Igniting Action to Reduce Gas Flaring:
Real Opportunities. Real Projects. Real Results.

Country Case Study:
Republic of Iraq (Federal Iraq)

Columbia Center on Sustainable Investment
A JOINT CENTER OF COLUMBIA LAW SCHOOL AND COLUMBIA CLIMATE SCHOOL

capterio

Andrew Bernstein, Mark Davis, Tom Mitro, Perrine Toledano

June 2025

Republic of Iraq (Federal Iraq) Gas Flaring Case Study

Context to this study

This case study is part of a broader report by the Columbia Center on Sustainable Investment and Capterio, which analyzes gas flaring in depth. The report presents extensive findings and a practical set of actionable recommendations for governments, national oil companies, international oil companies, and other stakeholders. The full report and case studies are available here.

Despite bold commitments made over the past two decades, global gas flaring remains stubbornly high—at around 140–150 BCM per year—emitting up to 1 billion metric tons of CO_2-equivalent greenhouse gases annually, and representing as much as $30 billion per year in lost revenue.

We believe flaring reductions are not only technically achievable, but also commercially compelling. By capturing and using flared gas, companies and governments can increase revenue, enhance energy security, reduce emissions, and accelerate the energy transition. Among all decarbonization options, reducing gas flaring is one of the fastest and most cost-effective "quick wins."

Countries with high flaring levels can make substantial progress—if key commercial, organizational, and political challenges are addressed. Delivering flare-capture projects at scale requires a thoughtful, integrated, and collaborative approach, supported by strong leadership, aligned incentives, and a relentless focus on delivery over rhetoric.

The full report examines six case studies—including this one—to illustrate how flaring can be reduced. We go beyond analyzing the "what" and "why" of flaring, and focus on the "how" of unlocking and accelerating actual delivery. Three of these cases are project-based examples from Angola, the Kurdistan Region of Iraq, and Argentina, where flared gas has been successfully captured and used. The other three country-based studies—covering Federal Iraq, Egypt, and Algeria—highlight both progress and untapped opportunities.

The full report also explores the systemic barriers to progress, the lessons learned from the case studies, together with some innovative life-cycle considerations for greenhouse gas emissions, and a detailed set of recommendations.

We encourage readers of this case study to explore the broader report and the other case studies. Together, we hope they offer a meaningful contribution to global efforts to end routine gas flaring.

Executive Summary

Republic of Iraq (Federal Iraq) Case Study

After many years of hesitation, Iraq seems to be on the road to tackling its persistent associated gas flaring problem, with several major projects coming on line soon. First among these is the multi-billion dollar Gas Growth Integrated Project, a four-part structure involving TotalEnergies, QatarEnergy and state-owned Basra Oil Company, incorporating associated gas capture and processing for three fields in southern Iraq (and possibly more in a second phase), a seawater treatment facility and a solar energy plant, all funded by Iraq's first zero routine flaring oil project. This discussion provides the story behind Iraq's multi-year effort to reduce associated gas flaring.

Introduction

Iraq should be an ideal country for flaring-reduction projects. For many years, its associated gas flaring has been among the highest in the world, while at the same time, Iraq has a substantial need for gas to address persistent electricity production shortfalls and to develop its industrial capacity.

According to the World Bank, Iraq flared 17.7 BCM of gas in 2023[1] (16.3 BCM excluding flaring in the Kurdistan Region of Iraq, where the oil sector is semiautonomous), ranking third globally after the Russian Federation and the Islamic Republic of Iran. Additionally, according to the 2025 International Energy Agency's Global Methane Tracker, an additional 3.3 BCM of methane was lost in Iraq through venting, leaking and from incomplete combustion at gas flares in 2024.[2] Iraq therefore has the potential to capture up to 21.0 BCM of additional gas with a notional revenue opportunity of up to $3.8 billion per year.[3]

If a significant portion of this gas were captured, it would allow Iraq to use gas to fuel power plants that currently run inefficiently on fuel oil, diesel fuel and crude oil, as well as capturing revenue from extracted natural gas liquids. Instead, Iraq has been running power plants well below capacity on highly polluting liquid fuels, and has also been importing gas and power from Iran at high prices, although U.S. sanctions waivers permitting the purchase of power were revoked in February 2025. Iraq has announced plans to commission two floating storage and regasification units to allow it to import liquefied natural gas (LNG) beginning in 2025, in order to make more gas available for electricity production. Iraq also imports petrochemicals and other derivative products that could instead be produced domestically from derivatives of gas, and it has a need to develop industrial sectors that would benefit from access to domestic gas.

Until recently, Iraq had implemented only one world-class flare-reduction project, Basrah Gas Company (BGC), which reports a gas processing capacity of almost 1 billion scf per day (10.3 BCM/a)[4]—an impressive volume although it falls short of the objective of twice that volume set when it was created in 2011. BGC also has not met one of its original objectives, to build a new LNG terminal to export part of the associated gas that it processes. The three fields that feed gas to BGC continue to flare substantial volumes – World Bank data indicates they flared 5.8 BCM in 2023 and Capterio indicates this is 4.6 BCM in 2024.

BGC was supposed to mark the beginning of the end for gas flaring in Iraq, but this has not been the case. After BGC, Iraq had difficulty launching additional projects, initially due to financial problems resulting from the sharp drop in oil prices in 2014 and the fight against the Islamic State. As conditions stabilized beginning in 2017, Iraq sought investments in flare reduction, but the projects were plagued by indecision and hesitation within the government.

The situation began to change in 2021, when Iraq's Ministry of Oil announced the signature of definitive agreements for the Gas Growth Integrated Project with TotalEnergies.[5] Pushed forward by the Minister of Oil at the time, Mr. Ihsan Abdul-Jabbar Ismail, and TotalEnergies CEO Patrick Pouyanné (with the support of French President Emmanuel Macron), the project will capture and process flared associated gas from three of the largest flaring fields in southern Iraq—Ratawi, Majnoon, and West Qurna 2—with a possible second phase covering additional fields. It also includes the construction of a seawater processing facility that will free up scarce freshwater currently injected in oil reservoirs to maintain pressure, as well as a 1 GW solar power facility. The project will effectively be funded with increased oil production from the Ratawi field, required to be operated on a zero routine flaring basis, a first for Iraq.

1 World Bank Group. (2023). *Global gas flaring tracking report.* https://www.worldbank.org/en/programs/gasflaringreduction/publication/2023-global-gas-flaring-tracker-report.

2 International Energy Agency. (2025). *Global methane tracker 2025.* https://www.iea.org/reports/global-methane-tracker-2025.

3 Based on assumed pricing of US$5 per MMBtu. See "Abbreviations and Conversions" in the main report of which this case study is a part.

4 "Basrah Gas Company", Basrah Gas Company, https://www.basrahgas.com/.

5 "Iraqi Oil Ministry in $27 Billion Gas Growth Integrated Project With Total Energies," *Clearly Gottlieb*, July 27, 2021, https://www.clearygottlieb.com/news-and-insights/news-listing/iraqi-oil-ministry-in-27-billion-gas-growth-integrated-project-with-totalenergies.

The Gas Growth Integrated Project was officially launched in 2023, two years after the agreements were signed, with state-owned Basra Oil Company taking a 30% equity interest and QatarEnergy 25%, alongside TotalEnergies which has retained a 45% interest and is the operator. The initial phase of the gas processing facility, designed to process 50 million scf per day (0.5 BCM/a), is currently scheduled for operation in 2025, with full project completion to process 300 million scf per day (3.1 BCM/a) expected in 2028 or 2029, followed by a possible second phase.

