



ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

8–11 June | ADB Headquarters, Metro Manila, Philippines

Blockchain-Enabled Microgrid Energy Management for Community-Centred Decentralised Energy Trading

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GLOBAL CHALLENGE



Energy inequality

Traditional grid expansion is slow, expensive, and often impractical in remote or disaster-prone regions



Enhanced Resilience

Localized microgrids offer "islanding" capabilities, maintaining critical power during regional grid failures through decentralized control.



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AI POWERED MICROGRID



Predictive Engine

Machine learning models for 95%+ accuracy in load and solar/wind generation forecasting.



Smart Storage

Active battery life management through AI-driven charge/discharge cycle optimization.



Dynamic Pricing

Pricing Engine to Dynamically calculate Price and support Bidding



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AI-MicroGrid Concerns

Trust Issue: No trust in
Decentralised and Peer to Peer
trading

Opacity: Prosumers have no control
over surplus solar valuation.

Insecurity: Data manipulation risks
in legacy billing systems.

**"Decentralization is the key
to resilience."**



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VISION-Blockchain & AI based Microgrid

- 01 Develop a Blockchain P2P Platform**
Build a secure, scalable framework for peer-to-peer energy trading and management within a microgrid.
- 02 Automate Billing & Settlement**
Allow different organisations to trade energy securely and privately
- 03 Enforce Access Control**
Ensure only legitimate, authenticated actors participate in the marketplace.
- 04 Integrate Predictive Modelling**
Develop a demand–supply predictive model embedding forecasts into blockchain records



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AI & BLOCKCHAIN MICROGRID DECENTRALIZED TRADING ARCHITECTURE

4. BUSINESS LAYER (Economic Policies & Compliance)

Policy

Compliance

3. APPLICATION LAYER (Interfaces for Users & Operators)

Prosumer Dashboard

Consumer Dashboard

Admin / Utility Portal

2. INTELLIGENCE LAYER (AI Agents & Blockchain Decentralization)

AI Predictive & Decision Framework

Temporal Deep Learning
Load & Solar Forecasting

Multi-Agent System
Autonomous optimization

Dynamic Pricing Engine

Hyperledger Fabric Blockchain Ledger

Smart Contracts
Chaincode execution

Private Channels
Data privacy segmentation

Immutable Ledger & Consensus Mechanism

1. DER LAYER / PHYSICAL LAYER (Grid Core & Attachments)

OPERATIONAL GRID CORE

Smart Meters
& IoT

Grid Core Infrastructure

Battery Energy
Storage (BESS)

Microgrid Controller



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BLOCKCHAIN-HYPERLEDGER FABRIC

A platform built on **Hyperledger Fabric** for automated, tamper-proof, and community-driven energy trading.

P2P Trading

Direct exchanges
between prosumers and
consumers.

Smart Contracts

Automated pricing and
settlement rules.

