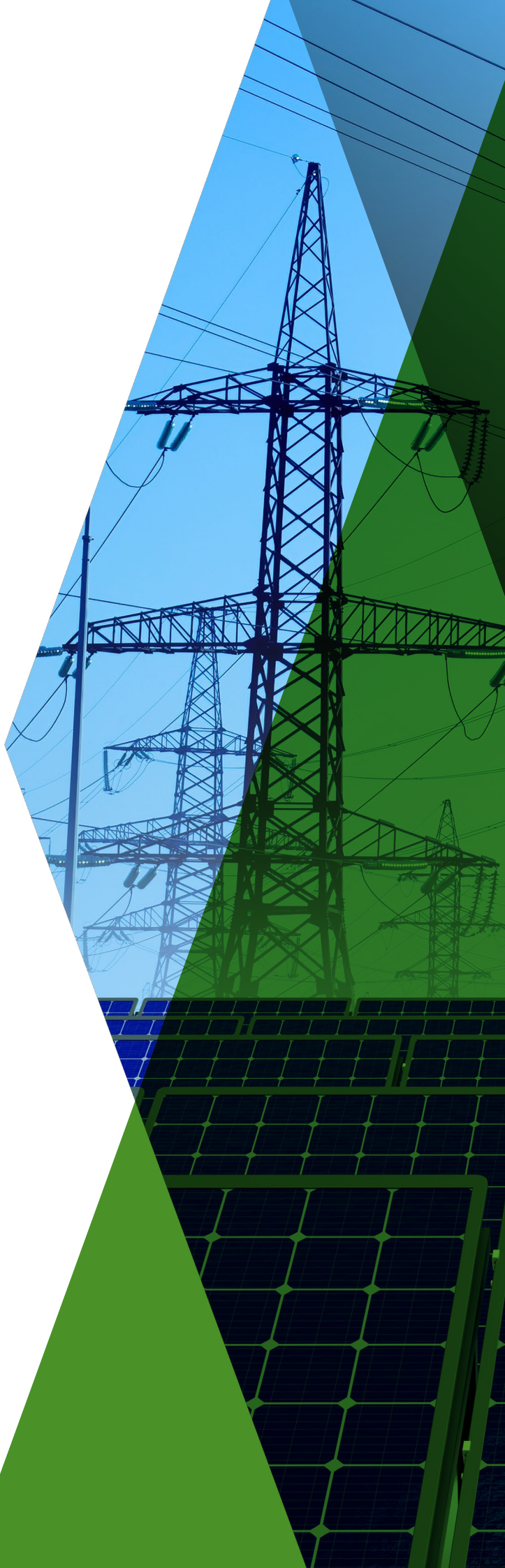
KAPSARC
مركز الملك عبدالله للدراسات والبحوث البترولية
King Abdullah Petroleum Studies and Research Center

Discussion Paper

Inexpensive Renewable Electricity Enables Saudi Arabia's Fuel Price Reforms



Walid Matar

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About KAPSARC

KAPSARC is an advisory think tank within global energy economics and sustainability providing advisory services to entities and authorities in the Saudi energy sector to advance Saudi Arabia's energy sector and inform global policies through evidence-based advice and applied research.

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Summary

Saudi Arabia is currently implementing fuel price reforms. The reforms are being executed in phases, where the ultimate goal is to have fuel prices approach their market equivalent values. Using the KAPSARC Energy Model, this analysis shows that such reforms would have been more costly for Saudi Arabia without the availability and the cost reductions of renewable electricity technologies. Solar photovoltaic technologies, in particular, have made enacting fuel price reforms more tenable. As the use of oil products for power generation and industrial processes ceased, renewable technologies would reduce the expected future need for natural gas. For instance, lower natural gas use by the electricity sector would result in an equilibrium (meaning that demand equals supply) natural gas price of $3-$4/mmBtu in 2040 with the deployment of renewable technologies. The projected rise in Saudi natural gas supply and these prices are sufficient to accommodate nearly 50 GW of renewable electricity capacity. Comparatively, this natural gas price would be above $7/mmBtu without renewable electricity. The advent of inexpensive renewable electricity lowers fuel costs for all natural gas users in industry and utilities. Moreover, the marginal electricity generation cost with renewable electricity drops by 30% on average. Renewable electricity thus proves to add considerable value in the context of Saudi Arabia.

1. Introduction

Saudi Arabia is reforming fuel prices to increase the allocation efficiency of its resources, to rationalize energy use, and to improve its fiscal standing (Saudi Ministry of Finance 2018). Reform in this case means raising fuel prices to approach some market-equivalent prices or to reflect their costs of production. Previously, the country had a long-standing policy to price fuels domestically below market levels in order to spur industrialization and support households.

As an example of supporting industries, low feedstock prices helped the Saudi Basic Industries Company (SABIC) become a major player in the global petrochemicals industry. In the absence of a market, prices for domestic supplies of natural gas and ethane had to be increased to make investments in its production, processing, and transport worthwhile. The domestic natural gas price has been raised in steps since then. From the time of SABIC's inception until 1998, the domestic price of natural gas was set by the Saudi government to be $0.50 per million British thermal units ($/mmBtu) (Albqami and Mathis 2012). The domestic price of natural gas is now $2.15/mmBtu. Most of the petrochemical feedstock used domestically comprises natural gas and ethane (Matar et al. 2015; Alshammari 2021; Matar 2025).

Low energy prices have also helped households to meet their demands for space cooling and mobility. Low fuel prices, for example, allowed the local electricity regulator to charge low electricity prices to households, schools, mosques, and commercial centers. In addition, Saudi Arabia used to offer gasoline at a fixed price of 0.45 SAR per liter until the end of 2015.

However, low domestic energy prices have discouraged investment in energy efficiency for conversion and end-use sectors. For instance, the Saudi Electricity Company (SEC 2020a) reported that the average national net thermal efficiency for its power plants was 36.2% in 2015, compared to 42.1% globally (Enerdata 2020). With the recent direction of the reforms, SEC reports that the average generation efficiency for the company rose to 37.7% in 2023 (SEC 2024).

Historically, energy inefficiency at the conversion stage has been compounded by low energy efficiency at the end-use stage. Domestic levels of energy efficiency for appliances such as air conditioners also appear to have lagged behind global averages (Alyousef and Varnham 2010). To improve end-use energy efficiency, the Saudi Energy Efficiency Center (SEEC) has implemented mandatory thermal insulation for new buildings, minimum energy performance standards for air conditioners, energy efficiency labeling for automobiles and appliances, and fuel economy standards (SEEC 2024).

In pursuit of reforms while minimizing the burden on the end-consumer, this paper argues that the ongoing fuel price reforms are enabled by the advent of inexpensive renewable electricity. To highlight the cost reduction of renewable power technologies, the average levelized cost of solar photovoltaic (PV) plants has decreased by 90% from 2010 to 2023 (IRENA 2024). In addition to the expansion of natural gas supply by Saudi Aramco (2024) and the establishment of a cash transfer scheme to help lower-income households, the thesis of this paper is that declining costs of renewable electricity have made it easier to raise fuel prices while mitigating their cost impact on energy consumers.

