

THE ENERGY TRANSITION OF THE UNITED ARAB EMIRATES 2008–2023. FROM MASDAR CITY TO COP28

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Abstract. This article outlines the changes to the United Arab Emirates' energy policy between 2008 and 2023. The research aims to demonstrate the multifaceted process of energy sector transformation, from implementing the Masdar City smart city concept and developing nuclear and solar energy to strengthening the country's international position by hosting the COP28 summit. The research addresses questions concerning the evolution of the energy mix and the importance of strategic investments in the UAE's transformation. The analysis was based on the theories of the rentier state and soft power. The research results indicate a gradual reduction in the dominance of natural gas, alongside an increase in the share of low-carbon sources – primarily nuclear and solar energy. Despite the partial implementation of their objectives and delays resulting from financial constraints, the implementation of energy security projects has contributed to the diversification of energy production. The hypothesis that the UAE's status as a net importer of natural gas has driven investment in low-carbon energy has been confirmed. Financed by revenues from fossil fuels, the transition has reduced emissions and freed up gas resources for future LNG exports.

Keywords: energy security, energy transition, nuclear energy, renewable energy, United Arab Emirates, rentier state.

JEL Classification: Q40, Q42, H87, O13

1. Introduction

In the second half of the first decade of the 21st century, the United Arab Emirates (UAE) embarked on an energy transition policy, symbolically marked by the 2006 announcement of the Masdar City project. This policy, initiated by the President and the Federal Supreme Council of the UAE, aimed to reduce fossil fuel consumption and transition to an economy independent of oil demand. This plan was carefully considered, particularly with regard to the UAE's domestic energy requirements. It should be emphasised that, due to the UAE's domestic natural gas and oil reserves, increasing energy security was not an urgent priority for the Federal Supreme Council. Instead, the UAE's search for alternative energy sources was driven by the growing demand for energy in the economy, the desire to increase exports of natural gas and oil, and the goal of establishing the UAE as a responsible climate

leader on the international stage. Between 2008 and 2023, the UAE invested significantly in nuclear and renewable energy sources.

The objective of this article is to analyse the multidimensional energy transition of the UAE between 2008 and 2023. The analysis covers the energy evolution, starting with the implementation of the Masdar City smart city concept, through the implementation of nuclear and solar energy programmes, to the strengthening of the UAE's position on the international stage as the host of the COP28 summit.

To achieve this objective, the article attempts to answer the following research questions: 1. How has the structure of the UAE's energy mix changed during the period under review? 2. What role did strategic investments, such as Masdar City, the Barakah power plant, and photovoltaic farms, play in the UAE's

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energy transition? The article formulates and verifies the hypothesis that the United Arab Emirates' (UAE) transformation into a net importer of natural gas in 2007 prompted the authorities to make strategic investments in nuclear and solar energy, despite the difficulties caused by the global financial crisis of 2008–2009. The aim was to reduce dependence on external gas supplies and make domestic resources available for export. These investments have led to a gradual shift in the energy mix towards low-carbon sources.

To verify the hypothesis, a dogmatic, decision-making and comparative method was employed, alongside desk research and statistical data analysis. The dogmatic method was employed to analyse the 1971 UAE Constitution, alongside strategic documents such as the Abu Dhabi Economic Vision 2030 and the UAE Energy Strategy 2050. These documents define the institutional framework for the transition to a new energy system. This study employed a decision-making method to analyse the Federal Supreme Council's and the UAE President's decision-making processes regarding key strategic investments, including the Masdar City project, the Barakah nuclear power plant, and large-scale photovoltaic farms. A comparative analysis was conducted to examine the evolution of the UAE's energy mix between 2008 and 2023, enabling the identification of the scope and direction of the transition. A qualitative analysis was conducted based on existing data on the energy mix and demand for raw materials, as well as government documents and reports from international institutions, such as the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA), the Energy Information Administration (EIA) and the Emirates Nuclear Energy Corporation (ENEC).

The analysis of the UAE's energy transition is based on the rentier state theory developed by Hossein Mahdavy (1970) and Hazem Beblawi (1987). According to this concept, states that derive a significant portion of their income from resource rents are characterised by a high degree of executive autonomy in strategic decision-making. In the UAE's case, revenues from oil exports have enabled costly investments in nuclear and solar energy to be financed without raising taxes or obtaining broad public consensus. At the same time, the article interprets the UAE's actions on the international stage using Joseph S. Nye's concept of soft power (Nye, 2004). Projects such as Masdar City, the acquisition of the IRENA headquarters, and the organisation of the COP28 summit served to build the UAE's image as a responsible player in global climate policy. The energy transition thus served two functions: an internal one, involving economic diversification and energy security, and an external one, involving public diplomacy and international legitimacy. This approach sheds light on

why a country that is one of the world's leading crude oil exporters also aspires to be a leader in the energy transition.

