DYNAMIC ENERGY TRADING WITH BLOCKCHAIN

The rise of renewable energy has transformed traditional consumers into prosumers, who both generate and consume electricity. However, centralized grids still dominate energy distribution, leading to challenges such as lack of transparency and over-dependence on the utility. Peer-to-peer (P2P) energy trading has emerged as a solution, allowing prosumers to trade surplus energy directly with nearby consumers. To enable this securely, blockchain technology provides a decentralized, tamper-proof ledger where transactions are transparent and automated through smart contracts. This project proposes a blockchain-based P2P energy trading framework integrated with a supply–demand ratio driven dynamic pricing model, where sellers and buyers negotiate prices using game-theoretic mechanisms.

Keywords: Blockchain, P2P Energy Trading, Dynamic Pricing, Smart Contracts.

Existing System: In traditional energy trading, energy exchange is centralized and grid-dependent, where prosumers sell surplus power to the utility or buy at fixed rate. Recent research has explored peer-to-peer (P2P) energy trading systems, which enable localized energy exchange between prosumers and consumers. These studies include simulation examples demonstrating improved adaptability and efficiency using blockchain.

Proposed System: This project proposes a blockchain-based peer-to-peer (P2P) energy trading framework implemented and evaluated through simulation. The system uses a supply–demand-ratio driven dynamic pricing model where sellers follow a dynamic pricing strategy and buyers/sellers, smart contracts on the blockchain automate transactions and settlements. The simulation implementation evaluates price convergence, reductions in energy flow to the main grid, economic benefits for prosumers and efficiency of the proposed approach without requiring real-world deployment.

Technologies:

1.Blockchain - for secure, transparent, and tamper-proof energy transactions.

2.Smart Contracts - to automate trading, settlement, and pricing without intermediaries.

3.Simulation Tools - to model and evaluate the energy trading framework in a controlled environment.

4.Dynamic Pricing - to balance supply and demand effectively.

Conclusion: The project successfully demonstrates a blockchain-based peer-to-peer energy trading framework with a supply–demand-ratio driven dynamic pricing model. Through simulation, it ensures secure, transparent trading, lowers grid dependency and improves prosumer benefits for sustainable energy communities.