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Project Title: Development of a strategic document and roadmap for chemical processes and materials in cooling systems

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Project Necessity:

Cooling systems and power plant condensers are important components of steam power plants and combined cycle power plants that must be carefully evaluated in terms of efficiency and performance. Various dimensions are important in the study of this power plant equipment, including compatibility with the installation location of the equipment, chemical control of materials used, recovery of consumables, construction materials, destruction and corrosion of equipment, required pumps, condition monitoring, maintenance, Economic efficiency, required water supply, etc. Accordingly, due to the variety of design of power plants and climatic conditions of their installation, different types of cooling systems and condensers have been used in power plants. Therefore, achieving a technology development roadmap for these systems is of great importance. Each of the mentioned cases plays an important role in the process of achieving optimal performance and reducing losses, so a comprehensive study in this area is an urgent and fundamental need of the electricity industry. For example, due to the diverse regional conditions in the country in terms of climate (temperature, access to water resources, etc.), making a decision in this regard requires sufficient information, the necessary technical and economic estimates, as well as the trajectory. It is suitable. This is achieved by carefully studying and evaluating the current situation of the country (by different regions), predicting future conditions in the short, medium and long term, as well as being in line with the general policies of the country in the electricity industry.

Project Goals:

With the above explanations, it is clear that the area in question in this project is the electricity industry and specifically the power plant industry, and the proposed document is nationally developed in the field of single-pass cooling systems (dry (Heller and ACC) and wet) and power plant capacitors. This document will cover all regions of the country and after determining the desired perspective in this area, will determine the roadmap for achieving the development of this technology.

The main purpose of this project is to synchronize the current situation of the country with global developments in the field of cooling systems and power condensers. This is done by carefully studying scientific documents and documents of developed countries and companies, reviewing the current situation, evaluating and predicting the future

Determining the desired vision and roadmap is accomplished. In this document, various dimensions from the perspective of chemistry and metallurgy will be considered, some of which are presented as follows:

- Investigation of chemical parameters affecting the design of cooling system components and condensers
- Evaluation of materials used in the manufacture of parts, equipment and their coatings
- Selection of corrosion inhibitors and anti-fouling
- Chemical control methods appropriate to the type of cooling system used
- Economic evaluation of cooling systems and condensers according to working and environmental conditions
- Methods of monitoring cooling systems and power plant condensers
- Operation and maintenance methods to reduce operating costs and increase equipment life
- Technical study of localization of components of cooling systems and condensers

Due to the interdisciplinary nature of the subject, it is obvious that in order to implement this project, an experienced research team consisting of related specialties should be used so that the compilation document has a high scientific and technical value and richness. For this reason, the project proposal and implementation process will be done jointly by the Chemistry and Process and Metallurgy research groups. It is expected that due to the wide range of topics to be studied, this project will lead to the development and compilation of a document consisting of several plans and definitions of several applied development projects, the use of which will definitely lead to the development of power plants.

Extensive studies will be carried out in order to achieve the desired document. For example, the use of hybrid systems, gas turbine air cooling methods (according to SATBA Comprehensive Atlas of Power Increase), optimization of water consumption in cooling towers and providing solutions to improve the performance of ACC cooling systems and Heller towers are some of the things from a chemical science perspective. And metallurgy will be dealt with.

Condenser consumption management should also be carefully evaluated in this document. Corrosion created in this equipment leads to perforation of pipes and finally infiltration of water of poor quality into the cycle, which in turn will saturate the filters and reduce the efficiency of the equipment.

Abstract:

This document will use three main approaches:

The first approach is to carefully fabricate, design, recover, and evaluate the status of chemical control materials and systems in refrigeration systems used in the electrical industry. Also, in order to optimize the mentioned cases and increase their efficiency, new and widely used technologies will be used.

The second approach will be to consider management issues. The methods of providing resources for use in different climates of the country will be a serious issue of this document, which will be examined from the perspective of chemistry and metallurgy.

The third approach is to study the possible solutions to increase the efficiency of cooling systems used in the electricity industry.

Therefore, after careful study of resources, negotiations with industries, companies and leading countries in the field of development of chemical technologies and materials used in cooling systems, as well as determining the country's perspective in this regard, different scenarios will be carefully evaluated and priority objectives identified. They will be. After that, technology development plans to achieve the goals of the document will be introduced and projects, sub-projects and the operational path of the document will be presented.

Steps and Methodologies:

Thus, in the first step, by formulating the basics of the document and technology intelligence, examining the history, dimensions and nature of technology and also classifying methods from the perspective of studying the complexity of technology life cycle indicators, the initial structure of the document will be formed. The next goal will be to identify technological areas, which is achieved by looking at the technology value chain, drawing a technology tree based on the area of application or market, products, outputs, services and systems, and types of technologies and technological subsystems. In this regard, the value of existing systems in the country must be determined. In this direction, parameters such as value chain at the enterprise level, direct and indirect activities as well as quality assurance activities, cost interest, industry value chain, active companies, capability of the country, databases and the state of the country in the field of operation, repair and maintenance services are carefully evaluated.

In the next step, future research will be conducted in this field. Codification of the guiding pillars of technology development of cooling systems will be achieved, which will include the study of concepts and methods of vision development, the method of formulating macro goals, the process of technology vision statement, analysis of experts' opinions on the dimensions of the vision statement. In addition, upstream documents will be used in the development of the vision.

In the next step, the technology development strategy must be determined. By reviewing the technology development strategy literature, the concepts and methods of technology prioritization, technology acquisition concepts and technology development strategy will be evaluated by explaining the technology development prioritization mechanism. It is important to note that the drafting perspective should be approved by the esteemed members of the Steering Committee of the document.

In the next step, the policies and technical measures for the development of cooling systems will be evaluated. By reviewing the literature on the subject definitions and concepts of policy-making and policy-making and actions, features and principles of macro-policy-making will be designed. In this regard, the concepts of the structure of actors in technology development, technological innovation system and functional understanding of the innovation system are used.

After reviewing the above, it is time to assess the challenges and obstacles to the development of cooling systems. Undoubtedly, identifying these barriers and challenges in achieving technology development is very important.

The process of developing a roadmap for the development of this technology will be carried out by formulating support measures and policies in order to lay the appropriate groundwork to address the challenges facing the development of cooling systems and using the opinions of experts. After reviewing the concepts of the roadmap, a roadmap for the development of cooling systems technology is developed. This includes determining the time and cost of policy actions, introducing technical plans in the field of cooling systems, determining the time and cost of technical measures, guiding technology development, determining the implementing bodies, identification of technical actions and projects, identification of policy actions and national division of labor.

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

- Comprehensive technical report including 6 chapters
- Paper entitled Strategic Document and Roadmap for Chemical Processes and Materials in Cooling Systems at the Twelfth Heat Exchanger Conference