The timeframe covered by the article is 2008–2023. The first date marks the start of construction of Masdar City, the world's first city designed to be carbon neutral. The second date marks the UAE's hosting of the COP28 summit, which confirmed the country's ambition to become a global leader in the transition to clean energy.

The issue of energy policy, and in particular the UAE's energy transition, has attracted the attention of many scholars. Notable among them is Mari Luomi (Luomi, 2012; 2015), who analysed the climate policy of the Persian Gulf monarchies and the UAE's transition in the context of a rentier state. Jim Krane (2019), on the other hand, has studied energy policy and fuel subsidies in the region. Toby Craig Jones (Jones, 2010) examined the impact of natural resources on political power in the Arabian Peninsula. The topics addressed in this article are therefore part of an ongoing academic debate. Robin Mills and Li-Chen Sim (2021) provided a thorough examination of the evolution of low-carbon energy in the Middle East. However, research combining a political science perspective with an analysis of the UAE's energy transition between 2008 and 2023 remains limited. The article is divided into the following sections: 1. Determinants of UAE energy policy; 2. Directions of the UAE's energy transition; 3. COP28 as the culmination of the UAE's energy transition.

2. Conditions of the UAE's Energy Policy

2.1 Political Structure and Decision-Makers

The UAE Constitution of 1971 defined legal regulations concerning the political system of the UAE and the scope of competence of state authorities, setting out, among other things, the direction of energy security policy. Initially temporary, the constitution became permanent in 1996 and has since been amended several times. The UAE is a federation consisting of the following emirates: Abu Dhabi, Dubai, Sharjah, Ras Al Khaimah, Umm Al Quwain, Fujairah and Ajman. These emirates form a unified entity in economic and customs matters (UAE Constitution, 1971).

Although each of the emirates is an absolute monarchy, together they form a federation with a central government. The Emirate of Abu Dhabi is the largest of the seven emirates. It covers 87% of the UAE's territory. It accounts for around 95% of the federation's oil reserves and 92% of its natural gas reserves. The executive branch has a tripartite structure consisting of the Federal Supreme Council, the president (head of state) and the Council of Ministers, which is responsible for day-to-day politics (UAE Constitution, 1971).

The Federal Supreme Council consists of the rulers of all seven emirates and is responsible for electing the president for a five-year term (this position is usually held by the monarch of Abu Dhabi; from 2004 to 2022, it was held by Khalifa bin Zayed Al Nahyan, and since 2022, by Mohammed bin Zayed Al Nahyan¹) and changes in legislation. Thus, the UAE is both a federal state and a monarchy. Each emirate is ruled by hereditary monarchs, with no participation from democratically elected political parties.

The head of state performs both ceremonial and executive functions in foreign policy. He appoints the prime minister, who is responsible for forming a government (the executive branch), which oversees the implementation of federal policy in all institutions, including the energy transition strategy. The Ministry of Energy and Infrastructure is responsible for implementing sustainable development goals and diversifying energy sources within the government. In addition to its executive powers, the Federal Supreme Council has legislative powers, including the ratification of federal laws before their promulgation (Article 47 of the Constitution). According to Article 46 of the Constitution, each emirate has one vote in the Council. The Federal National Council, which consists of 40 members, is a separate body. It plays a consultative role in matters such as draft federal laws (Article 89 of the Constitution).

It is worth noting that the UAE's political system differs from the traditional separation of powers, in which the legislative and executive branches are clearly distinct. The concentration of extensive powers in the Federal Supreme Council allows for the swift implementation of state policies, for example through the approval of federal laws. Between 2008 and 2025, the Council made decisions concerning energy policy and the pursuit of climate neutrality. Within its remit, the Federal Supreme Council has influenced the development of the Masdar project and the construction of the Barakah nuclear power plant, as well as the implementation of large-scale investments in solar energy. These decisions align with the UAE's Energy Strategy 2050, which aims to increase clean energy's share in the country's energy mix to 50%.