The effects of natural gas supply expansion have been studied by Matar and Shabaneh (2020). They show that a 67% rise in gas supply by 2030 causes a substantial drop in the equilibrium price of natural gas for industrial and other domestic consumers. They also show that higher domestic natural gas supply for the overall energy system will increase the use of gas in the electricity sector, thus reducing the deployment of renewable electricity. The natural gas price is considered to be part of the domestic reforms. It is worth noting that Saudi Arabia may not apply an equilibrium price (i.e., when supply equals demand) as it has to consider competitiveness with international natural gas consumers.

Past studies have shown that fuel price reform would induce investment in renewable power plants in Saudi Arabia (e.g., Matar, Echeverri, and Pierru 2016; Matar,

Mansouri, and Umeozor 2017; Elshurafa et al. 2021; Matar et al. 2024). Compared to a business-as-usual case with renewable electricity coming online, this paper goes a step further by studying the effects of the absence of renewable electricity on the energy system. A multi-sector energy system model that is designed for Saudi Arabia is used to uncover the benefits of renewable electricity for the entire system. The model is formulated to represent intersectoral price controls that prevail in the Saudi energy system. It is a partial equilibrium model comprising seven energy or energy-intensive sectors in Saudi Arabia. It outputs least-cost or highest-profit decisions for those sectors while achieving an equilibrium. The decisions pertain to how the sectors meet their products' demands given a large array of technological and fuel options. They may be broken down into operational and investment decisions. Using those decisions by the model, the effects of limiting renewable electricity generation on the energy system at large are assessed.

The next section provides a historical and current overview of fuel prices in Saudi Arabia. Then, the methods, data, and a description of the scenarios examined for this analysis are provided. The last section delves into the results and extracts insights from them.

2. Fuel Price Reforms in Saudi Arabia

After around 16 years of fixed and below-market domestic energy prices, Saudi Arabia began to reform energy prices in 2016. The reforms aim to facilitate rational energy use and improve the allocation efficiency of Saudi energy products (Gasim and Matar 2023). Producers of end-use goods were the primary target in the first round of reforms, like utilities or industry. The second round of reforms took place in 2018. The second round targeted end-use energy products, such as electricity and gasoline. After 2018, energy prices were mostly held constant until multiple rounds took place from 2023 until 2025. The fuel price adjustments in 2024 and 2025 were the most drastic yet. For instance, the domestic price of Arab Light crude oil rose by 240% and the fuel oil price jumped 250%. Table 1 summarizes the energy prices for a wide range of energy products. Fuel prices are expected to be further adjusted in the coming years in pursuit of the final goal of getting close to market parity.

Table 1. Nominal fuel prices for utilities and industry in Saudi Arabia (units in $/barrel unless stated otherwise).

<table>
<tr><th>Fuel</th><th>1990</th><th>2000</th><th>2010</th><th>2016</th><th>2018*</th><th>2024*</th><th>2025*</th></tr>
<tr><td>Arab Light crude oil</td><td>4.24</td><td>4.24</td><td>4.24</td><td>6.35</td><td>6.35</td><td>17.14</td><td>21.59**</td></tr>
<tr><td>Natural gas</td><td rowspan="2">$0.50/ mmBtu</td><td rowspan="2">$0.75/mmBtu</td><td rowspan="2">$0.75/mmBtu</td><td>$1.25/mmBtu</td><td>$1.25/mmBtu</td><td>$1.75/mmBtu</td><td>$2.15**/ mmBtu</td></tr>
<tr><td>Ethane</td><td>$1.75/mmBtu</td><td>$1.75/mmBtu</td><td>$2.50/ mmBtu</td><td>$2.50/ mmBtu</td></tr>
<tr><td>Diesel (for power and water utilities)</td><td rowspan="4" colspan="2">Data not available</td><td>3.60</td><td rowspan="2">14.00</td><td rowspan="2">16.03</td><td rowspan="2">36.51</td><td rowspan="2">53.67**</td></tr>
<tr><td>Diesel (for industry)</td><td>9.12</td></tr>
<tr><td>Fuel oil 380 centistokes</td><td>2.08</td><td>3.80</td><td>3.99</td><td>9.55</td><td>14.03**</td></tr>
<tr><td>Propane or butane (as natural gas liquids)</td><td>70% of cost-and-freight naphtha price in Japan</td><td colspan="4">80% of the average Ras Tanura propane or butane export price to Japan in the previous month</td></tr>
</table>

Source: World Trade Organization (2005); Albqami and Mathi (2012); Saudi Government (2015); SAMA (2020); Aljazira Capital (2024); Riyad Capital (2024); Argaam (2025).

*Notes: *Excluding Arab light crude oil, natural gas, and ethane, listed fuel prices include the 5% value-added tax implemented in 2018, which was raised to 15% starting in 2021. **Estimated using Argaam (2025).*

It has been shown that complete deregulation of fuel prices will induce greater allocation efficiency in Saudi Arabia (Matar et al. 2015). Greater allocation efficiency would come from discontinuing the use of oil products for power generation and water desalination, and in industrial processes (e.g., Matar et al. 2015, 2017; Matar and Anwer 2017). It is worth noting that Matar et al. (2015) show that the economic benefit stems from the value of oil that is saved domestically. The saved oil may be exported or used for more value-adding purposes to generate more revenues for Saudi Arabia. While industries and utilities exhibit sizable losses as a result of fuel price reforms, these losses can be and are mitigated by government support, which amounts to less than the economic benefit realized by increased fuel-price deregulation. Government support entails temporary cash transfers to local firms to cope with higher fuel prices during the transition. For instance, the Saudi government established the Balancing Account to compensate the Saudi Electricity Company (SEC) for any losses in the medium term (SEC 2020b).

To complement the reforms, Saudi Arabia has established the Liquids Displacement Program (LDP) and renewable electricity targets. LDP aims to raise the economic efficiency of oil use by expanding natural gas supply to industrial facilities, to replace thermal water desalination plants with more energy-efficient reverse osmosis plants, and to wean off oil for power generation in favor of natural gas and renewable electricity (United Nations Framework Convention on Climate Change 2024). Installed renewable electricity capacity in Saudi Arabia has been envisaged to be over 100 GW by 2030 (Alduwaihi and Luomi 2024).

To mitigate the higher costs resulting from higher energy prices for lower-income households, the Saudi government introduced the Citizen's Account (CA) (FBP 2018). Only Saudi citizens qualify for cash transfers under this program. The transfers vary according to the beneficiary's household size and income, and go up to a cut-off point.