The Gas Growth Integrated Project may presage a change of paradigm for Iraq, which in 2024 announced the initiation or signature of agreements for several new projects to reduce gas flaring in southern Iraq. Pushed forward by Prime Minister Mohammed Shia al-Sudani and current Oil Minister Hayan Abdul Ghani, these projects are a welcome change from the plethora of non-binding Memoranda of Understanding signed from 2017 to 2021 without concrete results (despite Iraq having endorsed the World Bank's Zero Routine Flaring by 2030 initiative in 2017[6], and also the UN's Global Methane Pledge[7]). The more recent projects appear to show a strong desire within the Government to tackle flaring after years of indecision from prior Governments. If these projects are carried forward, they will represent an important success for Iraq in finally addressing its flaring problem, potentially allowing it to meet the Prime Minister's announced (yet still highly ambitious) objective of eliminating routine flaring by 2028.[8]

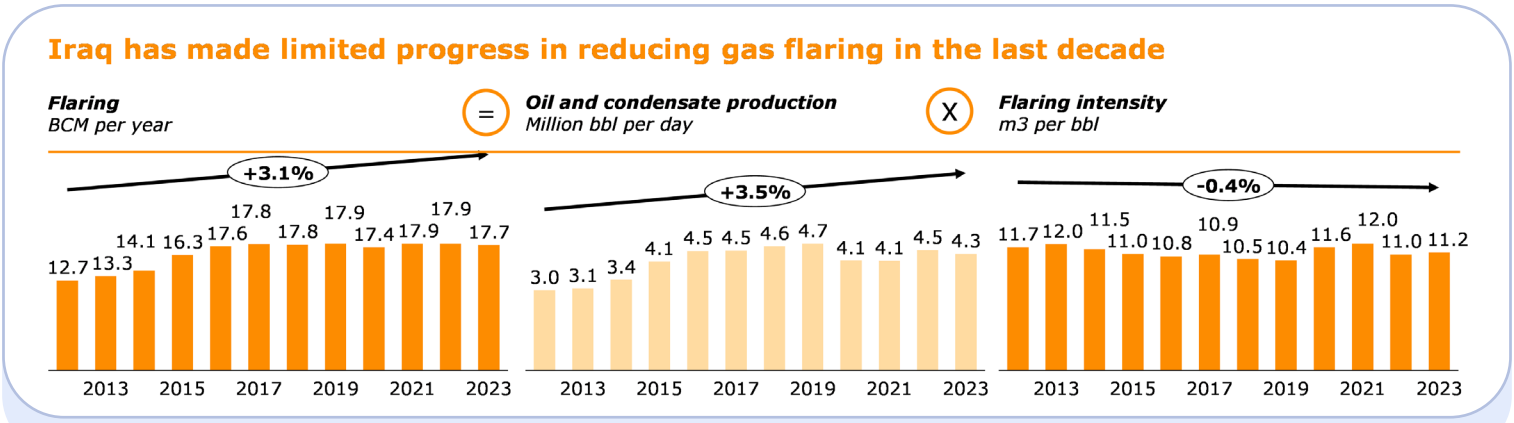
Associated Gas Flaring in Iraq

Overview

Iraq has flared large volumes of associated gas for more than a decade, and in 2023 it was third globally behind only Russia and Iran. It flared approximately 17.7 BCM of associated gas in 2023, and also lost an estimated 3.3 BCM of methane due to leaks and incomplete combustion. Approximately 16.3 BCM of the flared volumes in 2023 come from fields administered by the federal government, through the Iraqi Ministry of Oil, while the remainder, some 1.4 BCM, comes from fields in the Kurdistan Region, which are administered separately (see our case study of the Sarqala field). Compared with most other countries, Iraq's flares are substantial in size, at an average of 9 million scf per day, according to calculations based on World Bank data.[9]

Figure 1 shows Iraq's annual flared volumes of associated gas (including the Kurdistan Region), together with oil and condensate production, given that this product is the main driver of flaring.[10] The calculated "flaring intensity" (i.e. flaring in cubic meters per barrel of oil and condensate production) has remained broadly flat for a decade (and over two times the global average of 4.9 m^3 per barrel), suggesting that despite the good intentions and significant progress through BGC, the challenge remains.

6 "ZBF Initiative Endorsers," World Bank Group, https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030/endorsers.
7 "About the Global Methane Pledge," Global Methane Pledge, Climate & Clean Air Coalition Secretariat, 2025, https://www.globalmethanepledge.org/#pledges.
8 "PM: Our Goal is to Stop Gas Flaring at Zero Percent by 2028," *Iraqi News Agency*, February 1, 2025, https://ina.iq/eng/37443-pm-our-goal-is-to-stop-gas-flaring-at-zero-percent-by-2028.html.
9 "Global Gas Flaring Data," World Bank Group, June 2024, https://www.worldbank.org/en/programs/gasflaringreduction/global-flaring-data.
10 Note: Some of the condensate is produced through the processing of associated gas, and therefore it does not generate flared associated gas. Some of the condensate is produced through in-field condensation, and in this sense it is more similar to crude oil production. Because most sources measure flaring intensity by reference to oil and condensate production, we do the same in this report.

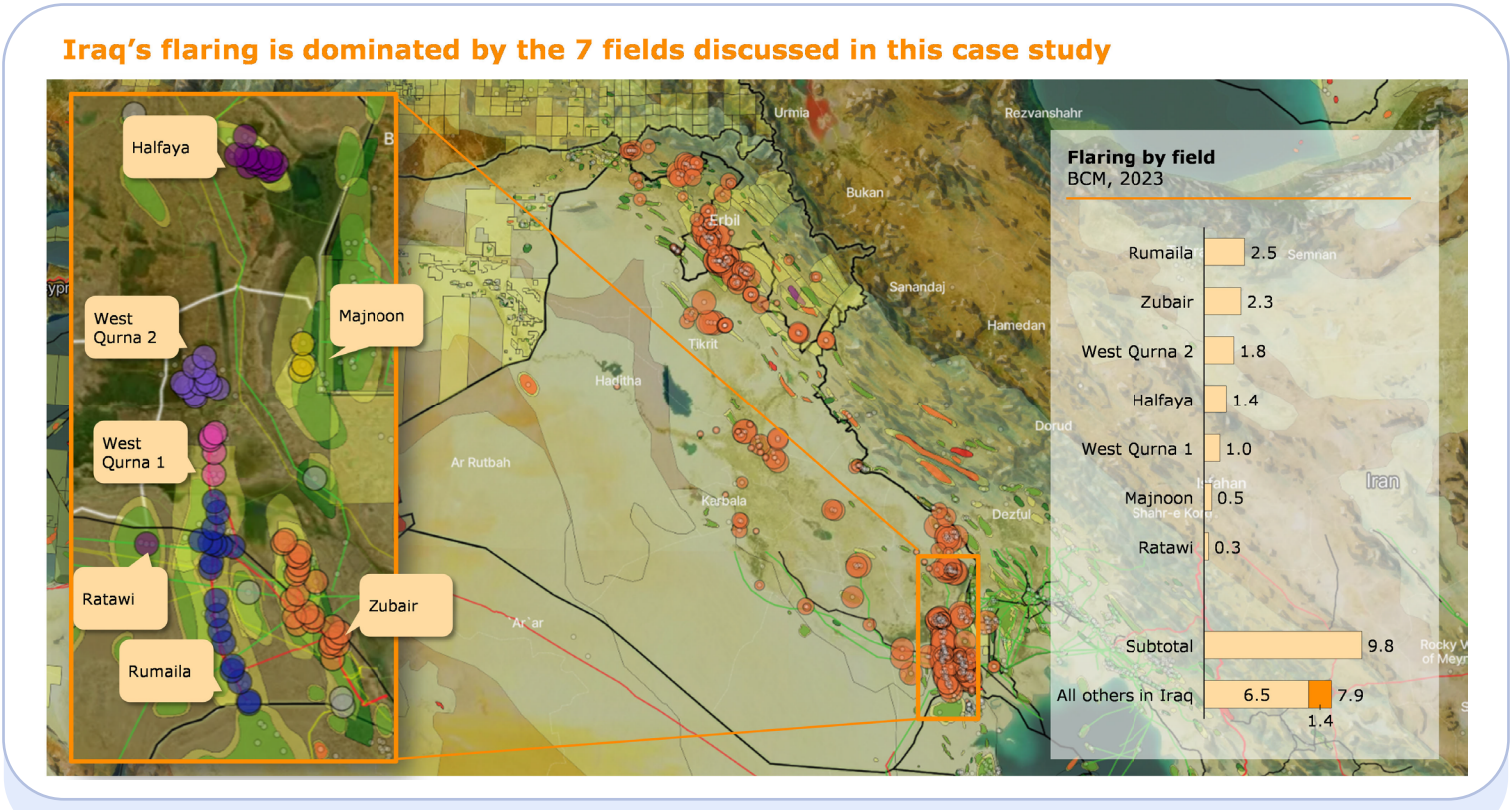


Source: World Bank; Capterio analysis.

