NATSTREAM

HACKATHON PROJECT

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Creating market incentives for price convergence of a Natural Gas Commodity token

Meet the Team

Andrea **@deapinkme**

Ben **@harpoondev**

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Why This Project?

Democratizing Commodity Exposure

Traditional commodity investing is heavily regulated and often inaccessible to everyday consumers. This project aims to bring commodity exposure on-chain, making it available to a wider audience and leveling the playing field.

Leveraging Real-World Expertise

We believe that integrating real-world commodity experience and knowledge from outside the crypto space is crucial. This collaboration will help build more robust, informed, and effective on-chain solutions for commodities.

Core Concept: Create Nat Gas token bringing commodities on chain

Our system leverages a unique incentive structure to drive efficient price discovery in the market.

Misaligned Traders

High Fees Collected

Bonuses to Aligned Traders

Arbitrage & Price Discovery

→ **Misaligned Traders Fund the System**

Participants whose trades deviate from the market consensus incur **higher transaction fees**.

→ **Self-Sustaining Bonus Mechanism**

Bonuses are dynamically funded directly from the fees collected from misaligned traders, creating a **circular economy**.

→ **Aligned Traders Receive Incentives**

Traders who align with accurate price signals benefit from **lower fees and performance bonuses**.

→ **Profitable Arbitrage and Price Discovery**

This structure creates **profitable arbitrage opportunities**, compelling traders to correct price discrepancies and leading to rapid, efficient price convergence.

Example Scenario: Trading Dynamics

Setup:

Oracle theoretical price: $3.50 (based on real-world natural gas data via Flare FDC)

Pool price: $4.20 (speculation/FOMO)

Deviation: 20% too high

Trading Dynamics

Trader Type	Action	Fee	Bonus	Net Result
Seller (aligned)	Sells 1 NATGAS	0.1%	+$0.17	Gets $4.37 (ABOVE market!)
Buyer (misaligned)	Buys 1 NATGAS	4%	None	Pays $4.37 (in quote)

Result: Sellers are incentivized to sell, pushing price down toward $3.50. As price converges, incentives decrease to zero.

Incentive Mechanism Breakdown

To ensure precise price discovery, our system employs dynamic fees and bonuses based on price deviation from the oracle's theoretical value.

1. Price Deviation Calculation

The initial step is to determine the percentage deviation between the pool's current price and the oracle's theoretical price:

$$deviation = \frac{|pool\_price - theoretical\_price|}{theoretical\_price} \times 100\%$$

2. Fee for Misaligned Traders

Traders whose actions contribute to widening the price discrepancy or do not align with the oracle's price incur a variable fee. This fee increases quadratically with deviation, funding the bonus system and discouraging speculative trading against accurate data.

$$fee = baseFee + \frac{deviation^2 \times multiplier}{10000}$$

- **Base Fee:** 3000 bp (0.3%)
- **Multiplier:** 2000
- **Maximum Fee:** 100000 bp (10%)

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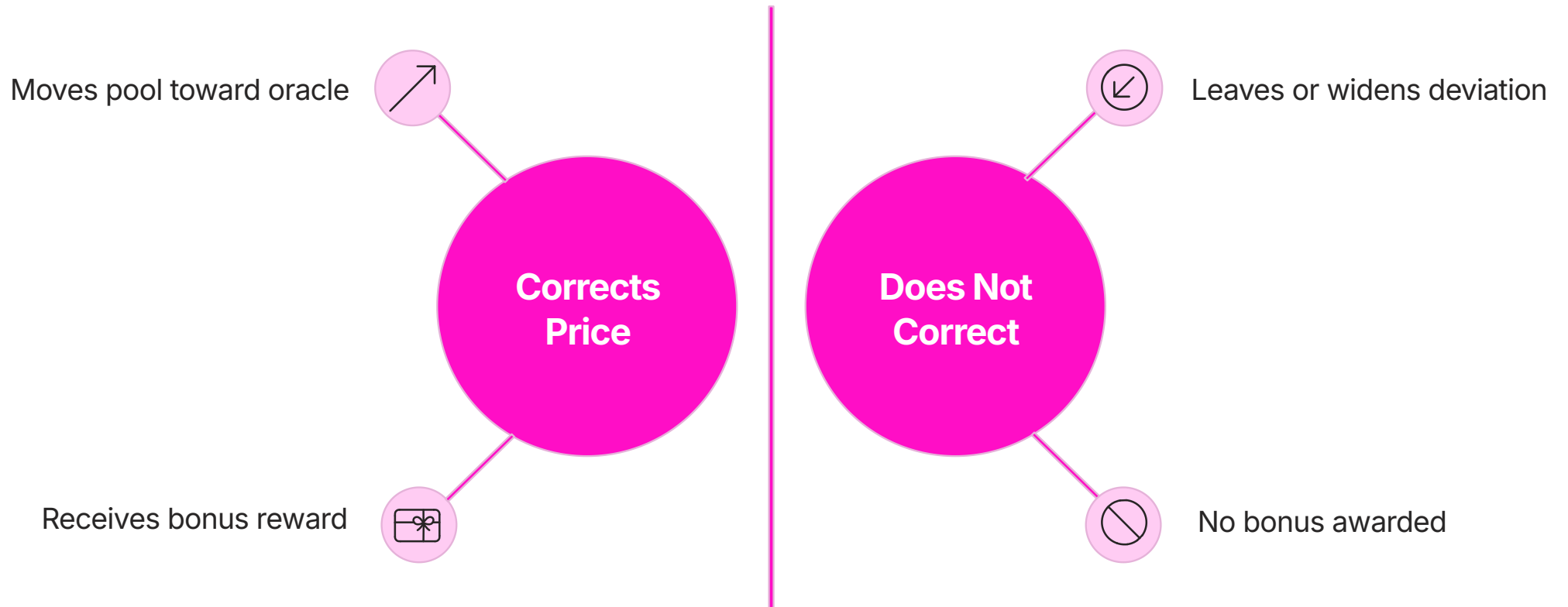# Bonus Structure for Aligned Traders

