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| **ENGR4901**  **INTRODUCTION to DESIGN PROJECTS**  **RESEARCH and DEVELOPEMENT**  **PROJECT PROPOSAL**  **PROJECT TITLE: Mobile Charging Stations for Electric Vehicle**  **COMPANY:**  **DATE:**  **Prepared by Team No:** INDE-4  **Advisor:** İsmail Kayahan  **Team Members (Student No and Name):**  **1.** Yağız Aras 20MECT1017  **2.** Baran Sönmez 21BMED1011  **3.** Ali Aras Yıldırım 20INDE1028  **4.** Yaprak Bozkurt 20INDE1029  **5.** Osman Işık 20SOFT1029  **6.** Orhan Murat Tuncer 21SOFT1028  *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*  *(Note: AGY101 Form of TEYDEB (TUBİTAK) has been adopted and used only for educational purposes in ENGR4901 course)* |

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# SECTION A – PROJECT and COMPANY INFORMATION

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**A.2.2**

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| **Personnel Information of the Company** | | | | | | |
| **Section** | **PhD** | **MSc** | **BSc** | **Vocational School** | **Other** | **Total** |
| **Production** |  |  |  |  |  |  |
| **R&D** |  |  |  |  |  |  |
| **Other** |  |  |  |  |  |  |
|  | | | | **TOTAL** | |  |

**A.2.3**

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| **Granted Projects of the Company :** |
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| **Examples of the Original Products of the Company :** |

# SECTION B – INDUSTRIAL R&D CONTENT, TECHNOLOGY LEVEL and

# INNOVATIVE ASPECTS of the PROJECT

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## B.1- BRIEF DESCRIPTION of the PROJECT

**B.1.1 (Yağız, İpek)**

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| **Project Title : Mobile Charging Stations for Electric Vehicle** |
| **Project Description :**  Electric vehicles are becoming the cornerstone of sustainable transport worldwide. The International Energy Agency (IEA) predicts that by 2030, the global number of electric vehicles will reach 140 million according to the current policy scenario and 245 million according to the scenario in line with the Paris Agreement targets. This dramatic growth brings with it a serious need for charging infrastructure. ‘Range anxiety’, which is one of the main obstacles to the widespread use of electric vehicles, stems from the inability of users to access charging facilities in a timely and comfortable manner.  Most EV users charge their vehicles at private charging stations located in their homes or workplaces, i.e. Private Charging Stations. According to the International Energy Agency's 2023 report, there are approximately 17.5 million home chargers worldwide. These stations are expected to account for 90% of the total charging infrastructure by 2030. However, this method is not suitable for all users as most of the residents in big cities do not have private parking spaces. Especially for users living in apartments or using street parking, home charging is out of reach. This shortcoming increases the need for public charging infrastructure. However, public stations are also limited in number and become a deterrent for many users due to time loss, difficulty of access and inadequate infrastructure. In addition, existing fixed charging stations are inadequate not only for daily urban use but also for long journeys between cities and touristic areas with seasonal peaks. The increase in demand in holiday regions, especially in the summer months, leads to long queues and deterioration of the user experience. Moreover, charging time remains one of the biggest challenges for EVs, as fast charging infrastructure is not available in all regions. In addition, the inadequacy of the electricity grid in certain regions also hinders the expansion of fixed stations.  All these structural and operational challenges reveal that fixed charging infrastructure alone is not sufficient for EV deployment. With these problems in mind, we consider the idea of mobile charging stations as a flexible, accessible and innovative solution. In this way, mobile charging stations, which are a complementary system to the limitations of the existing infrastructure, have the ability to provide on-site charging services by reaching the location of users in areas where charging demand is concentrated. By configuring these systems with solar panels and battery systems, we aimed to make them able to operate independently from the grid and thus ensure energy supply security. In addition, mobile charging station systems can play a vital role not only during peak demand periods, but also in emergency scenarios. For example, in the event of damage to the city infrastructure after a major earthquake, mobile charging stations can take on functions such as providing energy in gathering areas, supporting health institutions and keeping the communication infrastructure afloat.  In Turkey, although the share of electric vehicles in the market is increasing rapidly, the development in charging infrastructure is not progressing at the same pace. The installation of fixed stations takes time due to high cost, land supply and permit processes, which increases the importance of flexible solutions in the short term. The high number of users who do not have a private parking space in metropolises such as Istanbul reveals how valuable an alternative mobile charging stations are for Turkey.  The system to be considered in our project will be designed to have battery modules fed by solar energy. Solar energy is preferred because it is an environmentally friendly source. The energy collected by solar panels during daylight hours will be stored in integrated battery modules and will be used to provide charging support to vehicles, depending on the capacity.  In conclusion, the solar-powered mobile charging station to be developed within the scope of this project aims to provide a flexible and sustainable solution where the existing infrastructure is lacking. This system, which can be applied both in urban and rural areas, will create an environmentally friendly and user-friendly experience by enabling EV users to access energy where they need it.  Reference:  [1] International Energy Agency. (2023). *Global EV outlook 2023: Catching up with climate ambitions*. International Energy Agency. <https://www.iea.org/reports/global-ev-outlook-2023> |

**B.1.2**

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| **Keywords :** Electric Vehicles, Mobile Charging Stations, EV Charging Infrastructure, Off-grid Charging, Solar Power, Renewable Energy, Sustainable Transportation |

## B.2- OBJECTIVES, METHODS and R&D PHASES of the PROJECT

**B.2.1 (ORHAN,ARAS,BARAN)**

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| 1. **Explain the reasons to start the Project. (ORHAN)**   This project, a solar-powered mobile electric vehicle (EV) charging station, was started because of a combination of infrastructure deficiencies, environmental urgency, and a radical change in the transportation industry. It is becoming more and more clear that the current charging infrastructures are inadequate, unequally dispersed, and frequently rigid as electric mobility develops pace on a worldwide scale. In nations like Turkey, where urban congestion, geographic diversity, and seasonal population surges make adoption more difficult, this leads to structural hurdles.  The EV market is expanding rapidly on a global scale. The International Energy Agency (IEA) projects that, under present policies, there would be 140 million electric vehicles globally by 2030, with the potential to reach 245 million in climate-aligned scenarios. By 2024, there were more over 87,000 EVs in Turkey, and this figure is predicted to rise significantly over the next several years. However, the construction of charging infrastructure has not kept pace with this growth. In metropolitan Turkey, where a significant portion of the population lacks private parking, this paradigm fails, even if private home chargers make up around 90% of all charging worldwide.  Furthermore, because they require site purchase, permits, and grid connectivity, fixed public charging stations are costly and take a long time to install. Additionally, they are susceptible to blockages due to their static nature, particularly during vacations or in high-demand locations like touristy seaside regions. Without a significant time and financial commitment, it is not feasible to connect Turkey's highways with fixed chargers at a dense enough density.  The requirement for responsiveness and mobility is a major motivator for this project. Our solution may service underserved or overcrowded regions by utilizing mobile charging vans. Assuming an average charging session of 32 kWh, for instance, a 161 kWh van can charge roughly 5 EVs each day. This figure is derived from user behavior, which shows that most EV drivers choose medium-range charges over full recharges because of concerns about battery health.  About 37 full EV charges can be delivered daily by the proposed fleet of 8 vans, which is a hybrid of 5 units with 141 kWh and 3 units with 161 kWh. This equates to about 1,110 EVs every month. Even though it presently only covers 0.8% of Turkey's daily charging demand (4,350 EVs per day under normal circumstances), it offers targeted and scalable relief in areas where fixed infrastructure is either insufficient or impossible.  The impact on the environment is another crucial argument. When exposed to Turkey's average daily solar irradiation of 4.7 kWh/m²/day, our mobile chargers will incorporate foldable solar panels with a total area of 30 m² per van, running at 20% efficiency. Therefore, the potential energy yield is:  4.7 × 30 × 0.20 = **28.2 kWh/day/van**  Adjusted for real-world losses (e.g., shading, weather, movement):  28.2 × 0.75 = **21.15 kWh/day/van**  Fleet total: 21.15 × 8 = **169.2 kWh/day**  This solar contribution is in line with Turkey's national sustainability targets and marks a significant decrease in dependency on the grid, even though it is insufficient to fully recharge the vehicles. This balances the following based on the grid emission ratio of 0.426 kg CO₂/kWh:  169.2 kWh/day × 0.426 kg/kWh × 365 days = **26,309 kg CO₂/year**, or about **26 metric tons annually**.  These carbon reductions not only help meet climate goals but also enhance public health and air quality, particularly in cities.    The idea has strategic importance for disaster response in addition to standard mobility needs. As off-grid energy centers, mobile chargers can be used in remote medical facilities, temporary shelters, and post-earthquake recovery areas. In these situations, fixed stations fail because of the brittleness of the infrastructure. Energy security and societal resilience are improved by the mobile system's decoupling from the grid.   1. **Explain the objectives of the Project. (ORHAN)**   The overarching goal of this project is to design and deploy a **solar-powered mobile electric vehicle (EV) charging solution** that responds to Turkey’s unique mobility, energy, and infrastructure challenges. Below are the key objectives in detail:   * **Enhance Charging Accessibility Across Underserved Regions:**  One of the most pressing issues facing EV adoption in Turkey is the lack of accessible charging options—especially in densely populated urban neighborhoods where many residents do not have access to private parking, and in rural or touristic areas where fixed infrastructure is sparse. This project aims to bridge these gaps by introducing mobile charging vans that can be dispatched to areas with high or unmet demand, ensuring that EV drivers are not limited by location when planning their journeys. * **Promote Renewable Energy Integration into EV Charging:**  Each mobile charging unit is equipped with foldable solar panels covering 30 m², harnessing Turkey’s abundant solar potential. While not the primary energy source, these panels provide a meaningful contribution of over 21 kWh/day per van. This integration of solar energy not only reduces dependency on the grid but also supports the transition toward cleaner energy sources. It demonstrates a hybrid model that leverages both renewable and stored energy, setting a benchmark for sustainable transportation infrastructure. * **Reduce Environmental and Carbon Footprint:**  A key environmental objective of the project is to reduce the carbon intensity of vehicle charging. The solar panels are expected to save approximately 26 metric tons of CO₂ annually across the 8-van fleet. While modest in isolation, this reduction is significant in the broader context of sustainable transportation. In addition to greenhouse gas mitigation, reduced reliance on fossil-fueled grid power improves urban air quality, which has direct public health benefits. * **Provide Emergency and Disaster Response Capabilities:**  Turkey is prone to natural disasters, especially earthquakes, which can disable traditional infrastructure, including fixed EV charging points. Mobile charging vans offer critical support during such times by serving as mobile power banks for electric vehicles, temporary medical centers, shelters, or emergency communication units. Their off-grid capability makes them uniquely valuable in post-disaster scenarios where restoring power is a major challenge.  1. **Define the project outcomes and indicate the success criteria you are targeting. (Ali Aras)**   The projects outcome is the increasing the accessibility, user satisfaction, and range of the electric vehicle (EV) charging systems in Turkey. For that we need to reach the places where no charging station is established. Turkey has 3,600 kilometres long national highways, so it is not possible to have fixed charging stations in everywhere. Mobile units offer a flexible way to provide temporary service along at least four key intercity routes and in busy seasonal areas. Because they are mobile, these vans can respond to real-time demand, holiday traffic, or problems with existing systems. Success will be measured by placing vans on at least two intercity routes and two in the rural places per year and go to ease jams during at least three peak periods. We will use four vans total for the cost balancing, three will give services in urban areas with the battery capacity at 141kWh and the other two serve with 161kWh vans for rural areas.  Generation of Sustainable Energy and Reducing CO2 Emissions  Predicted electricity related reduction in CO2 calculated for using solar panels. Each mobile van will have Foldable solar panels with 30 m2area to generate energy. Vans solar panels have %20 efficiency and Turkey have average 4.7kWh/m2/day solar irradiance. We calculate daily energy production as; 4.7 x 30 x 0.20= 28.2kWh/day for 8 vans: 28.2 x 8 = 225.6 kWh/day but we need to consider our solar panel cannot be receive sunlight every moment like weather conditions, while driving or remains at shaded areas. So, we assume we collect %75 percent of it and it gives 28.2 x 0.75= 21.15kWh/day fleet total is 21.15 x 8 = 169.2kWh/day  Grid emission factor is 0.426 kg/ CO2/kWh, annually gross emissions avoided are; 169.2 x 0.426 x 365 =26,309 kg CO2 close to 26 tons CO2 for year  Battery Storage Capacity and Service Time  For our project we need batteries to storage energy for charging EVs. We aim to have enough batteries to charge our requested EV. Another aspect of this project is to shorten waiting times at EV charging points in the city. We will achieve this by give two mobile charging van services in crucial areas in Turkey. According to data from TEHAD and the Turkish Energy Market Regulatory Authority (EPDK), there were about 87,000 electric vehicles in the country by 2024. We assume that if 5% of the EV vehicles need charging on a regular day would be 87,000 x 0.05 = 4,350 vehicles/day. During crowded times like holidays or summer travels, the number of EVs in road may reach 100,000 by the following times, and with prediction about 6% of them could need quick charging in these times. Calculation 100,000 x 0.06= 6,000  For the demand distribution not, every customer fills their EV fully. They mostly do medium charge Fullment with 40kWh average because of the BMS slowing down the charging speed, for battery health.   |  |  |  |  | | --- | --- | --- | --- | | Charging Type | Energy/EV | % of Users | Avg. Energy Demand | | Daily top-up | 10 kWh | 30% | 10 x 0.3= 3 | | Medium charge (20-80%) | 40 kWh | 65% | 40 x 0.65= 26 | | Full charge | 50 kWh | 5% | 50 x 0.05=2.5 |   Weighted average is 3+26+2.5=31.5 approximately 32 kWh.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Battery | Unit Capacity(kWh) | Unit Price Tl | Unit for 60kWh | Total Price for 60kWh Tl | Unit for 100kWh | Total Price for 100kWh Tl | | Evacell 12.8V 100Ah | 1.28 | 16,000 | 47 | 752,000 | 79 | 1,264,000 | | TommaTech 25.6V 100Ah | 2.56 | 36,300 | 24 | 871,200 | 40 | 1,452,000 | | Megacell 51.2V 100Ah | 5.12 | 56,448 | 12 | 677,376 | 20 | 1,128,960 | | CTS 614V 100Ah (China, integrated) | 61.4 | 278,000 | 1 | 278,000 | 2 | 556,000 | | EVE 3.2V 280Ah (DIY) | 0.896 | 3,000 | 68 | 204,000 | 112 | 336,000 | | CTS-M141120 | 141 | 600.000-900.000 | 1 | 600.000-900.000 | 1 | 600.000-900.000 | | CTS-M161120 | 161 | 750.000-900.000 | 1 | 750.000-900.000 | 1 | 750.000-900.000 |   These was the candidate batteries for our project and their comparison table. The most logical ones are the CTS-M141120 and CTS-M161120 because they are mobile EV charger with the capacity of 141kWh and 161kWh battery. Also comes with fast charger with 120kw DC Charger. But we can use hybrid model for the 3 of 161kWhs and 5 of 141kWhs for more efficiency.  Our capacity is;  141 kWh vans nearly have: 141/32= 4.41 EVs  161 kWh vans have close to: 161/32= 5.03 EVs Average EVs served Fleet total is 4.41 x 5 + 5.03 x 3 = 37.14 EVs daily. Nearly 37 EV can be charged daily. 37 x 30 = 1,110 cars monthly. We wanted to achieve each van to have at least 4 EV capacity.  Our project covers the demand of Turkey as follows;  37/4,350 x 100 = %0.8 (Regular Demand) 37/6,000 x 100= %0.6 (Peak Demand)   |  |  |  | | --- | --- | --- | | Method | 141 kWh Van | 161 kWh Van | | Solar Only | 6.7 days | 7.6 days | | Grid 11 kWh | 12.8 hours | 14.6 days | | Grid 22 kWh | 6.4 hours | 7.3 hours | | DC 43 kWh | 3.3 hours | 3.7 hours |   Solar Energy Provides 21.15-28.2 kWh daily; in most times we need to charge our batteries from grids.  Driver Interaction and Satisfaction.  Another one of the objectives of the project is to give proper service to its customer and give them trust and satisfaction. For that our mobile app will provide customers with real-time updates on charger availability, current queues, and they can see on the map location of the mobile charging stations, and they can also want services to their location if there is no EV’s in the charger. With this, drivers can plan their travel more effectively and eliminate vagueness during travels.  To assess success, the project intends to generate 5,000 app sign-ups in the first five months, and complete 7,500 charging sessions and get 7000 good responses in the first eight months.   1. **Describe the methods, techniques and tools to be used in the R&D activities of the project within the scope of the planned workflow (Baran)**   Our R&D process includes both **theoretical research** and **practical implementation**, supported by existing studies in the field of mobile EV charging systems.  First, we will conduct an in-depth **literature review** on mobile charging technologies, battery integration, and off-grid energy systems, using studies such as Afshar et al. (2021) and Oruganti et al. (2019), which discuss the design and efficiency of solar-based mobile stations. These references will help us understand existing systems, identify gaps, and define our technical goals.  We will apply the **Design Thinking Method** to generate solutions based on user needs and environmental constraints. The technical design of our system will be created using **AutoCAD** for structural layout and **Proteus** for electronic circuit simulation. For performance validation, we will run **energy simulations using MATLAB** and **PV performance modeling via PVsyst**, especially to evaluate solar input under different weather scenarios, as emphasized in Kashani et al. (2023).  Our hardware development will be based on:   * **High-efficiency lithium-ion batteries**, selected and dimensioned according to the average charging needs of EVs (32 kWh per vehicle). * **Foldable solar panels** (with 20% efficiency) to maximize energy generation on mobile units. * **MPPT charge controllers** for maximizing solar input efficiency. * **ESP32 microcontrollers** for IoT-based communication and monitoring systems.   For the software side, we will develop a **mobile application** that allows users to track charging unit availability in real-time and request on-demand service, as described in recent smart mobility models. IoT sensors will collect and update data every 30 seconds, enhancing system reliability and driver satisfaction.  The overall **R&D workflow** will be managed using **Trello** or **Notion** for task coordination, and documentation will be maintained throughout the project for traceability. The **thermal safety and operational resistance** of the components will also be examined through basic thermal simulations and field testing.  By combining academic research with practical engineering tools, our project aims to deliver a sustainable and flexible charging solution that can support Turkey’s growing EV network while contributing to CO₂ reduction goals, as discussed in the Global EV Outlook 2023 by the IEA.   1. **Specify which of the following R&D phase(s) is/are covered in the proposed project. (İpek)**   This project is carried out with the Technical and Economic Feasibility Studies phase. This phase includes the technical feasibility of integrating solar energy into mobile stations, the infrastructure requirements, the feasibility of the project and the economic analysis to evaluate the return on investment. The project process also includes the Design Development and Verification Studies phase. This phase is the phase where the design is detailed, developed and its technical accuracy is tested. The project includes improvement of the design through simulations, analysis and tests to ensure functionality, safety and compliance with standards. |