Figure 1: Gas flaring, oil and condensate production, and gas-flaring intensity in Iraq. Flaring increased in line with higher oil production before stabilizing, although intensity has increased in the most recent years.

A significant reason for the increase in flared volumes over this period is growth in oil production from 2012 to 2019, which was a major goal for Iraq as it initiated the reconstruction of the country following the second Gulf War. Flaring volume then stabilized, but given lower oil production due to the COVID-19 pandemic and OPEC+ constraints, flaring intensity increased. In 2023, Iraq's flaring intensity was 11.2 m^3 per barrel of crude oil and condensate, the sixth highest flaring intensity registered among the twenty countries with the highest flaring volumes globally (behind Iran, Venezuela, Algeria, Libya and Congo Brazzaville).

Iraq's flaring occurs mainly at several large fields in the Basra area. Figure 2 shows the concentration of these fields in southeast Iraq, near the Arabian Gulf, through which Iraq exports the vast majority of its oil production.



Source: Capterio FlareIntel; World Bank.

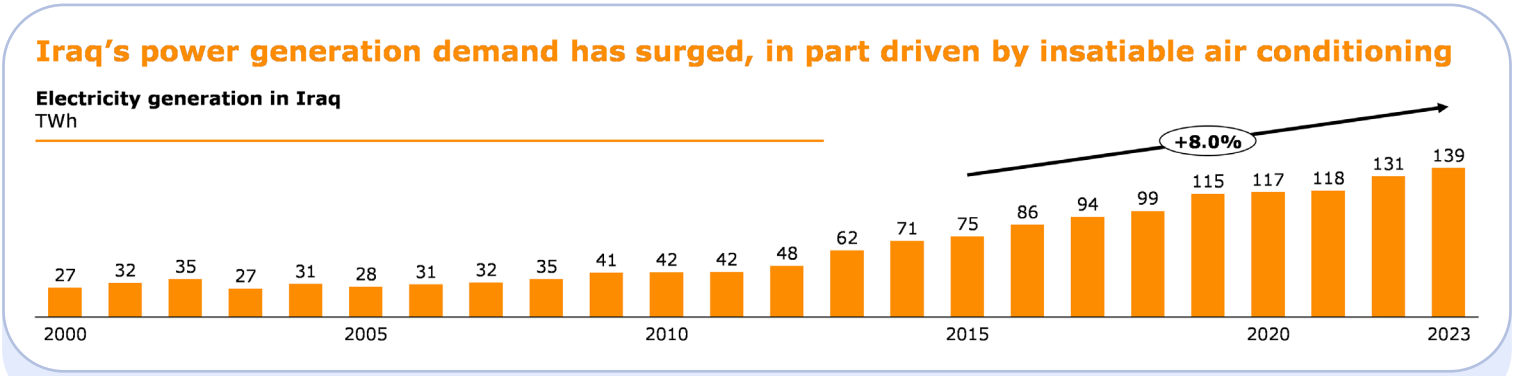
Figure 2: Map showing flaring in Iraq, with additional detail on the flaring at the seven major fields discussed in this case study. For clarity, we separate the 1.4 BCM of flaring associated with production in the Kurdistan Region of Iraq.

As Figure 2 shows, based on World Bank and Capterio FlareIntel data, 60% of Federal Iraq's flaring (some 9.8 BCM from the total of 16.3 BCM flared in Federal Iraq in 2023) came from several large fields that are the subject of the flare-reduction projects discussed later in this case study.

Iraq's Persistent Electricity Shortfalls

Iraq's significant flaring comes despite the fact that the country needs gas to address constant shortfalls in electricity production that have sparked repeated protests among the population, particularly in summer months when temperatures often approach 50° Celsius. In 2022, the US Energy Information Administration estimates that Iraq's peak electricity generation supply was 23 GW, well below the summer peak demand of 34 GW.[11] According to the International Monetary Fund (IMF), in 2021 Iraq's power plants operated at approximately 59% of nameplate capacity, due mainly to obsolescence and an inefficient fuel mix (using mainly liquids rather than gas).[12]

As Figure 3 shows, electricity demand in Iraq has been growing dramatically, at 8% per year since 2015 (with a pause only in the pandemic years).



Source: Energy Institute Statistical Review of World Energy.

Figure 3: Growth in electricity demand in Iraq, which has been driven by population growth, economic growth, and in part by insatiable demand for air conditioning in the summer months.

A significant part of the challenge in Iraq is that electricity provided by the State is heavily subsidized, while a substantial part of electricity delivered by the State is never paid for. The IMF found that only 36% of the electricity produced in Iraq in 2021 was actually sold to customers.[13] A 2020 Economic Reform White Paper prepared by a Government working group found that, in 2018, tariff collections for electricity represented 0.4% of gross domestic product (GDP), while the electricity sector's expenditures were 2.6% of GDP (with the difference made up mainly by subsidies from the Ministry of Finance and the accumulation of arrears to the Ministry of Oil and, to a lesser extent, to Iran.)[14] The IMF similarly found that electricity sector operational costs (without accounting for amortization of capital expenditures) amounted to ten times sector revenues in 2019.[15] The shortfall was funded from subsidies and the accumulation of arrears. As of 2019, a significant part of the population paid $0.6 to $1.2 per kWh for electricity furnished by local diesel generator operators (often run by criminal gangs), making up for several hours per day when people

11 U.S. Energy Information Administration, *Iraq Country Analysis Executive Summary* (Washington D.C., 2024), https://www.eia.gov/international/content/analysis/countries_long/Iraq/pdf/iraq_2024.pdf.

12 "The Fiscal Cost of Iraq's Electricity Sector and Potential Gains from Reform," *International Monetary Fund, The Middle East and Central Asia Department*, February 3, 2023, p. 16, https://www.elibrary.imf.org/view/journals/002/2023/076/article-A002-en.xml.

13 Ibid.

14 The Emergency Cell for Financial Reforms was formed by the Iraqi Cabinet pursuant to its Resolution Emergency Cell for Financial Reforms, *White Paper: Final Report* (October 2020), p. 23, https://iraqieconomists.net/en/wp-content/uploads/sites/3/2020/10/Iraq-White-Paper-Complete-En.pdf.

15 *International Monetary Fund, The Middle East and Central Asia Department*, "The Fiscal Cost of Iraq's Electricity Sector and Potential Gains from Reform"

are unable to obtain electricity from the State.[16] As a comparison, the average household electricity price in Iraq was $0.024 per kWh in 2022.[17]

One of the main reasons for the inefficiency of power production is the absence of available gas for electricity production, with power plants relying to a large extent on highly polluting and relatively high opportunity cost fuel oil, diesel fuel, and crude oil (one of the main reasons why they operate well below capacity).[18] The gas that Iraqi power plants do use includes imports supplied by Iran at a cost (reportedly in the range of $6-7 per MMbtu, a fuel cost equivalent to $0.04 per kWh, assuming a high efficiency gas power plant), which is substantially higher than the price of gas produced in Iraq (including gas supplied by BGC).[19] Gas captured and processed in Iraq is sold for power production at a loss – according to the IMF, in 2021 natural gas was sold by the Ministry of Oil for power production at US$1.0 per MMbtu (equivalent to a fuel cost of $0.006 per kWh assuming an efficient plant),[20] well below the international market price (and even this often is not paid).