3. Bonus for Aligned Traders

Conversely, traders who move the pool price closer to the oracle's theoretical price receive a bonus. This incentive mechanism ensures that profitable arbitrage opportunities emerge for those who correct price inefficiencies.

$$bonus = \frac{deviation^2 \times multiplier}{10000}$$

- **Multiplier:** 100
- **Maximum Bonus:** 500 bp (5%)

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Moves pool toward oracle

Corrects Price

Receives bonus reward

Leaves or widens deviation

Does Not Correct

No bonus awarded

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Treasury Mechanism: Ensuring Self-Sustainability

Treasury Growth Formula

$$TreasuryGrowth = \text{Fees Collected} - \text{Bonuses Paid}$$
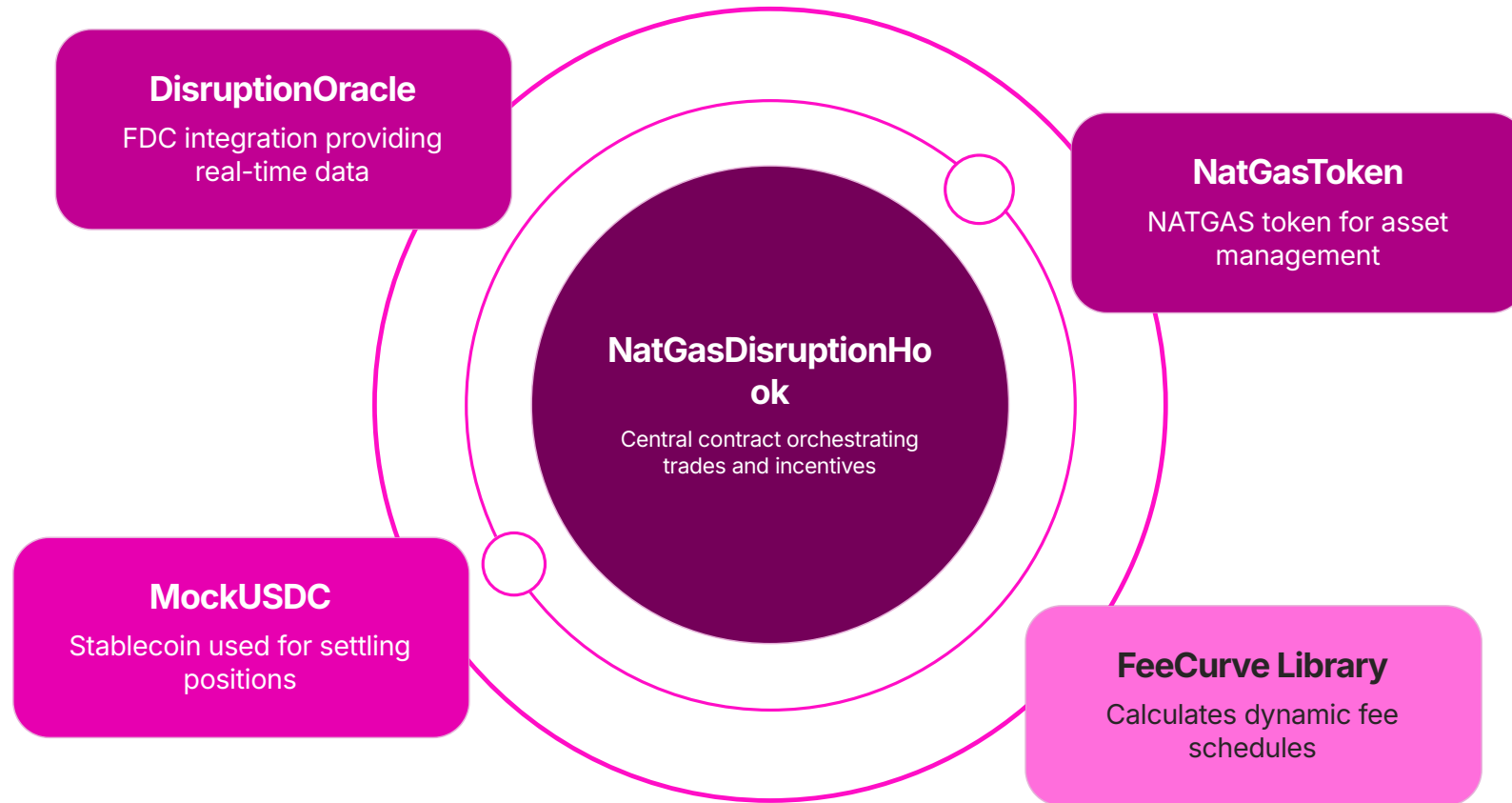
Treasury Impact Examples

