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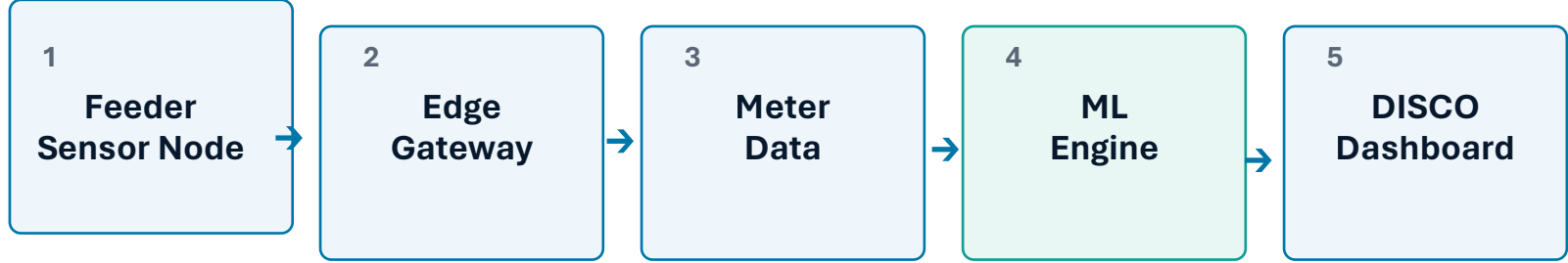


TIEC4.0 Poster Title

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Proposed solution

GridGuard AI is a hardware-software layer for DISCOs. It reconciles feeder-level energy input against metered customer consumption, estimates technical loss, and flags suspicious loss gaps.



Detection logic NTL Index = Feeder Input - Metered Energy - Estimated Technical Loss.
If the residual exceeds threshold, GridGuard raises a bypass flag.

- Works with full AMI deployment
- Also supports statistical NTL mode for legacy-meter feeders
- Alerts field officers by dashboard/SMS

Technical design

ML anomaly detection pipeline

- 1 Read feeder V/I every 60 seconds
- 2 Compute KCL balance: expected vs actual
- 3 Feed residual into Isolation Forest
- 4 Detect sudden time-series load patterns
- 5 Generate suspect zone + probability score
- 6 Send alert to dashboard and field team

Prototype demo focus: simulated feeder input + customer readings + injected theft anomalies + live dashboard alerts.

Budget, target users, market & scale

- Target users: DISCO revenue protection, metering, and field inspection teams
- Initial market: Band A feeders with high tariff and high bypass incentive
- Scale path: 1 pilot feeder -> 10 feeders in 1 DISCO -> licensing across 11 Nigerian DISCOs
- Hardware stack: CT/PT clamp sensors, Raspberry Pi gateway, 4G/LoRaWAN, solar enclosure

Item	
Sensor node + enclosure	₦1.20M
Edge gateway + comms	₦0.85M
Installation + calibration	₦0.75M
Dashboard + ML prototype	₦1.20M
Contingency / field ops	₦0.50M
TOTAL	₦4.50M

Economic feasibility & business model

Pilot feeder ROI model: Band A feeder with 500 customers

Energy injected / month	150,000 kWh
Assumed bypass loss	20% = 30,000 kWh
Tariff	₦225 / kWh
Monthly lost revenue	₦6.75M
Recovered by GridGuard	30% = ₦2.0M/month
Annual recovery	₦24M+
Payback period	< 3 months

Business model: hardware-enabled SaaS + deployment fees + monthly analytics subscription per feeder, with optional performance-based recovery share.

Timeline for prototype / trial

- Month 1-3** **Prototype & Pilot**

Build sensor node, dashboard, KCL simulator, and anomaly detection pipeline. Secure 1 DISCO feeder test.
- Month 4-8** **Deployment & Validation**

Deploy on feeder, collect live data, compare alerts with DISCO inspection records, tune thresholds.
- Month 9-12** **Scale & Licensing**

Expand to 10 feeders, package dashboard as SaaS, begin licensing discussions with 3 DISCOs.

References

- [1] Nigerian Electricity Regulatory Commission (NERC). Tariff, metering, and market reports.
[2] Association of Nigerian Electricity Distributors (ANED). Power distribution sector reports.
[3] International Energy Agency (IEA). Africa Energy Outlook and electricity access reports.

Acknowledgements

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