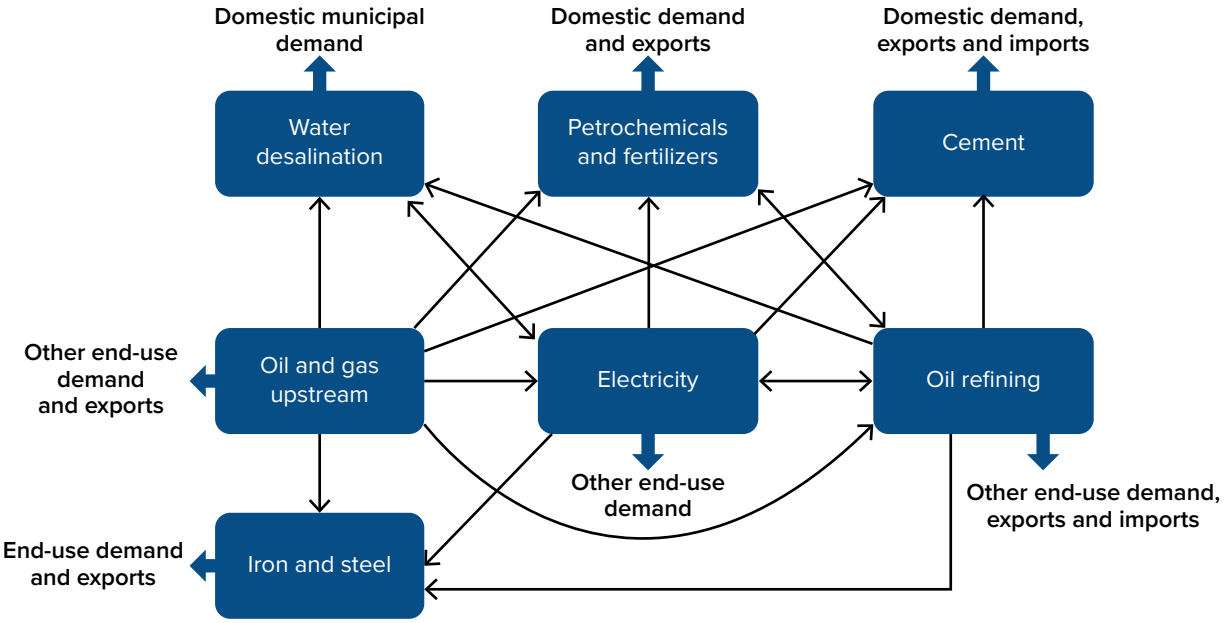
3. Methods and Scenario Analysis: The KAPSARC Energy Model

3.1 Methods and Data

The KAPSARC Energy Model (KEM) is applied in this study. KEM is a multi-sector energy systems model for Saudi Arabia (KAPSARC 2016). It is formulated as a mixed-complementarity problem to easily consider inter-sectoral fuel prices that are set by the Saudi government. KEM consists of seven core sectors represented in western, southern, central, and eastern Saudi Arabia: (1) electric power generation and delivery, (2) oil refining, (3) petrochemicals and fertilizers, (4) water desalination, (5) cement production, (6) upstream iron and steel production, and (7) upstream oil and gas transshipment. The energy flows among the sectors are depicted in Figure 1. Fuels may flow from the oil refining sector to other sectors. It is important that the entire KEM is used in this analysis, as the refined fuel use of other sectors is allowed to fluctuate depending on the policy settings that are input. Generally, the sector maximizes its profit if it exports internationally, while it minimizes its total costs if it only satisfies domestic needs.

KEM was run from 2023 to 2040. The equilibrium among the seven sectors was found over a two-year moving window throughout the 18-year time horizon. The data used to parameterize the latest version of KEM have been detailed by Matar (2025). The most pertinent domestic data to the thesis of this paper are highlighted in this section, and they are the exogenous (or input as fixed values) fuel prices, local natural gas supply, and renewable electricity investment costs.

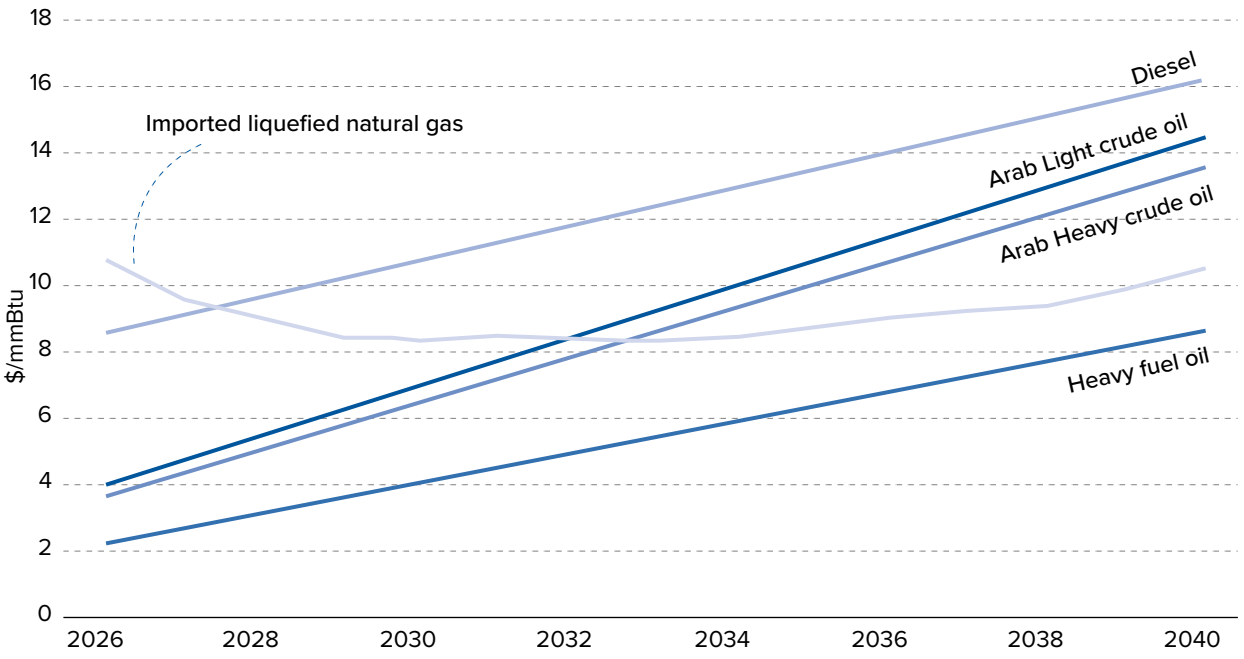
Figure 1. Sectors and their associated energy flows in the KAPSARC Energy Model.



Source: Author.

Domestic fuel prices that are input in KEM are summarized for the period 2023 to 2025 in Table 1, and they are depicted in Figure 2 for later years. They comprise prices for oil products and any imported liquefied natural gas (LNG). Oil prices are estimated to grow linearly until they reach a reference price by 2040. Beyond 2025, the prices for the domestic supply of natural gas, ethane, propane, and naphtha are set to their market-clearing prices that are determined by KEM.

