



Active management in state-owned energy companies: Integrating a real options approach into multicriteria analysis to make companies sustainable



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HIGHLIGHTS

- An approach for assessing a portfolio of projects in state-owned energy companies.
- Decision makers' preferences, data analysis, and projects rankings are discussed.
- Multiple projects are ranked using a multicriteria analysis.
- The analysis synthesizes real options valuations and economic and social impacts.
- The approach supports a company's economic and financial decision making process.

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ABSTRACT

As a fundamental approach to assess active management and decision-making challenges in large state-owned energy companies (e.g., sustainability, social responsibility, economic growth, and shareholder value), this paper presents a methodological approach, based on a real case study, for integrating real options analysis into multicriteria analysis in order to evaluate and holistically rank a portfolio of multiple firms' projects. While real options analysis adds value to the projects by hedging uncertainty and valuing flexibility in the decision-making process, multicriteria analysis allows ranking the projects through an Aggregate Quality function that synthesizes economic and social impacts such as gross domestic product and employment. The proposed approach divides the decision-making problem into three main areas that consider aspects related to decision makers' preferences (*behavioral area*), data analysis (*analytical area*), and projects' rankings (*multicriteria analysis methods*) based on the use of Preference Ranking Organization Methods for Enrichment Evaluations (PROMETHEE). A case example involving a portfolio of projects in state-owned energy companies discusses the benefits of the proposed methodology.

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1. Introduction

In state-owned energy companies, legal entities where governments partially or totally own the shares with voting rights, decision makers (shareholders and managers) need to align their actions and decisions not only to create stable financial and economic returns by properly managing companies' resources (financial, human, and technological), but also to generate stakeholders'

value (employees, local communities, value to society, security, and so on). These actions and decisions are supported theoretically by the shareholder theory [1] and stakeholder theory [2], respectively. In this regard, decision makers (DM) pay a lot of attention to planning and managing macro-engineering projects (e.g., construction of refining plants, roads, petrochemical plants, electric power plants, bridges, etc.) considering multiple perspectives simultaneously (financial, economic, and social, just to name a few).

Corporations' annual reports show that ranking, selecting, balancing, and analyzing multiple projects that affect multiple strategic goals, are difficult tasks for managers and DM. Table 1 shows

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Table 1
State-Owned Energy Companies: Challenges, Projects, and Perspectives. Source: Authors' own assessment based on companies' annual reports.

Company	Goals and challenges	Main portfolio of projects and perspectives
Saudi Aramco: one of world's biggest oil companies (about 9.5 million barrels of oil per day in 2014)	Ali I. Al-Naimi, Minister of Petroleum & Chairman, mentions that Saudi Aramco does its best to enable sustainability, enhancing hydrocarbon discovery, refining processes, and promoting economic growth [3]. The firm's challenges are aligning efficient generating power to run operations and shifting the business model to influence "downstream operations while remaining focused on financial performance, profitability, and innovation"	<ul style="list-style-type: none"> • Sustainable development projects of the Kingdom as another main driver of the Saudi economy • Develop smart infrastructure (i.e., Jazan airport and a 660-km Jazan-Jiddah coastal railway) • Provide assistance to build homes in prepared communities (i.e., Dammam, Jubail, and Al-Hasa) • Enhance the Sadara joint venture with The Dow Chemical Company, which "is the first chemical complex in the countries of the Gulf Cooperation Council (GCC), employing more than 3500 people while contributing to an additional 15,000 people indirectly" [3] • Pursue new shared strategies in advanced materials, water management, energy efficiency, renewable energy, and advanced computing • Investments in super manufacturing hubs and conversion parks connected to chemicals plants targeting high-value and high-growth markets
Rosneft: one of Russia's largest and fullyintegrated oil and gas corporations (around 4 million barrels of oil per day in 2014)	Andrey Belousov, Chairman, states that the "company's management has followed a balanced approach in its investment, operating, financial and social policy" [4]. The firm's strategies are focused on new energy potential and security, and sustainability of natural resources.	<ul style="list-style-type: none"> • International portfolio of projects in different countries; for example, Venezuela, Canada, USA, Brazil, Norway, Germany, Italy, Algeria, Egypt, Mozambique, China, India, and UAE, among others • High-priority projects involving both seismic and exploration drilling, and long-term gas supply agreements including offshore oil and gas development. For Rosneft, gas production contributes mostly to shareholder value • Acquisition of new assets and employees hired from third-party service contractors enhance employment opportunities reaching 261,500 employees in 2015 • The MBTE plant facilitates further growth of environmentally clean fuels in 2016. Therefore, Rosneft has strong protection policies for endangered animal species of the Arctic zone related to subsoil projects
China National Petroleum Corporation (CNPC): highly diversified company with worldwide operations (close to 3.3 million barrels of oil per day in 2014)	Wang Yilin, CNPC's Chairman, states that sustainable development is inseparable from society. So, "creating shared value with all our stakeholders while meeting the demands of society and addressing common challenges based on the development concept of innovation, harmony, environmental-friendliness, openness and mutual benefit" [5]	<ul style="list-style-type: none"> • In China, CNPC launched 21 R&D and technological "projects to support 14 counties (districts) in 8 provinces (municipalities and autonomous regions)", and established the national energy R&D center for heavy oil development • Promotion of natural gas utilization and alternative fuels such as gas-fired power generation, city gas, shipping, public transportation, etc. In addition, there are coal-to-gas projects in Beijing, Hebei, and Xinjian to improve the environmental quality in winter • Effective alignment of economical and intensive land use "during the preparation period for oil and gas exploration and development, pipeline construction, and refining and chemical projects" [5] • Company follows meticulous employment protection activities to assure the best conditions for approximately 1,518,200 employees
British Petroleum (BP): multinational company producing nearly 2.1 million barrels of oil per day in 2012	To earn the support of society according to Bob Dudley, acting Chief Executive, BP needs to be a responsible operator acknowledging environmental issues, economic impacts, and relationships with communities, suppliers, customers, partners and governments [6]	<ul style="list-style-type: none"> • BP's projects and activities contribute to nearly "300,000 jobs in its supply chain in the US and UK alone—around 10 times the number directly employed" (around 80,000 across the globe) • Important partnerships to develop Canada's oil sands responsibly, especially the three oil sands lease areas—Sunrise, Pike and Terre de Grace—all of which are located in Alberta • Relevant portfolio of high return and longer-life upstream assets, while building high-quality downstream businesses with premium products and advanced technologies (55% of the upstream portfolio is natural gas) • BP's Khazzan project in Oman expects to deliver "around 1.5 billion cubic feet of gas per day – equal to about 40% of Oman's total daily domestic gas supply" [6]

the main challenges of portfolio management in several state-owned energy companies, for example, Saudi Aramco in Saudi Arabia [3], Rosneft in Russia [4], China National Petroleum

Corporation [5], British Petroleum in the United Kingdom [6], to name some. Note that economic views, employment, financial performance, and environment are common challenges and

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