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**Project Title:**

Feasibility Studies of Geothermal Energy Exploitation of Abandoned Oil and Gas Wells in Iran

<b>Department:</b>	Renewable energy	<b>Employer:</b>	Niroo Research Institute
<b>Project/Program Manager:</b>	Davar Ebrahimi	<b>Executor:</b>	Amir Farhang Sotoodeh
<b>Project Financial Code:</b>	800001	<b>Project Quality Code:</b>	PEPN18
<b>Type of Project/Program:</b>	Feasibility Studies	<b>Assistant:</b>	Technology

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**Keywords:** Abandoned Oil Wells, Organic Rankine Cycle (ORC), Heat Exchanger, Desalination, Depleted Oil Reservoir, Zeotropic Mixtures

**Project Necessity:**

Using of abandoned oil and gas wells to exploit geothermal energy has been considered in many countries. Most of the costs of exploiting geothermal energy resources are related to drilling wells, so retrofitting abandoned oil and gas wells to extract geothermal energy can be more economical. Harnessing energy from these wells in oil fields is considered as a renewable and sustainable energy source that can be used for electricity generation and direct use for space heating and desalination of saline water regardless of weather conditions. There are many oil and gas fields in Iran and many wells have been drilled in these fields. Many of these wells lose their production conditions over time and can be used to extract geothermal energy.

In addition to production wells, there are some exploration and dry wells in each hydrocarbon field. Due to the potential of these wells to extract geothermal energy, they can be used as a renewable energy source. Furthermore most of the oil and gas wells are located in areas that face the problem of water supply. Geothermal energy extracted from these wells can be used to desalinate coproduced water in the oil fields.

### **Project Goals:**

- 1- Investigation of geothermal energy utilization in oil and gas wells in different countries.
- 2- Feasibility studies of geothermal energy exploitation of abandoned oil and gas Wells in Iran.
- 3- Performance analysis and optimization of a combined power generation and water purification system from geothermal energy of abandoned oil wells

### **Abstract:**

Every year many oil and gas wells in the oilfields get depleted and abandoned all over the world. Notwithstanding the costs and risks of the petroleum wells depletion, they contain sufficient amounts of geothermal energy that can be used for different purposes. Utilizing the geothermal heat of the abandoned oil and gas wells, besides saving drilling costs and managing the residual oil pollution, can relieve the energy problems. This project investigates the possibility of geothermal heat extraction from abandoned oil and gas wells. Furthermore, it focuses on the advantages and challenges of the utilization of the wells.

The extraction of geothermal energy from oil and gas fields is divided into two branches: first, matured active wells that produce large amounts of high-temperature water in an uneconomical manner (before making the well abandoned), and second, the abandoned wells. There are many case studies in which geothermal energy has extracted from oil wells for some applications, including greenhouse heating, space heating or cooling, heat tracing, etc.

### **Steps and Methodologies:**

This project consists of two phases. In the first phase, case studies and feasibility studies of exploiting geothermal energy in oil and gas wells have been examined. In the second phase almost all kinds of utilized energy systems in the abandoned wells were reviewed. In this phase of the project, multigeneration systems in geothermal resources of abandoned oil wells has been designed.

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

The literature review outlined that there is an obvious absence of the combined or multigeneration systems in geothermal resources of abandoned oil wells. Therefore, a new approach is presented to use the abandoned wells' geothermal heat by a multigeneration energy system that simultaneously produces power and water with a cascade ORC unit and an HDH unit. For the working fluids of the ORCs, four sets of zeotropic mixtures are chosen, and the results show that the total output works are about 22-23 kW, and the produced freshwater is in the range of 532750-533042 L/day.

Project Documentation:

Preparing two reports from phases of this project.

Preparing two book chapters related to geothermal energy, published by Elsevier Publications.