The Political, Legal, and Contractual Context in Iraq's Hydrocarbon Sector

Iraq's oil and gas sector operates under a politicized, mostly centralized structure inherited from the period before Saddam Hussein came to power in 1979. The Ministry of Oil administers the oil and gas sector under a law adopted in 1976,[21] operating through a number of State-owned companies involved in oil and gas production, distribution, marketing and various downstream and other activities. A national hydrocarbon law was debated in 2007 and again in 2011, but has never been adopted, primarily because of a political stalemate between the federal government and the Kurdistan Regional Government.

While the 1976 law gives the Ministry of Oil a legal monopoly on the management of the oil and gas sector, as a practical matter the majority of Iraq's oil production is operated by or under the supervision of major international companies, pursuant to service contracts entered into with the Ministry of Oil's production companies. Six licensing rounds have taken place, although the fields awarded in 2009 in the first two rounds, together with several fields operated directly by Ministry of Oil companies without private sector participation, account for the vast majority of Iraq's current oil production and associated gas flaring (excluding the Kurdistan Region).

Under these licensing round agreements, the international operators operate under a "technical services" contract and receive a service fee that provides them with cost recovery plus a fixed fee per barrel of oil produced. They are not entitled to receive any share of their own production, but they generally receive their fee in kind, in the form of export oil delivered at Iraq's main export terminal in the Arabian Gulf. This structure is unusual by international standards because it does not give the international operators any exposure to oil prices, with the main risks and rewards remaining with the State (more recent licensing rounds provide a fee based on a profit-sharing formula with exposure to oil prices, but to date they have generated little production).

16 César Alejandro Hernández Alva, Tim Gould, Tae-Yoon Kim, Peg Mackey, Christophe McGlade, Pawel Olejarnik, Molly A. Walton, and Brent Wanner, *Iraq's Energy Sector: A Roadmap for a Better Future (International Energy Agency*, April 2019), p. 18, https://www.iea.org/reports/iraqs-energy-sector-a-roadmap-to-a-brighter-future.

17 Harry H. Istepanian and Noam Raydan, A Roadmap to Prepare Iraq's Power Sector for Energy Transition, (reviewed by Dr. Luay Al-Khateeb, Al Bayan Center for Planning and Studies, October 2022), pg. 3, https://www.bayancenter.org/en/2022/10/3509/.

18 White Paper: Final Report, *Emergency Cell for Financial Reforms*, 20.

19 Ibid., 24.

20 International Monetary Fund, The Middle East and Central Asia Department, "The Fiscal Cost of Iraq's Electricity Sector and Potential Gains from Reform," (2023), p. 19, https://www.elibrary.imf.org/view/journals/002/2023/076/article-A002-en.xml. See also <Emergency Cell for Financial Reforms, White Paper: Final Report (October 2020), p. 24, https://iraqieconomists.net/en/wp-content/uploads/sites/3/2020/10/Iraq-White-Paper-Complete-En.pdf.>

21 "Tax and Legal Framework," Iraq, Extractive Industries Transparency Initiative, 2025, https://eiti.org/countries/iraq.

The two main licensing round agreements contain different terms relating to associated gas, with the recent contract being far more progressive on gas.

- The first licensing agreements, which cover three super-giant fields near Basrah in southern Iraq (Rumaila, Zubair and West Qurna 1), and which source the Basrah Gas Company's flare capture project, provide no financial incentives for capturing flared gas to the international partners (respectively, bp, ENI, and CNPC, which recently replaced ExxonMobil), nor do they provide any penalties for flaring gas. The operators are required to deliver all associated gas unprocessed for free to the Ministry of Oil's Basra Oil Company (BOC) (which then sells the gas to BGC), and they may not implement flare capture projects without government consent. Flaring of any gas not taken by BOC is explicitly authorized in the contracts (and is indeed substantial), even though the operators are required to keep flaring to a minimum.
- The second licensing agreements, which cover one of the fields in the Gas Growth Integrated Project (West Qurna 2, operated by Lukoil) as well as several other fields, require the operators to include gas-processing plants in their development plans, with costs fully recoverable, and provide them with a per barrel (equivalent) fee for natural gas liquids produced at their processing plants (but no compensation for the processed gas). Flaring is prohibited except as authorized by law or by BOC or another Ministry of Oil company, and is required to be kept to a strict minimum.

For the fields operated by the Ministry of Oil's state-owned production companies (such as BOC), there are no specific legal, regulatory, or fiscal incentives or penalties relating to gas flaring. In any event, it is unlikely that the Ministry of Oil would vigorously enforce any such incentives against its own companies.

Flare Reduction Before the Gas Growth Integrated Project

After the second Gulf War, Iraq's priority was to increase oil production to fund its reconstruction—in 2023, oil represented over 90% of total federal revenue and 96% of exports.[22] In 2009, when it awarded the first licensing round agreements, its stated ambition was to increase oil production from 2.4 million barrels per day in 2009 to more than 6 million barrels per day six years later.[23] The terms of the licensing round agreements contemplated even more, with aggregate plateau production levels provided in the agreements amounting to more than 12 million barrels per day.[24] As a result of the increased oil production, an energy strategy document endorsed by the Iraqi Council of Ministers in 2013 estimated that associated gas production would increase from 2 billion scf per day (20.7 BCM/a) in 2011 to 6 billion scf per day (62 BCM/a) in 2020 (in a medium production scenario), with non-associated gas supplying an additional 1 billion scf per day (10.3 BCM/a) in 2020.[25]

The Basrah Gas Company Project

Iraq first started to address gas flaring in 2008, when the Ministry of Oil adopted a national gas master plan and announced the signature of a non-binding agreement with Shell for

22 International Monetary Fund, Iraq 2024 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Iraq (Washington D.C., May 2024), pg. 25, 28, https://www.imf.org/en/Publications/CR/Issues/2024/05/15/Iraq-2024-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-Executive-549028.

23 Timothy Williams, "Iraq Auctions Development Rights to Oil Fields," *New York Times*, June 25, 2009, https://www.nytimes.com/2009/06/26/world/middleeast/26oil.html.

24 Iraq Prime Minister Advisory Commission, Integrated National Energy Strategy (INES), (Baghdad: Booz&Co., September 2012), p.31, https://documents1.worldbank.org/curated/en/406941467995791680/pdf/105893-WP-PUBLIC-INES-Summary-Final-Report-VF.pdf.

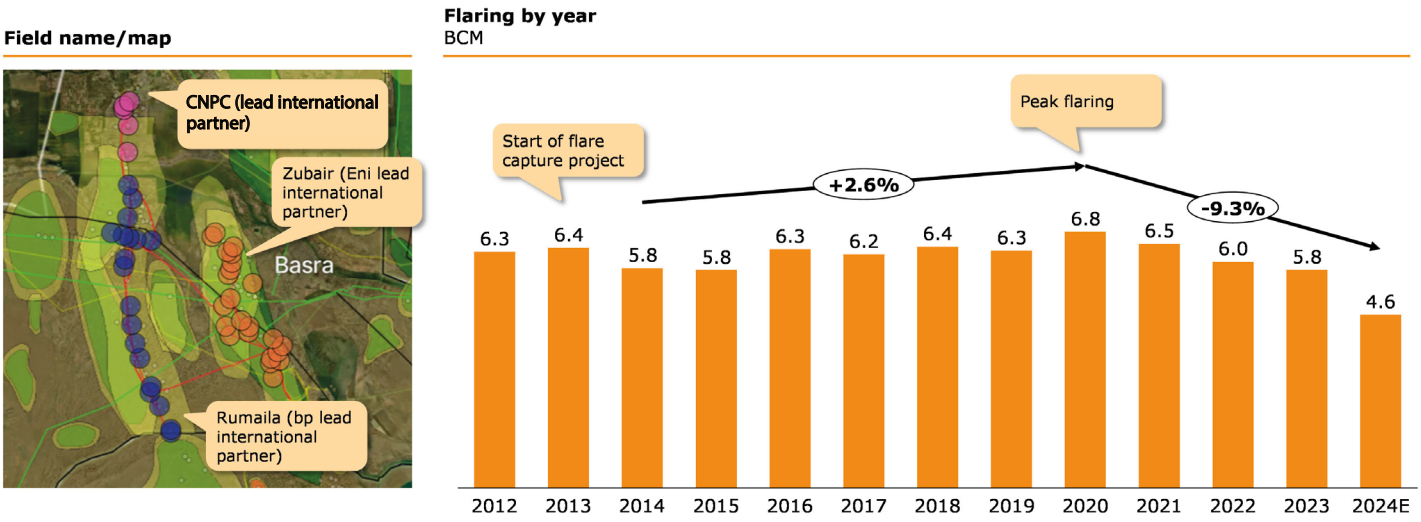
25 Ibid., 43.