Immutable Audit

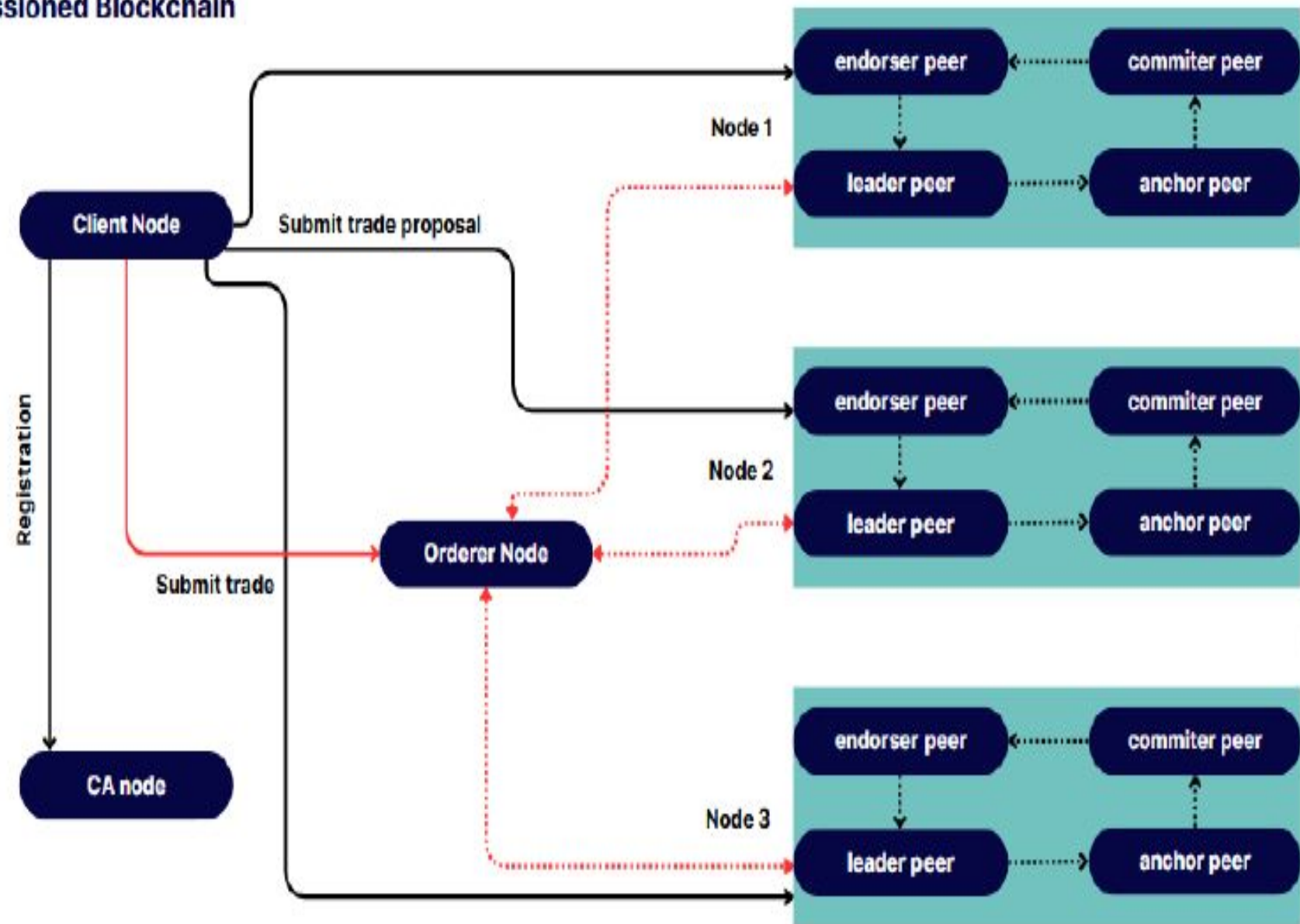
Verifiable transactions
stored on a distributed
ledger.



HYPERLEDGER FABRIC: TRANSACTION PROCESS FLOW

- 1
- Submit Proposal
- 2
- Simulate & Endorse
- 3
- Collect Endorsements
- 4
- Broadcast to Orderer
- 5
- Block Generation
- 6
- Block Broadcast
- 7
- Commit to Ledger
- 8
- Sync Within Org
- 9
- Ledger Updated

Permissioned Blockchain





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MARKETPLACE COMPARISON

Feature	Traditional Model	Proposed Blockchain Model
Transparency	Low (Utility-side only)	High (Verifiable/Auditable)
Intermediary Cost	High (Utility margins)	Low
Pricing Control	Centralized/Fixed	Dynamic/Community-led
Data Integrity	Mutable Databases	Immutable Ledger



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WHO BENEFITS? COMMUNITY ENERGY INCLUSION



Prosumer (Solar Owner)

- ✓ High revenue on surplus generation
- ✓ Transparent audit of every transaction
- ✓ Automated monthly bill adjustment



Consumer (Buyer)

- ✓ High reduction in monthly electricity cost
- ✓ Access to local, clean solar energy
- ✓ AI recommends optimal purchase volume



Energy Retailer/Controller

- ✓ Real-time data on community energy flows
- ✓ Improved grid balancing & demand visibility



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CONCLUSION

Blockchain + AI + Microgrid = Energy Equity for Vulnerable Communities

POLICY/REGULATIONS

- Regulatory sandbox support needed
- Policy template for DER trading rules

Other Country USE CASES

- West Suffox (UrbanChain)
- Brooklyn (Ethereum)
- Perth (Power Ledger)



Thank You

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