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**Project Title:** Strategic Document of weather related hazard identification in electric power industry and zonation of their characteristic parameters in Iran

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### Project Necessity:

Structures and systems are exposed to a variety of hazards during their service life. In order to ensure the reliability and safety of energy and reduce the damage caused by the failure or out-of-service of structures of the electricity network, it is necessary to design new structures for stability and durability against various hazards and evaluate the existing structures for maintain their level of safety. For this purpose, it is necessary to identify the types of hazards harmful to structures and systems and to determine their characteristics quantitatively. On the other hand, considering the potential of creating critical conditions due to the occurrence of environmental hazards, it is necessary to identify and determine the types of hazards and predict them in the future in order to plan activities related to crisis management. Environmental hazards are sudden or gradual events of natural or human origin that endanger the health and safety of the environment, human habitation and industry. Environmental hazards come in a variety of forms. From the perspective of origin, environmental hazards can be classified into three general categories:

- Atmospheric hazards (weather Related)
- Geohazards (geological and geotechnical)
- Human (manmade) hazards

One of the most important types of hazards is atmospheric environmental hazards, which include atmospheric phenomena such as wind, storms and tornadoes, snow, ice, rain, flood, temperature, humidity, pollution and corrosive environments of materials, etc... Since most environmental hazards are random in nature, their characteristics such as time of occurrence, magnitude, duration, etc. are also of the type of random quantities and if there is sufficient statistical data, are characterized using the Statistical models. Appropriate behavioral models also express some phenomena, which are deterministic in nature. The main atmospheric phenomena affecting the structures have been studied in the past years and some of their characteristic parameters have been determined and zoned in the country. However, due to the passage of years and decades of these studies, the environmental and climatic changes along with the acquisition of new knowledge and data from them, it is necessary to review and update past studies along

with new studies. Extreme values of hazard characteristic parameters, which are often presented as a map (zoning) at a specific geographical level (for example, the boundaries of a country), have many applications for engineering and research purposes, the most important of which is to design structures with specific safety and reliability, and Planning for risk and crisis management activities.

### **Project Goals:**

In this project (as the first step of implementing the program to identify environmental hazards and zoning of their characteristic parameters in the country), a strategic document and roadmap will be developed. The purpose of the main program is to identify the types of atmospheric hazards associated with the structures of the electricity industry, appropriate behavioral and statistical models to characterize their parameters, collect the required data and finally, provide quantitative values of their characteristic parameters are in the country (in the form of zoning maps). Given that the present project requires different areas of scientific and technical knowledge, expertise and technology, it is necessary to have a comprehensive program to coordinate and direct the activities required by different stakeholders and increase their efficiency and effectiveness. For this purpose, first a strategic document and a roadmap (in the present project) have been prepared. A strategic document is a set of structured visions, goals, policies, strategies, actions and action plans that seek to develop knowledge and technology through smart government intervention and support for innovation, the desired future of development and the path to achieve it. In the country. The existence of a strategic document and a comprehensive roadmap will lead to the correct direction of activities and capital needed to develop knowledge and technology and achieve its goals.

### **Abstract:**

In this project, a strategic document has been developed regarding the identification of atmospheric environmental hazards affecting the structures of the electricity industry and the zoning of their characteristic parameters throughout the country. This document has been provided using the methodology developed in Niroo Research Institute to develop the strategic documents for technology development in the electricity industry. According to the mentioned methodology, the activities of providing this document were performed in seven stages. In the first stage, activities include justifying the need to identify and zoning environmental hazards from different perspectives (technical, economic, political and social, environmental and legal), determining and the scope of document studies along with the collection and review of technical literature and available documents (including books, articles, dissertations, reports and plans of organizations) in related fields. At this stage, the types of atmospheric hazards known in the world and their important characteristics were also collected. In the second phase of the project, activities including reviewing and selecting target countries for comparative studies, and studying the activities carried out in those countries in order to identify and zoning atmospheric hazards and related planning, is gathered and investigated. Activities carried out in the third phase of the project include identifying, classifying and determining the overall scope of this document in two parts: types of systems and structures of the electricity industry (in three areas of electricity generation, transmission and distribution) and types of environmental hazards affecting the electricity industry. In the classification of atmospheric hazards, only the hazards that existed in the country were considered. Hazards were classified into 5 general categories including rainfall, wind, pollution, temperature and climate change, and hazards in each of these categories were identified. In the fourth phase of the project, the Macro Directions of the document, including the goals of identifying environmental hazards and its development strategies were developed. Development strategies actually include prioritizing the hazards affecting the structures of the electricity industry based on the effective criteria that were done at this stage. The activities carried out in the fifth phase of the project include the formulation of micro policies and actions of the project. The activities of this stage generally include identifying development challenges and formulating actions and policies to address these challenges (through interviews with various experts). In the sixth stage of the project, activities related to the development of the action plan and roadmap were carried out. These activities generally include determining executive projects along with their budgeting and scheduling, determining executive actions along with their budgeting and scheduling and finally, drawing a roadmap for identifying and zoning environmental hazards related to industry. In the seventh stage of the project, a program for evaluating and updating the document was developed. The activities of this stage generally include the development of an evaluation mechanism, evaluation indicators, and a program for evaluating and updating the document.

