

Sustainability is one of the most important issues for the protection of nature and crucial that urgent attention and action should be taken by the every part of society. With the increasing energy demand, the importance of sustainability in the energy field also increases. In order to supply some of this energy need, abandoned oil wells can be used as a direct or indirect geothermal energy source, if geologically and technically appropriate.

Sustainability in Energy, From Oil & Gas to Geothermal Energy

Significance

The energy industry, where the greatest investment is made, is another area where sustainability is crucial. For instance, if geologically and technically possible, oil and gas wells that were formerly utilized to produce hydrocarbons but have now reached the end of their productive lifespan or have failed for some other reason can be utilized as a direct or indirect source for geothermal energy. Orphan oil and gas wells are non-producing wells that are unplugged and do not have a listed solvent owner who can cap and mitigate the well. These wells have the potential to leak gas, oil, and other hazardous substances into the air and water since they lack a solvent owner on file. Repurposing these wells will eliminate the possibility of harming the environment and ensure a solvent owner of record.

Technical aspects

Electricity generation, heating (greenhouse and housing), thermal and health tourism, industrial mineral extraction, fishing and drying are main areas that geothermal energy can be used. When the thermal energy capacities of abandoned wells are determined, it can be decided for what purpose these wells can be used. Since many data such as geological formation, temperature and flow information are known, the thermal energy capacities of the wells can be easily calculated. Since all these studies have already been carried out, there will be no additional costs for determining the thermal energy capacity. In the light of the data obtained, ones can decide the right usage area of the geothermal energy potential. There are different types of well abandonment in onshore and offshore wells. Possibility of repurposing of abandoned wells are related to abandonment strategies of them. Most suitable technique would be decided according to the thermal potential of the well and its structure. Converting techniques and producing oil and heat at the same time from the abandoned oil wells are two alternatives of thermal energy harnessing. The conversion of an abandoned well can be achieved by implementing Engineered Geothermal Systems (EGS) in open or closed loop configurations.

Commercial advantages

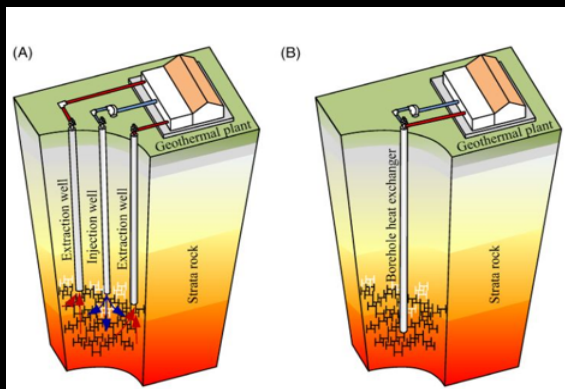
Drilling cost varies between 50% and 70% of the total investment budget of any geothermal facility project. Due to that, significant economic benefit can be obtained from the drilling investment required to reach the geothermal energy source by using already existed abandoned oil wells.

Community sustainability

Abandoned oil well to be used for geothermal energy harnessing can keep serving humanity as a green energy re-source. Thus, the energy needed in all areas of life is obtained from a renewable energy source for a sustainable nature. Brine mining (extraction of any desirable compounds or elements) is another opportunity to save the nature.

Way forward & solutions

- Energy policy should be established for the reuse of abandoned oil wells.
- More academic researches and technical studies should be carried out to discover the hidden thermal power in abandoned oil wells and to be used for the benefit of society.
- Incentive mechanisms should be created to attract investors' interest in producing energy from abandoned oil wells.



Kurnia, J.C. et al. (2021). Geothermal energy extraction using abandoned oil and gas wells: Techno-economic and policy review. Int J Energy Res. 2021;1-33

Key Takeaways

Two configurations of EGS system;

Open Loop (A)

- Direct Contact
- Large Heat Transfer Area
- High Enthalpy
- Min. Two Wells
- Enhancement needs
- Costly

Closed Loop (B)

- Indirect Contact
- Less Heat Transfer Area
- Less Enthalpy
- One Well
- No enhancement needs
- Cost effective

• The energy demand accelerates each day with developing technology and increasing population.

• Studies show that the world's energy consumption increased sharply in the new millennium and exceeded 160.000 TWh in 2022.

• James P. Williams et al. estimated abandoned well amount for U.S. as 4 million and for Canada as 370.000 at 2020.

• According to the Cheng et al. (2014) there are 20 – 30 million abandoned oil wells in the World.

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