Digital Energy Grid Hackathon

Team Name: Energy Ways
Institution / Organization: Imperial College London

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

Solution Overview

With the rapid growth of EVs in the UK, the energy grid is facing increased strain. Currently, DSOs struggle to manage and control DERs leading to instability. Energy Ways bridges this gap, enabling seamless communication between DSOs, DERs, agents, and consumers.

We value flexibility, speed, and monetary benefits, using a mix of real-time and historical data to optimize grid operations. Our reinforcement learning-based algorithm predicts and adapts to demand, while incorporating consumer consent for smart energy management. By enabling dynamic coordination and offering demand flexibility, we allow consumers to participate in demand response programs and provides monetary incentives for consumers to support grid stability.

The DEG ecosystem benefits through greater flexibility, consumer choice, and efficient grid management, aligning with regulatory standards for demand response and energy balancing. Think of us as the Waze of the energy world, guiding the grid through real-time decisions to keep energy flowing smoothly and efficiently.

Technical Architecture

Architecture Overview

Three agents coordinate EV charging flexibility: Supervisor (central orchestration), Forecasting (predict + optimize), Charging Port (edge telemetry + optional V2G offer). Communication uses an Agent2Agent protocol.

- Supervisor Agent (GCE VM)

Model: Claude Sonnet (API)

Functions: Aggregate charging port status; consult forecasting agent; issue DER power adjustment commands.

- Forecasting Agent (GCE VM)

Model: gpt-oss-20b + Deep Q learning

Functions: Learn from historical + real-time data (Monte Carlo style); generate flexibility/demand forecasts; send recommended actions to Supervisor; request updated port data.

- Charging Port Agent (Local)

Model: gpt-oss-20b (lightweight)

Functions: Stream port telemetry/status; assemble concise status reports; optionally offer EV battery for V2G / DER monetization.

- Inter-agent Communication: Agent-to-Agent protocol (for discovery, messaging, decisions).
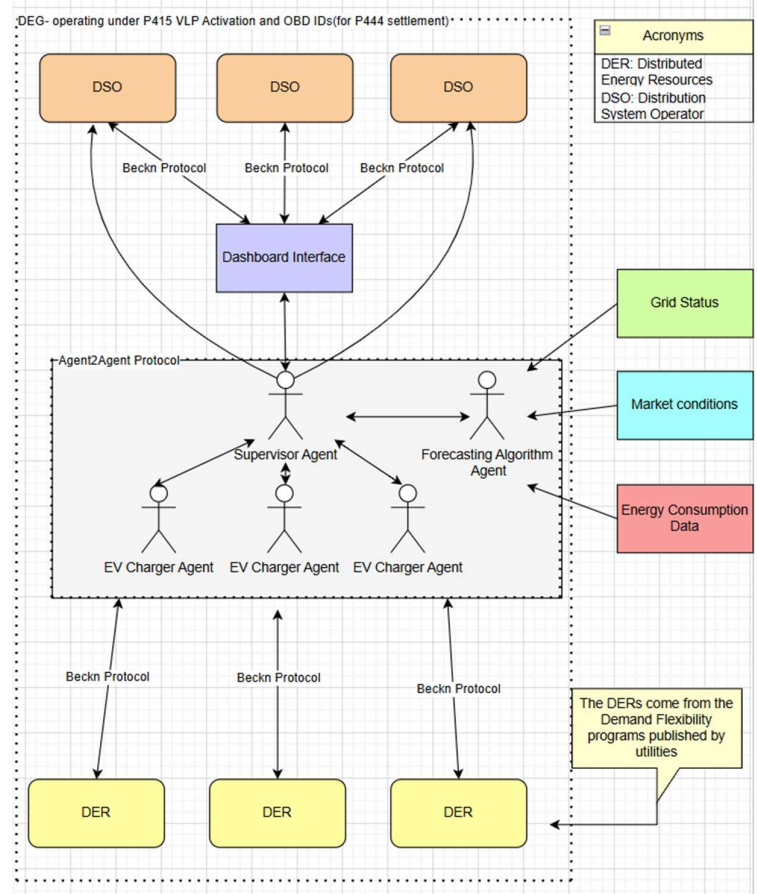
Assumptions: All data referenced in diagram is accessible from a Beckn-compliant DSO.

Agent Workflow

Our workflow follows a simple

1. EV Charger Agents relays situation reports, when prompted or notices extreme situations, to the Supervisor Agent
2. Supervisor Agent (S Agent) gathers situation reports from EV Chargers and contextual data from DSOs
3. S Agent relays all the data to Forecasting Algorithm Agent. Access to DSOs is only possible when following Beckn Protocol.
4. Forecasting Algorithm Agent uses contextual data of energy market and situation reports to make a decision. Forecasting Agent uses a Monte Carlo-based algorithm to generate a decision. Decision is passed to Supervisor
5. Supervisor Agent puts decision in place by communicating with EV Charger Agents and DERs where power should be directed. DERs such as car batteries and solar panels communicate with EV Charger Agents using Beckn Protocol, so we can leverage DERs within Demand Flexibility Programs
6. Forecasting agent regularly prompts Supervisor agent for status reports to evaluate how well the action performed and improve the algorithm.

Business Model and Impact

Our platform monetises by optimising grid energy flows and capturing value through performance-based partnerships and fee-for-service models—not just subscriptions. With EVs accounting for around 20 % of new UK car registrations and over 76,500 public chargers installed by April 2025, the infrastructure boom presents major opportunities. Stakeholders benefit across the ecosystem: Utilities/DSOs gain real-time DER orchestration and enhanced grid resilience. Aggregators monetise flexibility by pooling consumer DERs. Data centres optimise procurement by shifting demand. Consumers & prosumers receive incentives for participating in grid stabilisation.

Government funding supports this growth; the UK announced a £1.5 billion package backing EV rollout and infrastructure to 2030, just yesterday!

Built on an AI-driven, scalable platform, we support increasing EV and DER deployment, promote sustainability by reducing carbon intensity, and unlock new revenue streams through flexibility services and infrastructure optimisation.

References

protocol-specifications/docs/README.md at master · beckn/protocol-specifications · GitHub

Monte carlo: https://www.ibm.com/think/topics/monte-carlo-simulation

Electric vehicle public charging infrastructure statistics: April 2025 - GOV.UK

£1.5bn package announced to help Britain switch to electric vehicles | UK News | Sky News

Declarations

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 Submission Format: 1-2 page PDF uploaded via Dora Hacks