what ultimately became the Basrah Gas Company (BGC) project.[26] That project became a reality in 2011, with the signing of agreements to create BGC as a joint venture company with three shareholders: State-owned South Gas Company (51%), and affiliates of Shell (44%) and Mitsubishi (5%). BGC's purpose was to rehabilitate and expand an existing gas processing facility previously operated by South Gas Company. The objective was to capture and process 2 billion scf per day (20.7 BCM/a) of gas from the fields in the first licensing round, and to build an LNG facility at Khor al-Zubair. A decade after operations began in 2013, BGC has been partially successful, increasing processing capacity from 250 million scf per day in 2013 to nearly 1 billion scf per day in 2023[27] but this is only half of the initial goal, and no LNG facility has been constructed.

As Figure 4 shows, despite BGC's success in rehabilitating the processing facilities, flaring from the three fields that feed the facilities—Rumaila, Zubair, and West Qurna 1—remained essentially flat or even grew for several years after BGC started operating, although flaring has declined since its peak in 2020. The main reason for the initially higher flaring is that the increased oil production generated additional associated gas that more than offset the gains from BGC being able to process more recovered flared gas. Equally, since much of the in-field power generation in the upstream fields is derived from diesel generation units, we see significant opportunities to decarbonize and save cost (and improve safety) by replacing these with gas-fired units that process and capture flared gas. Two projects highlighted in our adjacent case study on Egypt may offer inspiration.

Financial difficulties (including arrears in payments from the State for processed gas) prevented BGC from increasing its capacity more quickly, and although this was partially compensated by revenues generated from LPG exports, this was not sufficient to fund the needed investments. In addition, operating the oil facilities was complex One executive told us, "*We started operating the field and found it was very challenged by old equipment and our first priority was to do remedial work and only after that have we been able to focus on other priorities, such as flare reduction.*"

Flaring at the fields supplying the Basrah Gas Company increased with oil production until recent reductions driven by greater gas processing capacity



Source: Capterio FlareIntel; World Bank.

Figure 4: Flaring at the three fields that are associated with the Basrah Gas Project: Rumaila, West Qurna 1, and Zubair. Flaring increased as oil production in the fields ramped up. In more recent years, flaring reduction has resulted from BGC's increased processing capacity investments.

26 Ruba Husari, "Shell Inks Iraqi Gas Deal in Baghdad," *Iraqi Oil Forum*, April 24, 2009, https://www.iraqoilforum.com/shell-inks-iraqi-gas-deal-in-baghdad/.

27 "Basrah Gas Company", Basrah Gas Company, https://www.basrahgas.com/.

Flaring at the fields that feed BGC's facilities began to decline in 2021, as BGC increased processing to an average of 820 million scf per day (8.5 BCM/a),[28] while oil production stabilized due in part to OPEC+ constraints. In 2022, BGC announced plans to expand processing capacity by 40% to 14.5 BCM/a over five years, with the expansion partially funded by a loan from the International Finance Corporation.[29] Despite this success, the three fields that feed BGC flared approximately 5.8 BCM in 2023, and an estimated 4.6 BCM in 2024, leaving ample opportunity for further revenue generation. In addition, since many flares in the upstream fields are unmetered, great practical insights on production performance, equipment reliability and process optimization can be gleamed from near real-time satellite data – leading to improved operations and faster interventions.

2014 to 2021: Flaring Reduction Hampered by Financial Constraints Followed by Indecision

During the decade that followed BGC's commencement of operations, Iraq announced many other projects to reduce flaring but implemented none. The initial problem was financial – in late 2014, as Iraqi authorities were reviewing the second licensing round development plans, international oil prices plunged. At around the same time, the Government's resources turned to combating the Islamic State, which occupied large parts of northern and western Iraq. The Ministry of Oil subsequently ordered operators to reduce investments to limit the use of export oil, so as to limit the devotion of export oil to pay the rapid cost recovery contemplated in the licensing round agreements.[30] Significant arrears developed, as the volume of lower-priced export oil needed to repay costs incurred and accounted for in US dollars plus fixed per-barrel fees skyrocketed. Plans to expand oil production and construct gas-processing facilities were put on hold, as was a seawater-treatment project designed to provide water for injection into reservoirs to maintain pressure and boost oil production.

As Iraq emerged from the Islamic State crisis in 2017, the Ministry of Oil launched an initiative to construct three gas processing hubs in southern Iraq, with the Deputy Minister in charge of gas affairs announcing this at a conference in Houston and inviting companies to submit investment proposals. But two problems quickly emerged.

First, the Deputy Minister provided no guidance to investors as to the contractual and fiscal structures of the proposed investments, or as to the qualifications of companies that could submit proposals.[31] Numerous proposals were received (including for the fields that later became part of the Gas Growth Integrated Project), all with different structures, making it practically impossible to compare them. Second, the process quickly became politicized, with the Iraqi government announcing numerous non-binding memoranda of understanding (including some with clearly unqualified companies) around political events, but never following through with binding agreements. Compounding the problem, the Iraqi Government entered a period of political crisis in 2019, making it effectively impossible to have major new investment projects approved.

The World Bank recognized this problem, proposing the adoption of a natural gas market framework that would have started with the construction of several gas processing facilities, followed by the establishment of a gas market allowing investors to purchase associated gas for processing and resale (along with extracted liquids), and to invest in transportation

28 Ali Al-Aqily, "Q&A: Basra Gas Company Deputy Director Marfaa Kadhim al-Asadi," *Iraq Oil Report*, March 24, 2022, https://www.iraqoilreport.com/news/qa-basra-gas-company-deputy-director-marfaa-kadhim-al-asadi-44686/.

29 Ali Al-Aqily, A, "Q&A: Marfaa Kadhim al-Asadi," *Iraq Oil Report*, December 15, 2023, https://www.iraqoilreport.com/news/qa-marfaa-kadhim-al-asadi-deputy-director-of-basra-gas-company-46205/.

30 Kevin Baxter, "Iraq Warns Oil Companies of Spending Cuts," *The Wall Street Journal*, September 14, 2015, https://www.wsj.com/articles/iraq-warns-oil-companies-of-spending-cuts-1442223305.

31 Ben Lando, "Q&A: Deputy Minister Hamid Younis Salih," *Iraq Oil Report*, May 9, 2017, https://www.iraqoilreport.com/news/qa-deputy-oil-minister-hamid-younis-salih-2-22728/.

infrastructure. The Council of Ministers adopted the World Bank proposal in early 2018,[32] but it was never implemented.

As the world entered the COVID-19 lockdown in early 2020, none of the projects contemplated after the 2017 announcement was part of a binding agreement, let alone actually processing flared gas. The volume of associated gas processed in 2020 had only increased modestly compared to 2012 (mainly through the work of BGC), while overall flaring increased significantly (as shown above in Figure 1). In 2019, just before the pandemic year, flaring in Iraq (including the Kurdistan Region) was 17.9 BCM, a substantial increase compared to 12.7 BCM in 2012.

The Gas Growth Integrated Project

Announcement and Signature

In 2021, against the background of four years of turmoil in its attempt to tackle flaring, Iraq started to move forward to implement a major integrated project to significantly increase its associated gas processing capacity, as well as addressing other investment needs in southern Iraq. In March 2021, the recently installed Minister of Oil, Mr. Ihsan Adbul Jabbar Ismail, and the CEO of TotalEnergies, Mr. Patrick Pouyanné, announced the signature of a non-binding Heads of Agreement for the Gas Growth Integrated Project.