2.2 Internal and External Factors Influencing the Energy Transition

Since 2008, the UAE's energy policy has focused on obtaining energy from sources other than fossil fuels. The energy transition at the end of the first decade of the 21st century was influenced by internal factors,

¹ In 2004, Mohammed bin Zayed Al Nahyan became Crown Prince of Abu Dhabi. His brother Khalifa bin Zayed Al Nahyan (President of the UAE) entrusted him with the task of modernising the country. This enabled Mohammed bin Zayed Al Nahyan to initiate the Masdar City project.

such as political and economic considerations, as well as external factors resulting from the international situation and global climate policy.

One of the internal factors influencing the UAE's energy transition was the state budget's dependence on oil exports. In 2008, the UAE had approximately 97.8 billion barrels of proven oil reserves; by 2023, this figure had increased to around 111 billion barrels thanks to new discoveries (EIA, 2023). Despite the growth in reserves, the UAE authorities recognised the risk posed by long-term dependence on fluctuations in commodity prices on global markets. Abu Dhabi's crown prince, Mohammed bin Zayed Al Nahyan, made economic and energy diversification a strategic priority, as set out in the Abu Dhabi Economic Vision 2030, which was adopted in November 2008.

Another important factor influencing the UAE's energy transition was the growing domestic demand for energy. Population growth and infrastructure development have led to increased demand for energy, including natural gas.

Domestic natural gas production (around 50 billion m³ in 2008) failed to meet the growing domestic demand of around 60–70 billion m³. Consequently, the UAE became a net importer of natural gas in 2007. The Dolphin gas pipeline from Qatar reached its full capacity of around 20 billion m³ per year in 2008 (EIA, 2020). In 2023, the UAE's gas balance was as follows: domestic production of around 57 billion m³, imports from Qatar of around 20 billion m³, and domestic consumption of around 70–77 billion m³. Despite the increase in domestic production, the UAE remained dependent on gas imports. This motivated the development of nuclear and solar energy, with the aim of freeing up gas resources for future LNG exports.

The UAE's dependence on external suppliers created new risks for its energy security. The lack of control over gas prices and supplies posed a potential geopolitical threat. This risk materialised during the 2017–2021 diplomatic crisis. Together with Saudi Arabia, Bahrain and Egypt, the UAE accused Qatar of supporting terrorism and imposed an economic blockade on the country.

Despite the ongoing conflict, gas supplies through the Dolphin pipeline were not suspended. However, the UAE authorities decided to take action to find alternative energy sources, fearing a cut-off of supplies from Qatar. The strategic solution was to replace natural gas in the power industry with nuclear and solar energy. In the long term, this would enable domestic gas resources to be redirected for export as LNG.

Another internal factor behind the UAE's change in energy policy was the country's high level of carbon dioxide emissions per capita. In 2009, the UAE was the sixth highest emitter of CO₂ per capita worldwide, primarily due to the intensive use of air conditioning, seawater desalination, and energy-intensive

infrastructure projects (EIA, 2023). Additionally, the renewable energy sector offered the prospect of creating well-paid jobs in design, management, installation and maintenance, especially for new entrants to the labour market. For example, the construction of the Al Dhafra solar power plant between 2020 and 2023 generated around 4,500 jobs during the construction phase. This provided real employment prospects for young people (Blackridge Research, 2026).

Changes in the UAE energy sector were also influenced by external factors resulting from the international situation and global climate policy. The first of these was the Paris Agreement and the resulting climate policy commitments. Notably, the UAE was the first country in the Middle East to ratify the Paris Agreement in 2016, committing to a 7% reduction in projected greenhouse gas emissions by 2030 (UAE Ministry of Climate Change, 2016). The organisation of the COP28 summit in Dubai in 2023, chaired by Dr Sultan Al Jaber (president of the state-owned ADNOC), increased international expectations of the UAE's energy transition actions (UNFCCC, 2023a). Significant volatility in oil prices on global markets has impacted the UAE's energy transition. Fluctuations in oil prices, particularly during the 2008–2009 financial crisis, made the UAE authorities aware of the risk of excessive budget dependence on the oil sector. This reinforced the need to develop renewable energy sources (IMF, 2010). The significant decline in the cost of renewable energy technologies also played a key role in changing the direction of the UAE's energy policy. Falling photovoltaic and wind energy prices increased their competitiveness compared to conventional sources. With an average of 350 sunny days per year, the UAE was able to develop cheap solar electricity production (IRENA, 2021).

