



Renewable energy support mechanisms in the Gulf Cooperation Council states: Analyzing the feasibility of feed-in tariffs and auction mechanisms



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ARTICLE INFO

Keywords:

Gulf Cooperation Council (GCC) states
Renewable energy policies
Feed-in tariffs
Auctions
Fossil fuel subsidies

ABSTRACT

Renewable energy will be a crucial ingredient in the transition to a more sustainable future. The renewable energy sector requires a variety of financial support mechanisms in order to further consolidate and expand. Currently, the most prominent renewable energy support mechanisms are feed-in tariffs and renewable energy auctions. Although these mechanisms have been used and analyzed extensively in Western countries and, more recently, economies in transition, they have rarely been examined in the Arab Gulf region. Yet, particularly the Gulf Cooperation Council (GCC) states have undertaken important steps towards renewable energy adoption, which could be greatly facilitated with the use of financial support mechanisms. This paper analyzes the feasibility of feed-in tariffs and renewable energy auctions adoption in GCC. Based on an extensive meta-analysis of the literature on these two mechanisms in both developed and developing countries, the paper identifies a set of conditions necessary for success and evaluates the presence of favorable these conditions in the GCC context. Our findings reveal that while conditions that would ensure political feasibility are largely absent for both types of mechanisms, auctions could be a more successful strategy at the moment.

1. Introduction

Increasing renewable energy in the national energy mix is considered a fundamental requirement for a more sustainable energy regime. It has been observed in both developed and developing countries that, provided that effective and efficient support mechanisms are embraced and applied, renewable energy resources can be utilized at significant levels. In Germany, for instance, 30% of gross electricity generation¹ came from renewable energy in the year 2015 [11]. In order to achieve such significant share of renewable energy in the national energy mix, however, effective support mechanisms are necessary. This paper discusses two sets of mechanisms that stand out most prominently: feed-in tariffs and renewable energy auctions.

The first mechanism, feed-in tariffs (FITs), is one of the most widely used renewable energy support mechanisms worldwide. FITs offer long-term pricing schemes to renewable energy producers and aim to compensate any cost and risk-related issues which can arise in such a niche area. FITs were applied in 73 countries and 35 states/provinces in the United States, China, India, Canada, and Australia as of early 2015 [81]; (p. 88).

Renewable energy auctions, on the other hand, are an alternative

financial support mechanism for renewable energy production, which primarily aim at increasing deployment of renewable energy in the most cost-efficient way. Under this mechanism, following a government's call for tenders regarding the installation of a certain capacity of renewable energy-based electricity, renewable energy companies enter the auction, submitting a bid with a per unit price of electricity that they are able to produce. Subsequently, the government evaluates the offers on the basis of a number of criteria and then signs a PPA ("Power Purchasing Agreement") with the successful bidders [56]. Depending on their aims and design, there are different types of auctions. These can be *technology-specific* (targeting a particular type of renewable energy source) and *site-specific* (regarding a certain area where electricity is generated from renewable energy sources). Furthermore, they can be *sealed-bid auctions* and *multi-round descending clock auctions*, where the former has undisclosed bids and the latter is the progressive lowering of the initially offered price [56]. As of June 2015, more than 60 countries have adopted auctions, some with great success. India, for example, has witnessed a 65% decrease in real market price of solar power compared to that of 2010 [47].

This paper analyses the feasibility of feed-in tariffs and renewable energy auctions adoption in the Arab Gulf region, where there is an

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¹ "Gross electricity generation" is defined as "the total amount of electrical energy produced by transforming other forms of energy" and it is the electricity generated in all types of power plants [25].

Table 1
Renewable energy projects in the GCC (Source: [26] in [45]; (p. 61).