Let's examine how the treasury balance shifts under different scenarios of price deviation, based on the trading dynamics:

Deviation	Scenario	Fees Collected (from misaligned)	Bonuses Paid (to aligned)	Net Treasury Impact
10%	Aligned sell @ $3.85, Misaligned buy @ $4.23	$0.096 (2.3% of $4.23)	$0.0385 (1.0% of $3.85)	+$0.0575
20%	Aligned sell @ $3.50, Misaligned buy @ $4.20	$0.176 (4.2% of $4.20)	$0.175 (5.0% of $3.50, capped)	+$0.001
30%	Aligned sell @ $3.00, Misaligned buy @ $4.50	$0.45 (10.0% of $4.50, capped)	$0.15 (5.0% of $3.00, capped)	+$0.30

As deviations increase, the system efficiently collects higher fees from misaligned traders, strengthening the treasury and allowing for substantial bonuses to those who help restore price equilibrium. The caps on fees and bonuses ensure fairness while maximizing the incentive effect.

Smart Contracts Architecture

The core of our protocol is built upon a modular smart contract architecture, designed for efficiency, security, and seamless integration with real-world data.

NatGasDisruptionHook

The main contract orchestrating trades, applying incentives, and managing liquidity based on oracle data.

DisruptionOracle (FDC Integration)

Feeds accurate, real-time natural gas price data from the Flare Data Connector into the system.
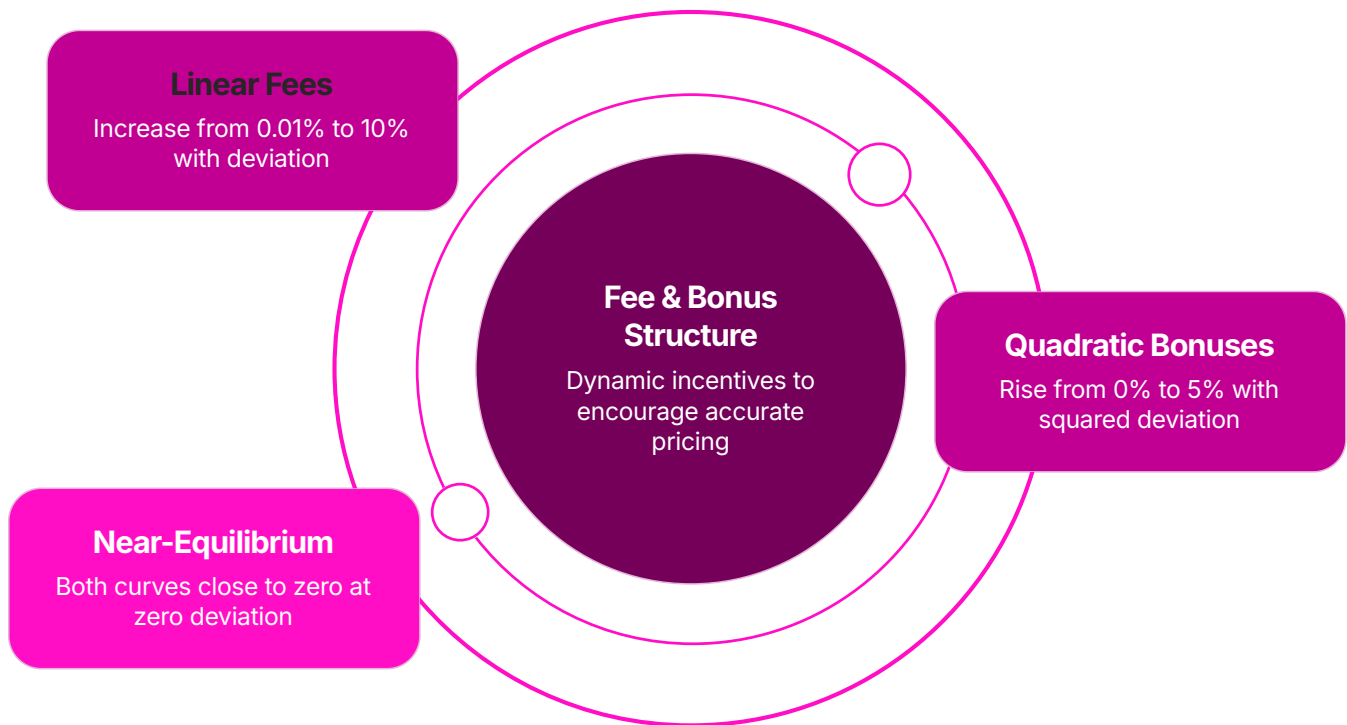
FeeCurve & BonusCurve Libraries