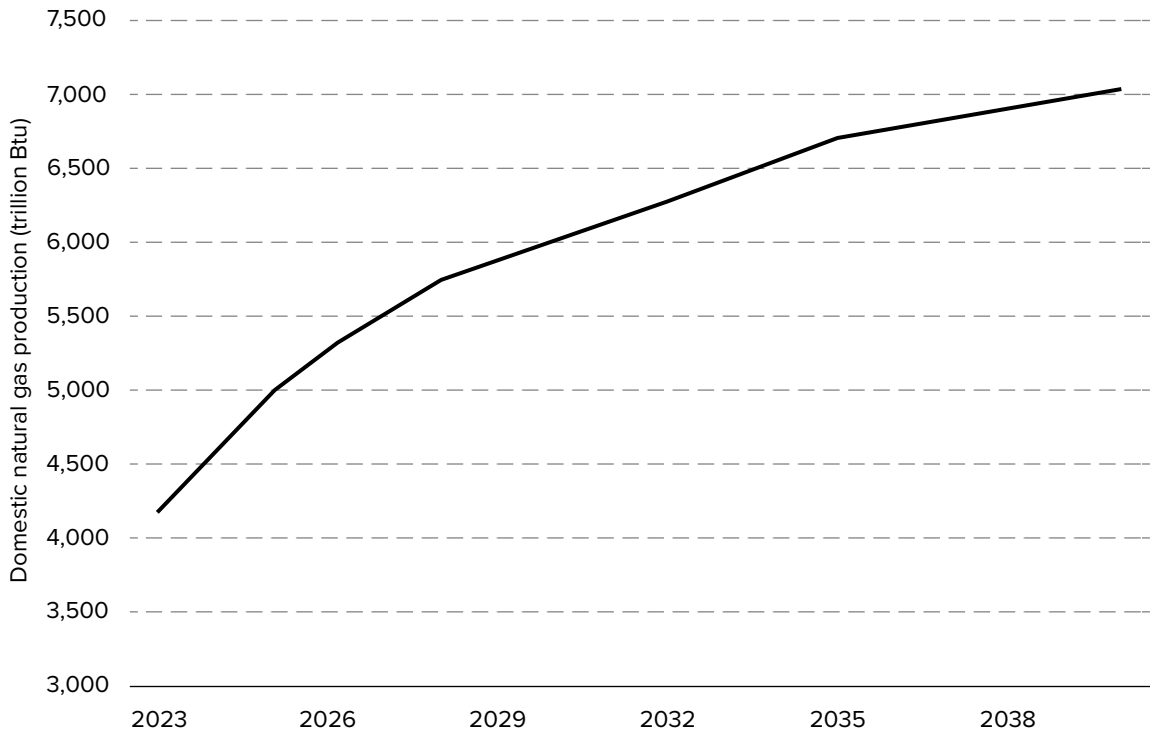
Figure 2. Domestic prices of oil products and imported liquefied natural gas until 2040.



Source: Author.

Total domestic production of natural gas projections used are shown in Figure 3. Natural gas production in 2023 and the 50% increase in production targeted by 2040 are consistent with the ambition of Saudi Aramco (2024). The growth in natural gas production is planned to come from non-associated and unconventional sources, like the Jafurah Gas Field. The profile is an estimation based on Nexant's World Gas Model. Although Jafurah is rich in natural gas liquids (NGL) (see Gray 2022), natural gas production growth rates are also applied to the production of ethane and other NGL.

Figure 3. Input natural gas production in Saudi Arabia until 2040.



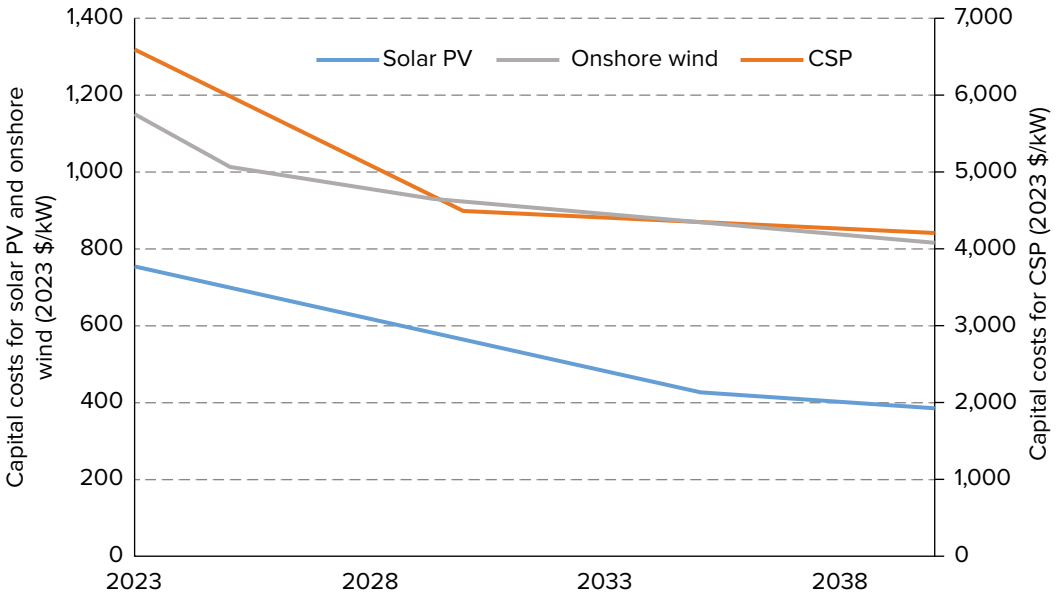
Source: Author.

3.2 Model Scenarios

Two scenarios are run in KEM. In one scenario, called "Renewables," renewable electricity plants are allowed to be built. This is viewed as the business-as-usual case. The Renewables scenario considers renewable electricity plants currently under construction in Saudi Arabia. In the other scenario, called "No Renewables," only the renewable electricity plants in operation are considered. The model is not allowed to build future renewable plants. Both scenarios (note that battery storage has not been considered in the analysis) have the same demands for the outputs of the sectors. One way to view unchanging demands is that the prices of end-consumer goods (e.g., electricity) remain the same. Hence, the only change affecting the results is the supply-side element of the energy system.

Domestic electricity demand growth assumptions are taken from Mikayilov and Al-Mestneer (2024), and they are discussed in more depth by Matar (2025). In the case where renewable electricity plants are built, Saudi Arabia can install up to 6 GW of each renewable generation technology annually. The limit represents any capital and supply chain constraints that may arise. The costs of solar PV, concentrated solar power (CSP), and onshore wind are expected to continue declining in the future. Figure 4 shows the evolution of capital costs for renewable technologies, with fixed operational costs taken as a small percentage of capital costs.

Figure 4. Capital costs of renewable electricity technologies until 2040.



Source: IRENA (2024); NREL (2024a, 2024b, 2024c).

Further, renewable power installations can contribute to the planning reserve margin in KEM. The reserve margin is defined by the installed capacities that can address the peak power load in the electricity system. Solar PV capacity contributes 15%, CSP contributes 60% due to the accompanying thermal energy storage, and onshore wind turbines can contribute 10%. These percentages are author assumptions. However, they are derived from past work with the Saudi Ministry of Energy.

4. Results and Discussion

This section examines the model results in three key areas. Natural gas is consumed by industry and by power and water utilities. Its price for these consumers would affect the prices of other products in the economy. Thus, the equilibrium natural gas price domestically is a critical metric to examine. Another key area is the amount of oil products used by the energy system. If consumers use more oil without renewable electricity, that will come at increasing prices, as shown in Figure 2. The third result that is explored is the cost to generate one more unit of electricity.