In 2016, Saudi Arabia's Crown Prince Mohammed bin Salman announced the Vision 2030 strategy, which included the development of renewable energy sources. This increased pressure on the UAE to accelerate its own efforts and maintain its position as a leader in the energy transition in the Persian Gulf region (Climate Change Laws, 2016).

An analysis of the internal and external factors influencing the UAE's energy transition reveals that it was not merely a response to global climate trends. Rather, changes to the UAE's energy policy were part of a broader strategy to bolster the country's long-term energy and economic security.

The dynamic development of nuclear and renewable energy sources in the UAE was driven by a combination of factors related to the economic and social situation, as well as changes in the global energy market.

3. Directions of the UAE's Energy Transition

3.1 The Masdar City Project as a Pioneering Energy Policy Instrument

In April 2006, Crown Prince Mohammed bin Zayed Al Nahyan of Abu Dhabi initiated the Masdar City project (Masdar, 2016). The project aimed to build a city based on a model of sustainable urban development, with almost zero carbon dioxide emissions. The project was one of the elements of the Abu Dhabi emirate's economic diversification strategy, which was set out in the *Abu Dhabi Economic Vision 2030* document in 2008. This document set out a plan for economic transformation that assumed a gradual reduction in dependence on the oil sector. The Masdar City Project aimed to combine economic goals with the ambition of building the emirate's international image as a leader in sustainable development. Masdar City was to be characterised by advanced urban planning and technological innovation. Designed for 50,000 residents and 50,000 daily commuters, it was to be a zero-emission city. Key features of the Masdar City project's urban planning and innovative technology included implementing an autonomous underground transport system and using modern wind towers to reduce the temperature of the urban environment.

The Masdar City project was conceived at a time of global economic growth and skyrocketing oil prices. It was intended to demonstrate to citizens that Crown Prince Mohammed bin Zayed Al Nahyan was pursuing a policy aimed at preparing the UAE for the energy transition. Masdar (the Abu Dhabi Future Energy Company) was responsible for implementing the project. Masdar is a subsidiary of the state investment fund Mubadala Development Company. The total investment budget was estimated at 22 billion USD (Arab Urban 2026).

The Abu Dhabi government allocated 15 billion USD to the entire Masdar initiative, of which less than a third was earmarked for the construction of the city. The remainder of the budget was to be provided by external financial institutions and corporate partners, including Credit Suisse and Siemens Venture Capital. Construction of Masdar City began in February 2008, with the first phase originally scheduled for completion in 2009 and the entire city by 2016.

A key success of Abu Dhabi's policy in implementing the Masdar City project was the selection of Abu Dhabi as the headquarters of the International Renewable Energy Agency (IRENA). Dr. Sultan Al Jaber, CEO of Masdar, led the diplomatic campaign to secure the location. Germany initiated the agency and organised the founding conference in Bonn in January 2009. The UAE has committed to providing 136 million USD over six years to finance IRENA's activities, as

well as covering the operating costs of the headquarters indefinitely. Additionally, the Abu Dhabi Fund for Development, a state-owned financial institution, has pledged to provide up to 50 million USD per year in loans to finance renewable energy projects in developing countries. It should be noted that the implementation of the Masdar City project coincided with the global financial crisis, leading to an update of its financial security. Masdar subsequently announced a reduction in the investment budget from 22 billion USD to 18–19.8 billion USD (Aramco World, 2017).

The completion date for the investment was postponed from 2016 to 2030. The global financial crisis also prompted a rethink of Masdar City's environmental objectives. The vision of a zero-emission city was replaced by the concept of a low-emission city. Nawal Al-Hosany, Masdar's deputy director of sustainability, announced that the original project assumptions regarding cooling towers, city wind turbines, and solar panel-covered roofs had been abandoned. However, the Masdar City project was able to retain its function as an instrument of soft power (i.e., a state's ability to influence other international actors through attraction and persuasion rather than coercion) due to the reduction in funding for the project caused by the global financial crisis. In October 2010, Alan Frost, the project's director, confirmed that the Personal Rapid Transit (PRT) system would only be implemented as a pilot scheme due to the high cost of underground construction. The PRT system involved autonomous electric vehicles travelling on underground tracks. Masdar City was connected to the external power grid in 2016, meaning that the concept of complete energy self-sufficiency was definitively abandoned.

