Project Title: Design and commissioning of a chemical and process research laboratory

Department:	Chemistry and Process Engineering	***Employer:***	(Font:Times New Roman 10)
Project/Program Manager:	Amirhossein Khalili-Garakani	***Executor:***	NRI
Project Financial Code:	339002	***Project Quality Code:***	PPCPN39
Type of Project/Program:	(Font:Times New Roman 10)	***Assistant:***	(Font:Times New Roman 10)

Project Staff: Amirhossein Khalili-Garakani, Afsaneh Larimi, Zeinab Norouzi, Abbas Yousefpour, Morteza Faghihi, Aliakbar Asgharinezhad, Mohsen Esmaeilpour, Soheila Dalirian

---

Keywords: Research Lab, Process Design, Catalyst and adsorbent, Membrane & membrane process, Organic electronic, Molecular dynamic, Energy storage

Project Necessity:

Alignment with the general policies of the power industry and its subsidiaries can be seen as the need to establish a research laboratory. Therefore, some of them are referred to as follows:

In the second chapter of Tavanir Company's Articles of Association, which deals with the activities and duties of the company, monitors the national electricity network, reviews, studies and other necessary measures for technology development, transfer of technical knowledge and supply of goods and equipment required by the power industry and support the development of activities training and research in specialized fields related to the power industry are mentioned as some of the activities in line with the construction of the laboratory. Also, the expected output of research projects implemented in the laboratory can be in line with some of the twelve strategic goals of the power industry (modification, optimization and development of infrastructure, loss reduction, acquisition of new and applied technologies, network adaptation and compliance with environmental, safety considerations and health) knew.

On the other hand, in terms of infrastructure, the research laboratory can step in accordance with the six development plan, in the areas of upgrading the quality control system of equipment, processes and services, expanding applied research and development and acquiring new technologies and improving the ability to generate electricity from new and renewable energy. In the field of environment and safety, improving environmental knowledge, reducing the volume of waste, water consumption and chemical consumption in the power plant by modifying processes and developing technologies can be considered among the items in which the research laboratory will participate.

The various pillars of the research laboratory in the field of optimal production portfolio as well as loss reduction as another important topic of the sixth and seventh development plan will provide services in the following areas: research and technical-economic studies using high-efficiency power plants; development of storage pump power plants based on the results of feasibility studies; Supporting the increase of distributed generation capacity with the priority of simultaneous production of electricity, heat and water (desalination plant); rehabilitation of old steam units; upgrading and improving measuring equipment; localization of new technologies with the aim of reducing losses.

Some of the goals and policies of the resistance economy in the Ministry of Energy, which can be considered as indirect results of the research laboratory, are as follows:

- Increasing water and electricity efficiency in all stages of the production chain to consumption
- Modifying the structure of resource supply and modifying the pattern of water consumption

- Increasing the efficiency of power plants, reducing transmission and distribution losses and optimizing energy consumption

Another important document that the research laboratory will take to achieve its goals is the document of the expansion of the application of nanotechnology in the horizon of 1404. Research and implementation projects related to nanotechnology in the field of electricity and energy will also be on the agenda of this laboratory.

On the other hand, according to the recent policies of the research institute in joining young specialists in the form of faculty members and research experts to groups, the need for laboratory space in order to implement applied research projects in the water and electricity industry is felt more than ever. Be. Unfortunately, the lack of sufficient space in service laboratories to conduct research doubles the importance of allocating research laboratory space to the Department of Chemistry and Process. Also, this laboratory has the ability to generate income and attract researchers in doctoral and postdoctoral courses by providing in-house and out-of-research services.

Project Goals:

1- Designing and launching a research laboratory in the Department of Chemistry and Process

2- Feasibility study and review of sub-axes that can be developed in the research laboratory

Abstract:

It is obvious that chemical sciences and chemical engineering are among the most important branches of science in industry, especially in the water and electricity industry, and are used in various parts of power plants. Also, the basis of research in the mentioned fields is laboratory work such as synthesis of materials required by the water and electricity industry, design and simulation of existing units under construction in power plants, etc. On the other hand, according to the recent policies of the research institute in joining young specialists in the form of faculty members and research experts to the departments, the need for laboratory space in order to implement applied research projects in the water and electricity industry is felt more than ever.

Unfortunately, the lack of sufficient space in service laboratories to conduct research doubles the importance of allocating research laboratory space to the Department of Chemistry and Process. Also, this laboratory has the ability to generate income and attract researchers in doctoral and postdoctoral courses and provide special industrial study opportunities for faculty members of other educational centers under the supervision of the Ministry of Science by providing in-house and out-of-research services. The laboratory can include the following research areas:

1. Computer-aided process design

2. Filters, membranes

3. Catalysts, photocatalysts, attractions and ion exchange

4. Molecular simulation and modeling (at the nanoscale(

5. Organic electronics

6. Energy storage

Steps and Methodologies:

Chapter 1: Doing Studies

-Expressing the necessity of equipping and setting up a laboratory and collecting and studying reports, documents and relevant standards

-Similar domestic laboratories and study of similar laboratories abroad

- Provide a list of services that can be provided

Chapter 2: Determining the technical specifications and price of equipment

- Checking and determining the physical and technical specifications of the required test equipment

- Gathering information of equipment manufacturers and suppliers according to after-sales service and providing a calibration certificate for test equipment

- Provide a list of test equipment with an approximate price, technical specifications and scope of work and purchase priority

Chapter 3: Laboratory Design

-Study and review of laboratory standards and necessary approvals for the laboratory and its personnel

-Estimating the required space and preparing a layout map of the equipment in the laboratory and checking the transportation status of the equipment to the laboratory.

-Explain the installation and administrative requirements for setting up a laboratory

- Evaluation of occupational safety and health issues required in the laboratory

Chapter 4: Presentation of economic evaluation plan, approximate schedule and estimated validity for equipping and setting up the laboratory

-Economic evaluation and market study to provide laboratory services with forecast of return on investment

- Providing a schedule including activities for the purchase, installation and commissioning of laboratory equipment to the stage of operation

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

1. PPCPN39\E: Design and commissioning of a chemical and process research laboratory, February 2022.