## B.3- INNOVATIVE and ORIGINAL ASPECTS of the PROJECT

**B.3.1 (YENER,İPEK)**

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| 1. **a. Product and/or Process Innovation Aimed in the Project: (İpek)**   This study aims to provide a new generation solution that offers mobility, accessibility and energy flexibility by removing the dependency of electric vehicle charging on fixed systems. The system will be designed to be used not only for individual users but also in different scenarios such as post-disaster energy needs, access problems in rural areas and touristic areas with temporary density. In addition, thanks to its battery-supported structure, it can operate without putting a momentary load on the grid and does not require fixed infrastructure investment, making the product a flexible solution. The product also aims to make renewable energy sources more accessible and contribute to the reduction of carbon emissions with its environmentally friendly structure.  **b. Innovations in the company's existing products or processes: (İpek)**  *(Indicate the foreseen differences and advantages compared to those in the market and sector)*:  There are designs and field applications for mobile charging stations in the world. When these designs were investigated, it was stated in the literature review conducted by (Afshar et al. 2021) that the portable station developed by Volkswagen charges four electric vehicles at the same time and operates independently of the grid. While Tesla develops high-capacity mobile energy units for use in large-scale events; NIO offers mobility-oriented solutions with its mobile charging vans, which it actively uses in China. In addition, it was emphasized in the same study that mobile charging systems are classified according to their energy source, charging strategy and application purpose, and that these systems can be used as temporary energy infrastructure. In addition, the mobile system supported by solar energy developed by (Oruganti et al. 2019) has a photovoltaic capacity of 20 kWp. Thanks to its battery integration and three-phase output, it works as a charger for electric vehicles and also as an energy support infrastructure. In addition, (Kashani et al. 2023) drew attention to the applicability of photovoltaic-based wireless charging systems, especially in rural and disaster areas, but emphasized that these systems are still at the prototype level. When we look at real applications, the mobile charging station we plan to develop will be able to take its place in the market in terms of having a portable and modular structure integrated with solar energy, which can operate independently of the grid. It offers a strategic complement to existing systems thanks to its capacity to provide energy in times of disaster, its ability to reach rural areas and its flexible positioning against seasonal densities. Of course, the system has some limitations: Energy production depending on the duration of sunlight, the service period depending on the battery capacity and the initial investment cost. However, these limitations can be greatly reduced with battery capacity optimization and smart management systems that provide energy efficiency. Finally, the fact that there is no clear legislation specific to mobile energy systems in Türkiye yet makes this project a pioneering and guiding initiative in this field.  References:  [2] Afshar, S., Macedo, P., Mohamed, F., & Disfani, V. (2021). *Mobile charging stations for electric vehicles—A review*. Renewable and Sustainable Energy Reviews, 152, 111654. <https://doi.org/10.1016/j.rser.2021.111654>  [3] Oruganti, K. S. P., Vaithilingam, C. A., Rajendran, G., & A., R. (2019). *Design and sizing of mobile solar photovoltaic power plant to support rapid charging for electric vehicles*. Energies, 12(18), 3579. <https://doi.org/10.3390/en12183579>  [4] Kashani, S. A., Soleimani, A., Khosravi, A., & Mirsalim, M. (2023). *State-of-the-art research on wireless charging of electric vehicles using solar energy*. Energies, 16(1), 282. <https://doi.org/10.3390/en16010282>   1. **Explain the original contributions of the company in the innovation activities of the project mentioned above. (Yener)**   Our company's contributions to the mobile electric vehicle charging station are unique, strategic, and multi-dimensional. First, our strong investor network will ensure the financial sustainability of the project. The "Smart Energy Management" software we are currently developing can also be directly integrated into this project. Our R&D team has five years of experience in electric mobility and renewable energy. Thanks to our active collaborations with leading technical universities in Turkey, we are capable of offering advanced technology solutions.  We also have partnerships in smart city projects with three major municipalities. In addition, our strategic cooperation with one of Turkey's largest electric vehicle charging network operators will allow us to deploy mobile stations quickly and improve user experience. Our current production facility can reduce prototype development time by 30% through its assembly line. We also have service points in seven provinces across Turkey, which can manage maintenance and operational support efficiently. We can supply 60% of our electronic components from local suppliers. This lowers supply chain risks and supports the project's goal of localization.  In terms of marketing, we have a digital platform that directly reaches over 50,000 electric vehicle users. We also have a wide data pool about users’ driving and charging habits. This will help us introduce the solution quickly and place it in the right locations. We see this project as a strategic part of our company’s 2030 carbon-neutral goal. By ensuring that our systems are compatible with second-life battery technologies, we also contribute to the circular economy.  Most importantly, through our existing collaboration with AFAD, we will be able to deploy mobile charging stations quickly during disaster scenarios. In this way, we aim to provide a solution that also brings social benefit. |

# SECTION C – PROJECT PLAN and COMPANY INFRASTRUCTURE

**C.1- WORK PLAN**

## C.1.1- WORK-TIME BAR CHART

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| **Project Title : Mobile Charging Stations for Electric Vehicle (Yener,İpek)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Project Phases (Responsible Personnel)** | **Kick-off Date** | **Due Date** | **Duration (Months)** | **2025/1** | | **2025/2** | | | | | | **2026/1** | | | | | | | | **2026/2** | | | | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | | 8 | | 9 | 10 | |
| WP-1 Market Research and Competition Analysis (Aras) | **01.05.2025** | **15.07.2026** | **7** | **X** | **X** | **X** | **X** |  |  |  | **X** |  | **X** |  |  | **X** | | |  | **X** | |  | |  |  | |
| WP-1.1 Electric Vehicle User Surveys and Interviews | **15.05.2025** | **15.10.2026** | **5** | **X** |  | **X** |  | **X** |  |  |  | **X** |  |  |  | |  | |  |  | |  | |  | **X** | |
| WP-2 Design of Solar Panel & Battery (Electrical Engineering) (Yağız) | **1.06.2025** | **1.03.2026** | **8** |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |  |  | |  | |  |  | |  | |  |  | |
| WP-2.1 System Integration  (Yağız) | **01.09.2025** | **1.01.2026** | **4** |  |  |  |  | **X** | **X** | **X** | **X** |  |  |  |  | |  |  | |  |  | |  | |  | |
| WP-3 Design of Mobile System (Yağız) | **1.06.2025** | **1.01.2026** | **7** |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |  |  |  |  | | |  |  | |  | |  |  | |
| WP-4 Vehicle Integration Design (Mechanical Engineer) | **1.06.2025** | **1.02.2026** | **2** |  | **X** | **X** |  | **X** | **X** | **X** |  | **X** | **X** |  |  |  | | |  |  |  | | |  | |  |
| WP-4.1 Structural Analysis and Optimization | **15.08.2025** | **15.04.2026** | **6** |  |  |  | **X** | **X** | X | **X** |  |  | **X** | **X** |  |  | | |  |  |  | | |  | |  |
| WP-4.2 Integration System Design and Testing | **15.09.2025** | **15.04.2026** | **6** |  |  |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** |  |  | | |  |  |  | | |  | |  |
| WP 5- Control System & Software Dev. (Orhan) | **01.09.2025** | **15.11.2025** | **2.5** |  |  |  |  | **X** | **X** | **X** |  |  |  |  |  |  | | |  |  |  | | |  | |  |
| WP 6- Design Testing & Validation (Baran) | **15.11.2025** | **01.01.2026** | **3** |  |  |  |  |  |  | **X** | **X** | **X** |  |  |  |  | | |  |  |  | | |  | |  |
| WP-6.1 Performance Testing | **01.01.2026** | **01.02.2026** | **1** |  |  |  |  |  |  |  |  | **X** | **X** |  |  |  | | |  |  |  | | |  | |  |
| WP-6.2 User Acceptance Testing(Yener) | **01.01.2026** | **01.06.2026** | **1** |  |  |  |  |  |  |  |  | **X** | **X** | **X** | **X** | **X** | | | **X** |  |  | | |  | |  |
| WP 7- Marketing & Deployment Plan (İpek) | **01.04.2026** | **01.10.2026** | **5** |  |  |  |  |  |  |  |  |  |  |  | **X** | **X** | | |  | **X** | **X** | | |  | | **X** |
| WP-7.1 Business Model Development (Yener) | **01.01.2026** | **01.06.2026** | **1** |  |  |  |  |  |  |  |  | **X** | **X** | **X** | **X** | **X** | | | **X** |  |  | | |  | |  |
| WP-7.2 Pilot Launch Planning(Yener) | **01.01.2026** | **01.06.2026** | **1** |  |  |  |  |  |  |  |  | **X** | **X** | **X** | **X** | **X** | | | **X** |  |  | | |  | |  |
| WP-8 Final Project Documentation | **15.05.2026** | **15.06.2026** | **1** |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  |  | **X** | | | **X** | |  |