Modular contracts defining dynamic fee structures and bonus distributions based on price deviation.

NATGAS & MockUSDC

The primary utility token and a stablecoin used for trading within the protocol.

Fee & Bonus Structure

Our dynamic fee and bonus system incentivizes accurate pricing and discourages speculative trading, driving efficient market convergence.

Linear Fees
Increase from 0.01% to 10% with deviation

Fee & Bonus Structure
Dynamic incentives to encourage accurate pricing

Quadratic Bonuses
Rise from 0% to 5% with squared deviation

Near-Equilibrium
Both curves close to zero at zero deviation

Fees: Deterring Misalignment

- **Aligned Traders:** 0.01% fee (minimal to cover gas)
- **Misaligned Traders:** 0.3% - 10% fee, scaling with deviation from oracle price.
- **Base Fee:** 0.3% at equilibrium (zero deviation).

Bonuses: Rewarding Accuracy

- **Maximum Bonus:** Up to 5% of the swap amount.
- **Scaling:** Increases quadratically with price deviation, rewarding larger corrections.
- **Equilibrium:** Bonus is zero when the pool price matches the oracle.
- **Funding:** Bonuses are funded from the protocol treasury.

Sponsors / Tools

Uniswap V4

We leverage Uniswap V4's innovative hook architecture to implement custom AMM logic, dynamic fee structures, and integrated incentive mechanisms, forming the core of our decentralized exchange.

LayerZero

LayerZero provides seamless, secure cross-chain messaging capabilities, enabling future expansion and liquidity for the NATGAS token across diverse blockchain ecosystems.

Flare Network

The Flare Data Connector (FDC) is critical for supplying accurate, decentralized, and verifiable real-world natural gas price data to our smart contracts, underpinning our oracle mechanism.

Tech Stack

Core Technologies

- Solidity 0.8.25: Smart contract language.
- Foundry
- Uniswap V4: Decentralized exchange protocol.
- Flare Data Connector: Oracle integration.
- Next.js 14: Frontend framework.
- wagmi & viem: Web3 Hooks and clients.

Deployment Networks

- Flare Coston2: For FDC-specific testing.
- Base Sepolia: For EVM compatibility.

Key Innovations

- FDC Integration: Seamless real-world data.
- Asymmetric Incentives: Rewards for alignment, penalties for deviation.
- Self-Sustaining Bonuses: Fees fund rewards.
- Gradual Curves: Dynamic fee/bonus scaling.
- Real-World Data: Driving price convergence.

Next Steps

Expand to Perps & Futures Markets

Diversify our offering by introducing perpetual contracts and futures. This expansion will enable more sophisticated hedging and speculative strategies, attracting a broader range of traders and significantly boosting market depth and liquidity on the platform.

Integrate Predictive Price Oracle

Develop and integrate a predictive price model for natural gas by leveraging key market drivers. This will involve incorporating real-time weather data via the Flare Weather Feed and storage information from the EIA API into a robust forecasting formula.

$$Price_{pred} = f(Weather_{Flare}, Storage_{EIA})$$

This will enhance the oracle's accuracy and contribute to greater market stability.

[GitHub - deapinkme/ETHGlobalBuenosAires25](#)

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