Saudi Arabia	United Arab Emirates	Kuwait	Qatar	Bahrain	Oman
<ul style="list-style-type: none"> ● KAUST rooftop PV panels 2 MW (completed) ● KAPSARC PV Phase 1 – 3.5 MW (completed) ● KAPSARC PV Phase 2 – 1.8 MW (completed) ● Princess Nora University solar water heating 17 MW (completed) ● ARAMCO, 300 MW capacity off-grid (planned) ● Saudi Aramco North Park PV Project 10.5 MW (completed) ● SEC – Dubai ISCC Power Plant phase 1 CSP 50 MW (planned) ● Waad Al-Shamal ISCC Project 50 MW (planned) ● Al-Aflaj Solar PV Park 50 MW (planned) ● KACST Al Khafji PV desalination plant 10 MW (planned) ● K.A.CARE, Royal Commission for Jubail and Yanbu 50 MW PV (planned) ● K.A.CARE, 500 MW PV plants around the kingdom (planned) ● K.A.CARE, King Salman Green Initiative, Madinah (planned) ● K.A.CARE/SWCC, Solar & Wind Desalination in north and south (planned) 	<ul style="list-style-type: none"> ● Sir Bani Yas Wind Energy Plant 30 MW (planned) ● Solar power plant, Utico, RAK 40 MW (planned) ● Waste to Energy, TAQA 100 MW (bids invited) ● Masdar City solar PV park ADFEC 10 MW (completed) ● Shams 1 CSP plant 100 MW (completed) ● Mohammed bin Rashid Al Maktoum 1 – 13 MW (completed) ● Mohammed bin Rashid Al Maktoum 2 – 200 MW (financial closure) ● Mohammed bin Rashid Al Maktoum 3 – 800 MW (bids invited) ● Waste to energy, Bee'ah 83 MW (planned) ● Noor 1 Solar PV plant 350 MW (bids invited) 	<ul style="list-style-type: none"> ● MEW/KISR-Shagaya Wind turbine 10 MW (bidder selected) ● MEW/KISR-Shagaya Solar thermal 50 MW (bidder selected) ● MEW/KISR-Shagaya PV 10 MW (bidder selected) ● Al-Abdaliyah ISCC project 60 MW (planned) 	<ul style="list-style-type: none"> ● KAHRAMAA-Solar Power Plant 230 MW (announced) ● Mesaieed waste to energy plant 40 MW (completed) ● Al Duhail Solar PV Park 10 MW (announced) 	<ul style="list-style-type: none"> ● Waste to Energy plant 25 MW (planned) ● BAPCO Bahrain PV Plant 5 MW (completed) ● Petra Solar-Manama Solar PV Park 5 MW (completed) 	<ul style="list-style-type: none"> ● Solar thermal EOR plant 1 GW (planned) ● Solar thermal EOR plant 7 MW (completed) ● Dhofar Wind farm 50 MW (planned)

ongoing effort to diversify the energy mix towards more renewable energy sources (See Table 1).² However, which mechanism can best support such efforts, both in terms of technical potential and political feasibility, is subject to debate.

While in the early 2010s FITs were advocated as the main way forward to expand the renewable energy base, the focus in the region has shifted towards auctions. While none of the Gulf Cooperation Council (GCC) states have FITs in place they are still an agenda item particularly for rooftop solar. Regarding auctions, their application is limited as they are currently mainly adopted in Dubai (for a solar power plant of 100 MW) while there are plans for their introduction in Saudi Arabia. Given the increasing emphasis on renewable energy in the region, choosing the right support policy will be key to boost the expansion of its use. This paper analyzes which of these two mechanisms is a more feasible option for the GCC states, given their political, institutional and economic characteristics.

We focus on GCC states for three main reasons. First they correspond appropriately with the prominent group of leading resource-rich rentier states³ of the Middle East. Hence, investigating GCC states allows us to draw generalized conclusions about the rentier states of the Middle East. Secondly, GCC states are the main carbon emitters in the region. According to 2009 calculations of global CO2 emissions (metric tons per capita), Qatar ranked first, Kuwait third, the United Arab Emirates (Henceforth, UAE) fifth, Bahrain seventh, Saudi

Arabia eleventh, and Oman thirteenth, among a total of 214 countries [95]. Concretely, 42% of carbon emissions of GCC states comes from generation of electricity and production of heat, followed by 36% from industrial sector, 20% from transportation, and 2.3% from residential sector [40]. Therefore, when per capita carbon emissions are considered, electricity generation of the Arab Gulf region is one of the most critical issues to be tackled with, from the perspective of the global efforts to curb greenhouse gas emissions. Thirdly, there is a growing interest in renewable energy in the region. After the 2008 financial crisis, GCC states started to pay more attention on the need to diversify their energy sectors, since over-reliance on international oil market means being much more affected by the oil price fluctuations [7].

This research presented in this article uses mostly qualitative data, based on an extensive literature review of journal articles, organizational reports, regional evaluations and institutional publications of the International Renewable Energy Agency that reveal how the support mechanisms are designed, introduced and affected the energy sector in the countries they were applied. In this respect, cases from Asia, Europe, North Africa and South America were reviewed through publications (reviewed research includes country cases on Germany, Spain, Portugal, Malaysia, China, Japan, Brazil, South Africa, and Peru) dating from 2002 to 2015 [8,14,17,29,33,39,49,53,60,62,76,82,86,87,91]. Furthermore, five in-depth interviews were carried out by the first author with senior policy experts of the International Renewable Energy Agency Headquarters in Abu Dhabi, UAE, in April 2015.

The paper is structured as follows. Part 2 identifies the conditions under which FITs and auctions have been successful or not based on developed and developing country experiences. Part 3 examines the

² For further information on these efforts, also see [1,4,10,22,75,70,74,79].

³ These states are Gulf Cooperation Council member states, namely United Arab Emirates, Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman. In these states, fossil resource revenues (rents) make up large shares of governmental income.

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