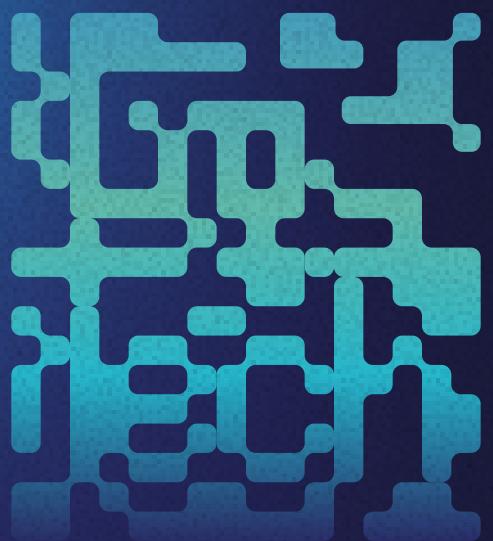




# KRITI'25

## EnergyChain Challenge

Organizer :  
Finance and Economics Club



High Prep  
| 600 Pts

# EnergyChain Challenge

600 Points

Start : 10/01

End : 04/02

## OVERVIEW

The energy sector faces three critical challenges defined by the World Energy Council: Energy Security, Energy Equity, and Environmental Sustainability. Current systems suffer from intermediary-heavy distribution networks, opaque carbon credit trading, and limited participation from small-scale renewable energy producers. The lack of transparency and high entry barriers have created monopolistic market conditions, preventing efficient resource allocation and sustainable development.

Blockchain technology enhanced with ZK-SNARKs offers a revolutionary solution by enabling transparent and secure energy trading through smart contracts, while protecting sensitive business data. This technology allows prosumers to participate in energy markets directly, while smart meters and IoT devices can accurately report and record usage patterns on an immutable ledger. The transparent nature of blockchain enables real-time verification of energy transactions and carbon credits, promoting trust and efficiency in the market, while ZK-SNARKs protect competitive advantages and sensitive data.

The objective is to create a decentralized energy distribution system that enables direct peer-to-peer energy trading, verifiable carbon credit transactions, and efficient smart grid management while ensuring equitable market participation and environmental sustainability.

## **KEY OBJECTIVES**

- Develop a transparent smart grid system that enables direct prosumer participation through blockchain-based verification
- Create an automated carbon credit trading platform with real-time verification mechanisms
- Implement automated settlement systems using smart contracts for real-time energy trading
- Integrate IoT devices and smart meters for accurate energy consumption monitoring
- Design a scalable system that reduces entry barriers for small-scale renewable energy producers
- Enable efficient order matching and settlement through automated smart contracts
- Implement privacy-preserving mechanisms using ZK-SNARKs for sensitive transactions

## **GUIDELINES**

- Solutions must leverage blockchain technology to ensure transparency and immutability in energy trading
- Smart meters and IoT devices must be integrated for real-time grid management and consumption tracking
- System architecture should support both small-scale prosumers and large energy providers
- Implementation should focus on reducing intermediaries and enabling direct peer-to-peer trading
- Carbon credit verification must include robust mechanisms to prevent double-spending
- Solutions must incorporate ZK-SNARKs to protect sensitive trading data while maintaining system transparency

## EVALUATION CRITERIA

- **Innovation (13%)**: Novel approaches to energy distribution and market efficiency
- **Functionality (15%)**: System usability and integration with existing grid infrastructure
- **Blockchain Implementation (22%)**: Effective use of smart contracts and consensus mechanisms
- **Technical Complexity (20%)**: Architecture design and implementation quality
- **Integration (10%)**: Smart meter and IoT device integration
- **Privacy Enhancement (10%)**: Effective use of ZK-SNARKs for data protection
- **Scalability & Sustainability (5%)**: Support for growing network of prosumers
- **Presentation (5%)**: Solution demonstration and documentation quality

## MID-EVALUATION REQUIREMENTS

- Detailed system architecture showing the blockchain-based trading mechanism
- Prototype implementation of smart contracts and consensus protocols
- Integration plan for IoT devices and smart meters
- Prototype of ZK-SNARK circuits for privacy-preserving features

Mid-evaluation Deadline: 11:59 PM, 24th January 2025

Note: Mid-evaluation submissions are mandatory but will not be graded for final evaluation.

## **FINAL SUBMISSION**

- Complete presentation covering:
  - Transparent energy trading mechanism
  - Smart grid management system
  - Carbon credit verification protocol
  - Privacy-preserving features implementation
- Source code including:
  - Smart contracts
  - Trading protocols
  - IoT integration modules
  - System documentation
  - ZK-SNARK circuits and integration modules

Bonus: Live deployment demonstrating peer-to-peer energy trading