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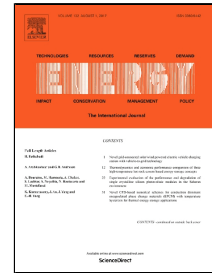
Possible futures for Iran's oil production pathways: Fuzzy cognitive map-based scenarios

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A new hybrid fuzzy cognitive map-based scenario planning approach for Iran's oil production pathways in the post-sanction period

Abstract

In today's competitive dynamic world/markets, providing a desirable framework for exploring future perspectives is a crucial challenge to support robust decision making and proper policy making. This research proposes a novel framework that develops plausible future energy scenarios through the Fuzzy Cognitive Map (FCM) technique. As a new method in scenario planning, FCM model attempts to present a set of rational, reliable and credible plausible scenarios together with analyzing dynamic behaviors of parameters. The integrated FCM-based approach encompasses STEEP analysis to identify parameters, Cross Impact Analysis (CIA) to determine key drivers, Morphological analysis for scenario selection, and FCM model to develop semi-quantitative scenarios. This new approach for scenario development brings together the benefits of both quantitative and qualitative analysis and it is not limited to the investigation of few pre-defined scenario drivers. As a research case, the proposed methodology is examined to detect plausible trends for Iran's oil production in the post sanction era. The implemented FCM simulations indicate that in three scenarios oil production increases and growth will be significant in the first two scenarios. The fourth projection is the most pessimistic scenario that can be imagined in the post-sanction era where the country faces massive investment backlogs.

Keywords: Scenario Planning; Fuzzy Cognitive Map; Iran; Post-Sanction; Oil Production.

1. Introduction

The outlook of energy sector in Iran is expecting a new transformation following the landmark agreement between the U.S., world powers, and Iran over the country's nuclear issue in July 2015. The agreement is assumed to limit the Persian Gulf country's nuclear program in return for removing sanctions on its energy and financial industries.

The country now hopes to compensate the lost share of oil market in a short term period with participation of foreign oil corporations. "Today is a starting point for international cooperation with Iran," said Zanganeh, Iran's oil minister, to the representatives of some of the biggest international oil companies (IOCs) in Tehran. It plans to produce 3.8 million to 3.9 million barrels of oil a day (mb/d) with output rising by 500,000 bbl/d soon after sanctions on financial transactions, oil tankers, and insurance coverage are lifted, and by 1 million barrels within the following five months [1]. This flood of new oil is anticipated to add \$17 billion to the Iran's export's revenue (about 3.5% of GDP) [2]. Old customers, with India in particular, are also eagerly preparing themselves to do business again with an Iran free of sanctions [3], as the country's foreign direct investment may rise to \$3 billion a year.

Despite the huge growth potential, there is still a very high degree of uncertainty on Iran's oil production capacity even in short period which has contributed to adverse perceptions as highlighted in Fig 1. These uncertain and contradictory perspectives are expanded through more unstable parameters for the medium-term and long-term future pathways of oil production in Iran. Political challenges led by decade – long nuclear negotiations are at the forefront of these factors [4]. After the implementation of international sanctions in the year 2012, Iran suffered US

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