### WORK PACKAGE DESCRIPTION FORM (Can be used as many as you need!)

**C.1.2**

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-1 Market Research and Competition Analysis (Aras) | |
| **Starting-Finishing Dates of WP and Duration** | | 01.05.2025-15.07.2026 7 moths |
| **List the activities of the work package:**   * Turkey’s demand and EV charge station analysis. Investigate the demand and its behavior look for the patterns and locations. And locate the location of fixed stations and their workload. * Sectoral examination, prices, devices, locations. Gather the basic knowledge that we will need later for our project. Supplier's components system * Market research and cost analysis for similar services. Studying the costs and the market for creation of outcome material and making assumptions for further spendings. * Investigating law and restrictions and grid permissions.   Checking the regulations, licenses warranties, and financial standards. * Identify the market gaps, unserved areas.   By that we can fore see the demands that are needed but not met some of them could have urgency to that we will cover.   * Comparison of the device's capacities and performance from market and ours.   We want to provide proper services and more advanced technology different from the market. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**  Data collection from the current similar services in the market. Supplier connections formed.   * EV frequency in the areas. * Possible solar power generation calculation. * Costs of the equipment. * Accessibility of the services and its comparison with the competitors. * Charging capacity and speed analysis. * Renewable energy comparison with competitors. | | |
| **List the experiments, tests and analysis in the work package:**   * Seasonality analysis of the demand. Detection of the variability among the time and location. * Pricing analysis customer and project sensitivity. Evaluating the expected cost-effective price with the prediction of the customer will. * World-wide analysis for better structure.   Looking for the alternatives or implementable systems for improving the project   * Service model analysis to compare our project to other chargers fixed or mobile. * Renewable energy used charger rate among customers analysis.   Average charging amount variety through competitors | | |
| **Describe the outcomes and performance criteria of the work package:**   * With the proper market research starting the project well prepared and advance plan for minimizing the risks and showing better performance.   This will be gain by good data collection and suitable analysis with the accurate estimates.   * Our competitors have not much of the renewable energy, we will generate partial of our capacity from solar energy. * Analyzing at least 5 EV chargers with collecting data. * Documentation of at least 5 spots for unmet demand areas with no competitor or by insufficient competitor. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  Market research for equipment and technical analysis is related with WP-2 (Design of Solar Panel & Battery System) work package, and it will shape the project.  We gather the data of the market, and they will be used in WP 7- Marketing & Deployment Plan Work Package. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-1.1 Electric Vehicle User Surveys and Interviews (Aras) | |
| **Starting-Finishing Dates of WP and Duration** | | 15.05.2025-15.10.2026 5 month |
| **List the activities of the work package:**   * Designing user survey.   For gathering the expectation and their desires from our services in future. Also, we gather intel for the charging routines and preference.   * Distribution of the surveys. Published in digital platforms and sites, and high demand areas as physically. * Make Interviews with EV users.   A more direct approach for more clarified communication and more specific information transfer leads to more insight for our project.   * Comparison of the device's capacities and performance from market and ours.   We want to provide proper services and more advanced technology different from the market. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Datamining techniques for clarifying and clustering to groups to see the user behaviors clearly. * We will analyse the charging frequency and duration locations and the acceptable prices from EV users. * Daily travel distances and range problem discussion via interviews. | | |
| **List the experiments, tests and analysis in the work package:**   * Statistical analysis of surveys using Minitab. * Data Clustering and analysis with MATLAB. * Interview study and implementations on project. | | |
| **Describe the outcomes and performance criteria of the work package:**   * We aim to gather at least 120 surveys. 20 will be trained and the rest will be used for clustering. * 10-15 interviews will be good data for variety and for important adding. * Create EV user's profiles for regions. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * The results we get from this WP will be used to create suitable systems in WP-2 * The interviews and surveys provide us with the current market state also, the needs in the market (WP-1.2 Competition Analysis & Market Gap Identification) which can be fulfilled by our project. * The data we collected will be used in WP-7(Marketing and Deployment Plan) when the deployment phase starts. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-2 Design of Solar Panel & Battery (Yağız) | |
| **Starting-Finishing Dates of WP and Duration** | | 1.06.2025-1.03.2026 / 8 month |
| **List the activities of the work package:**   * Calculating the technical requirements of the solar panel and battery to be used in the project and selecting the battery and solar panel by looking at these calculations. * Calculating the capacity of the battery and selecting the one suitable for the project. * Determining the daily energy output that can be generated and selecting the appropriate solar panel size that will provide the energy that can provide this output. * Drawing the electrical connection diagrams of the batteries and solar panel. * Developing solar-powered charging scenarios and battery charging plans. * The choice of an MPPT charge controller and the strategy for integrating it into the system. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Review of the literatur: Conducting a survey on solar EV charging systems to follow best practices and technological developments. * Physical arrangement and AutoCAD integration design: Arrangement and design of solar panels and batteries, precise mechanical calculations. * MATLAB and PVsyst simulation studies: Measuring and modeling and simulating the performance of the system under different environmental conditions. * Design and simulation of circuits: Designing and simulating electrical circuits to calculate energy efficiency and measuring the reliability of the system.   Parameters   * Solar radiation data * Panel efficiency: The efficiency of selected solar panels will be observed. * Battery capacity: The battery capacity will be determined to ensure sufficient energy storage. * Daily energy production: Daily energy output from the solar panels will be calculated. * Charge-discharge cycle life: The battery's charge-discharge cycle life will be assessed. | | |
| **List the experiments, tests and analysis in the work package:**   * Battery charge/discharge efficiency and battery life test * Testing the performance of solar panels in different weather conditions. * MPPT controller efficiency measurements * Simulations and tests for problems such as overheating * Energy production and storage analysis of the produced energy | | |
| **Describe the outcomes and performance criteria of the work package:**  System analysis will be carried out by considering key parameters such as panel efficiency and battery capacity. The system will optimize its daily energy generation and storage capacity. Numerous field tests and simulations will be carried out during the design phase. A minimum of 20 kWh of solar energy production per day and the capacity to charge at least four vehicles with the system are the performance requirements for the battery and panels. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * WP-3 (Design of Mobile System) - Provides technical energy requirements for physical system design. * WP-4 (Vehicle Integration Design) - Provides input for battery weight and panel layout. * WP-5 (Control & Software Dev.) - Determines the requirements for energy management and monitoring the battery status. * WP-6 (Design Testing & Validation) - Creates infrastructure for performance tests. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-2.1 System Integration (Yağız) | |
| **Starting-Finishing Dates of WP and Duration** | | 01.09.2025-01.01.202 / 4 month |
| **List the activities of the work package:**   * Physical and electrical installation and integration of devices and power providers such as solar panels, batteries, MPPT charge controllers and DC fast chargers. * Cabling of system components, determination of component placement and assembly details. * Integration studies for energy flow and security scenarios and creation of a security plan. * Pre-assembly of the system on the platform of the vehicle to be used. * Installation of monitoring sensors and communication modules in the vehicle used. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * For system design, layout plans will be created using the AutoCAD program. * Electrical circuit switching simulations will be created using the Proteus program. * A prototype will be assembled for testing on the charger car that we use. * Analysis and examination of parameters such as voltage level, energy loss, connection times, system response time, cable temperatures, data transmission speed (IoT) will be performed. | | |
| **List the experiments, tests and analysis in the work package:**   * To test the operability of the entire system, the vehicle will be charged outside and analyses will be conducted. * The energy distribution between the panel, battery and MPPT and the efficiency of this distribution will be measured. * Thermal tests will be conducted to determine heat accumulation and cable life. * Data latency and accuracy tests will be conducted for IoT data tracking. | | |
| **Describe the outcomes and performance criteria of the work package:**    The main goal is to obtain a fully integrated and portable system that is fully compatible with the system. The system completes the required energy consumption without any problems. It is aimed to keep the energy loss below 10% and the IoT verification update to be a maximum of 30 seconds. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * WP-2’nin (Solar Panel & Battery Design) - System components will be integrated based on the technical outputs derived from this work package. * WP-4 (Vehicle Integration Design) - Compatibility of the physical assembly will be ensured. * WP-5 (Control System & Software Development) -Outputs from sensor data and energy flow tests will provide reference data. * WP-6 (Design Testing & Validation) -An integrated system will be achieved at this stage. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-3 Design of Mobile System (Yağız) | |
| **Starting-Finishing Dates of WP and Duration** | | 1.06.2025-01.01.2026 / 7 month |
| **List the activities of the work package:**   * Design of the mobile system in terms of structural and functional aspects. * Vehicle-mounted layout design for positioning solar panels, batteries, and charging units on the mobile vehicle. * Planning and designing the electrical hardware and wiring infrastructure. * Determination of the mechanical placement strategy for foldable solar panels on the mobile vehicle. * Design and layout planning of user interaction points such as screens and connection points to be found in the mobile vehicle. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * 3D design and assembly layout modeling using 3D drawing programs such as AutoCAD and SolidWorks. * Evaluations and studies will be conducted on issues such as the efficiency of the area to be used, cable lengths and user ergonomics. * Simulations and circuit layout design using the Proteus program.   **Parameters**   * System volume: The overall volume of the charging system will be measured. * Total weight: The total weight of the system will be evaluated to ensure it is manageable for mobility and deployment. * Balance condition: The system's balance will be evaluated to ensure stability and prevent tipping during operation or transportation. * Ease of access: Accessibility for both users and maintenance staff will be reviewed to enhance usability and streamline service processes. * Service durations: The duration needed for maintenance and repairs will be analyzed to reduce downtime and improve the system's overall reliability. | | |
| **List the experiments, tests and analysis in the work package:**   * Analysis of assembly compatibility will be conducted using a mock-up or digital prototype of the portable system. * Load distribution and center of gravity calculations and tests will be performed. * Testing of the foldable solar panel mechanism will be carried out in an outdoor environment. * Tests will be conducted to evaluate the durability and safety of components placed inside and outside the vehicle against vibrations. | | |
| **Describe the outcomes and performance criteria of the work package:**    The final design of an optimized mobile system incorporating all components will be achieved. It is critical that the solar panel surface is sufficiently large and has a safely foldable structure. The total volume of all hardware must be determined, and it should be securely and accessibly integrated into a standard mobile vehicle. The resulting design outputs must be compatible with WP-4 Vehicle Integration Design | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * The physical integration of the battery and solar panel system developed in WP-2 will be achieved through the design obtained here. * In the WP-4 (Vehicle Integration Design) process, the design obtained here will be utilized and implemented. * For WP-2.1 (System Integration), it will provide a layout plan and create an assembly guide for physical integration. * For WP-6 (Testing & Validation), the foundation of the physical system on which functional tests will be conducted will be established here. | | |

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| **Project Title** | Vehicle Integration Design | |
| **Work Package No**  **and Title** | WP-4 Vehicle Integration Design | |
| **Starting-Finishing Dates of WP and Duration** | | 1.05.2025 – 1.03.2026 |
| The purpose of this work package is to plan and execute the mechanical integration of the solar-powered mobile charging system into a selected electric vehicle (EV) platform. Since the entire charging infrastructure (solar panels, batteries, fast DC chargers, and control electronics) will be housed inside a vehicle, it is critical to ensure the system fits structurally, distributes weight efficiently, and performs safely under real road conditions.  The main goal is to verify that the charging system can be physically mounted on a real vehicle without compromising driving safety or the vehicle’s structure. We will evaluate mechanical compatibility, optimize the use of space, and ensure that all components are accessible for maintenance and operation.  **List the activities of the work package:**   * Design the structural interface between the charging system and the selected electric vehicle (van or similar platform). * Conduct fitment and clearance analysis to determine suitable mounting areas for solar panels and batteries. * Analyze weight distribution across the vehicle to avoid performance or safety issues during driving. * Develop a structural mounting plan that accounts for modularity and ease of assembly/disassembly. * Ensure that the installed system does not interfere with vehicle ventilation, driver comfort, or safety regulations. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Use CAD software tools (such as AutoCAD and SolidWorks) for 3D modeling of the full assembly. * Analyze center of gravity (CG) and axle loads using vehicle dynamics principles. * Measure stress points and vibrational loads using reference data from EV chassis behavior. * **Key parameters** include: total weight (kg), CG shift (cm), structural clearance (cm), and mechanical stability under motion. | | |
| **List the experiments, tests and analysis in the work package:**  **Prototype Fitment and Clearance Validation**  A full-scale prototype of the charging system will be assembled and placed into the selected electric vehicle. This test aims to confirm whether all components physically fit without interference, overlapping, or compromising safety zones (e.g., driver compartment, ventilation, access panels).  **Road Performance and Stability Test**  The integrated vehicle will undergo a 50 km road test including turns, slopes, and uneven surfaces. The goal is to evaluate how the added system components affect vehicle balance, suspension response, and ride safety under normal and dynamic driving conditions.  **Emergency Deployment Simulation**  A timed deployment exercise will be performed to simulate how quickly the system can be activated in a post-disaster scenario (e.g., blackout, remote location). The process will be observed to identify mechanical bottlenecks or user friction points.  **Accessibility and Maintenance Analysis**  This test will evaluate how easily technicians or users can access the battery units, cabling, and charging ports for maintenance or upgrades. It will assess clearance distances, tool access, and ease of part replacement under normal field conditions. | | |
| **Describe the outcomes and performance criteria of the work package:**   * The charging system must be securely mounted and show no signs of instability under normal driving conditions. * The final integration must pass structural stress tests and meet all safety margins. * Mechanical compatibility with at least one EV model must be validated for further development. * The mounting strategy must allow for easy servicing and future upgrades of components. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  **Design Foundation for WP-4.1 and WP-4.2 Structural and Integration Testing**  The mechanical design completed in WP-4 forms the physical foundation for subsequent structural analysis (WP-4.1) and system-level integration (WP-4.2). By determining how each component is mounted, secured, and spatially distributed within the vehicle, WP-4 directly impacts how future testing will be performed under both simulated and real-world conditions.  **Usability and Ergonomics Input for WP-6.2 User Acceptance Testing**  The vehicle integration decisions made in WP-4 will affect how users interact with the system physically (e.g., cable access, charger reach, panel deployment). These design choices will influence the outcomes of WP-6.2, where user testing evaluates whether the system feels intuitive, accessible, and safe during real operation.  **Support for WP-7 in System Deployment Strategy**  A well-executed integration in WP-4 ensures that the final product can be reproduced in other vehicles with minimal redesign. This outcome is essential for WP-7, where deployment and scalability will be planned. The physical design established in WP-4 helps define the standard model to be marketed and rolled out. | | |