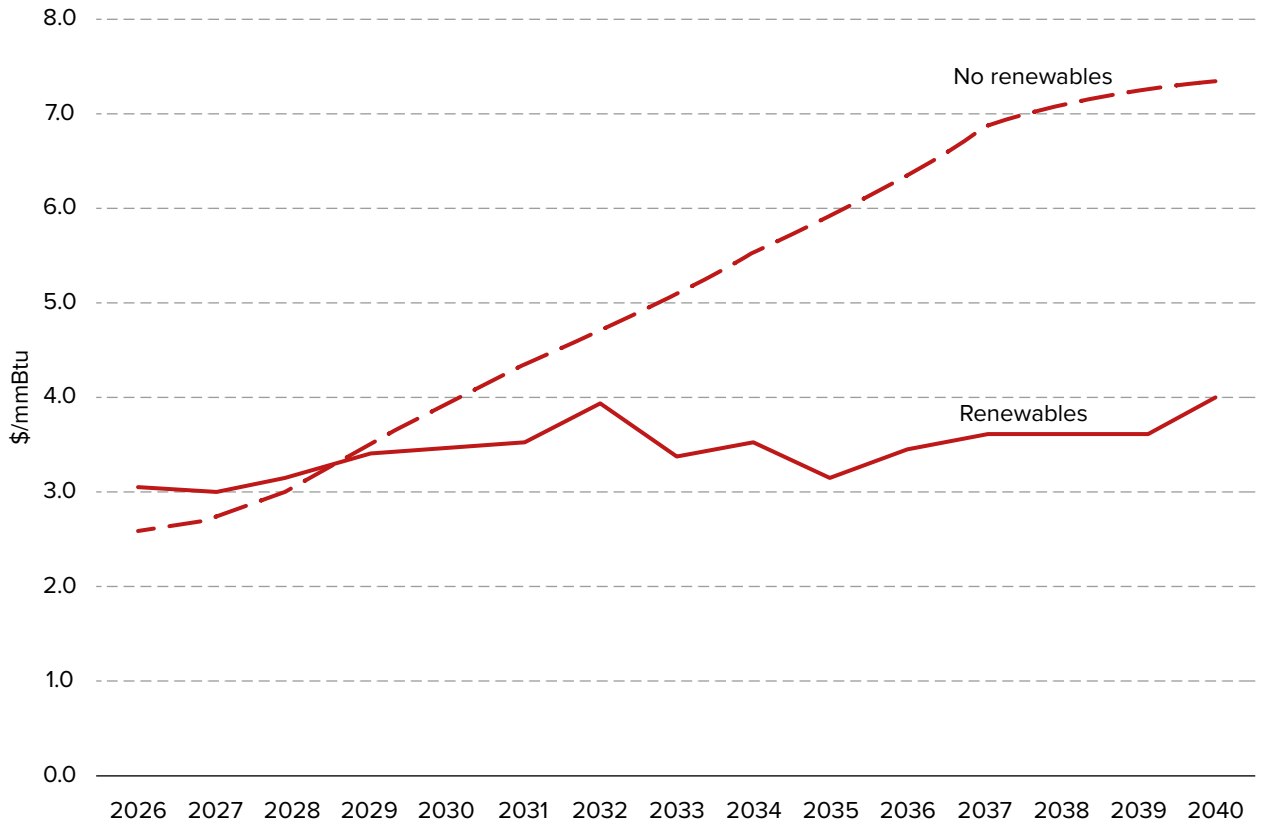
4.1 Domestic Natural Gas Price

Currently, natural gas is neither exported by nor imported into Saudi Arabia. Thus, its "competitive equilibrium," or deregulated, price only applies to local suppliers and consumers. The price of natural gas is determined by KEM as the price at which domestic demand matches domestic supply in a hypothetical market. In other words, it is the equilibrium price in a supply-demand curve. It represents the scarcity of natural gas.

Figure 5 shows the model results for this price for both scenarios. In a business-as-usual case with renewable electricity deployed in Saudi Arabia, the price at which natural gas demand matches supply is between $3 and $4 per mmBtu throughout the time horizon. The electricity sector uses 3,750 trillion Btu of natural gas in 2040 in the Renewables scenario. For comparison, that natural gas price increases until it exceeds $7 per mmBtu by the late 2030s if renewable plants are not installed. Correspondingly, the electricity sector's use of natural gas rises to around 4,450 trillion Btu in 2040. The natural gas price rises over the time horizon because, as discussed in Section 4.2, there is still oil use at increasing prices in the energy system. The marginal natural gas supply in the No Renewables scenario would displace one mmBtu of heavy fuel oil.

This result suggests that natural gas consumers, whether they are power plants, fertilizer plants, or cement producers, would have to spend about twice as much on fuel if renewable electricity was not available. The lower natural gas prices in the Renewables scenario also mean that there may be less of a cost transfer to the end-consumers of those sectors' products.

Figure 5. Domestic market-clearing price of natural gas from 2023 to 2040.

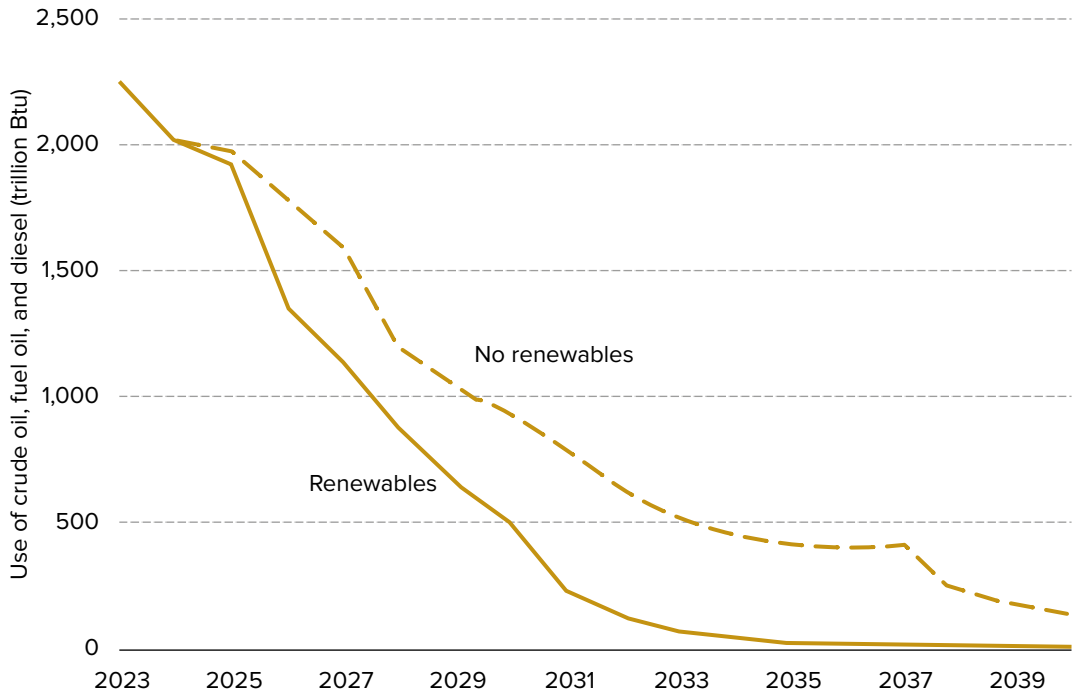


Source: KEM.

4.2 Domestic Demand of Refined Oil Products

Figure 6 graphs the combined amounts of the Arab Light and Heavy crude oils, fuel oil, and diesel that Saudi industry and utilities use over time. In both scenarios, domestic oil use falls precipitously. In the Renewables scenario, which is business-as-usual, the fall is steeper, and the amount effectively reaches zero by 2035. The Renewables scenario still exhibits small amounts of fuel oil for power generation in 2040. Oil is not phased out in the No renewables scenario, and this contributes to higher costs for the energy system, in addition to the higher natural gas price.

Figure 6. Quantities consumed domestically of refined oil products and crude oil, from 2023 to 2040.



Source: KEM.