Announced as a "multi-billion dollar investment project," the Gas Growth Integrated Project involves four components:[33]

- Construction of a facility to process associated gas at three fields in southern Iraq: West Qurna 2, Majnoon and Ratawi. The goal was to process 300 million scf per day of associated gas from the first three fields in a first phase, with a possible second phase expansion to 600 million scf per day to include associated gas from several other fields. Construction of export infrastructure for natural gas liquids is also part of the project.
- Funding and supervision of construction of the seawater treatment facility that had been on hold for a decade, with an announced capacity of 2.5 million barrels per day of seawater. Once constructed, this facility will free up freshwater resources that are currently used to maintain oil reservoir pressure.
- Development of oil production at the Ratawi field, to increase production from 60,000 barrels per day to approximately 210,000 barrels per day.
- Construction of a 1 GW solar power facility, to solve chronic electricity shortages in southern Iraq.

At the time of the announcement, it was not clear whether this was another politicized non-binding agreement in principle, or a breakthrough. It turned out to be the latter, as the project was pushed forward by Minister Ihsan and Mr. Pouyanné, who constituted and empowered working groups to hammer out the details of definitive agreements.

Those agreements were signed and announced in late August 2021, although the process remained linked to high politics, as the signing ceremony took place around a visit to Iraq by French President Emmanuel Macron.[34] The difference this time was that the agreements signed were binding and definitive, providing a clear path to the implementation of the project.

32 Republic of Iraq General Secretariat of the Council of Ministers, Council of Ministers' Resolution No. (51), January 30, 2018, https://www.iraq-businessnews.com/wp-content/uploads/2018/03/RESOLUTION_NO_51_OF_2018_EN.pdf.

33 GGIP: A Multi-Energy Project to Support Iraq Towards Its Energy Independence, *TotalEnergies*, April 2025, https://totalenergies.com/company/projects/gas/ggip-multi-energy-project-Irak.

34 Office of the French Presidency, "Press Conference Given by President Emmanuel Macron from Baghdad," press release, August 28, 2021, https://www.elysee.fr/en/emmanuel-macron/2021/08/28/press-conference-given-by-president-emmanuel-macron-from-baghdad.

Total anticipated project costs were announced at $27 billion (including operating expenses and a possible second phase), with capex for the first phase announced at around $10 billion.

Shortly after the signature, two things happened. First, the Iraqi Government announced a desire for BOC to acquire a 40% interest in the project. Second, following elections held in October 2021, the Government was relegated to caretaker capacity, without the ability to approve major new projects. As a result, implementation of the project was delayed.

The formation of a new Government took a full year. Mr. Mohammed Shia al-Sudani became Prime Minister on October 27, 2022, appointing Mr. Hayan Abdul Ghani (former Director General of both BOC and South Gas Company) as new Minister of Oil. During a January 2023 visit to France, Prime Minister al-Sudani and President Macron announced a broad strategic partnership, with President Macron's office announcing that "they showed their commitment to the implementation of TotalEnergies' multiple-energies project (...) based on solar energy and investments in gas."[35]

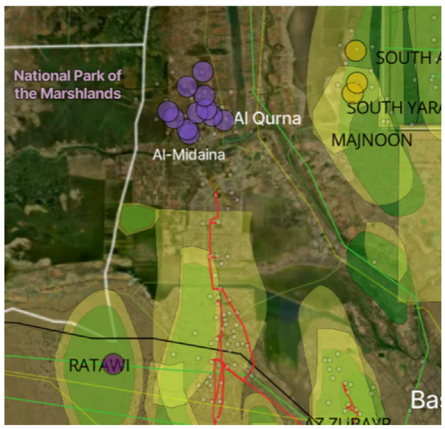
In April 2023, the Iraqi Government and TotalEnergies announced an agreement under which state-owned BOC would acquire a 30% interest in the project, with QatarEnergy being invited to acquire a 25% interest by TotalEnergies with the support of the Iraqi Government. TotalEnergies retained a 45% interest and is operator of the project.[36] Definitive agreements for BOC and QatarEnergy to acquire interests in the project were announced in July 2023.[37]

Flaring at the Fields in the Gas Growth Integrated Project

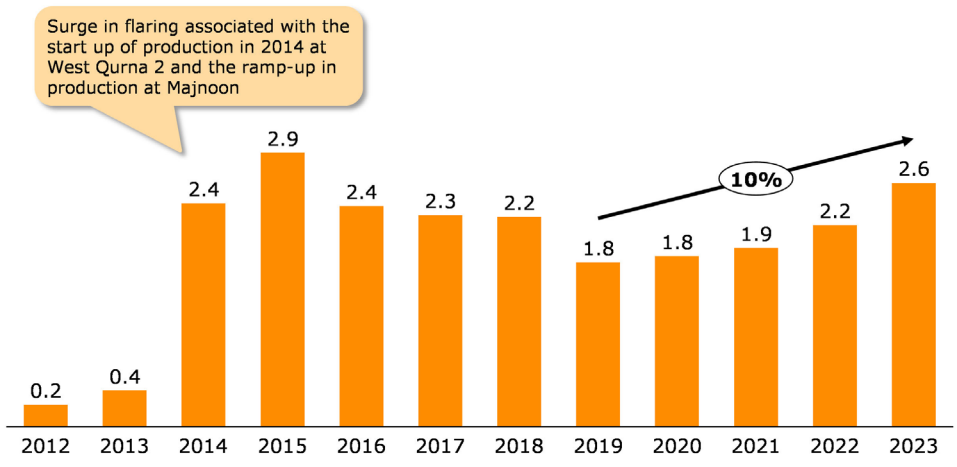
The Gas Growth Integrated Project, once it is operational, will capture and process associated gas from two of the fields with the largest flaring volumes in Iraq – Majnoon and West Qurna 2 – as well as developing oil production at the Ratawi field with a zero routine flaring objective. Figure 5 shows the recent state of flaring at these three fields.

Flaring at the fields supplying the Gas Growth Initiative has increased in recent years

Flaring map showing Ratawi, West Qurna 2 and Majnoon



Flaring by year
BCM



Source: Capterio FlareIntel; World Bank.