In 2022, Masdar's management officially changed the project's goal from achieving zero emissions to reducing emissions by 50% (Hite, 2024). Considering the results of the Masdar City project, it is worth noting that by the end of 2023, around 15,000 people were living and working in the city, including 5,000 permanent residents – accounting for around 11% of the projected population. The development covered less than one-sixth of the planned 6 km² area.

However, it managed to attract over 1,000 companies, accounting for around 67% of the 1,500-strong target. Apart from IRENA, another achievement of the project was the establishment of the regional headquarters of institutions such as Siemens, the Mohammed bin Zayed University of Artificial Intelligence (MBZUAI), the UAE Space Agency, the Advanced Technology Research Council (ATRC), G42 Healthcare and Khalifa University (formerly the Masdar Institute of Science and Technology). Masdar City's appeal to renowned international companies and institutions confirmed the project's effectiveness in establishing the

UAE's image as a centre of innovation and sustainable development in the Persian Gulf region. Although Masdar City was not completed according to the original plan, the project boosted the career of Masdar CEO Dr. Sultan Al Jaber.

In 2009, Al Jaber was appointed by UN Secretary-General Ban Ki-moon to the Advisory Group on Energy and Climate Change. From 2010 to 2016, he served as the UAE's special envoy for climate change. In 2020, Dr. Al Jaber assumed the role of Minister of Industry and Advanced Technology of the UAE, and three years later he presided over the COP28 summit in Dubai (Masdar 2026).

3.2 Nuclear Energy – Barakah Power Plant

In December 2006, the Gulf Co-operation Council (GCC) countries, including the UAE, decided to conduct joint research on the peaceful use of nuclear energy. In 2008, the UAE published a document entitled *United Arab Emirates Policy on the Assessment and Potential Development of Peaceful Nuclear Energy* (ENEC 2008), which set out principles for safety and environmental protection in the context of nuclear energy development. The document predicted an increase in energy demand from 15.5 GWe in 2008 to over 40 GWe in 2020, a total reduction in coal consumption, and the development of nuclear energy and renewable energy sources (RES) (World Nuclear Association 2025).

The United Arab Emirates has committed to operational transparency during the construction of the nuclear power plant and its daily operation, in accordance with the guidelines of the International Atomic Energy Agency, and to the use of nuclear energy for peaceful purposes only. This declaration was of particular significance in the context of the prevailing geopolitical tensions in the Persian Gulf region. As posited by Paul Dorfman, the head of the international nuclear energy consulting group Nuclear Consulting Group (NCG), the development of civil nuclear programmes has proven to be more contentious in this region than in other parts of the world. This is primarily due to the potential for military utilisation of this technology. It is important to acknowledge the UAE government's consistent stance against the presence of weapons of mass destruction in the Middle East².

In January 2009, US Secretary of State Condoleezza Rice in the George W. Bush administration and UAE Foreign Minister Abdullah bin Zayed Al Nahyan signed an agreement on peaceful co-operation in the field

² They then committed to complying with the provisions of UN Security Council Resolution 1540 of 2004, which requires states to introduce national regulations to prevent terrorist and criminal organisations from acquiring weapons of mass destruction (ENEC 2008).

of nuclear energy, known as the “123 Agreement”³. The agreement, which was the result of many months of negotiations, provided for the UAE's voluntary renunciation of uranium enrichment and nuclear fuel processing on its own territory in favour of importing ready-made fuel. This unparalleled measure prompted non-proliferation specialists to regard the accord as a “gold standard” for nuclear collaboration (UAE Embassy 2026). The UAE's voluntary renunciation of its uranium enrichment and fuel processing capabilities has allayed international concerns regarding the potential military utilisation of its nuclear programme. The UAE's peaceful nuclear policy was confirmed in December 2009 with the establishment of the Emirates Nuclear Energy Corporation (ENEC) by President Khalifa bin Zayed Al Nahyan. The entity in question was responsible for the implementation of the nuclear programme. As part of the construction project for the nuclear power plant, ENEC engaged in negotiations with various reactor suppliers, including the French company Areva and the Korean consortium Korea Electric Power Corporation (KEPCO), which included companies such as Hyundai, Samsung, and Doosan. In the final analysis, ENEC entered into a contractual agreement with KEPCO. The decision to select the Korean consortium was influenced by several factors. One factor was price: KEPCO's offer of 20 billion USD was almost half the price of Areva's proposal of 36 billion USD, and the offer from Japanese-American company GE-Hitachi was even higher (MIT Technology Review, 2019). Furthermore, Areva had experienced significant delays and budget overruns in constructing a reactor in Olkiluoto, Finland, while GE-Hitachi was known for missing contract deadlines. KEPCO, on the other hand, had around 40 years' experience of building reactors in South Korea using a tried-and-tested project standardisation model (MIT Technology Review, 2019). The contract between ENEC and KEPCO included the delivery of four nuclear reactors, as well as the transfer of knowledge and training for Emirati specialists. The significance of this agreement to both parties was demonstrated by the attendance of both the South Korean President, Lee Myung-bak, and the UAE President, Khalifa bin Zayed Al Nahyan, at the signing ceremony on December 27, 2009 (Congressional Research Service, 2010).

