Digital Energy Grid Hackathon — Design Document (Preview)

1. Team Information

Team Name: (To be finalised)
Institution / Organization: Independent (London, UK)

Team Members:
- Amritpal Singh – Technical Lead (data handling, integrations, system design, documentation, pitching)
- Okeoma Amaobi – AI Engineer & Frontend Developer (model experimentation, dashboard interface)
- Godfrey Dekera – UI/UX & Workflow Visualisation (user experience, orchestration clarity)

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2. Problem Focus

Selected Problem Statement: Problem 1 Utility Interface with Agentic Orchestration for Grid-Scale Demand Flexibility.

3. Solution Overview

Local electricity networks increasingly face short, unpredictable load spikes due to rapid adoption of EV chargers, heat pumps, home batteries and other behind-the-meter assets. Today, operators rely on manual intervention, delayed visibility and siloed tools, increasing the risk of overloads, customer interruptions and costly infrastructure upgrades.

Our proposed agent monitors feeder-level data, predicts potential overloads and automatically coordinates distributed energy resources (DERs) using Beckn-based workflows. It discovers available flexibility providers, selects suitable assets and dispatches actions within seconds reducing strain while maintaining transparency, auditability and consumer participation.

4. Technical Architecture (Up to 200 Words)

The system consists of four components: (1) a real-time data ingestion and monitoring layer receiving simulated feeder load signals; (2) a lightweight forecasting model estimating near-term overload probability; (3) an orchestration agent that initiates Beckn Search, Select and Confirm workflows to request flexibility from subscribed DER providers; and (4) an operator dashboard visualising system state and actions.

When projected load exceeds a defined threshold, the agent triggers Beckn workflows to discover flexible assets such as EV chargers, batteries or commercial loads. It selects suitable providers based on availability, location, capacity and response time. Confirm messages dispatch actions, while Track responses return status.

Assumptions: simulated data replaces utility telemetry, DER catalogues remain illustrative, dispatch effects are modelled, not executed on physical devices. Limitations include lack of real commercial pricing signals, latency constraints and regulatory processes beyond scope.

[ARCHITECTURE DIAGRAM WILL BE INSERTED HERE — Data Flow → Forecasting → Agent → DERs → Dashboard]

5. Agent Workflow

1) Receive live feeder load data.
2) Forecast near-term load and detect overload risk.
3) Initiate Beckn Search to discover participating DERs.
4) Select optimal DERs based on flexibility needs and constraints.
5) Send Beckn Confirm requests to dispatch actions.
6) Track DER responses and update dashboard.
7) Log all decisions and outcomes for auditing and settlement purposes.

6. Business Model & Impact

Potential customers include utilities, flexibility service providers and energy aggregators. Value may be captured through SaaS licensing, per-feeder subscriptions or per-activation fees. Consumers benefit by participating in flexibility programs, earning incentives and reducing bills. Operationally, the agent improves grid reliability, reduces emergency interventions and defers expensive substation upgrades.

The system lowers entry barriers for smaller energy assets, aligning with evolving UK flexibility regulations and distributed market participation goals.

7. Declarations

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