7. In both cases the desk reports zero.



Figure 2: Mean gross deliveries and full stock change over three periods by maximum purchase size. Each purchase generates four administrative deliveries; the reported balance is zero at every size.

At a maximum of eight credits, a high-demand employee with fourteen ordinary deliveries needs two purchases, while a low-demand employee with three needs one. Larger bundles reduce purchase traffic but do not alter the one project delivery needed for each deletion. Batching can therefore reduce the gap due to H without eliminating the gap due to S.

6 Discussion

6.1 Evidence of a deletion

The self-removal project is verifiable at the event level. A log can establish that a particular message was delivered, moved out of an inbox, and used to issue one certificate. The log does not by itself establish that the project reduced inbox stock. The message was created by the same project that removed it. The relevant counterfactual is the stock without either event.

The distinction is separate from duplicate claims. This model permits no certificate to be sold twice, and it assumes that every certified deletion occurred. The overstatement arises because one side of the project is outside the inventory while the other side is credited. A registry that improves unique identification of deletions would not resolve that boundary choice.

6.2 What the stock means

Removing an old message is not necessarily beneficial. It may contain a task, a record of a decision, or information needed later. Our backlog benchmark treats every initial message as eligible and assumes that it would otherwise remain for all three periods. The benchmark demonstrates the effect of a removal under those assumptions; it is not a recommendation to clear an actual archive. Conversely, sending and removing a self-addressed message could impose little human attention if fully automated. Counting it as a delivery still matters for a stock-flow comparison, but it does not establish that it is as costly as an ordinary message.

The boundary can also be defined differently. An employer could monitor only its employees' inboxes while a provider operates elsewhere. Its physical employee-inbox stock would then exclude the provider's generated messages and removals alike. The provider's deletion can affect a broader net claim only if the project is assessed against a counterfactual and its own deliveries are included. Administrative messages between the employer and desk remain inside the employer boundary whenever an employee receives them.

6.3 Limits

The numerical cases fix demand, keep all new non-project mail in inboxes, and assume a provider can generate and delete any number of self-addressed messages. A real study would need to measure ordinary deletion rates, retention needs, automation, notification settings, channel substitution and the costs of verification. It would also need an explicit definition of a valid removal and a counterfactual for old messages. Our simulation contains no observations of people or organizations.

The conservation result requires fewer assumptions than the simulations: for a project that creates and removes one message per claimed credit, each complete creation-removal cycle contributes zero to a closed inbox stock. More realistic behavioral assumptions can change demand or administrative traffic, but they do not make that cycle a net removal.

7 Conclusion

A removal certificate can accurately describe a deleted message while overstating the change in a system's inbox stock. When the message was created for the purpose of deletion, counting the deletion alone permits net-zero reporting without a net-zero inventory. Counting both events preserves the stock identity, but leaves the ordinary messages to be accounted for.

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