ENEC chose the location for the Barakah nuclear power plant in the emirate of Abu Dhabi due to its seismic stability, distance from urban centres and access to seawater. The cornerstone of the Barakah power plant was laid in March 2011 (ENEC 2026). The ceremony was attended by South Korean President Lee Myung-bak and UAE Crown Prince Mohammed bin Zayed. Construction of the first unit of the nuclear

power plant began in July 2012. In January 2020, the UAE became the first Arab country to generate nuclear energy when it launched its first nuclear reactor, informing the international community of this achievement. Speaking at the event, Vice President and Ruler of Dubai, Mohammed bin Rashid, said that the UAE's goal is “to operate four nuclear power plants that will provide a quarter of the country's energy needs in a safe, reliable and emission-free manner” (DW, 2020).

Between 2020 and 2024, all units at the Barakah nuclear power plant were gradually commissioned, making it the first commercial nuclear power plant in the Arab world. At full operating capacity, the plant supplies around a quarter of the UAE's electricity and avoids 22.4 million tonnes of CO₂ emissions each year (ENEC, 2024). The successful construction of the nuclear power plant has strengthened the UAE's position as a leader in the energy transition in the Persian Gulf region.

3.3 Large-Scale Solar Energy Projects

Large-scale solar energy projects have played a pivotal role in the United Arab Emirates' 21st-century energy transition strategy. The concept of solar energy development in the UAE was set out in strategic documents adopted by the UAE Council of Ministers at the federal level and by the authorities of Abu Dhabi and Dubai at the emirate level. In November 2015, Dubai's ruler, Mohammed bin Rashid Al Maktoum, announced the Dubai Clean Energy Strategy 2050. This strategy aims to meet 75% of the emirate's energy needs from clean sources by 2050. In January 2017, the UAE Cabinet, chaired by Vice President and Prime Minister Mohammed bin Rashid Al Maktoum, adopted the UAE Energy Strategy 2050 at the federal level. This strategy aims to increase the share of clean energy in the country's total energy mix to 44%. All of the above documents envisaged the development of large-scale photovoltaic projects as part of this diversification.

The first significant solar project in the UAE was the Shams 1 concentrated solar power plant. In 2010, the Abu Dhabi authorities decided to implement this investment, selecting a consortium of Total (France) and Abengoa Solar (Spain) as partners of the state-owned company Masdar through a tender process. The 600 million USD project was implemented as a public-private partnership. Masdar held a 60% stake, Total held a 20% stake, and Abengoa Solar held a 20% stake (Masdar, 2013). The inauguration of the 100 MW power plant took place in March 2013, with the event being marked by the official opening ceremony presided over by UAE President Khalifa bin Zayed Al Nahyan. During the inauguration, Dr. Sultan Al Jaber, then CEO of Masdar, stated that “the UAE is the only OPEC country supplying both hydrocarbons and renewable energy to the international market” (TotalEnergies 2013).

³ The name “123 agreement” came from Section 123 of the US Atomic Energy Act of 1954.

In January 2012, the Ruler of Dubai, Mohammed bin Rashid Al Maktoum, announced the construction of a solar park in Seih Al Dahal, which was subsequently designated as the Solar Park. The initial phase of the investment, with a capacity of 13 MW and a value of 124 million AED, was initiated in October 2013 (NS Energy Business 2020). The project was implemented by the state-owned Dubai Electricity and Water Authority (DEWA) under an IPP (Independent Power Producer) model, which involved the participation of foreign partners in subsequent phases of the investment. By 2030, it is anticipated that Solar Park will attain a capacity of 5 GW, with the total expenditure anticipated to exceed 50 billion AED.

