IMPLEMENTATION ROADMAP

Pilot Phase (0–3 Months)

- Install a small pilot system (21 kW solar + Battery 300 kw)
- Integrate VFD, MPPT, BMS, IoT monitoring on one pump line
- Test performance: solar yield, battery backup, dust impact, pumping stability
- Finalize optimized design for full deployment.

Full Deployment (3–9 Months)

- Install ~100 kW solar + ~320 kWh $LiFePO_4$ battery.
- Integrate grid + diesel (4h + 2h logic) with automatic switching.
- Deploy AI-based tracker, automatic dust cleaning, and full EMS.
- Achieve 24/7 hybrid dewatering with major diesel reduction.

Optimization & Scaling (9–18 Months)

- Add AI optimization, predictive maintenance, seasonal tuning.
- Improve efficiency and reduce diesel to minimum.
- Prepare a replicable model for other HCL mining sites.

METHODOLOGY & PROCESSES

SMART INDIA HACKATHON 2025

OPEX-Based Design

Cost-efficient model enabling vendor-managed installation, operation, and maintenance without upfront investment

IoT Integration

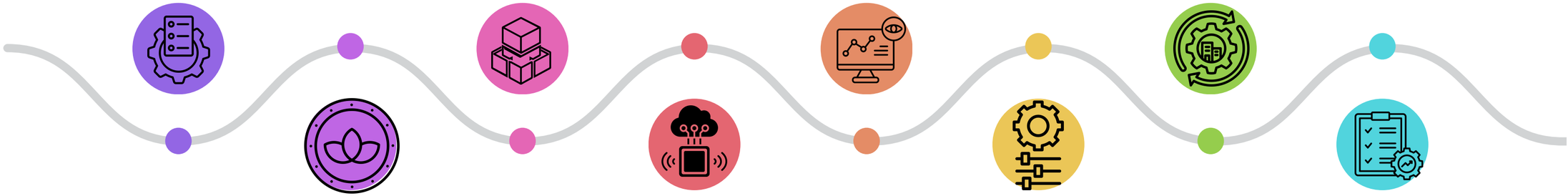
End-to-end IoT connectivity enabling real-time sensor communication, device control, and data synchronization

System Testing & Calibration

On-site validation of pump performance, power output, sensor accuracy, and safety thresholds before activation

Performance Analytics

Cloud-based analysis of flow patterns, energy savings, and pump efficiency for continuous improvement



Resource Mapping

Assessment of water flow, pump head, land availability, solar irradiance, and PV sizing for optimized system planning

Modular Installation

Scalable deployment of solar panels, pumps, sensors, and control units with plug-and-play field integration

Automation & Monitoring

Live dashboard insights with automated alerts, pump control logic, and AI-driven predictive maintenance

Hybrid Continuity Planning

Backup alignment with grid/diesel systems to guarantee uninterrupted pumping during low-sun conditions