

Key Roles And Needs

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Key Roles and Needs Analysis

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Description: Analysis of user roles and their specific needs

Key Roles and Needs

Project: Self-Charging Electric Vehicles (SCEV)

This document outlines the key roles and their associated needs for the successful development of Self-Charging Electric Vehicles (SCEVs). The project's unique approach necessitates a multidisciplinary team with expertise in diverse fields.

I. Key Roles

A. Project Management:

- **Role:** Project Manager

- **Responsibilities:** Overall project planning, execution, monitoring, and control; risk management; resource allocation; stakeholder communication; budget management.
- **Needs:** Extensive experience in complex engineering projects, strong leadership skills, proficiency in project management methodologies (e.g., Agile, Waterfall), and familiarity with automotive industry standards.

B. Engineering:

- **Role:** Lead Electrical Engineer
- **Responsibilities:** Design and development of the AI-powered Energy Management Unit (EMU), integration of energy harvesting systems, battery management system (BMS) optimization.
- **Needs:** Deep understanding of power electronics, embedded systems, AI/ML algorithms, and experience with high-voltage systems in automotive applications.
- **Role:** Lead Mechanical Engineer
- **Responsibilities:** Design and integration of the advanced photovoltaic body panels, regenerative suspension system, and thermoelectric generation (TEG) modules; ensuring structural integrity and aerodynamic efficiency.
- **Needs:** Expertise in materials science (lightweight composites), automotive design, and experience with integrating complex mechanical systems.
- **Role:** Software Engineer (AI/ML)
- **Responsibilities:** Development and implementation of the machine learning algorithms within the EMU for energy prediction and optimization; data analysis and model training.
- **Needs:** Strong programming skills (Python, C++), experience with machine learning frameworks (TensorFlow, PyTorch), and knowledge of real-time systems.

- **Role:** Software Engineer (Embedded Systems)
- **Responsibilities:** Development of the embedded software for the EMU and other control systems; ensuring real-time performance and system reliability.
- **Needs:** Proficiency in C/C++, experience with embedded system development, and familiarity with automotive communication protocols (CAN, LIN).

C. Testing and Validation:

- **Role:** Test Engineer
- **Responsibilities:** Development and execution of test plans for all hardware and software components; data analysis and reporting; ensuring compliance with safety and regulatory standards.
- **Needs:** Experience in automotive testing, familiarity with simulation tools, and strong analytical skills.

D. Research and Development:

- **Role:** Materials Scientist
- **Responsibilities:** Research and selection of optimal materials for photovoltaic panels and other components; ensuring durability, efficiency, and cost-effectiveness.
- **Needs:** Deep understanding of material properties, experience with perovskite or multi-junction solar cells, and knowledge of lightweight composite materials.

E. External Collaboration:

- **Role:** Liaison with Component Suppliers
- **Responsibilities:** Managing relationships with suppliers of key components (solar cells, TEGs, linear generators); negotiating contracts and ensuring timely delivery.
- **Needs:** Strong negotiation skills, experience in procurement, and familiarity with the automotive supply chain.

II. Needs Across Roles

- **Strong Collaborative Environment:** The project's success hinges on seamless collaboration between engineering disciplines and software development. Open communication and shared understanding are crucial.
- **Access to Advanced Simulation Tools:** Accurate simulation is essential for optimizing the energy harvesting systems and EMU. Investment in high-fidelity simulation software is needed.
- **Testing Infrastructure:** Access to specialized testing facilities for evaluating the performance of the components and the integrated system under various real-world conditions is paramount.
- **Regulatory Compliance Expertise:** Navigating the complex regulatory landscape for automotive safety and emissions will require dedicated expertise.
- **Intellectual Property Protection:** The innovative nature of the project necessitates a robust strategy for protecting intellectual property.

III. Unique Project Needs

- **Expertise in Multiple Energy Harvesting Technologies:** The project requires a deep understanding of solar, kinetic, and thermal energy harvesting, which are not typically combined in a single automotive application.
- **AI/ML for Real-time Energy Management:** The EMU's AI-powered capabilities require expertise in machine learning applied to real-time, resource-constrained environments.
- **Lightweight and Durable Materials:** The use of lightweight composites for the photovoltaic body panels demands expertise in material science and manufacturing techniques.

This Key Roles and Needs document serves as a starting point and will require further refinement as the project progresses. Regular review and updates are essential to ensure alignment with project goals and evolving needs.