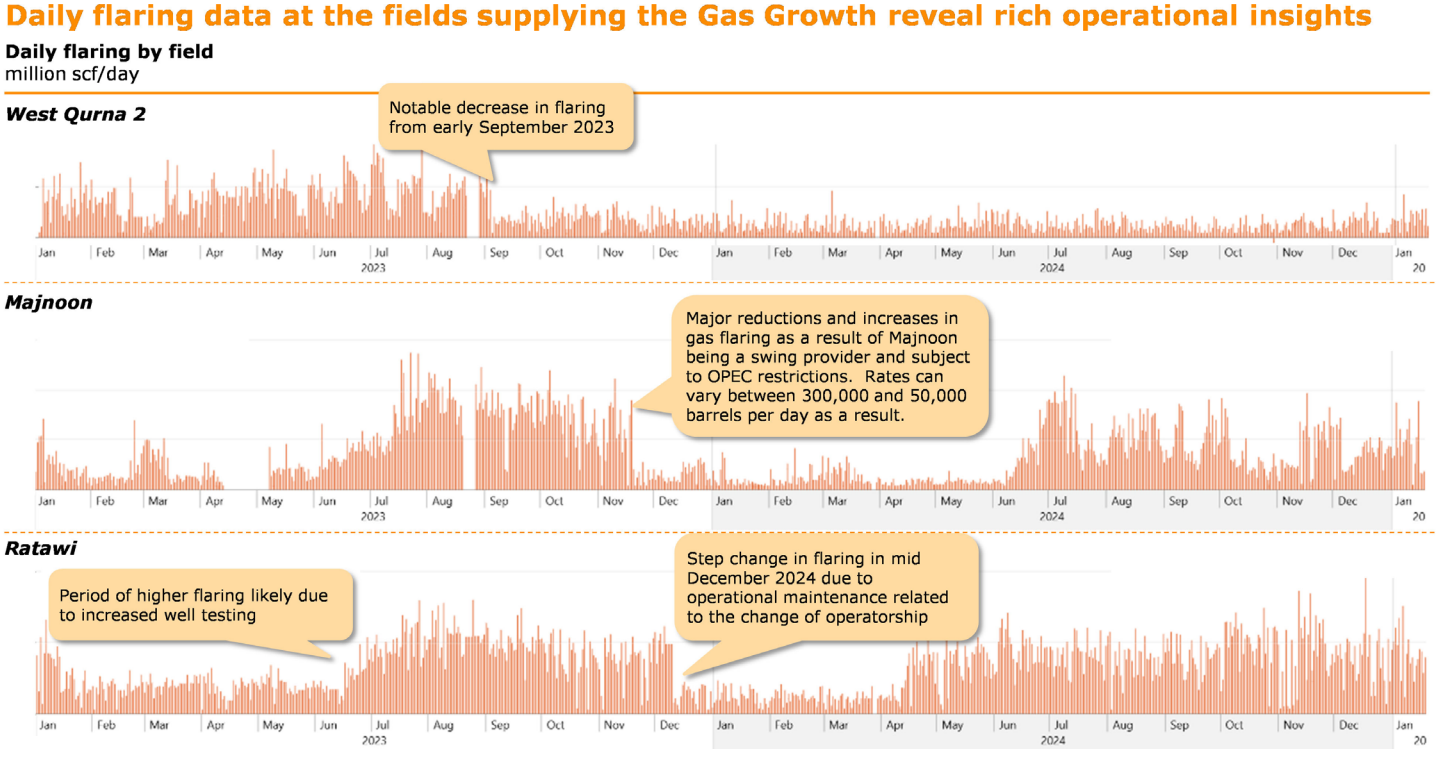
Figure 5: Annual flaring at the Ratawi, Majnoon and West Qurna 2 fields associated with the Gas Growth Integrated Project. Data from the World Bank.

35 "France and Iraq Sign Comprehensive Strategic Partnership Agreement," *Reuters*, January 27, 2023, https://www.reuters.com/world/middle-east/france-iraq-sign-comprehensive-strategic-partnership-agreement-elysee-2023-01-27/.

36 TotalEnergies, "Iraq: Agreement Between Iraq and TotalEnergies," press release, April 5, 2023, https://totalenergies.com/media/news/press-releases/iraq-agreement-between-iraq-and-totalenergies.

37 "Iraqi Ministry of Oil and Basra Oil Company in Acquisition of Stake in Gas Growth Integrated Project," *Clearly Gottlieb*, July 10, 2023, https://www.clearygottlieb.com/news-and-insights/news-listing/iraqi-ministry-of-oil-and-basra-oil-company-in-acquisition-of-stake-in-gas-growth-integrated-project.

Capterio has analyzed daily flaring data from each of these fields in 2023 and 2024, using its FlareIntel satellite analytical platform. Figure 6 has the profiles for each field which are further discussed below.



Source: Capterio FlareIntel Pro.

Figure 6: Daily flaring at the three fields (West Qurna 2, Majnoon and Ratawi) that supply the Gas Growth project, from Capterio's FlareIntel platform. Daily data such as these provide rich operational insight and enable operators and partners to better optimize their operations, capture more gas and reduce emissions.

The main findings were as follows:

- Flaring at the **West Qurna 2** field was approximately 1.8 BCM in 2023. It is notable that there has been a major reduction in flaring from September 1, 2023 to the present day, meaning that 2024's figure was 70% lower, as shown in Figure 6. The reason for the reduction is unclear, as the operator (Lukoil) announced increased oil production from two new well pads put into operation in June 2023.[38] It also announced the award of a contract for a gas treatment and compression facility in September 2023,[39] but this would not have been operational in time to explain the reduction in flaring. A possible alternative explanation is that a lower proportion of any gas sent to flares has been combusted since September 2023, with more flares unlit, or flares operating with lower combustion efficiencies.
- **Majnoon** flaring was 0.5 BCM in 2023 and has been erratic, with a shutdown from mid-April to early May 2023 and a dramatic reduction from November 19, 2023, to June 12, 2024. Flaring ramped up from mid-June 2024. Majnoon is operated by BOC and is reported to be used by Iraq as a "swing" field to manage compliance with OPEC+ quotas.[40]
- In 2023, associated gas flared at the **Ratawi** field was 0.3 BCM, although the timeseries above highlights both periods of lower and higher flaring, which increased modestly

38 "Lukoil Increased Oil Production at West Qurna-2," *Rogtec Magazine*, June 8, 2023, https://www.rogtecmagazine.com/lukoil-increased-oil-production-at-west-qurna-2/.

39 "SICIM wins new EPC contract in Iraq," *SICIM*, July, 12, 2023, https://www.sicim.eu/en/news-detail/sicim-wins-new-epc-contract-in-iraq/.

40 Jassim Al-Jabiri, "Q&A: Dhia Shaker al-Luaibi, director of Majnoon oil field," *Iraq Oil Report*, September 28, 2022, https://www.iraqoilreport.com/news/qa-dhia-shaker-al-luaibi-director-of-majnoon-oil-field-2-45161/.

in 2024. This may reflect temporary oil production shutdowns in conjunction with the handover of operatorship from BOC to TotalEnergies, possibly relating to planned or unplanned maintenance.

The data show that these three fields present substantial opportunities to capture value through flare reduction. The total revenue potential of the 2.6 BCM flared at these fields in 2023 (without taking into account methane leaked from partial combustion) would be on the order of US$470 million annually if the flared gas were sold at rather conservative prices of $5 per MMbtu. While the plan is to use the gas in State-owned power production facilities rather than selling it, the savings are likely to be of a similar order from reduced gas imports and the alternative use (or export sale) of fuel oil, diesel and crude oil that is currently used to produce electricity (in addition to the fact that the power plants will operate much more efficiently with gas).

Project Implementation

As of the date of this report, the Gas Growth Integrated Project has not yet reduced any flaring, as the new facilities have not yet been completed. Construction has started on a project for early gas processing of 50 million scf per day, which is scheduled to become operational by the end of 2025.[41] Front-end engineering and design work on the full phase 1 gas processing facility was completed by KBR. In April 2025 the Council of Ministers approved the award of a US$1.7 billion Engineering, Procurement and Construction contract for the gas processing facility to China Petroleum Engineering & Construction Corporation (along with a contract for pipelines for the seawater processing facility).[42] Commissioning is scheduled for 2028.[43]

Does the Gas Growth Integrated Project Mark a Change in Paradigm for Iraq?

While the Gas Growth Integrated Project remains to be completed, the progress made to date presents a sharp contrast with Iraq's chaotic attempts to address gas flaring in earlier years. Previous approaches started when Iraq asked investors to submit their own proposals rather than providing them with a clear, structured process to award projects. In this environment of uncertainty, investors scrambled to find political support to push their projects to conclusion. Only it was never a conclusion, with most projects stalling quickly once the photographers left the signing ceremonies for non-binding memoranda of understanding. The World Bank recognized the problem, but its natural gas market framework initiative was too ambitious for a country that has never had a domestic gas market.

The Gas Growth Integrated Project was different, with a full suite of binding agreements followed by an implementation process that is now well underway. The main driver appears to be the determination of Minister of Oil Ihsan to ensure that this project, unlike the others studied in the prior four years, would actually go forward. It was also driven by the commitment of Mr. Pouyanné, who cited motivation from TotalEnergies' roots in Iraq, where the company had implemented its first international project a century earlier. The project also fits with Mr. Pouyanné's public strategy of funding energy transition initiatives with revenue from hydrocarbon production.