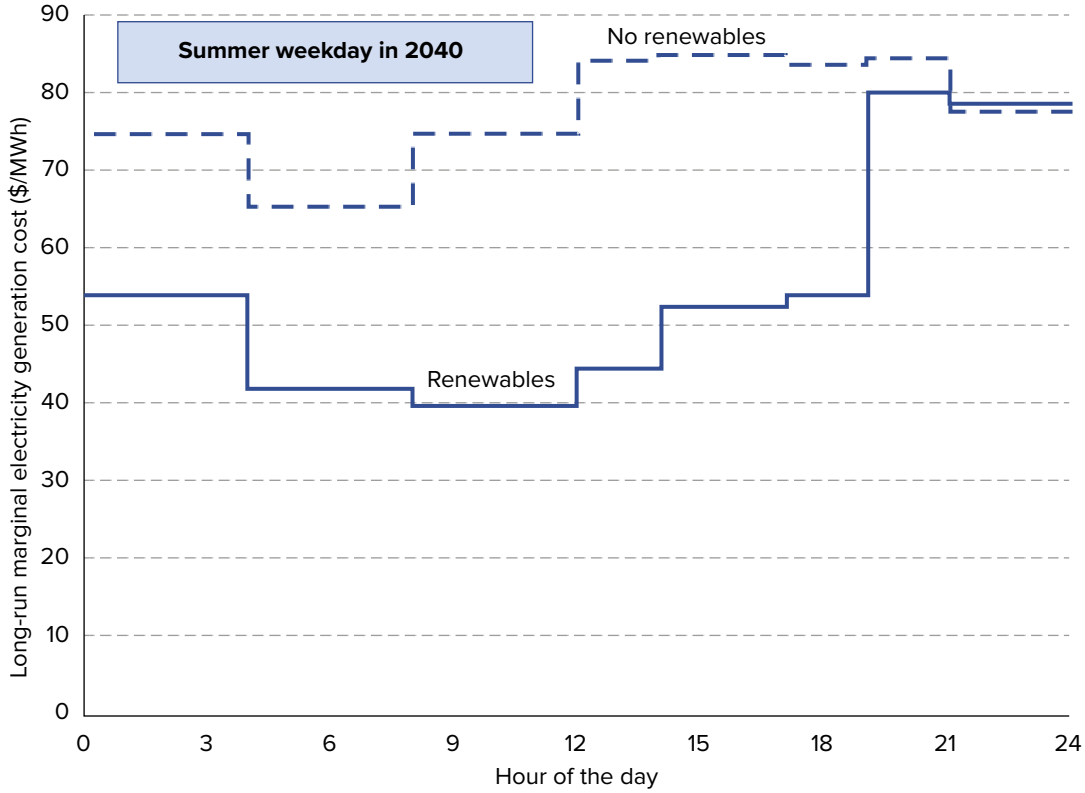
In the No renewables scenario, fuel oil is still being used for electric power generation in significant amounts until 2040. It is also used for cement production until it is phased out in 2037, and that is why a sharp decline is observed at that time. The option to install renewable power enables oil displacement, too.

4.3 Electricity Generation Costs

As a result of the higher clearing price of natural gas and, in relation to this, the increased use of oil products, the electricity generation costs are substantially higher without renewable technologies. The modeled long-run marginal costs of electricity generation for a summer weekday in 2040 are shown in Figure 7 for both scenarios. The regional cost profiles that KEM produces are averaged for all of Saudi Arabia. The average is weighted by the electricity generation of four regions at any given time during the day.

On average, the marginal electricity costs are 30% lower with renewable electricity deployed. The reductions in cost result from 37 gigawatts (GW) of solar PV being built in addition to what is already under construction in the Renewables scenario. In all, nearly 50 GW of solar PV capacity is operable by 2040. Saudi Arabia may choose to deploy higher capacity as part of a strategy to export electricity or any other mandate. The costs during the nighttime peak are somewhat similar for two reasons: (1) the inoperability of solar PV plants and the lack of a storage medium, and (2) the fact that a tiny amount of fuel oil is used in the western region of Saudi Arabia during the summer nighttime period in the Renewables case. The marginal electricity generation at that time would be oil-fired in both scenarios. However, when costs begin to decline starting at 9 am due to the operation of solar plants, the costs increase during the late morning and early afternoon hours in the case without renewable electricity. Additionally, the marginal electricity costs would be 54% to 88% higher from noon until 7 pm.

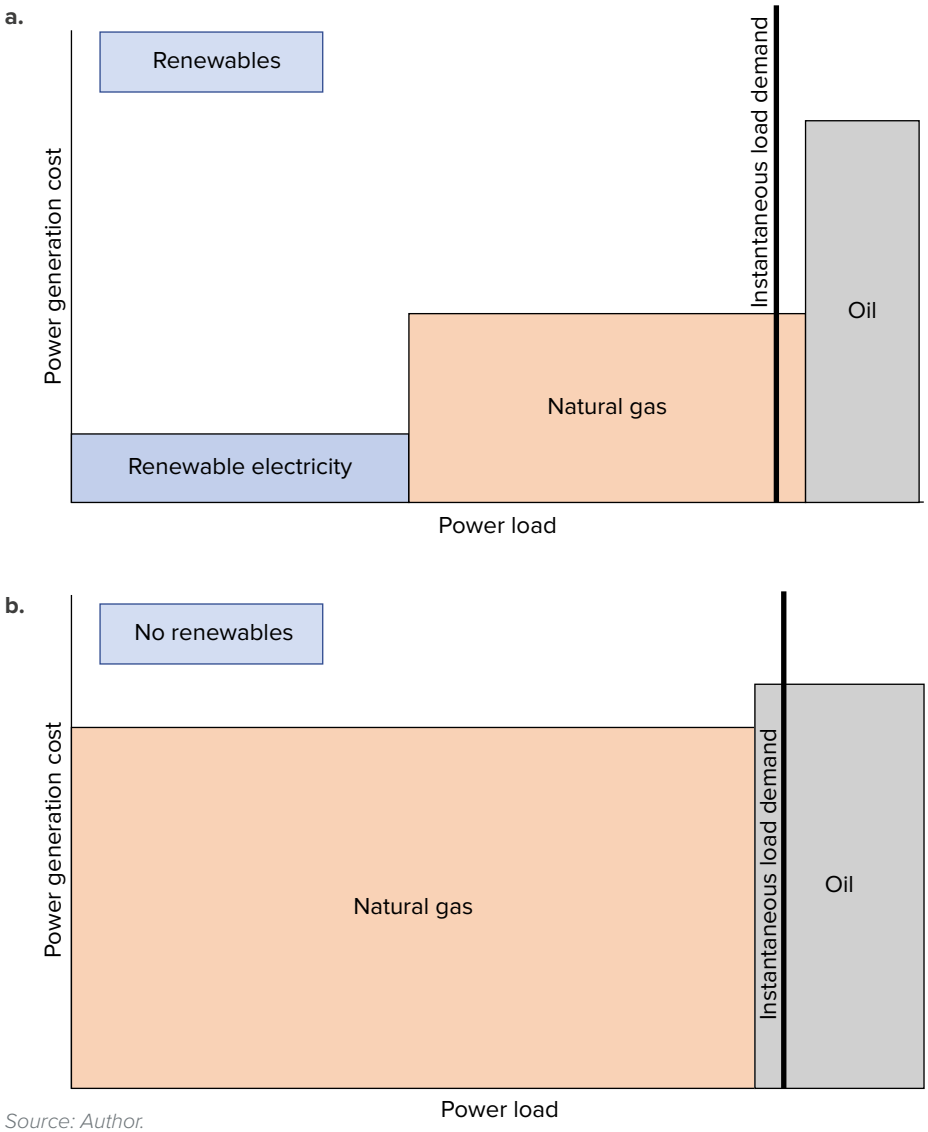
Figure 7. Marginal electricity generation costs in the summer of 2040.