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| **Project Title** | Structural Analysis and Optimization | |
| **Work Package No**  **and Title** | WP-4.1 Structural Analysis and Optimization | |
| **Starting-Finishing Dates of WP and Duration** | | 15.08.2025 – 15.09.2026 |
| This work package focuses on the structural integrity and weight optimization of the mobile charging station components when mounted on a vehicle. As the system includes heavy batteries and solar panels, ensuring a balanced and vibration-resistant setup is crucial. The goal is to minimize the system’s weight without compromising its mechanical strength, while maintaining long-term stability and safety during mobile operation.  We aim to select optimal materials and designs that will endure the stresses of road travel, vibrations, and external impacts while staying cost-efficient.  **List the activities of the work package:**   * Conduct stress analysis on all mechanical joints and load-bearing components * Select and test structural materials based on performance and cost * Perform FEA (Finite Element Analysis) simulations to identify weak points * Redesign overengineered or vulnerable components to achieve weight reduction | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Finite Element Analysis using tools such as ANSYS or SolidWorks Simulation * Vibration and fatigue simulation to reflect road conditions and long-term use * Comparison of aluminum alloys, composites, and other lightweight materials * **Evaluation parameters**: maximum stress (MPa), deformation (mm), vibration frequency (Hz), and safety factor | | |
| **List the experiments, tests and analysis in the work package:**  **Finite Element Simulation for Load Distribution**  Structural stress simulations using FEA tools will be performed on mounting points and support frames. These simulations will replicate both static loads (vehicle parked) and dynamic forces (while driving), focusing on deformation zones and failure points.  **Material Fatigue and Vibration Testing**  Material samples (aluminum alloys, composite sheets, etc.) will be mounted on a vibrating platform to replicate long-term exposure to road conditions. The goal is to determine which material maintains integrity over extended periods without cracks or loosening.  **Structural Mount Strength Test**  Brackets and joints will be physically tested with increasing loads to determine their yield points. Stress-strain curves will be recorded to compare theoretical safety factors with real-world performance.  **Thermal Stress Evaluation of Load-Bearing Elements**  To account for environmental variation, structural materials and joints will be exposed to controlled heat cycles simulating summer temperatures and electrical heat loads. The aim is to measure expansion, warping, and strength degradation. | | |
| **Describe the outcomes and performance criteria of the work package:**   * All mounting points and structural components must pass safety stress limits with a factor of at least 1.5 * System weight is reduced by at least 10% compared to initial estimates * Final report includes structural drawings, material bill of quantities, and optimization notes for WP-4.2 integration | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  **Structural Assurance for WP-4.2 System Integration**  Validated materials and load paths are essential for safely assembling the system in WP-4.2.  **Performance Reliability for WP-6 Functional Testing**  The structural results from WP-4.1 help ensure the system remains intact during intensive use and environmental stress scenarios in WP-6.  **User-Oriented Feedback for WP-6.2 Acceptance Criteria**  A lightweight, secure, and stable system improves user experience. Testers in WP-6.2 will evaluate physical stability and safety, both of which rely on the outputs from this work package. | | |

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| **Project Title** | Integration System Design and Testing | |
| **Work Package No /**  **and Title** | WP-4.2 Integration System Design and Testing | |
| **Starting-Finishing Dates and Duration** | | 15.09.2025 – 15.09.2026 |
| This WP involves the physical assembly of the full mobile charging system into a selected vehicle and the execution of real-world functionality tests. The system includes solar panels, battery storage units, MPPT charge controllers, and charging ports, all of which will be configured and validated through integration testing.  It will also verify that the system operates reliably under different lighting, road, and user interaction conditions. This work package is a critical step toward delivering a field-ready prototype.  **List the activities of the work package:**   * Perform full assembly of system components on the test vehicle * Integrate electrical and mechanical subsystems with the vehicle platform * Install and calibrate energy monitoring sensors and communication units * Conduct initial test charging sessions in varied daylight and usage scenarios * Observe and document ease-of-use and field readiness | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Layout and installation plan executed via AutoCAD and Proteus simulation * Functional tests to measure voltage stability, energy efficiency, and battery interaction * Parameters: voltage drop (%), setup time (min), energy transfer efficiency (%), IoT update delay (sec), user interaction accuracy (%) | | |
| **List the experiments, tests and analysis in the work package:**  **Full-System Charging Test in Real Conditions**  The fully integrated system will be used to charge an actual electric vehicle under typical daylight and ambient temperature conditions. The aim is to verify whether the system operates reliably with both battery-stored and solar-generated energy sources.  **Solar Panel Deployment and Recovery Time Test**  The foldable solar panel mechanism will be manually deployed and retracted multiple times to measure deployment speed and mechanical ease. Conditions such as partial shading or uneven terrain will be included to reflect real-world usage.  **System Connectivity and Power Flow Analysis**  Power input/output pathways will be monitored using sensors to track voltage drops, current flow, and power losses between solar panels, batteries, and the EV charger. Any inconsistencies will be recorded and analyzed to improve energy efficiency.  **Emergency Setup Drill**  A field team will simulate a rapid deployment scenario where the vehicle must be parked and charging must begin within 15 minutes. Timers, setup procedures, and user interface response times will be evaluated to measure operational readiness.  **User Interface Observation and Feedback Session**  A group of test participants will be asked to interact with the integrated system (including mobile app and physical interface). Observers will record usability issues, and participants will provide feedback regarding clarity, intuitiveness, and perceived reliability. | | |
| **Describe the outcomes and performance criteria of the work package:**   * System must demonstrate full functionality under normal daylight operation and partial shade * Charging capability must meet or exceed 32 kWh/session performance standards * Deployment time must remain under 15 minutes in all tests * 90% or more of user testers should report that the system is easy to operate and understand | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  **Functional Platform for WP-5 Control System Implementation**  All hardware connections, sensors, and power circuits established in WP-4.2 provide the environment where WP-5 software and routing logic will be tested.  **User-Oriented Feedback for WP-6.2 Acceptance Criteria**  The prototype system prepared here will be directly used in WP-6.2 to collect real-world user feedback. System layout, stability, and physical interface all contribute to the acceptance score.  **Support for WP-7 in Marketing and Deployment Readiness**  A successfully integrated and tested system allows WP-7 to confidently prepare promotional content and deployment strategies. Visual materials, setup guides, and performance figures will come from this WP’s final results. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-5 **Control System & Software Development**  (Orhan) | |
| **Starting-Finishing Dates of WP and Duration** | | 01.09.2025 - 15.11.2025 |
| **List the activities of the work package:**  **Development of Routing, Communication, and Data Handling Systems**  The development process begins with implementing shortest path algorithms to enable the mobile charging station to determine the most efficient routes for deployment. Algorithms like A\* or Bellman-Ford will be adapted to real-time routing conditions, helping the unit locate and reach EVs in need of charging quickly and reliably. This routing logic is crucial for mobility and responsiveness of the system.  **Low-Level Code Integration for System Component Control**  Low-level code integration is another vital task. These scripts, written in languages like C, C++, or Rust, are responsible for the internal communication between system components such as MPPTs (Maximum Power Point Trackers), batteries, solar panels, and the EV charging unit. This layer ensures that all hardware elements operate in sync.  **Cloud-Based Data Storage for System Monitoring and Logging**  Additionally, a cloud-based data infrastructure will be developed and integrated. Using services like AWS, the system will store operational data related to battery health, energy usage, and performance logs. This long-term data storage is critical for monitoring, maintenance, and future improvements to the charging system. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**  **Techniques and Tools for Routing, Control, and Cloud Communication**  To determine optimal routing, we will use graph-based algorithms such as A\* or Bellman-Ford, which are well-suited for finding the most efficient path in dynamic environments. These algorithms will be tested within the system to evaluate their performance in real-world navigation.  Low-level system control will be managed using code developed in efficient languages like C, C++, or Rust. These are chosen for their performance and direct access to hardware, allowing precise control over all components of the charging station.  For cloud data management, AWS will be used to store raw data retrieved from the system in real time. This setup will ensure robust, scalable, and secure data handling.  **Key Parameters for System Performance Evaluation**  The following parameters will be examined during these processes:   * Accuracy and response time of pathfinding algorithms * Overall system efficiency and reliability * Quality and granularity of energy tracking data * Battery health indicators and lifecycle data * Latency in data transmission between components * Success rate of data uploads to the cloud * Communication stability across all hardware units | | |
| **List the experiments, tests and analysis in the work package:**  **Testing Route Accuracy and Navigation Performance**  The selected routing algorithm will be tested in simulated environments to ensure the charging station can find and follow the shortest route without errors. It is essential that the system performs this function without delay or deviation to be practical in mobile deployment.  **Verification of Component Communication and Functionality**  Unit testing and component-level diagnostics will be carried out to identify and correct any faulty communication between internal system parts. This includes verifying that all sensors, controllers, and actuators are functioning and sending/receiving data correctly.  **System Monitoring and Data Tracking Simulation**  The entire system will also undergo synthetic application testing to evaluate how well it monitors its own status. The goal is to ensure that data on performance, energy levels, and location are correctly recorded and transmitted to the cloud for logging and long-term tracking. | | |
| **Describe the outcomes and performance criteria of the work package:**  The routing algorithm must consistently calculate the shortest route with an accuracy of **at least 95%**, and the system should reach its assigned target location within a **±10% margin** of the estimated travel time. Route recalculation under dynamic conditions (e.g., blocked paths) should respond in under **2 seconds** to ensure real-time usability.  The control system software must operate with **less than 1% critical error rate** during charging, monitoring, and routing tasks. All low-level communication between components must achieve a **99.5%+ success rate** in message delivery, verified through repeated simulation and field testing.  Regarding data handling, the system should successfully log at least **98% of sensor and operational data** into the AWS cloud storage without loss. Data transmission latency should not exceed **500 milliseconds** in typical operating environments, and storage uptime must be maintained at **99.9%**, in accordance with industry cloud standards.  Battery health tracking and energy logging must align with expected trends, with no more than a **±5% deviation** from actual energy usage based on controlled field tests. This will ensure accurate system diagnostics and long-term performance sustainability. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:** Connection to WP-2 for Component and Design Validation WP-6 tests the battery and solar panel components designed in WP-2 to ensure they meet performance expectations and operate reliably under real-world conditions. Integration with WP-2.1 for Communication and System Cohesion The system-wide communication structure and integration logic established in WP-2.1 will be validated in WP-6 to confirm that all components interact as intended. Verification of WP-3 Outputs for Usability and Design The usability and mechanical design elements from WP-3 are tested in WP-6 to ensure that they function properly and are user-friendly when integrated into the complete system. Testing of WP-4 Mobile Application Integration The connection and synchronization between the mobile application and physical system developed in WP-4 will be evaluated for performance, stability, and responsiveness. Validation of WP-4.2 Component Communication and Data Flow The communication reliability and data processing mechanisms developed in WP-4.2 will be stress-tested in WP-6 to assess system stability and identify any performance bottlenecks. Evaluation of WP-5 Code and Feature Implementation All software functions and control features developed in WP-5 will be tested in WP-6 to confirm correct integration and system-wide functionality. Baseline Testing for WP-6.1 Performance Optimization The initial testing results obtained in WP-6 will provide a reference point for deeper performance analysis and optimization carried out in WP-6.1. User-Oriented Feedback for WP-6.2 Acceptance Criteria WP-6 test outcomes will inform WP-6.2 by providing data on system usability and functionality, which will help ensure the system aligns with user needs during acceptance testing. Support for WP-7 in Marketing and Deployment Readiness The validated system performance and reliability demonstrated in WP-6 will supply the essential metrics and confidence needed for deployment planning and marketing strategies in WP-7. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-6 **Design Testing & Validation**  (Orhan) | |
| **Starting-Finishing Dates of WP and Duration** | | 15.11.2025 - 01.01.2026 |
| **List the activities of the work package:**  **System Design Testing**  The first activity involves checking whether the system design aligns with the intended purpose. This includes verifying electrical schematics, mechanical layouts, and logical system flow to ensure the designs are practical, efficient, and compliant with industry standards.  **Implemented Code and Feature Testing**  The software and control algorithms implemented in earlier stages are tested to ensure that all features perform correctly under expected conditions. This includes evaluating functional accuracy, response speed, and error handling.  **Physical System and Components Testing**  The mechanical and electrical components such as chassis, solar panels, batteries, and wiring are tested for durability, strength, and safety. The goal is to verify that all parts of the system withstand normal operational stress and environmental conditions.  **Component Integration Testing**  Tests are conducted to check if all the different system components—including hardware, software, and electrical systems—are successfully integrated. This ensures there are no communication failures or mismatches between connected subsystems.  **Test Result Analysis**  Data collected during all tests are carefully analyzed to identify patterns, validate expected performance, and spot potential issues. This analysis will help inform further development or optimization work. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**  To simulate high usage conditions, load testing tools will be used to replicate multiple EVs charging simultaneously. These simulations will help evaluate the system’s stability under peak demand. Real-time monitoring systems will collect operational data from all key components during testing.  Energy efficiency tests will measure the energy consumed by the system versus the energy delivered to vehicles. Battery health will be monitored continuously through charge/discharge cycle tracking to detect capacity loss or degradation trends.  The mobile application will undergo stress testing by simulating high numbers of concurrent users to assess latency, response time, and reliability. All test data will be logged and analyzed to detect any weaknesses or performance bottlenecks in the system. Parameters to Be Examined  * **Charging efficiency and session duration**, * **Battery capacity retention and overall health**, * **System uptime and failure rate under stress**, * **Mobile app response time under high user load**, * **Energy consumption versus energy delivered**, * **System stability and performance consistency during continuous use**. | | |
| **List the experiments, tests and analysis in the work package:**  **Battery Performance Test**  Charge/discharge cycle tests will be carried out to check how the batteries perform in real-life usage and how much energy degradation occurs over time.  **Solar Efficiency Test**  Solar panels will be monitored under different weather and sunlight conditions to assess whether they consistently produce the expected daily energy, aiming for a minimum of 21 kWh/day per van.  **Mechanical Load and Vibration Test**  The structural frame, mounts, and internal components will be tested for mechanical reliability when subjected to motion, road bumps, and long-distance travel vibrations.  **Software/System Integration Test**  Hardware and software modules will be run together to ensure correct interactions—especially between the solar input, batteries, EV chargers, and routing software.  **Mobile App Usability and Stress Test**  The mobile application will be stress-tested under simulated high traffic to evaluate responsiveness, stability, and error handling in real-time.  **Thermal Management Analysis**  Internal system temperatures will be logged during high-power charging to verify whether the cooling and ventilation designs prevent overheating.  **Charging Session Analysis**  Each charging session will be monitored in terms of energy delivered, session duration, and system stability, to ensure it meets the average expected performance (~32 kWh/session in ~90 minutes). | | |
| **Describe the outcomes and performance criteria of the work package:**  **Expected System Functionality with Measurable Metrics**  The system is expected to operate continuously with minimal error, meeting all its design requirements. Specifically, solar panels must generate a minimum of **21 kWh/day per van**, with consistency across various weather conditions.  Each EV charging session should take **no longer than 90 minutes**, with an average energy delivery of approximately **32 kWh**.  The mobile app should maintain a **response time of less than 1 second** and complete transactions without crashes in **at least 99%** of test cases.    Structurally, the system must pass all mechanical and load tests with **no major component failures**. During testing, communication between components must maintain a **99.5% success rate**, and all logged data must have a **data retention rate of 98% or more**, ensuring no significant packet loss or missing logs. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  **Connection with WP-2**  Battery and solar panel components designed in WP-2 will be tested and validated in WP-6 to confirm that theoretical outputs align with real-world performance.  **Connection with WP-2.1**  The system-level communication and integration work conducted in WP-2.1 will be further validated through component compatibility and inter-system data flow analysis in WP-6.  **Connection with WP-3**  Design decisions from WP-3, especially related to usability and user-facing elements, will be tested in WP-6 to verify practicality and performance.  **Connection with WP-4**  The integration between the mobile application and physical charging station will be tested here, ensuring seamless interaction and user experience.  **Connection with WP-4.2**  The communication quality and performance of all app and hardware interactions developed in WP-4.2 will be stress-tested, and the data from those tests will be analyzed for deeper system improvements.  **Connection with WP-5**  All codes and features developed in WP-5 will undergo functional and performance testing here, with results used for refining system behavior and stability.  **Connection with WP-6.1**  The base data from WP-6 testing will be essential for deeper performance benchmarking and system tuning in WP-6.1.  **Connection with WP-6.2**  User testing outcomes in WP-6 will guide interface and feature refinements in WP-6.2, helping align the final product with user expectations.  **Connection with WP-7**  The validated outputs and test data from WP-6 will inform deployment and marketing decisions in WP-7, ensuring reliable performance metrics are available to support rollout strategies. | | |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | |
| **Work Package No**  **and Title** | WP-6.1 **Performance Testing**  (Orhan) | |
| **Starting-Finishing Dates of WP and Duration** | |  |
| **List the activities of the work package:**  **Measuring system performance under various operational conditions**  This includes evaluating how the entire system behaves when it is used in different scenarios, such as different weather, times of day, or locations.  **Testing charging time and energy efficiency of the system**  We will test how long it takes to charge electric vehicles and how much energy is used during each session to evaluate overall efficiency.  **Analyzing battery discharge and recharge cycles**  Battery behavior will be tracked over multiple charging and discharging cycles to understand how the battery performs and degrades over time.  **Assessing the mobile app's response time and reliability under load**  The mobile app will be tested by simulating many users at once to see if it can respond quickly and without errors under pressure.  **Evaluating the overall system’s ability to handle high usage**  The whole system will be pushed to its limits to find out if it can operate reliably when used by many vehicles and users at once. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**  To simulate high usage, load testing will be performed with multiple EVs charging at the same time. We will compare the amount of energy delivered to vehicles versus the energy consumed to check efficiency. App stress tests will simulate heavy traffic from users, and battery performance will be monitored through real-time health checks. All data will be logged for later analysis to identify strengths and weaknesses.  **Parameters to Be Examined**  We will focus on charging efficiency and session duration, battery health and capacity over time, system uptime and any failure occurrences, how fast the app responds under load, and the balance between energy input and output. | | |
| **List the experiments, tests and analysis in the work package:**  **Charging Efficiency Test**  We will measure the amount of energy delivered to EVs and compare it to the total energy consumed by the system during a session to calculate efficiency.  **System Load Test**  By simulating constant and repeated charging activity, we will see if the system can remain stable and functional under high usage for extended periods.  **Battery Performance Test**  The battery will be charged and discharged repeatedly to test how much energy it can hold and how its performance changes with usage.  **App Stress Test**  We will simulate a high number of users interacting with the mobile app to check if it continues to respond within acceptable time limits and doesn’t crash.  **Energy Consumption Test**  We will analyze how much energy the system uses and how much it outputs to ensure there is no major energy loss in the system.  **Failure Mode Analysis**  This will identify which parts of the system are most likely to fail when it is under stress or pushed to extreme conditions. | | |
| **Describe the outcomes and performance criteria of the work package:**  The system should remain stable and functional during tests, with a failure rate of less than 5% even under high load. Charging sessions should be completed within 90 minutes. After 500 full charge/discharge cycles, the battery should still maintain at least 90% of its original capacity. The mobile app should respond to user actions in under 2 seconds during high-traffic conditions. These outcomes will confirm the reliability, speed, and efficiency of the whole system. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**  **Connection to WP-6 for Design Validation**  WP-6.1 builds on the testing groundwork of WP-6 by pushing the system into performance-based conditions to confirm it works reliably under real use.  **Input to WP-6.2 for User Acceptance**  The performance results collected here will help determine whether the system is ready for real users and meets the expectations required for user acceptance testing in WP-6.2.  **Support for WP-7 in Marketing and Deployment**  Data from WP-6.1 will be important for WP-7 by showing that the system performs well and reliably, making it easier to promote and prepare for deployment in real markets. | | |