The subsequent phases of the project reflected the evolution of the UAE's foreign policy, as evidenced by the changing ownership structure. While Western partners (Total, Abengoa) dominated in the initial phase, Abengoa's financial crisis in 2015 and the growing importance of China's Belt and Road Initiative contributed to the entry of new partners: in the fourth phase of the project, a 24% stake in Noor Energy 1 was acquired by Saudi Arabia's ACWA Power and China's Silk Road Fund.

Between 2014 and 2023, the share of solar energy in the UAE's electricity production increased from 0.3% to 8.3% thanks to the implementation of these and subsequent projects, as did installed capacity, which grew from 133 MW to over 5 GW (Ember, 2024). Large-scale solar energy projects have played a significant role in the UAE's energy transition. They have enabled the diversification of the energy mix and reduced dependence on natural gas. They have demonstrated the competitiveness of photovoltaic systems compared to traditional energy sources. Furthermore, they have strengthened the UAE's international reputation as a leader in sustainable development in the Middle East.

4. COP28 as the Culmination of the UAE's Energy Transition

The UAE was the first country in the Middle East to commit to achieving net-zero emissions by 2050. The announcement was made on October 7, 2021, at Expo 2020 in Dubai, by the UAE's Vice President and Prime Minister, Sheikh Mohammed bin Rashid Al Maktoum, and the then Crown Prince of Abu Dhabi, Sheikh Mohammed bin Zayed Al Nahyan (UAE Government Portal, 2021). When analysing this event, it is important to note that the choice of location for the announcement was part of a deliberate strategy to present the UAE as a leader in energy transition on the international stage, despite its ongoing investment in the hydrocarbon sector.

During COP26 in Glasgow in November 2021, the decision was made to select the UAE as the host of COP28 (UNFCCC, 2023b). In January 2023, while

preparations for the summit were underway, the UAE's president, Sheikh Mohammed bin Zayed Al Nahyan, appointed Sultan Ahmed Al Jaber Ph. D, as president of the UN climate conference. Analysis of the research material reveals that Al Jaber is the first COP president to have served simultaneously as CEO of the Abu Dhabi National Oil Company (ADNOC) and as chairman of Masdar (COP28 UAE 2023).

In light of the above findings, it is important to emphasise that the fulfilment of financial obligations was made possible by revenues from oil exports, which remained the UAE's main source of budget revenues throughout the entire review period. Paradoxically, it was revenues from the hydrocarbon sector that financed the energy transition. Investments in Masdar City, the Barakah nuclear power plant and large-scale photovoltaic projects resulted in tangible changes to the UAE's energy mix between 2008 and 2023.

Analysis of the collected research material has shown that, in 2008, the UAE extracted around 50 billion m³ of natural gas from its own resources. The domestic electricity sector relied almost exclusively on this raw material, accounting for 99% of its requirements (UAE Ministry of Energy, 2015; IEA, 2023).

At that time, no energy was produced from renewable or nuclear sources. By 2023, natural gas production had increased to around 57 billion m³, supplemented by imports of around 20 billion m³ from Qatar via the Dolphin pipeline (Dolphin Energy, 2026). Taking the installed capacity data into account, commissioning the Barakah nuclear power plant (5,600 MWe) and large-scale photovoltaic farms (over 5 GW) reduced natural gas's share of the electricity mix to 72%. Low-carbon sources accounted for the remaining 28%, comprising nuclear energy (20%) and solar energy (8%) (Ember, 2024; Low Carbon Power, 2023).

The effects of the UAE's 15-year energy transition are presented in Figure 1.

The analysis shows that the UAE's energy transition aligns with the particular economic logic of rentier states in the Persian Gulf.

In 2023, the UAE exported around 70% of its domestic oil production, primarily to Asian customers. Japan accounted for 40–44% of these exports (EIA, 2023). The remaining 30% was used for domestic consumption, primarily in the refining, petrochemical and transport sectors.

The high market value of oil means that using it for electricity generation is not economically rational. The domestic electricity sector therefore relies on natural gas, which has a lower unit value. In the long term, the development of nuclear and solar energy has enabled a gradual reduction in domestic gas consumption, allowing it to be exported in the form of LNG. The energy transition therefore not only serves the declared climate goals, but also frees up gas resources for future export.