Source: KEM.

Illustrative electricity supply cost curves are shown in Figure 8 to elucidate the marginal electricity cost differences between the scenarios. Both scenarios have the same load at any moment in time. Higher amounts of natural gas are used in the No renewables scenario because more gas would be allocated to the electricity sector – at the expense of other sectors – if no renewable electricity is installed. Aside from the absence of renewable electricity in the No renewables scenario (Figure 8b), power generation costs using natural gas are also higher than in the Renewables scenario (Figure 8a). Additionally, the Renewables scenario requires natural gas to produce the marginal electricity most of the time. This is in contrast to the No renewables scenario, where the existing or marginal electricity is produced using oil at particular instances in time.

Figure 8. Illustrative electricity supply curves in the Renewables (a) and No renewables (b) scenarios.



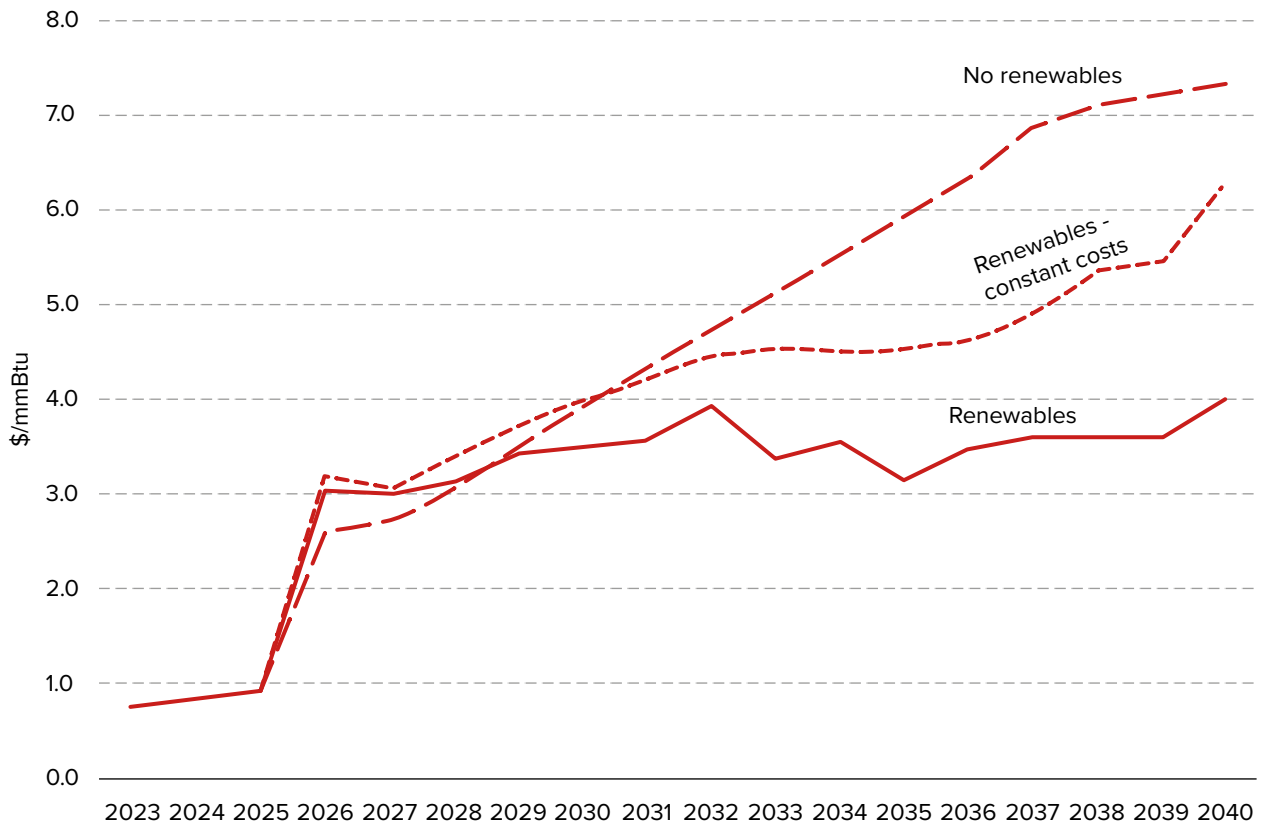
Source: Author.

4.4 What if the Costs of Renewable Technologies do not Continue Declining?

As Figure 4 shows, NREL (2024a, 2024b, 2024c) estimates that the capital costs of renewable technologies are set to decline in the coming years. In this section, the question of whether this trend would affect the thesis of the paper is explored. For this, the capital and fixed operational costs for installing renewable capacity are envisaged to remain at their 2023 levels. The capital cost of solar PV is held constant until the end of the time horizon at $758/kW; for CSP it is $6,589/kW, and it is $1,160/kW for onshore wind turbines. The same set of results is examined: the equilibrium natural gas price, the amounts of oil products that are used domestically, and the marginal cost to generate electricity.

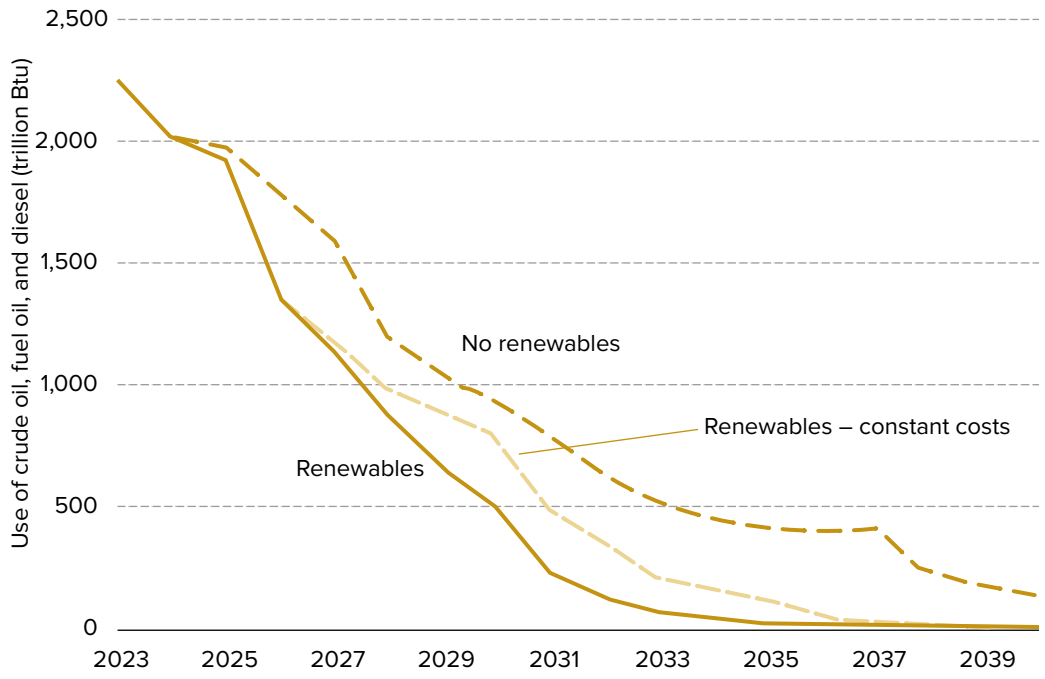
The results for projections of constant costs shown in Figures 9 to 11 fall in between the results of the No renewables and Renewables scenarios. The equilibrium price of natural gas in the long run rises at a slower rate than in the No renewables scenario to around $6/mmBtu in 2040. It is still significantly higher than the $3-$4/mmBtu with the expected cost reductions of renewable technologies. Similarly, domestic oil use falters at a pace that is slower than the Renewables scenario but faster than the No renewables one. If the costs of renewable electricity technologies remain flat, the marginal cost to generate electricity on a summer weekday in 2040 drops by 9% compared to the No renewables scenario. This is much lower than the 30% decline that is expected if renewable technologies continue their cost reductions. Compared to 37 GW of additional solar PV built when the costs of renewable technologies follow the cost reductions in Figure 4, the model builds 26 GW when PV costs remain flat.

