

Atho Inflationary/Deflationary Network Model

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Scope

This file explains how Atho transitions between inflationary and deflationary behavior under active consensus policy.

Canonical references:

- Src/Utility/const.py
- Src/Main/blockveri.py
- Src/Main/consensus.py
- Src/Main/emission.py

Executive Summary

- Block time: 120 seconds (262,800 blocks/year).
- Era size: 2,000,000 blocks (~7.61 years).
- Eight pre-tail eras: 100 -> 50 -> 25 -> 12.5 -> 6.25 -> 3.125 -> 1.5625 -> 0.78125 ATHO/block.
- Bootstrap allocation: 781,250 ATHO at block 1 (included in total pre-tail base).
- Tail starts at height 17,000,000 (~64.69 years) at 0.1953125 ATHO/block.
- Tail annual issuance: 51,328.125 ATHO/year.
- Hard max supply cap: 500,000,000 ATHO.
- Fee floor: 500 atoms/vB (5e-7 ATHO/vB).
- Fee routing: pre-tail 40% to consensus pool, post-tail 55% to consensus pool.
- Tail burn target on non-pool share: 100% burn / 0% miner, with floor clipping.
- Supply floor: 21,000,000 ATHO.
- Protocol deflation threshold: ~24.802% sustained utilization.

Emission Schedule

Phase	Height range	Reward (ATHO/block)	Issuance (ATHO)	Cumulative subsidy (ATHO)
Era 1	0 .. 1,999,999	100.0	200,000,000	200,000,000
Era 2	2,000,000 .. 3,999,999	50.0	100,000,000	300,000,000
Era 3	4,000,000 .. 5,999,999	25.0	50,000,000	350,000,000
Era 4	6,000,000 .. 7,999,999	12.5	25,000,000	375,000,000
Era 5	8,000,000 .. 9,999,999	6.25	12,500,000	387,500,000
Era 6	10,000,000 .. 11,999,999	3.125	6,250,000	393,750,000
Era 7	12,000,000 .. 13,999,999	1.5625	3,125,000	396,875,000
Era 8	14,000,000 .. 15,999,999	0.78125	1,562,500	398,437,500
Transition	16,000,000 .. 16,999,999	0.78125	781,250	399,218,750
Tail	17,000,000+	0.1953125 (clipped by cap headroom)	until hard cap	until 500,000,000

Total pre-tail base including bootstrap:

- 399,218,750 ATHO subsidy path + 781,250 ATHO bootstrap at block 1 = 400,000,000 ATHO.
- Remaining mintable headroom after pre-tail base: 100,000,000 ATHO (tail subsidy only, then subsidy suppresses to zero).
- Supply closure: 399,218,750 + 781,250 + 100,000,000 = 500,000,000 ATHO.

Hard-cap rule:

- total_supply <= 500,000,000 ATHO.

- Subsidy is clipped at coinbase by remaining cap headroom.
- After cap is reached, subsidy remains 0 and fees continue through the same burn/pool paths.

Fee and Burn Math

Per block at full utilization

- Total fee capacity at floor: $3,500,000 * 500 = 1,750,000,000$ atoms = 1.75 ATHO
- Routed-to-pool share at tail (55%): 0.9625 ATHO
- Burn-path share at tail (45%): 0.7875 ATHO
- Tail issuance per block: 0.1953125 ATHO
- Net per-block formula: $\Delta_{\text{block}} = 0.1953125 - (0.7875 * \text{utilization})$

Per year at full utilization

- Tail issuance: $0.1953125 * 262,800 = 51,328.125$ ATHO/year
- Total annual fees at floor: 459,900 ATHO/year
- Annual burn-path max (45%): 206,955 ATHO/year
- Annual net formula: $\Delta_{\text{year}} = 51,328.125 - (206,955 * \text{utilization})$
- Formula above applies while subsidy is still positive; after hard-cap clip, subsidy term is

Deflation Threshold

Set annual net to zero:

$$51,328.125 - 206,955u = 0$$

$$u = 51,328.125 / 206,955 \approx 0.24802$$

So:

- <24.802%: inflationary protocol net.
- =24.802%: neutral.
- >24.802%: deflationary protocol net (until floor clipping binds).

Post-tail net annual change by utilization

Utilization	Net annual change
0%	+51,328.125 ATHO/year
25%	-410.625 ATHO/year
30%	-10,758.375 ATHO/year
40%	-31,453.875 ATHO/year
50%	-52,149.375 ATHO/year
75%	-103,888.125 ATHO/year
100%	-155,626.875 ATHO/year

Hard-Cap and Floor Timelines

Time to hard max supply (500,000,000 ATHO)

- Tail headroom to mint after pre-tail base: 100,000,000 ATHO.
- Tail blocks required to exhaust headroom: $100,000,000 / 0.1953125 = 512,000,000$ blocks.
- Last positive-subsidy block: height 528,999,999 (~2,012.94 years from genesis).
- First zero-subsidy block: height 529,000,000 (~2,012.94 years from genesis).
- Time from tail start (17,000,000) to zero subsidy: ~1,948.25 years.

Time to supply floor (21,000,000 ATHO) after burn

Assumptions for this table:

- Burn-enabled policy path.
- Sustained utilization at listed level.
- Current post-tail burn path (45% of total fees, floor clipped).

	Sustained utilization	Circulating at hard cap	Additional blocks from 529,000,000 to floor
	Approx years from genesis to floor		
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	25%	399,200,000 ATHO	1,921,015,874 ~9,322.74
	50%	298,400,000 ATHO	704,507,937 ~4,693.71
	75%	197,600,000 ATHO	299,005,292 ~3,150.71
	100%	96,800,000 ATHO	96,253,969 ~2,379.20

Notes:

- No-burn scenarios do not reach floor via protocol burn accounting.
- Any burn-enabled utilization above 0% eventually reaches floor after hard-cap subsidy shutdown.

Floor-Clipped Burn Behavior

Burn is constrained by available headroom:

- $\text{burn_headroom} = \text{emitted_up_to} - \text{cumulative_burned_before} - \text{supply_floor}$
- $\text{effective_burn} = \min(\text{desired_burn}, \text{routed_non_pool_fees}, \text{burn_headroom})$

Implications:

- Consensus cannot burn below 21,000,000 ATHO effective circulating supply.
- At/near floor, burn is clipped to available headroom.
- Unburned routed fees fall through to miner accounting for exact coinbase closure.

Bottom Line

Atho's active model is:

- **400M total pre-tail base over ~64.69 years** (399.21875M subsidy + 781,250 bootstrap),
- then fixed tail subsidy (0.1953125 ATHO/block) until clipped by hard-cap headroom,
- with pool-routed fees and burn on routed non-pool share,
- with a hard max emitted supply cap of **500,000,000 ATHO**,
- and a hard **21M supply floor**.

Current utilization pivot is **~24.802%** for neutral net supply change.