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**Project Title: Future Study of Investigation of Novel Instrumental Analysis and its application in Condition Monitoring for Generation and Transmission of Electric Power Industry**

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<b>Type of Project/Program:</b>	Future Study	<b>Assistant:</b>	Research Assistant

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**Keywords:**

Chemical analysis, status monitoring, power generation and transmission, power plant water cycle, power plant fuel, trans oil, online monitoring, modern monitoring methods

**Project Necessity:**

The most important fields of application of chemical science in the electrical industry are divided into three main topics: chemical control of processes, measurement and monitoring of chemical parameters through various methods of chemical analysis, and supply (selection, synthesis, formulation, etc.) of required chemicals. They return. From another point of view, most of the chemical analyzes required by the electricity industry are performed in three main and important fields: water, oil and fuel.

Due to the special importance of developing and applying modern techniques of chemical analysis in the electricity industry, in this research, the main chemical parameters of water, oil and fuel, which have a special place in the electricity industry, are introduced. In the following, reference and modern techniques for measuring each of these parameters were examined in detail. Finally, each reference technique was compared with modern techniques for measuring the same parameter in terms of technical-economic justifications and climatic conditions.

In order to determine the position of the country's electricity industry in terms of the application of modern chemical analysis techniques, the country's main power plants and their laboratories were visited. Then, the country's power plants were compared with the power plants of developed countries in terms of application of new chemical analysis techniques. In conclusion, while presenting the results of this comparison as a general summary, new chemical analysis techniques that can be used in the electricity industry, taking into account the technical-economic considerations as well as the country's climatic conditions in three areas of water, oil and fuel analysis separately priority Were classified.

### **Project Goals:**

In this project, while reviewing and identifying new device analysis techniques, solutions for developing their application in the electricity industry in order to improve the control of production processes and transmission of electric current will be presented as a comprehensive set. First, the current situation of the electricity industry is examined from the perspective of chemical analysis methods and monitoring of water, fuel, smoke and oils used in power plants. In this regard, the application of modern technologies in the world electricity industry is also studied. In addition, the current situation of Iran with developed countries is examined from the perspective of climate, development and need from all aspects. Finally, in a comprehensive application plan, the needs of the electricity industry in order to use new technologies of instrumental analysis and their application in monitoring the status of the following areas will be prioritized.

- (1) Purification of raw water and preparation of ion-free water
- (2) Chemical control of power cycle, boilers and cooling towers
- (3) Analysis of effluents, solid wastes
- (4) Analysis of various insulating oils, industrial lubricants

### **Abstract:**

Due to the increasing dependence of humans on electricity and the importance of continuing the optimal production of electrical energy, the development of scientific methods to control the processes related to the generation and transmission of electricity is of increasing importance. In this regard, the processes related to the production of electrical energy in power plants and equipment of the distribution and transmission network should be continuously, online, with high accuracy and monitoring.

Significant and very important part of these processes, especially in the production of electricity in thermal power plants and energy transmission by transmission and distribution networks, as well as the discussion of protecting valuable equipment in the electricity industry against environmental and industrial damage (such as corrosion) They are directly or indirectly related to various processes and chemicals, and in this regard, from the past to the present, many of these processes and equipment are measured by classical chemical methods, which are characterized by low accuracy and lack of accuracy. Their ability to automate.

The main purpose of this project is to review and identify strategies for developing the application of new instrumental analysis techniques (separation and spectroscopy) in the electricity industry in order to improve process control and monitor the status of electricity generation and transmission equipment. The main features of instrumentation methods are high accuracy and the possibility of their automation, which is one of the main needs of the Iranian electricity industry. In this regard, new device analysis techniques can be used in various fields such as (1) raw water treatment and ion-free water supply (2) chemical cycle power control, boilers and cooling towers (3) effluent analysis , Solid wastes (4) Analysis of various types of insulating, lubricating and thermal oils will be studied.

### **Steps and Methodologies:**

#### **1- Gathering references in the field of analysis of water, fuel and oils of power plants and examining the current position of the country's electricity industry in terms of the application of chemical analysis methods and their application in monitoring the situation**

I. Collection of scientific resources in the field of modern techniques of chemical analysis and monitoring of usable status in the field of raw water treatment and preparation of ion-free water, chemical control of power cycle, boilers and cooling towers, analysis of effluents, solid wastes, analysis Types of insulating, lubricating and thermal oils.

II. Investigation of current conditions of power plants from the point of view of application of chemical analysis methods taking into account climatic conditions and costs.

#### **2- Investigating new methods of chemical analysis and monitoring the situation in the field of fuel, water and oils of power plants**

I. Study and study of modern methods of instrumental analysis and monitoring of water, fuel and oils of power plants and its applications in the electricity industry.

II. Investigating the development process and application of new methods of chemical analysis and their application in monitoring the situation of electricity industries in developed countries.

### **3- Comparing the current conditions of the country from the perspective of using new methods of chemical analysis and their application in monitoring the situation and prioritizing the use of these methods in the country**

I. Comparison between the current situation in Iran and developed countries from the perspective of the application of modern methods of chemical analysis and monitoring the situation in the electricity industry.

II. Investigating the advantages, achievements and challenges of implementing new methods of chemical analysis and using them in monitoring the situation from climatic, technical and economic aspects.

III. Prioritize the use of modern methods of chemical analysis and monitoring the situation by assessing the feasibility of climatic conditions and costs for the electricity industry.

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

- 1 electronic technical report
- 2 international article
- 1 Book