## **Steps and Methodologies:**

The seven steps of the project are as follows:

### **1. Development of the Document's Basis of identification and zoning of atmospheric hazards**

At this stage, the need to identify and zoning atmospheric hazards, time horizon and geographical area for the project were determined. In addition, previous study records and documents in the fields related to the identification and zoning of atmospheric hazards in the world and Iran were collected. Relevant documents were found and collected by searching databases on the Internet and records collected in previous projects and information obtained from experts.

### **2. Comparative studies**

At this stage, criteria (such as climate similarity, leadership, etc.) were first selected to determine suitable countries, and by reviewing and determining the appropriate indicators to evaluate these criteria and using scoring, 6 countries were selected. Then, comparative studies were conducted to investigate the following cases in 6 selected countries: General introduction of the country, general climatic conditions, the most important atmospheric hazards in the country, research and executive institutes in the field of studying environmental hazards, institutions active in the field of studying atmospheric hazards in the electricity industry, studies related to meteorological parameters in different groups, Characteristic models and parameters for quantifying the severity and extent of atmospheric hazards, strategic planning and policy in the field of atmospheric hazards, research and executive topics of the day in the field of atmospheric hazards.

### **3. Technical Delineation and identification of atmospheric hazards framework and determination of various structures of electricity industry**

At this stage, the identification and classification of various atmospheric hazards affecting the structures of the electricity industry was performed. Among the various types of atmospheric hazards, those that existed in the country were considered. Then, the main systems of the electricity industry and the structures of each of them in the three fields of electricity generation, transmission and distribution were classified. Finally, by examining the effect of each atmospheric hazard on the structures, a structure-hazard matrix was prepared in which the impact or non-impact of each hazard on each of the structures is shown.

### **4. Developed of macro directions**

At this stage, the macro direction of the document, including the goals and strategies of the document were developed. To determine the overall objectives of the document, a draft of the objectives was prepared based on the relevant upstream documents and the objectives were finalized based on a survey of experts by a questionnaire. In the continuation of this stage, the strategies of the document, which are in fact the priorities of hazards (in combination with the structures under their influence), were also determined. Prioritization of hazards affecting the structures of the electricity industry was developed during a process using expert questionnaires.

### **5. Develop a plan of technical tactics**

At this stage, during the interviews with experts, the challenges ahead in the implementation of activities for identification and zoning of atmospheric hazards in the country were determined from different perspectives. Then, executive measures and policies were designed to respond to the identified challenges, and based on that, a list of technical and non-technical (managerial) tactics required in related areas was prepared.

### **6. Development of roadmap and action plan**

At this stage, a list of executive projects and managerial measures (including title, time and budget of each of them) required to achieve the objectives of the document was prepared to identify and zoning priority risks. The opinions of relevant experts were used in preparing the list of projects and their executive specifications. Finally, the actions and projects developed were drawn and presented in the form of a roadmap.

### **7. Develop an evaluation and updating program**

At this stage, in order to evaluate the progress and effectiveness of the document, performance and effectiveness indicators, evaluation mechanism and document update were developed and presented.

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

The main result of the project is the technical report of the stages and the final electronic report in which the goals, policies and executive and managerial tactics required to achieve the main goal of this project are specified and the way to achieve them along with the required resources and requirements (including The list of technical and

managerial tactics and executive projects, along with scheduling and budgeting and identifying their potential implementers) are presented in the form of an action plan and roadmap.

If the program is successfully implemented, the required design parameters of the structures in relation to the loading of atmospheric phenomena will be determined optimally and realistically, and their use in the design will lead to the desired level of safety while avoiding unnecessary conservatism in design and cost savings in the construction of structures.