Project Proposal

Agentic AI for Solar-Storage Optimization & Resilience

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Subject: Master Thesis Project Scope & Implementation Plan

Executive Summary

Illigo is currently expanding its operational footprint toward integrated solar, electric vehicle (EV), and battery storage solutions. However, current early-stage deployments face operational challenges where battery mismanagement and solar intermittency lead to financial losses rather than efficiency gains.

This project proposes the development of an **Autonomous Energy Optimization Agent**. Leveraging my experience in Machine Learning (ML) solutions at Siemens Healthineers and aligning with my Masters Thesis on *"Agentic Web Approaches for Automated Fault Diagnosis,"* this project will move beyond simple rule-based control. We will develop an intelligent system that optimizes charging cycles for cost and grid stability while acting as a "Guardian," proactively managing variables like weather volatility and hardware constraints to ensure system viability.

Project Background & Objectives

The Business Challenge

Service stations equipped with solar panels and batteries are failing to optimize the energy mix. Batteries often discharge at sub-optimal times, and solar production is heavily impacted by cloud coverage (specifically in target regions like Africa). This results in:

- **Operational Inefficiency:** Poor battery operation causing net financial losses.
- **Grid Instability:** Inability to smooth out peak demand times.
- **Management Gaps:** Lack of an automated algorithm to manage inverters dynamically.

The Solution: "Agentic" Optimization

We will transition from static manual rules to an **Agentic AI approach**. The objective is to deliver an algorithm that acts as the "Brain" of the local station controller, capable of observing data, planning energy distribution, and executing control commands.

Core Objectives

1. **Economic Optimization:** Maximize financial viability by arbitrating between Solar production, Grid prices, and Battery storage.
2. **Operational Resilience:** Implement "Agentic Reasoning" to handle dynamic disturbances (e.g., sudden cloud cover, unexpected customer arrival bursts).
3. **Thesis Alignment:** Demonstrate Level 4 Autonomous principles (Observe → Plan → Act) applied to Microgrid fault avoidance.

Technical Approach: The "Agentic" Methodology

To align academic requirements with Illigos practical needs, I propose a three-layered architecture. This mirrors the *"Brain / Hands / Evidence"* structure used in advanced industrial automation.

Phase 1: The Evidence (Data & Perception)

- **Goal:** Establish a "Clean Baseline" for decision-making.
- **Actions:** Ingest historical charging session data and station specifications. Integrate Satellite Weather Data to model solar production patterns (addressing cloud coverage).
- **Thesis Relevance:** Structuring raw logs into a "Knowledge Base" (similar to OCPP logs) that the AI can interpret without noise.

Phase 2: The Brain (Optimization & Reasoning)

- **Goal:** Build the decision-making engine.
- **Actions:** Develop the optimization algorithm. Instead of static *If/Then* rules, the Agent will assess the **State** (SOC, Weather, Price) and determine the optimal **Action** (Charge, Discharge, Hold).
- **Key Variables:** Solar production vs. Cloud coverage; Customer arrival patterns (professional drivers); Peak demand avoidance.

Phase 3: The Hands (Simulation & Control)

- **Goal:** Validate the strategy before deployment.
- **Actions:** Implement the algorithm within Illigos existing simulator. Simulate "Fault Scenarios" (e.g., prolonged cloud cover during peak demand) to prove the system reduces losses.

Scope of Work & Timeline

Total Duration: ≈ 150 Hours | **Start Date:** Flexible (January 2026)

Phase	Activity	Deliverable	Est. Hours
1. Discovery	Review simulator, clean data, map Business Intent (Cost/Viability).	Cleaned Dataset	30h
2. Development	Develop the mathematical model for Solar/Battery/Grid arbitration.	Python Algorithm (Alpha)	60h
3. Simulation	Run algorithm against historical weather/usage data. Measure ROI.	Performance Report	40h
4. Reporting	Finalize thesis text and business documentation for Illigo.	Final Codebase	20h+

Why This Fit Works

- **Siemens Experience:** My background in industrial data science ensures a practical understanding of how theoretical models translate to actual hardware constraints.
- **Thesis Synergy:** My research into *"Agentic Web Approaches"* and *"Self-Healing Networks"* translates directly to creating a robust battery management system that automatically "heals" inefficiencies.
- **Value for Illigo:** The project delivers a sophisticated, research-backed algorithm designed to turn current battery losses into a profitable, optimized asset.

Next Steps:
I am prepared to commence work in January 2026. Upon review of this scope, I look forward to receiving the contract draft to formalize this collaboration.