41 TotalEnergies, "GGIP in Iraq: TotalEnergies launches construction of an early gas treatment unit to stop flaring and supply power plants," press release, January 10, 2025, https://totalenergies.com/news/press-releases/ggip-iraq-totalenergies-launches-construction-early-gas-treatment-unit-stop.

42 "Iraq approves two major energy project contracts," *MEED*, April 2, 2025, https://www.meed.com/iraq-approves-two-major-energy-project-contracts. https://www.meed.com/iraq-approves-two-major-energy-project-contracts

43 "GGIP: A Multi-Energy Project to Support Iraq Towards Its Energy Independence," *TotalEnergies*, April 2025, https://totalenergies.com/company/projects/gas/ggip-multi-energy-project-Irak.

The project was also political, like those before it, with support at the level of both the Iraqi Prime Minister and the President of France. But the cause-and-effect may have gone in the opposite direction, with the pursuit of the Gas Growth Integrated Project supporting political objectives in both Iraq and France, rather than the other way around. In any event, compared to other politically motivated projects that did not go forward, any political drivers for this project have clearly been more effective.

The benefit of the Gas Growth Integrated Project will be to reduce gas flaring and the associated emissions of greenhouse gases. Of course, overall emissions benefits from the Gas Growth Integrated Project will be offset by the increased oil production associated with the linked oil projects. But there really is no other way for Iraq to finance flaring reduction projects given its almost complete dependence on oil revenues. Had Iraq borrowed internationally to fund the gas processing facility rather than integrating it with an oil development, Iraq would have repaid the borrowing with oil revenues. And there is no guarantee that the Ratawi development would have taken place with a commitment to zero routine flaring had it not been part of this integrated project.

Hope for the Future?

As the Iraqi Government has pushed forward to implement the Gas Growth Integrated Project, it seems to have started to debottleneck a number of other gas flaring reduction projects in southern Iraq. Several gas processing projects have been announced in recent months, including three projects that are substantially advanced:

- The completion in June 2024 of the Halfaya gas processing facility (launched in 2018 under a second licensing round agreement, but put on hold during the COVID-19 pandemic), with a processing capacity of 300 million scf per day. Here the main investors are state-owned Missan Oil Company and partner PetroChina.[44]
- The signature in 2024 of definitive agreements for the rehabilitation and expansion of gas-processing facilities at the Nahr Bin Umar field by Halfaya Gas Company (unrelated to the operator of the Halfaya oil field and gas-processing facility).[45] Halfaya Gas Company is owned by an Iraqi company, Raban al-Safina. The project is reported to use a BOOT (build-own-operate-transfer) structure, under which the company will construct the facility, operate and own it for the 15-year duration of the agreement and then transfer it to an Iraqi state-owned company. The facility will have an initial capacity of 150 million scf per day, with a possible second phase that would double its capacity and include additional oil production. The project also includes the construction of pipelines, as well as an export terminal. The Iraqi Council of Ministers has announced the approval of sovereign guarantees to support loans for the project. In addition, Baker Hughes has announced a collaboration to supply equipment and pre-engineering design work for the project. In January 2025 Halliburton and BOC announced a plan to develop the field to increase oil production, along with increased associated gas that presumably will feed the processing facility.[46]
- A new gas facility at the Nasiriyah and Gharraf fields, with equipment and engineering work supplied by Baker Hughes. This represents the materialization of one of the projects underlying a memorandum of understanding signed in 2018, for which definitive agreements were signed only in 2021 and construction started in 2022. As

44 "Halfaya Gas Processing Plant put into operation," *CNCP*, June 11, 2024, https://www.cnpc.com.cn/en/nr2024/202407/01deb14fd4bf409a9e00f5efd91ee50d.shtml.

45 Lizzie Porter, Jassim Al-Jabri, Ali al-Aqily and Staff of Iraq Oil, "Iraq Explores New Partners for Nahr bin Omar Gas Project," *Iraq Oil Report*, March 11, 2023, https://www.iraqoilreport.com/news/iraq-explores-new-partners-for-nahr-bin-omar-gas-project-45569/.

46 Aref Mohammed, "Iraq to sign deal with Halliburton to develop Nahr Bin Omar oilfield - BOC manager," *Reuters*, January 16, 2025, https://www.reuters.com/markets/deals/iraq-sign-deal-with-halliburton-develop-nahr-bin-omar-oilfield-boc-manager-2025-01-16/.

of April 2024, the facility was reported to have been 60% complete, with plans for it to come online before the end of 2024. Using temporary processing facilities, the project was reported in 2024 to be capturing between 20 and 25 million scf per day, and the objective on completion was to capture and process 200 million scf per day. Currently, independent data captured by Capterio does not show significant flare reduction at these fields. In May 2025, the Prime Minister's office announced a 2026 target date for completion of the first phase of the project, with phase two scheduled for 2027.[47]

In addition, the Ministry of Oil has continued to sign memoranda of understanding relating to potential gas flaring projects. In March and April 2024, the Ministry of Oil also announced the signature of a memorandum of understanding with Siemens and Schlumberger to invest in a gas flaring reduction project with a capacity of 120 million scf per day, although the field and region were not identified.[48] The announcement indicated that the project will be undertaken in conjunction with the Siemens Roadmap signed with the Ministry of Electricity to construct power generation facilities in Iraq, with the gas being used in a 2 GW power station to be constructed by Siemens.[49] In May 2024, the Ministry of Oil signed a memorandum of understanding with Honeywell to explore strategic collaborations for Iraq's oil and gas fields, including the cessation of gas flaring and the provision of development, automation, remote control, and monitoring services.[50] In March 2025, the Prime Minister's office announced the approval of a multi-phase project (with a structure reportedly similar to the Gas Growth Integrated Project) under which bp will increase oil production at the giant Kirkuk fields in northern Iraq (which are themselves major flarers today), funding the rehabilitation and expansion of associated gas processing facilities with a targeted capacity of at least 400 million scf per day.[51]

These projects give reason to hope that Iraq could approach the realization of the Prime Minister's announced goal of eliminating routine flaring by 2028. Iraq has incentives to realize its objectives with the revocation by the Trump administration in February 2025 of sanctions waivers that previously facilitated imports of electricity from Iran, which have prompted Iraq to commission two floating storage and regasification units to allow it to import LNG for electricity production, while waiting for its own gas production to come on line. With elections planned for later in 2025, the challenge will be for the next government (whether headed by Prime Minster Sudani or a successor) to pursue the concrete implementation of projects with the determination shown since the agreements for the Gas Growth Integrated Project were signed in 2021.

47 John Lee, "Baker Hughes discusses Energy Development Projects in Iraq," *Iraq Business News*, May 3, 2025, https://www.iraq-businessnews.com/2025/05/03/baker-hughes-discusses-energy-development-projects-in-iraq/.

48 "Iraq Signs Agreement with Siemens Energy to Convert Flare Gas into Fuel for Electricity," *Reuters*, March 20, 2024, https://www.reuters.com/business/energy/iraq-signs-agreement-with-siemens-energy-convert-flare-gas-into-fuel-electricity-2024-03-20/.

49 Siemens, "Siemens and Iraqi Government Sign Roadmap Implementation Agreement," press release, April 30, 2019, https://press.siemens.com/global/en/pressrelease/siemens-and-iraqi-government-sign-roadmap-implementation-agreement.

50 "Honeywell Signs Strategic Agreements to Further Support Iraqi Energy Sector," *Intelligent CIO Middle East*, May 14, 2024, https://www.intelligentcio.com/me/2024/05/14/honeywell-signs-strategic-agreements-to-further-support-iraqi-energy-sector/.

51 "BP Deal Aims to Revamp Kirkuk Energy Sector," *Iraq Oil Report*, May 1, 2025, https://www.iraqoilreport.com/news/bp-deal-aims-to-revamp-kirkuk-energy-sector-47052.

To find out more, or share your feedback, please email the authors at: ptoled@law.columbia.edu or mark.davis@capterio.com.

Columbia Center on Sustainable Investment

A JOINT CENTER OF COLUMBIA LAW SCHOOL AND COLUMBIA CLIMATE SCHOOL

capterio