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| **Project Title** | Mobile Charging Stations for Electric Vehicle | |
| **Work Package No /**  **and Title** | WP-6.2 User Acceptance Testing (Yener) | |
| **Starting-Finishing Dates and Duration** | | 01.01.2026-01.06.2026 (5 months) |
| **List the activities of the work package:**   * Evaluation of the charging process from a user perspective will be conducted to observe how intuitively users interact with the system and identify potential friction points. * User feedback through surveys and interviews will help gather both quantitative ratings and qualitative insights related to the usability and reliability of the service. * Analysis of user experience data and identification of improvement areas will enable the project team to pinpoint inefficiencies and prioritize enhancements for the next development iteration. * Creation of user acceptance reports and recommendations will provide a documented basis for refining the system and guiding deployment decisions. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Usability testing with real EV users in various scenarios (urban, rural, emergency) will help ensure that the system performs consistently under different environmental and logistical conditions. * Post-use surveys and semi-structured interviews will be employed to obtain structured metrics and open-ended opinions that offer a deeper understanding of the user experience. * These parameters will be used; user satisfaction scores, task completion time, error rates, ease of use ratings, and feature satisfaction, as they allow for measurable evaluation of interface effectiveness and user expectations. | | |
| **List the experiments, tests and analysis in the work package:**   * Field testing with at least 30 EV owners using the mobile charging station in different contexts will simulate realistic use cases and verify the practicality of the system in diverse situations. * Mobile app usability testing with focus on reservation system and real-time tracking features will evaluate how accurately and conveniently users can interact with the digital interface. * Comparative analysis of user satisfaction between our mobile charging solution and fixed stations will allow assessment of our system’s value proposition against existing alternatives. * Testing of emergency scenarios where users need immediate charging assistance will assess the system’s capability to respond swiftly and reliably during urgent and high-stress conditions. | | |
| **Describe the outcomes and performance criteria of the work package:**   * System must achieve an average user satisfaction score of at least 4.0/5.0, which would indicate a high level of acceptance and comfort among users. * 85% of users should be able to complete the charging process without assistance, demonstrating that the system is intuitive and user-friendly even for first-time users. * Mobile app should receive a usability score of at least 80/100, which would confirm that its interface, features, and response time meet modern user experience standards. * At least 75% of test users should express willingness to use the service regularly, showing that the system meets not only functional needs but also inspires user trust and long-term interest. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * This work package uses the fully integrated system from WP-4.2 and control system from WP-5, which are necessary to simulate real usage conditions and ensure functional testing accuracy. * Results directly inform WP-7.1 (Business Model Development) by identifying valuable features and pain points that influence the final value proposition. * User feedback provides critical inputs to WP-7.2 (Pilot Launch Planning) as it will help optimize deployment strategies and prioritize features that improve user engagement. * Findings may trigger iterations to WP-5 if software improvements are needed, ensuring that issues revealed during user testing are addressed before final rollout. | | |

**WORK PACKAGE DESCRIPTION FORM**

**C.1.2**

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| **Project Title** | Mobile Charging Stations for Electric Vehicle | |  |
| **Work Package No /**  **and Title** | WP 7- Marketing & Deployment Plan (İpek) | |  |
| **Starting-Finishing Dates and Duration** | | 01.03.2026-01.05.2026 |
| **List the activities of the work package:**   * Strategies suitable for target user groups will be created. * In this, survey and interview data from WP-1.1 will be used. Promotion language and channel selection specific to each segment (e.g. Instagram for young people, LinkedIn for corporate users). * Differentiating aspects of the product will be highlighted * Technical superiorities will be concretized with system test results from WP-6 ("21 kWh production", "90 min charging time"). Promotional content will be based on this data. * Marketing strategies will be planned. * A weekly content calendar will be prepared for social media campaigns. Contact will be made with electric vehicle clubs, local governments and private companies for cooperation. * Marketing materials will be prepared. * Logo, slogan, brochure and poster designs will be made and Canva/Figma tools will be used for these. Applications such as Adobe Premiere or CapCut will be used for promotional videos. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * The strengths, weaknesses, opportunities and threats of the project will be evaluated through various analyses. * A SWOT analysis will be conducted. Weaknesses will be determined with the feedback obtained. Gaps in the sector and increasing EV demand will be analyzed as opportunities. Threats such as regulatory risks and dependence on weather conditions will be included in the analysis. * Usage areas and expectations from the service will be investigated according to WP-1 user feedback and survey results. * Questions such as charging location preference, price sensitivity, and frequency of use from more than 120 surveys collected in WP-1.1 will be analyzed. When and where users want to benefit from the service will be determined and divided into segments. * A marketing plan will be provided by examining parameters such as user awareness and interest in the service, service access time, digital and traditional promotion methods. * The user awareness level will be measured with the feedback received from the user acceptance tests conducted in WP-6.2. Digital methods and traditional methods (brochure) will be evaluated through comparative analysis. In line with the findings, a multi-channel marketing plan specific to the target audience will be created. | | |
| **List the experiments, tests and analysis in the work package:**   * Market demand and awareness level will be analyzed. * This will be done by measuring which group is more interested in the mobile charging station and in which groups the promotion strategy (social media, posters) is effective, again using user data collected under WP-1. After promotion is made to each segment, feedback rate, application density and access metrics will be measured. The results will be statistically analyzed and the promotion strategy will be revised. * In-app user behavior analyses will be conducted. * Information such as where users spend time in the mobile application and where they click will be examined to test the accuracy of marketing messages. The promotion language will be shaped by measuring which features attract more attention. * A comparative analysis of the mobile charging station with different distribution models will be conducted. * The advantage-risk differences of fixed, callable and route-planned models will be analyzed. | | |
| **Describe the outcomes and performance criteria of the work package:**   * Within the scope of this work package, a marketing and distribution plan specifically prepared for the user segment will be created. The prepared promotional materials (logo, brochure, poster, social media post, etc.) will be presented in at least five different formats. The effectiveness of the promotional strategies will be evaluated with at least 50% user satisfaction. The clarity and visual compatibility of the promotional materials will be evaluated with user feedback. The data obtained will guide the development of the marketing plan. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * The marketing and distribution plan will be derived from the outputs of WP-1. * The results of this Work Package will form the basis for WP-7.1 and WP-7.2. * User satisfaction, understandability rate and service orientation are evaluated based on WP-6.2. | | |

