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**Project Title:** Electric Vehicle Charging Stations Development Roadmap

<b>Department:</b>	Power Electronics	<b>Employer:</b>	Niroo Research Institute
<b>Project/Program Manager:</b>	Behrooz Arezi	<b>Executor:</b>	Saeed Hatami
<b>Project Financial Code:</b>	730002	<b>Project Quality Code:</b>	PIEPN19
<b>Type of Project/Program:</b>	Amani	<b>Assistant:</b>	Electricity Distribution

**Project Staff:** \_\_\_\_

**Keywords:**

Charging Stations - Electric Vehicle - Lithium Ion Battery - Battery swap station - Roadmap - Technology development document

**Project Necessity:**

One of the most effective ways to reduce the concentration of pollutants in urban environments is the use of electric vehicles, and therefore, despite the rich resources of fossil fuels in Iran, it is necessary to move towards the use of electric vehicles in big cities.

Because electric vehicles are connected to the power grid to recharge their batteries during day, they engage the power grid as the main custodian of the power grid. Connecting electric vehicles to the grid is a challenge and an opportunity for the electricity industry. The challenge is that the electricity industry has to plan extensively to service this relatively large load, both in the generation and transmission and distribution sectors, and the opportunity because electric vehicles have a potential energy storage capacity that By controlling and managing the charge and discharge of this source, the load curve of the power grid can be improved and, in fact, the scattered capacities of energy storage can be used instead of being left as a passive capital.

Electric car charging station technology is one of the most important sub-branches of electric car technology. All plug-in vehicles, including all-electric vehicles and rechargeable hybrid vehicles, are involved with the car charging category. There are different types of charging stations for electric vehicles, each of which is used in specific places. Normal charging stations are designed to charge during the overnight stop at home or during the daily stop at work. Semi-fast charging stations are intended for use by users who have been at a stop for 2 to 3 hours and wish to use this time to charge their vehicle. Parking lots for shopping malls, cinemas and theaters, sports clubs and stadiums, zoos, parks are good places to build these stations. Fast charging stations are intended for use by users who only stop to charge the car and intend to continue their journey after charging. These stations are usually located near urban or suburban gas stations.

Expanding the number of charging stations of all the above types is necessary and will increase the use of plug-in vehicles. At present, the transfer of technical knowledge or localization of construction of charging stations in the country is increasingly welcomed. This necessitates the recognition and fundamental development and organization of this new market, and the first step in this direction is to fully identify and encompass the strategic, technical, applied and economic dimensions of this technology in the form of a strategic plan for technology development.

## **Project Goals:**

After the "EV Technology Roadmap" was prepared in 2015 in Niroo Research Institute and the EV Technology Development Center was established, conducting comprehensive technical and economic studies on various parts related to EVs was on the center's agenda. . One of the important sub-branches related to the field of EVs are charging stations, which due to the wide range of technologies related to EVs, the document does not provide details related to their technology development. In this project, the aim is to study the relevant sub-technology by the power electronics group, which has expertise and capabilities related to that field, more carefully and to develop a strategic document for the development of this technology in Iran.

## **Abstract:**

In this report, first, documents are collected and basic studies are performed, and during that, patterns of roadmaps developed in developed countries will be examined in detail. Then, the current state of technology of EVCS (EV charging stations) in Iran is identified, the degree of technology compliance with the upstream documents is examined, different types of charging stations are introduced and the technology tree is drawn.

In the following, the reputable manufacturers of EVCS will be identified and their products will be introduced. The study of the global market, forecasting the future market in Iran and drawing the commercial future of this product are also done at this stage. The steps are as follows: first, identifying and determining reputable foreign manufacturing companies and reviewing the types of products they produce. The capabilities within the country are then identified and reviewed. These capabilities cover all relevant levels, including manufacturers, knowledge-based companies, and educational and research institutions.

Next, the market for EVCS is examined. In this way, first the volume of implemented projects in the world is estimated and evaluated. Then the global market of charging stations, the current and future status of this technology in other countries, both developed and developing, including manufacturers, product diversity, product selling prices, product sales curves in different time periods, market volume changes and ... , are evaluated and then the process of growth and technology development of these converters is examined. In continuation, the current situation of the country in relation to this technology will be reviewed and the future market volume will be presented according to the development estimates and applications, and the amount of imports, prices, etc. will be evaluated.

In the end, the method of technology acquisition is determined and explained by considering the different methods that exist for this work and also according to the evaluation of the capability of knowledge-based companies and research institutes related to this field.

In the next stage, a technical and economic justification report will be presented. First, a summary of the perspective of EV development in the country is mentioned, and then, based on the information extracted from EV technology development document, the domestic demand for charging stations is estimated, and at the end, a technical justification report and a typical economy is provided for the production of charging stations in Iran.

Finally, an action plan will be developed, including the implementation plan of the plan to develop EVCS in Iran and the details of the implementation schedule of the sub-projects of this plan.

## **Steps and Methodologies:**

Step 1 - Gathering documents and basic studies:

At this stage, after collecting references and documents related to other countries, their roadmap is reviewed and then the needs assessment of the development of technical knowledge of charging stations, the necessity and principles of the document are determined.

Step 2 - Determine the characteristics of the technology and explain its applications:

Familiarity with technology and identification of its various applications is done at this stage.

**Step 3 - Check the market for electric car charging stations:**

At this stage, the manufacturers of charging stations and their products are identified. The study of the global market, forecasting the future market in Iran and drawing the commercial future of this product in the country are also done at this stage.

**Step 4 - Determine how to access the technology:**

Explaining specialized strategies in the field of how to obtain technical knowledge of charging stations, feasibility study of localization of technical knowledge of technology and how to commercialize it is done at this stage.

**Step 5 - Technical and economic analysis and evaluation of the project:**

Based on the technology acquisition method selected in the previous step will be discussed.

**Step 6 - Develop an action plan:**

The implementation process of technology acquisition will be presented at this stage.

**Main Results (technical outputs, patents, papers, books, reports, etc.):**

Stage reports and final electronic report