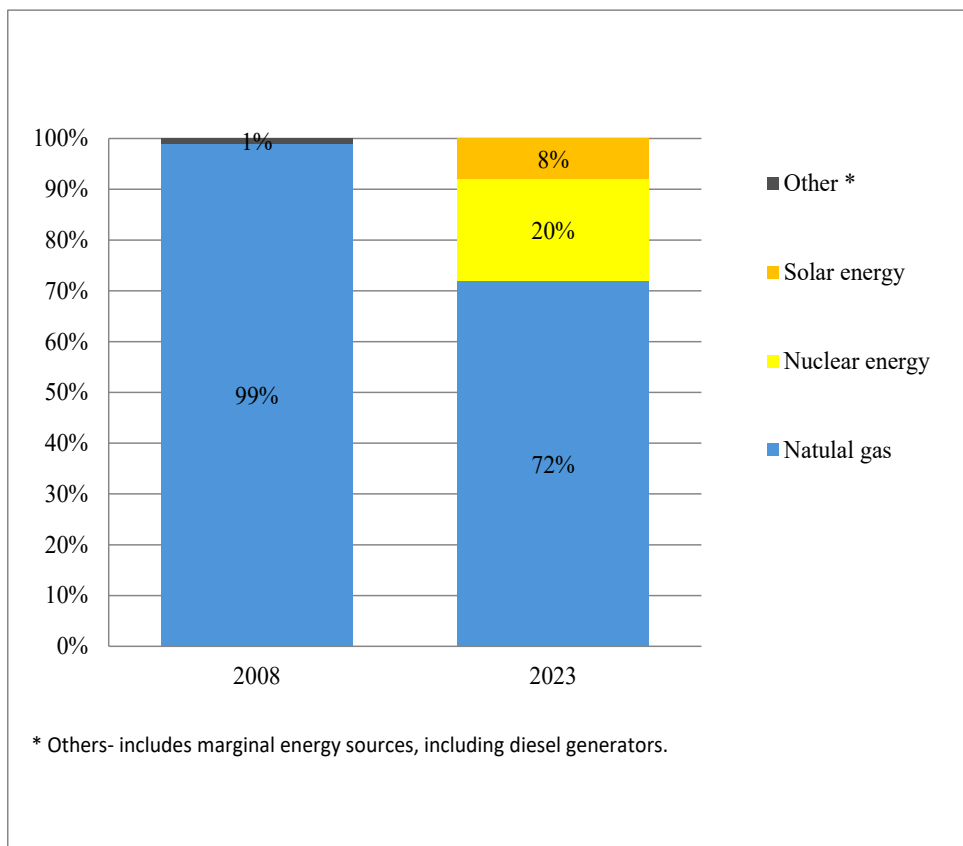


Figure 1. The United Arab Emirates' energy mix in 2008 and 2023

Source: UAE Government Portal (2015); IEA (2023)

Conclusions

The results presented in this article lead to several important conclusions regarding the United Arab Emirates' energy transition between 2008 and 2023. Firstly, in response to the initial research question concerning changes to the UAE's energy mix, statistical analysis revealed significant transformations. In 2008, natural gas was the primary source of energy production. However, by 2023, its share of the energy mix had decreased in favour of low-carbon sources such as nuclear and solar energy.

Secondly, with regard to the next research question concerning the role of strategic investments in the UAE's energy transition, it can be concluded that they all played a significant role. Masdar City was a symbolic starting point for the transition and a technology laboratory. The Barakah nuclear power plant has provided a significant proportion of the country's electricity. Photovoltaic projects enabled solar energy production to be scaled up. However, it should be noted that the objectives of both projects were not fully achieved. Masdar City was scaled back due to the global financial crisis of 2008–2009, and the launch of the Barakah power plant was delayed by seven years. Despite these setbacks, investments

have yielded measurable results in the form of a more diverse energy mix.

In light of the analysis, the hypothesis presented in the article has been confirmed. The UAE's transformation into a net importer of natural gas in 2007 prompted the authorities to make strategic investments in low-carbon energy, despite the global financial crisis of 2008–2009. This led to a gradual change in the energy mix between 2008 and 2023. These investments resulted in a gradual reduction in the role of gas, leading to a change in the energy mix between 2008 and 2023. Strategic investments have gradually reduced the role of natural gas in favour of low-carbon sources. This transition was financed using revenues from the sale of fossil fuels. The long-term goal is to reduce emissions and free up gas resources for future LNG exports. The UAE's case confirms the assumptions of rentier state theory regarding the authorities' high degree of autonomy in allocating resource rents. The energy transition did not result from social pressure or a democratic process, but from the strategic calculations of the ruling elite. At the same time, however, this case also illustrates how rentier states can use revenues from fossil fuels to build a post-hydrocarbon economy.

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