**WORK PACKAGE DESCRIPTION FORM**

**C.1.2**

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| **Project Title** | Mobile Charging Stations for Electric Vehicle | |
| **Work Package No /**  **and Title** | WP-7.1 Business Model Development (Yener) | |
| **Starting-Finishing Dates and Duration** | | 01.01.2026-01.05.2026 (5 months) |
| **List the activities of the work package:**   * Identifying revenue streams (pay-per-use, subscription, emergency service premium) will help determine which monetization models are most suitable for different user preferences and operational contexts. * Creating pricing strategies for different market segments will allow us to offer tailored solutions that meet the budget and expectations of both individual and institutional customers. * Developing partnership models with municipalities and EV manufacturers will establish strategic collaborations that can enhance service coverage and strengthen credibility. * Financial modeling and profitability analysis will provide insights into the economic viability of the project and guide investment decisions with realistic expectations. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Business Model Canvas methodology for mapping key elements will be applied to visualize and connect components such as customer segments, channels, and value propositions in a structured format. * Market analysis to determine price sensitivity will be based on WP-6.2 findings to align pricing strategies with consumer willingness to pay. * Financial modeling using Excel for ROI calculations will include variables such as investment cost, revenue growth, and operational expenses to assess economic return over time. * Parameters such as pricing points, revenue projections, operational costs, break-even analysis, partnership terms, and market penetration rates will be examined to support data-driven planning and validation. | | |
| **List the experiments, tests and analysis in the work package:**   * Price sensitivity analysis with potential customers from WP-6.2 will guide optimal pricing by revealing the limits and elasticity of user payment behavior. * Scenario planning for different business models (B2C, B2B) will allow us to compare the financial and operational impacts of targeting consumers versus institutions. * Cost-benefit analysis of solar vs. grid charging economics will help identify which energy source provides better profitability and sustainability under various conditions. * Market adoption rate simulations based on different promotional strategies will estimate potential user growth in response to campaign types, budgets, and channels. * Risk assessment for various revenue models will help anticipate financial or operational vulnerabilities and inform mitigation strategies. | | |
| **Describe the outcomes and performance criteria of the work package:**   * A complete business model with clear value proposition and revenue mechanisms will be developed to ensure the project's commercial feasibility and strategic clarity. * Financial projections indicating ROI within 4.2 years as targeted will demonstrate the investment’s economic potential and attract potential backers. * A pricing strategy that ensures 30% gross margin while remaining competitive will balance profitability with affordability, ensuring market traction. * Partnership agreements framework with at least two potential stakeholders will show our readiness to move into operational deployment with institutional backing. * A clear operational plan that details how to scale from pilot to full market deployment will enable controlled and sustainable growth aligned with technical and financial capabilities. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * This work package incorporates user feedback from WP-6.2 to refine the value proposition based on real-world user expectations and service experience. * Financial data from all previous WPs are used to build an accurate cost structure that reflects both development and operating expenses. * It provides the essential commercial framework for WP-7.2 (Pilot Launch Planning), enabling decisions on pricing, service scope, and regional prioritization. * It uses market research data from WP-1 to validate business assumptions with demand trends, regional gaps, and competitor positioning. | | |

**WORK PACKAGE DESCRIPTION FORM**

**C.1.2**

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| **Project Title** | Mobile Charging Stations for Electric Vehicle | |
| **Work Package No /**  **and Title** | WP-7.2 Pilot Launch Planning (Yener) (5 months) | |
| **Starting-Finishing Dates and Duration** | | 01.01.2026-01.06.2026 |
| **List the activities of the work package:**   * Selection of target regions for initial deployment based on EV density will be carried out by analyzing current regional EV usage statistics to ensure maximum impact during the pilot. * Coordination with local authorities for necessary permissions will be essential to comply with legal regulations and facilitate smooth operation during the field tests. * Development of operational logistics for the pilot fleet will involve planning routes, scheduling charging station positions, and ensuring resource availability for mobile unit operation. * Creation of marketing materials and launch campaign will help introduce the service to the public and stimulate early adoption through tailored content and outreach. * Training of operational staff for the pilot phase will prepare the field team for technical procedures, user interaction, and emergency handling scenarios. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * Pilot rollout strategy with phased implementation will allow a gradual and controllable deployment, enabling early adjustments based on field observations. * Marketing communication planning for target audience will focus on segment-specific messaging to attract diverse user groups, informed by prior user profiling. * Parameters such as geographic coverage, response time, service availability, marketing reach, customer acquisition cost, and operational efficiency will be examined to evaluate both commercial and logistical success during the pilot. | | |
| **List the experiments, tests and analysis in the work package:**   * Simulation of deployment scenarios to optimize coverage will help model different logistics strategies and select the one that ensures maximum regional accessibility with limited fleet size. * A/B testing of marketing messages to determine most effective communication will allow us to refine how we present the service and increase user engagement. * Analysis of potential operational bottlenecks and contingency planning will proactively identify risks such as fleet congestion or staff shortages and prepare response strategies. * Pilot launch timeline optimization to match seasonal demand patterns will ensure that the service goes live during a period of high need, maximizing visibility and adoption. * Assessment of staffing requirements for different coverage models will determine how many personnel are needed for efficient pilot execution in both urban and rural scenarios. | | |
| **Describe the outcomes and performance criteria of the work package:**   * Detailed pilot launch plan covering at least two intercity routes and two rural locations will demonstrate readiness for diverse deployment environments and support validation of the mobile solution's flexibility. * Marketing strategy with specific KPIs (5,000 app sign-ups within 5 months) will indicate whether promotional efforts are effectively reaching the intended audience. * Operational guidelines for mobile charging unit deployment and rotation will provide structured protocols to ensure timely and consistent service delivery. * Complete staff training program with performance measurement tools will ensure that personnel can perform tasks effectively and adapt to real-world challenges. * Launch timeline with clear milestones for evaluating success (7,500 charging sessions) will allow performance tracking and inform decisions about broader rollout. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * This work package builds on the business model established in WP-7.1 by putting strategic plans into action through real-world testing. * It incorporates technical capabilities verified in WP-6 (Design Testing & Validation), ensuring that only proven systems are deployed. * It utilizes market insights from WP-1 to target high-potential locations where EV driver needs are highest and underserved. * It creates the implementation framework for transitioning from development (WP-1 through WP-6) to commercial operation, serving as the bridge between prototyping and actual market entry. | | |

**WORK PACKAGE DESCRIPTION FORM**

**C.1.2**

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| **Project Title** | Mobile Charging Stations for Electric Vehicle | |
| **Work Package No /**  **and Title** | WP-8 Final Project Documentation (İpek) | |
| **Starting-Finishing Dates and Duration** | | 15.05.2026-15.06.2026 |  |
| **List the activities of the work package:**   * Preparing a final report that includes the general process of the project and the methods used. * Preparing all work packages and collecting outputs. | | |
| **Describe the methods to be used in the work package and list the parameters to be examined:**   * All documents from previous Work Packages will be systematically reviewed and integrated into the final report. * Project feasibility, sustainability and user benefit will be particularly emphasized for criteria. * The completeness, technical accuracy and narrative language of the report will be evaluated as quality criteria. | | |
| **List the experiments, tests and analysis in the work package:**   * The result of all tests and analyses performed in previous Work Packages will be synthesized. * The results will be interpreted in the light of user feedback and data obtained from market analyses. | | |
| **Describe the outcomes and performance criteria of the work package:**   * A final project report that is ready to be delivered, complied with academic rules and comprehensive. * Understandable in terms of both technical and content. * Reflects the contribution of all team members. | | |
| **Indicate the relationship between the outputs of the work package and other work packages:**   * WP-8 feeds on the outputs of all other Work Packages and this is all Work Packages combined presentation. | | |

## C.2- PROJECT MANAGEMENT and ORGANIZATION (A typical example of organization chart given below!)

**ORGANIZATION CHART**

**C.2.1 (Baran)**

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| 1. **Give an explanation about project management by using related organization chart**.   **Project Coordinator**  **Consultants**  **IPSOS Research and Consultancy Inc.**  **Market Research & Feasibility**  Market Research,System Desing & Feasibility Team   Mechanical Design Team  Software Development Team  **Protptype Production etc.**  **Electronic and Mechanical Design**   Control & Embedded Systems Team   Testing & Validation Team  Maintenance Team   Electrical & Energy Systems Team    Cloud Integration Team  Deployment & Operation Planning Team |

**PERSONNEL CV’S**

**C.2.2**

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| 1. For each of the project personnel, fill in the CV Form to include the expertise and R&D experience and attach to the project. |

(Aras)

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| Name: Ali Aras Yıldırım (Industrial Engineer)  Identity No: |
| Job in the Project: Market Research and Competitor Analysis, Power System Desing and Feasibility Analysis |
| Educational Background: (with graduation dates)  1. Işık University 2025  2. Final Anatolian High School 2020 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Supply Chain Management Intern. Supply Chain Management Intern ENKA İnşaat ve Sanayi A.Ş. Engineering for a better future 2023  2. Production, Production Planning Intern. Production, Production Planning Intern Sanovel İlaç 2024 |
| Qualifications (Expertise subjects)  Planning, Optimization with Matlab, Excel.  Supply Chain Management.  Data Minning. |
| Professional Certificates and Trainings  1. Xero Consulting Certificate  2. Matlab Onramps  3. |
| Publications, patents etc. in last three years  1.- |

(Aras)

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| --- |
| Name: Ali Durna (Electrical Engineer)  Identity No: |
| Job in the Project: Market Research and Competitor Analysis, Electrical System Desing and Setup, System Automation and Maintenance. |
| Educational Background: (with graduation dates)  1. Kocaeli University 2025  2. Mecidiyeköy Anatolian High School 2020 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Arçelik Maintainance and Technical Services Intern 2023  2. Kontek Industrial Automation Department 2024 |
| Qualifications (Expertise subjects)  PLC (Programmable Logic Controller) Programming and Automation Systems, Matlab |
| Professional Certificates and Trainings  1. Elginkan Career Industria Automation- PLC Programming  2.Matlab Onramp |
| Publications, patents etc. in last three years  1.- |

(İpek)

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| --- |
| Name: Yaprak İpek Bozkurt (Industrial Engineering)  Identity No: |
| Job in the Project: Marketing Strategy Development and Deployment Planning |
| Educational Background: (with graduation dates)  1. Emlak Konut Mimar Sinan Anatolian High School 2020  2. Işık University 2025 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Resim Ofset - Production Planning Intern-2022  2.Midas Giftware Industry- Quality Control Intern-2023  3.Ziraat Bank - Operations Intern-2024  4.Alius Media- Sales and Marketing-2024 |
| Qualifications (Expertise subjects)  Microsoft Office Suite, Matlab, Adobe Premiere, Minitab,Marketing,Planning |
| Professional Certificates and Trainings  1. Marketing Strategy Training  2. Matlab Onramp  3. Adobe Premiere Pro Basic Training |
| Publications, patents etc. in last three years  1. |

(İpek)

|  |
| --- |
| Name: İnci Bingöl (Industrial Engineering)  Identity No: |
| Job in the Project: Marketing Support Engineer |
| Educational Background: (with graduation dates)  1. Merkez Bankası Anatolian High School 2019  2. Işık University 2025 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Diler Iron & Steel Industry and Trade Inc, 2024  2. FPS Flexible Packaging Solutions Company, 2023 |
| Qualifications (Expertise subjects)  Microsoft Office Suite, Matlab, Minitab, Arena, Marketing |
| Professional Certificates and Trainings  1. Microsoft Excel – Advanced Level Training Program  2. Matlab Onramp  3. Marketing Training |
| Publications, patents etc. in last three years |

(Yener)

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| Name: Osman Yener Işık (Software Engineering)  Identity No: |
| Job in the Project: Software System Development and supporting system integration with embedded electronics. |
| Educational Background: (with graduation dates)  1. Işık University 2025  2. Sakarya Anatolian High School 2020 |
| Work Experience (Places and tasks they have worked so far by dates)   1. Freelance Mobile App Developer (2023-Present) 2. Junior Developer – ArgeX Software (2024) |
| Qualifications (Expertise subjects)   1. Software testing and debugging (unit tests, integration tests) 2. UI/UX design principles and user-focused development 3. Embedded systems communication and real-time monitoring |
| Professional Certificates and Trainings   1. Google IT Automation with Python – Coursera (2023) 2. AWS Cloud Practitioner Essentials – Amazon Training (2024) |
| Publications, patents etc. in last three years  1. |

(Yener)

|  |
| --- |
| Name: Bilal Yılmaz (Software Engineering)  Identity No: |
| Job in the Project: Embedded Software Development, Hardware-Software Interface Verification, Firmware Optimization, Data Processing |
| Educational Background: (with graduation dates)   1. Middle East Technical University (METU) – Computer Engineering – Expected Graduation: 2025 2. Ankara Science High School – 2020 |
| Work Experience (Places and tasks they have worked so far by dates)   1. Roketsan – System Test Engineering Intern – 2024 2. Havelsan – Quality Assurance Intern – 2023 |
| Qualifications (Expertise subjects)  System Integration Testing, Test Case Design, Test Automation (Robot Framework, PyTest), Jenkins, JIRA, Hardware-in-the-Loop |
| Professional Certificates and Trainings  TÜBİTAK – System Verification & Validation Training Program (2023) |
| Publications, patents etc. in last three years  1. |

|  |
| --- |
| Name: Orhan Murat Tuncer (Software Engineering)  Identity No: |
| Job in the Project: Software development and integration, algorithm development and architecture design of system. |
| Educational Background: (with graduation dates)  1. Işık University 2025  2. Mahmut Arslan Anatolian High School |
| Work Experience (Places and tasks they have worked so far by dates)  1. Kodland Python Pro Tutor 2023  2. Sakarya Teknokent Software Engineering Intern 2024  3. Inventra AI Engineer 2025 |
| Qualifications (Expertise subjects)  Data Science, Machine Learning, Computer Vision, Natural Language Processing, Web scraping (Selenium), Web development with Python, C# |
| Professional Certificates and Trainings  1. IBM Data Science  2. Hackkerrank SQL Intermediate |
| Publications, patents etc. in last three years  1.- |

(Orhan)

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| --- |
| Name: Ata Onur Kılıç (Software Engineering)  Identity No: |
| Job in the Project: Backend Infrastructure Design, Database Architecture, API Development and Integration, Low Level System Design and Implementation |
| Educational Background: (with graduation dates)  1. Işık University 2025  2. TED Ankara College Foundation High School – 2020 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Trendyol – Backend Intern – 2023  3. Robotek – Embeded System Intern – 2022 |
| Qualifications (Expertise subjects)  REST API Development, Microservice Architecture, PostgreSQL & MongoDB, Docker & Kubernetes, Python (FastAPI), Node.js, Redis, Git, CI/CD pipelines, C++, C, RasberryPI, Jatson Nano |
| Professional Certificates and Trainings  1. Udemy: The Complete Node.js Developer Course  2. Udemy: The Complete C Programming |
| Publications, patents etc. in last three years  1.- |