Figure 9. Comparing domestic market-clearing price of natural gas if the costs of renewable technologies were flat until 2040.



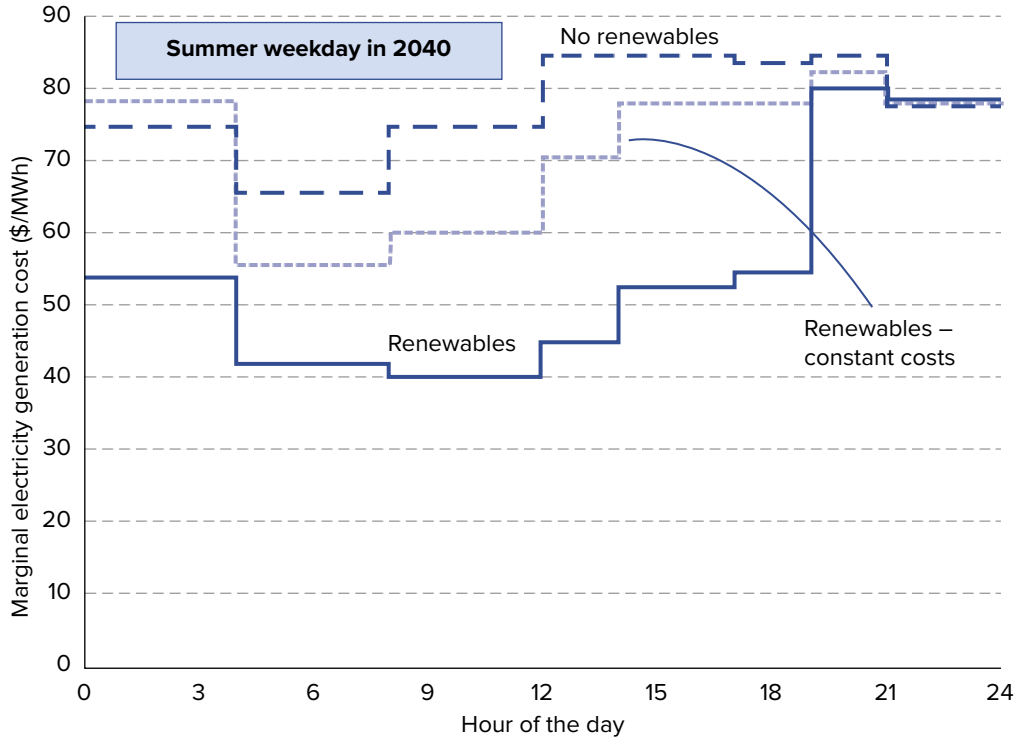
Source: KEM.

Figure 10. Comparing domestic oil use if the costs of renewable technologies were flat until 2040.



Source: KEM.

Figure 11. Comparing the marginal cost to generate electricity in 2040 if the costs of renewable technologies were flat until the end of the time period under study.



Source: KEM.

5. Concluding Remarks

Saudi Arabia aims to maximize the economic value of its energy resources. This means that resources are allocated to users where they produce the most value. Pricing fuels through establishing a price discovery mechanism or observing other similar markets around the world realizes this aim. Saudi Arabia is currently undergoing such fuel price reforms, expanding its own natural gas supplies, and deploying renewable electricity. All these initiatives have been shown in the literature to play a role in improving economic efficiency.

Homing in on renewable electricity, their emergence as an economically viable option and their persistent cost declines have shaped global energy systems. This paper has aimed to find the benefits that renewable power generation offers the Saudi energy system. In this context, the study has examined how sectors within the Saudi energy system cope with fuel price reform in the cases with and without renewable power technologies. A multi-sector energy system model designed for Saudi Arabia has been used to carry out the analysis. The analysis was conducted from 2023 to 2040.

Three areas of focus were identified in the modeling assessment. One was the market-clearing price of natural gas, or the price that achieves the equilibrium between domestic demand and supply. The other two areas were the domestic use of oil by the modeled sectors and the marginal electricity cost.

With renewable electricity investment allowed, it was found that the equilibrium natural gas price remains around $3-$4/mmBtu throughout the time horizon. Without renewable electricity, this price escalates over the years, surpassing $7/mmBtu by 2040. This essentially means that the natural gas price would double in the absence of renewable electricity. Industrial consumers of natural gas and utilities would be pressured to pass on at least some of these costs to their customers. Natural gas use by the electricity system also rises by 20% in 2040 without renewable technologies being used.

Also, while oil use would be nearly phased out in the business-as-usual case with renewable electricity deployment, oil use would still be significant if renewable power technologies were unavailable or too costly. Some fuel oil would still be used for power generation in 2040, though much lower than the case in 2023.

Without renewable power generation, fuel price reform would result in a combination of higher natural gas prices and persistent oil use. This combination would adversely impact the energy system and, in particular, the electricity system. The marginal electricity generation cost is expected to be higher without renewable power generation. In the afternoon and early evening hours, those costs would be 54% to 88% higher without renewable electricity. The marginal electricity generation cost with renewable electricity would drop by 30% on average.

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About the Author



Walid Matar

Walid Matar is a Principal Fellow in the Oil & Gas Program at KAPSARC, specializing in energy systems modeling. His work focuses on the KAPSARC Energy Model and related projects, including modeling residential electricity use and the distribution of refined products in Saudi Arabia. He has developed components covering electric power generation, oil refining, petrochemicals, cement production, and iron and steel industries. Walid holds a Ph.D. in Economics from the University of Portsmouth, an M.Sc. in Mechanical Engineering from North Carolina State University, and a B.Sc. in the same field from the University of South Carolina. His research bridges technical and economic perspectives, with interests in optimization, energy efficiency, and integrated energy systems.

About the Project

We developed the KAPSARC Energy Model (KEM) for Saudi Arabia to understand the dynamics of the country's energy system. It is a partial equilibrium model formulated as a mixed complementarity problem to capture the administered prices that permeate the local economy. KEM has been previously used to study the impacts of various industrial fuel pricing policies, improved residential energy efficiency on the energy economy, the feasibility of deploying power plant technologies in Saudi Arabia, natural gas storage, and a way to computationally analyze residential electricity prices.



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