(Yağız)

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| Name: Yağız ARAS (Mechatronics Engineer)  Identity No: |
| Job in the Project: Design of Solar Panel & Battery, System Integration, Design of Mobile System |
| Educational Background: (with graduation dates)  1. Işık University, 2025  2. Hasan Ali Yücel Anatolian High School (Bursa), 2020 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Erbend Makina Sanayi ve Ticaret A.Ş. (Bursa) 2023 - Production internship  2. Burçelik Makina (Bursa), 2024 - R&D internship |
| Qualifications (Expertise subjects)  3D Mechanical Design (SolidWorks), Simulation and Modeling (MATLAB/Simulink), Circuit Design & Analysis (Proteus) |
| Professional Certificates and Trainings  1. *Solar Energy System Design* – Udemy  2. *SolidWorks Mechanical Design Associate (CSWA)* – Dassault Systèmes |
| Publications, patents etc. in last three years  1.- |

(Yağız)

|  |
| --- |
| Name: Oğuz Yıldırım (Electrical and Electronics Engineer)  Identity No: |
| Job in the Project: Design of Solar Panel & Battery, System Integration, Design of Mobile System |
| Educational Background: (with graduation dates)  1. Marmara University (İstanbul), 2020  2. Kadıköy Anatolian High School (İstanbul), 2016 |
| Work Experience (Places and tasks they have worked so far by dates)  1. Bosch, Electrical and Electronics Engineer - 2022-2025  2. Arçelik , Electrical and Electronics Engineer 2020-2022 |
| Qualifications (Expertise subjects)  Solar Power System Sizing & Integration, 3D Mechanical Design (SolidWorks), Simulation and Modeling (MATLAB/Simulink), |
| Professional Certificates and Trainings  1. Battery Management Systems (BMS) for Electric Vehicles – Udemy  2. Solar Energy Basics – Delft University of Technology / edX  3.Energy Storage Systems: Fundamentals and Applications – EIT InnoEnergy |
| Publications, patents etc. in last three years  1.- |

(Yağız)

|  |
| --- |
| Name: Berk Yılmaz (Mechanical Engineer)  Identity No: |
| Job in the Project: Design of Solar Panel & Battery, System Integration, Design of Mobile System |
| Educational Background: (with graduation dates)  1. Yıldız Teknik University (İstanbul), 2019  2. Beşiktaş Anatolian High School (İstanbul), 2015 |
| Work Experience (Places and tasks they have worked so far by dates)  1. OYAK-Renault, Mechanical Engineer - 2021-2025  2. Karsan, Mechanical Engineer - 2019-2021 |
| Qualifications (Expertise subjects)  Finite Element Analysis (ANSYS, SolidWorks Simulation), 3D Mechanical Design (SolidWorks), Thermodynamics & Heat Transfer Applications, Energy Efficiency in Mechanical Systems |
| Professional Certificates and Trainings  1. Advanced Engineering Drawing and GD&T  2.ANSYS Mechanical Simulation Basics– ANSYS Learning Hub  3.Introduction to Thermodynamics and Heat Transfer – edX |
| Publications, patents etc. in last three years  1.- |

(baran)

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| --- |
| Name: Elif Nur Aksoy (Mechanical Engineering)  Identity No: |
| Job in the Project: Structural modeling, CAD design, and mechanical integration of energy components within vehicle chassis. |
| Educational Background: (with graduation dates)   * Istanbul Technical University – BSc Mechanical Engineering (2025) * Beşiktaş Anatolian High School – Science Track (2020) |
| Work Experience (Places and tasks they have worked so far by dates)   * Intern – Ford Otosan, Body Systems R&D (Summer 2024) * Assistant CAD Designer – SolarTech Student Club (2023) |
| Qualifications (Expertise subjects)   * SolidWorks and AutoCAD 2D/3D design * Mechanical stress and deformation simulations (FEA – ANSYS) * Material selection for lightweight structural applications |
| Professional Certificates and Trainings   * SolidWorks Associate Certification – Dassault Systèmes (2023) * “Intro to Vehicle Dynamics” – EdX (2024) |
| Publications, patents etc. in last three years  1.- |

(baran)

|  |
| --- |
| Name: Simay Koç (Industrial Engineering)  Identity No: |
| Job in the Project: Deployment logistics, user segmentation, and cost-benefit analysis for system design and marketing. |
| Educational Background: (with graduation dates)  Bahçeşehir University - Industrial Engineering (2023) |
| Work Experience (Places and tasks they have worked so far by dates)  Logistics Intern – Arçelik Global Supply Chain (2022)  Data Analyst – Campus Research Lab (2023) |
| Qualifications (Expertise subjects)   * Demand forecasting and segmentation * Excel/VBA, Python for logistics modeling * Risk-based decision making and process optimization |
| Professional Certificates and Trainings   * "Data-Driven Decision Making" – Coursera/Wharton (2023) * "Supply Chain Analytics" – MITx (2024) |
| Publications, patents etc. in last three years  1.- |

(baran)

|  |
| --- |
| Name: Mehmet Yıldız (Electrical & Electronics Engineering)  Identity No: |
| Job in the Project: Solar panel configuration, MPPT controller setup, and electrical safety validation. |
| Educational Background: (with graduation dates)   1. Polsko-Japońska Akademia Technik-Electrical Engineering (2025) 2. Ankara Science High School (2020) |
| Work Experience (Places and tasks they have worked so far by dates)  Summer Intern – ASELSAN Power Systems Lab (2022) Project Assistant – Akademia Electric Vehicle Society (2023–2024) |
| Qualifications (Expertise subjects)   * PV system modeling and sizing * Circuit design and simulation with Proteus and MATLAB Simulink * Battery management systems and safety circuits |
| Professional Certificates and Trainings  PVsyst Solar System Design Certificate (2023) |
| Publications, patents etc. in last three years  1.- |

## C.3- R&D CAPABILITIES of the COMPANY

**C.3.1**

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| **1. Explain the R&D capabilities and experience of your organization by considering what you see related to the following topics:**   1. **R&D personnel, laboratories, test environment, tool/equipment, software and hardware, library, etc. , (Orhan)**   This project will be supported by a R&D team consisting of industrial, electrical and mechanical engineers with clearly defined roles across work packages. The team will utilize advanced engineering software such as Solid Works 3D PROFESSİONAL, MATLAB/Simulink, ANSYS, PVsyst and LabVIEW to perform design, sturctural analysis and simulations.  All Development and testing will be conducted in dedicated R&D laboratories, which include circuit prototyping benches, simulation stations, and enviornmental test setups. The test envirnment will simulate real-world charging scenarios to validate performance and reliablity. A cloud server will be utilized for high-performance simulations and data processing.   1. **New product development and design ability, (Aras)**   We wanted to achieve mobile charging for EVs, by modifications with vans. These vans will have mobile chargers with capacity 141 kWh and 161 kWh LifePO4 batteries. For addition, they have foldable solar panels with 30m2 areas for each one which aims to generates its partially energy. We have used Jinko Solar Panel with high performance and low cost. To do that we integrate CTS-M141120 and CTS-M161120 mobile chargers with these solar panels. And the mobile chargers come with high-speed charging abilities with 50kWh DC charging.   1. **Experience and knowledge based on R&D activities of the company in the past,(Baran)** Organization has gained valuable experience through prior R&D projects focused on sustainable mobility and off grid energy systems We have worked on solar-powered battery integration fast charging applications and IoT based control systems. These experiences helped us develop technical skills in simulation system optimization, and real life prototyping. The knowledge gained directly supports our current project and enables us to build scalable efficient and user-oriented mobile EV charging solutions.      1. **Documentation systematic, (İpek)**   At the end of all work packages, detailed documentation is created. WP-8 is entirely devoted to compiling these documents and transforming them into a regular final report. Each WP defines its own outputs, includes test results and analyses. Thanks to this structure, a traceable, academically compliant and transparent R&D process is documented.   1. **Continuous relationships with universities and research institutions such as consultancy, service procurement and joint work, (Yağız)**   Our company maintains long-term collaborations with academic and research institutions for consultancy, service procurement and jointly developed innovation projects. We regularly partner with universities and evaluate emerging technologies and prototype testing opportunities. These relationships encourage innovation and provide the opportunity to work in harmony with the latest scientific developments.   1. **Long-term technological goals (Yener)**   The long-term technological goal of the project is to develop a fully autonomous and scalable mobile EV charging system that integrates high-efficiency solar panels, second-life battery technologies, and AI-based routing. The aim is to achieve grid independence, expand smart energy management, and ensure interoperability with national and international charging networks. |
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| SECTION D - ECONOMIC BENEFIT POTENTIAL of the PROJECT |

## D.1- ECONOMIC FORECASTS

**D.1.1**

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| **1. Indicate the added-value of the project, the contribution of the project output(s) to the company's efficiency and competitiveness.**  **2. Indicate the commercialization potential of the project output(s), the domestic/ international market share and the possibility of replacing an imported product.**  **3. Indicate your numerical estimates and the assumptions on which the project is based, based on the criteria listed below for the economic return of the project to your company.**  **a) Time to market: b) Expected increase in sales revenue: c) Expected increase in market share: d) Break-even point:** |

# SECTION E – PROJECT BUDGET

## 

### ESTIMATED PROJECT COST FORMS

### E.1 - PERSONNEL EXPENSES FORM (For each Work Package use a separate form!)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-1 Market Research and Competition Analysis (Aras) | | | | | | | |
| **Name** | | **Task in the Work Package** | **His/Her Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| *Ali Aras Yıldırım* | | Investigating the Market and Competitors and making analysis for project strong start and planning. | *Industrial Engineer* | *15/30* | *7* | *3.5* | *30,000* | ***105,000*** |
| *Ali Durna* | | Market Research and Competitor Analysis by comparing and helping the find right components and prepare good system planning for our project. | *Electrical Engineer* | *15/30* | *7* | *3.5* | *30,000* | ***105,000*** |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **210,000** |

### E.1 - PERSONNEL EXPENSES FORM

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-1.1 Electric Vehicle User Surveys and Interviews (Aras) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Yaprak İpek Bozkurt | | *Creating and Designing the survey and interviews according to gain knowledge for Deployment and Marketing Plan* | *Industrial Engineer* | *10/30* | *5* | *1.67* | *30,000* | **50,100** |
| *Ali Aras Yıldırım* | | *Survey and Interviews Distribution and Publication. Results analysis.* | *Industrial Engineer* | *10/30* | *5* | *1.67* | *30,000* | **50,100** |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **100,200** |

### E.1 - PERSONNEL EXPENSES FORM

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-2 Design of Solar Panel & Battery (Yağız) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Yağız Aras | | Solar panel and battery design, technical calculations | *Mechatronics Engineer* | *10/30* | *8* | *2,67* | *30.000* | ***80.100*** |
| Oğuz Yıldırım | | Electrical system design, solar panel integration | *Electrical and Electronics Engineer* | *10/30* | *8* | *2,67* | *30.000* | ***80.100*** |
| Berk Yılmaz | | Mechanical design, battery placement, and system optimization | *Mechanical Engineer* | *10/30* | *8* | *2,67* | *30.000* | ***80.100*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **240,300** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-2 System Integration (Yağız) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Yağız Aras | | Solar panel and battery design, technical calculations | *Mechatronics Engineer* | *10/30* | *4* | *1,33* | *30.000* | ***40.000*** |
| Oğuz Yıldırım | | Electrical system design, solar panel integration | *Electrical and Electronics Engineer* | *10/30* | *4* | *1,33* | *30.000* | ***40.000*** |
| Berk Yılmaz | | Mechanical design, battery placement, and system optimization | *Mechanical Engineer* | *10/30* | *4* | *1,33* | *30.000* | ***40.000*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **120.000** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-3 Design of Mobile System (Yağız) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Yağız Aras | | Solar panel and battery design, technical calculations | *Mechatronics Engineer* | *10/30* | *7* | *2.33* | *30.000* | ***69.900*** |
| Oğuz Yıldırım | | Electrical system design, solar panel integration | *Electrical and Electronics Engineer* | *10/30* | *7* | *2.33* | *30.000* | ***69.900*** |
| Berk Yılmaz | | Mechanical design, battery placement, and system optimization | *Mechanical Engineer* | *10/30* | *7* | *2.33* | *30.000* | ***69.900*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **209.700** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-4 Vehicle Integration Design (Baran) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Elif Nur Aksoy | | |  | | --- | |  | | Mechanical layout of system components, weight balance calculation, 3D CAD modeling | | Mechanical Engineer | *10/30* | 10 | *3.33* | *30.000* | **99.900** |
| Simay Koç | | Deployment logistics and field positioning strategy for integrated system | Industrial Engineer | *10/30* | 10 | *3.33* | *30.000* | ***99.900*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **199.800** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-4.1Structural Analysis and Optimization (Baran) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Elif Nur Aksoy | | |  | | --- | |  | | Structural simulations (FEA), support bracket modeling, mechanical load testing | | Mechanical Engineer | *10/30* | *13* | *4.33* | *30.000* | ***129.900*** |
| Mehmet Yıldız | | Electrical load integration review and structural compatibility of battery systems | Electrical Engineer | *10/30* | *13* | *4.33* | *30.000* | ***129.900*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **259.800** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-4.2 Integration System Design and Testing (Baran) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Osman Yener Işık | | Embedded system monitoring, real-time data flow and sensor communication integration | Software Engineer | *10/30* | *12* | *4* | *30.000* | ***120.000*** |
| Simay Koç | | Testing setup organization, user interaction evaluation, feedback collection | Industrial Engineer | *10/30* | *12* | *4* | *30.000* | ***120.000*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **240000** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP- 5 Control System & Software Development (Orhan) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Orhan Murat Tuncer | | Developing routing algorithms, system-level control software, and cloud storage integration. | Software Engineer | *10/30* | *9* | *3* | *30.000* | ***90.000*** |
| Ata Onur Kılıç | | Implementing low-level code integration, supporting data pipeline design, and helping test routing communication mechanisms. | Embedded Systems Engineer | *10/30* | *9* | *3* | *30.000* | ***90.000*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **180.000** |

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| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP- 6 Design Testing & Validation (Orhan) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Orhan Murat Tuncer | | Conducting system validation tests, analyzing software behavior, and verifying mobile app and routing software functions. | Software Engineer | *10/30* | *3* | *1* | *30.000* | ***30.000*** |
| Ata Onur Kılıç | | Performing component tests, data logging verification, and assisting in mechanical/software integration diagnostics. | Embedded Systems Engineer | *10/30* | *3* | *1* | *30.000* | ***30.000*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **60.000** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP- 6.1 Performance Testing (Orhan) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Orhan Murat Tuncer | | Testing software and performance, app load testing, logging results for WP-7 readiness. | Software Engineer | *10/30* | *6* | *2* | *60.000* | ***120.000*** |
| Ata Onur Kılıç | | Evaluating energy efficiency, battery cycles, and identifying system failure points under stress conditions. | Embedded Systems Engineer | *10/30* | *6* | *2* | *60.000* | ***120.000*** |
|  | |  |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **240.000** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-6.2 User Acceptance Testing (Yener) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Osman Yener Işık | | Conducting user tests, usability interviews, and documenting results | Software Engineer | 15/30 | *5* | *2.5* | 30,000 | 75,000 |
| Simay Koç | | Organizing test environment, collecting feedback, and user interaction analysis | Industrial Engineer | 10/30 | *5* | 1.67 | 30,000 | 50,100 |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | ***125,100*** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP-7 Marketing & Deployment Plan (İpek) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Yaprak İpek Bozkurt | | Creating targeted marketing language by user segmentation, preparing promotional content that emphasizes technical promises, managing logo, brochure and poster designs | Industrial Engineer | 15/30 | 5 | 2.5 | 30,000 | **75,000** |
| *İnci Bingöl* | | *Campaign planning and field collaboration development according to different distribution models* | *Industrial Engineer* | *15/30* | *5* | *2.5* | *30,000* | ***75,000*** |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | **150,000** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP 7.1 Business Model Development (Yener) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Osman Yener Işık | | Developing pricing model, creating customer profiles, integrating system costs | Software Engineer | 15/30 | *5* | 2.5 | 30,000 | 75,000 |
| Yaprak İpek Bozkurt | | Marketing alignment, strategy formulation, value proposition creation | Industrial Engineer | 12/30 | *5* | 2 | 30,000 | 60,000 |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | ***135,000*** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | | | |
| **Work Package No and Title** | WP 7.2 Pilot Launch Planning (Yener) | | | | | | | |
| **Name** | | **Task in the Work Package** | **Post in the Company** | **Men-Month Fraction** | **Number of Months** | **Total**  **Men-Month** | **Cost per Month** | **TOTAL (TL)** |
| Simay Koç | | Logistics planning, field distribution strategies, user access mapping | Industrial Engineer | 10/30 | *5* | 1.67 | 30,000 | 50,000 |
| Osman Yener Işık | | Deployment coordination, pre-launch technical validation | Software Engineer | 20/30 | *5* | 3.34 | 30,000 | 100,200 |
| Baran Sönmez | | Internal project synchronization, stakeholder briefings and risk mitigation planning | Project Coordinator | 15/30 | *5* | 2.5 | 30,000 | 75,000 |
| **WORK PACKAGE TOTAL MEN-MONTH** | | | | | |  | **TOTAL** | ***225,200*** |

### E.2 – TRAVEL EXPENSES FORM (Aras,İpek)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | | |
| **Name of Travelling Personnel** | | **His/Her Task in the Project** | **Explanation of the Travel** | **Relationship with the Project** | **City / State** | **Estimated Cost**  **(TL)** |
| *Ali Aras Yıldırım* | | *Market Research* | *Suppliers Meetings, Attending the fairs* | *Finding suitable materials and gaining new ideas for the project.* | *İstanbul, Ankara, İzmir, Bursa,Eskişehir* | *25,000* |
| *Yaprak İpek Bozkurt* | | *Survey Desing and Interviews* | *Making Survey and Interviews in field.* | *Designing and updating the survey and interviews according to field responses.* | *İstanbul, Eskişehir,* | *12,500* |
| *Ali Aras Yıldırım* | | *User Interviews and Survey Deployment* | *Doing Surveys and Interviews, and Publishers meetings.* | *Making Sure about the getting data from customers to shape the projects according to expectations and wanting.* | *Bursa,Eskişehir* | *12,000* |
| *Yaprak İpek Bozkurt* | | *Creating promotional language, content design research* | *Participation in Electric Vehicle Fairs.* | *Observing how technical information is conveyed to users and collecting field data on the language and structure to be used in brochures and posters.* | *İstanbul, Ankara* | *12,000* |
|  | | | | | **TOPLAM** | **61,500** |

### 

### E.3 – TOOL/EQUIPMENT/SOFTWARE/PUBLICATION EXPENSES FORM

### (Yağız- 1,2,3,4) Baran(5,6) Orhan (7) –(İpek 8,9)-Aras (10-11-12-13)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1 USD = 40 TL** | | | | | | | | | | | |
| **Project Title** | | **Mobile Charging Stations for Electric Vehicle** | | | | | | | | | |
| **No** | **Tool/Equipment/**  **Software/Publication** | | **Qty.** | **Capacity** | **video editing** | **Purpose of Usage** | **Purpose of Usage after Project (\*)** | | **Unit Cost (USD)** | **Unit Cost**  **(TL)** | **Total Cost**  **(TL)** |
| **R & D** | **Production** |
| **1** | SolidWorks 3D Proffesional | | *3* | *1* |  | *Desing and Simulation* | *X* |  | 3.456 | *138,240* | ***414.720*** |
| **2** | MATLAB with Simulink | | *1* | *3* |  | Simulations for system performance | *X* |  | 2,500 | *100.000* | ***100.000*** |
| **3** | PVsyst | | *1* | *3* |  | Solar energy production simulation | *X* |  | *1,200* | *48.000* | ***48.000*** |
| **4** | Proteus | | *1* | *3* |  | Circuit layout design and simulation | *X* |  | *800* | *32,000* | ***32,000*** |
| **5** | ANSYS | | *3* | *1* |  | Performing FEA-based structural | *X* |  | *927* | **36.000** | **36.000** |
| **6** | LabVIEW | | 1 | 1 |  | Industrial Data Logging | X |  | 193 | **7.500** | **7.500** |
| **7** | AWS Cloud Computing Services | | 1 | 1 Year | Cloud server with 16 cores, 64 GB RAM | Cloud data storage and processing | X |  | 1,985.60 | 79,424 | 953.088 |
| **8** | Adobe Premiere Pro | | 1 | 1 | Video Editing | Preparation of promotional videos | X |  | 164,85 | 6,594 | 6,594 |
| **9** | Canva Pro | | 1 | 1 | Graphic Design | Preparation of posters, brochures and promotional materials | X |  | 21.25 | 850 | 850 |
| **10** | Deye Hybrid Inverter SUN-6K-LP3 | | 8 |  |  | Store the energy from solar panels to battery |  | X | 700 | 31,000 | 248,000 |
| **11** | Cabling (PV1-F, MC4, Battery) | |  | 160m |  | Cables needed for the inverter to connect battery |  | X | 2.50 | 100 | 16,000 |
| **12** | Folding Mounting System | | 8 |  |  | Solar system structure |  | X | 300 | 12,000 | 96,000 |
| **13** | DC Protection (Fuse, breaker) | | 8 |  |  |  |  | X | 75 | 3,000 | 24,000 |
| **(\*)** *Tick the appropriate option.* | | | | | | |  |  |  | **TOTAL** | **1,982,752** |

### E.4 – WORK DONE by DOMESTIC R & D INSTITUTIONS EXPENSES FORM (ipek-1),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | |
| **Institution of R & D Work Out Sourced** | | **Explanation of R & D Work** | **Relationship with the Project** | **Reason for**  **Out-Sourcing** | **Cost (TL)** |
| ODTÜ GÜNAM- Solar Energy Research Center | | Conducting efficiency and thermal resistance tests of the solar panels to be used in the project in a laboratory environment. | Obtaining measurement data to verify the performance of selected solar panels and increase the reliability of the system design. | High precision measuring devices and a controlled test environment were required. | **10,000** |
|  | |  |  |  |  |
|  | |  |  | **TOTAL** | **10,000** |

### E.5 – CONSULTANCY and OTHER SERVICES PROCUREMENT EXPENSES FORM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Title** | **Mobile Charging Stations for Electric Vehicle** | | | | |
| **Company or Institution that Consultancies and other Services are Taken From** | | **Explanation of the Services** | **Relationship of the Services with the project** | **Reason for Service Procurement** | **Cost (TL)** |
| Ipsos Research and Consultancy Inc. | | The company will do perform interviews and filed surveys to EV users | They will provide services to three different cities with surveys and interviews. | Providing us with more reach and more data. Leads to more accurate planning | **50,000** |
|  | |  |  |  |  |
|  | |  |  | **TOTAL** |  |

### 

### E.6 – MATERIALS EXPENSES FORM(Aras1,2,7) (Baran 3,4,5,6)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1 USD=40TL** | | | | | | | |
| **Project Title** | | **Mobile Charging Stations for Electric Vehicle** | | | | | |
| **No** | **Materials** | **Purpose(s) of the use in the Project Activities** | **Quantity** | **Reason(s) for the Procurement** | **Unit Cost**  **(USD)** | **Unit Cost**  **(TL)** | **Total Cost**  **(TL)** |
| 1 | CTS-M141120 | *Energy Storage & EV charging* | *5* | |  | | --- | | *Mobile EV battery unit* | | 18,010 | *700,000* | *3,500,000* |
| 2 | CTS-M161120 | *Energy Storage & EV charging* | *3* | *Mobile EV battery unit* | 20,590 | *800,000* | *2,400,000* |
| 3 | AL-6061 T6 Aluminum Sheet | Mounting structure | *30* | *Structure* | *85* | 3,303 | 33,030 |
| 4 | Stainless Steel Brackets | mechanical fastening | *30* | *Structure* | *12* | *466* | 13,980 |
| 5 | BOSCH Automotive-Grade Mounting Rails Kit | rail system | *3* | attaching controllers | *460* | 17,876 | 53,628 |
| 6 | CFRP Sheets | testing for mounting | *6* | *Structure* | 210 | 8,160 | *48,960* |
| 7 | *Jinko 410W Solar Panel* | *Energy Generation* | *15* | *Solar Panel* | *125* | *5,000* | *600,000* |
| 8 |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |
|  | | | | | | **TOTAL** |  |

## E.7 – PERIODICAL and TOTAL EXPENSES FORM (TL)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Project Title : Mobile Charging Stations for Electric Vehicle** | | | | | | |
| **Cost Items** | **2025** | | **2026** | | **TOTAL (TL)** | **FRACTION in the TOTAL COST (%)** |
| **Period-I** | **Period-II** | **Period-I** | **Period-II** |
| **Personnel Cost** | 898.260 | 748.550 | 748.550 | 598.840 | 2.994.200 | 24.7846 |
| **Travelling Cost** | 18.450 | 15.375 | 15.375 | 12.300 | 61.500 | 0.5090 |
| **Tool/Equipment/Software/**  **Publication Cost** | 594.825 | 495.688 | 495.688 | 396.550 | 1.982.752 | 16.4123 |
| **Domestic R & D Service Cost** | 3.000 | 2.500 | 2.500 | 2.000 | 10.000 | 0.08277 |
| **Consultancies and Services Cost** | 18.000 | 15.000 | 15.000 | 12.000 | 60.000 | 0.49683 |
| **Materials Cost** | 2.091.722,4 | 1.743.102 | 1.743.102 | 1.394.481 | 6.972.408 | 57.714500 |
| **Patent Rights Cost** | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL COST** | 3.624.258 | 3.020.215 | 3.020.215 | 2.416.172.00 | 12.080.860 | 100 |
| **CUMULATIVE COST** | 3.624.258 | 6.644.473 | 9.664.688 | 12.080.860 |  |  |
| **TOTAL MEN-MONTH** | | | | | |  |

## 

## E.8 - PERIODICAL and TOTAL EXPENSES FORM (USD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1 USD = 40 TL** |  | | | |  | |
| **Proje Adı: Mobile Charging Stations for Electric Vehicle** | | | | | | |
| **Cost Items** | **2021** | | **2022** | | | **TOTAL (USD)** |
| **Period-I** | **Period-II** | **Period-I** | **Period-II** | |
| **Personnel Cost** | 22.456,5 | 18.713,75 | 18.713,75 | 14.971 | | 74.855 |
| **Travelling Cost** | 461.25 | 384,375 | 384,375 | 307,5 | | 1.537,5 |
| **Tool/Equipment/Software/Publication Cost** | 14870.64 | 12.392,2 | 12.392,2 | 9.913,76 | | 49.568,8 |
| **Domestic R & D Service Cost** | 75 | 62,5 | 62,5 | 50 | | 250 |
| **Consultancies and Services Cost** | 450 | 375 | 375 | 300 | | 1500 |
| **Materials Cost** | 52.293,06 | 43.577,55 | 43.577,55 | 34.862,04 | | 174.310,2 |
| **Patent Rights Cost** | 22.456,5 | 0 | 0 | 0 | | 0 |
| **TOTAL COST** | 90.606,45 | 75.505,375 | 75.505,375 | 60.404,3 | | 302.021,5 |
| **CUMULATIVE COST** | 90.606,45 | 166.111,825 | 241.617,2 | 302.021,5 | |  |