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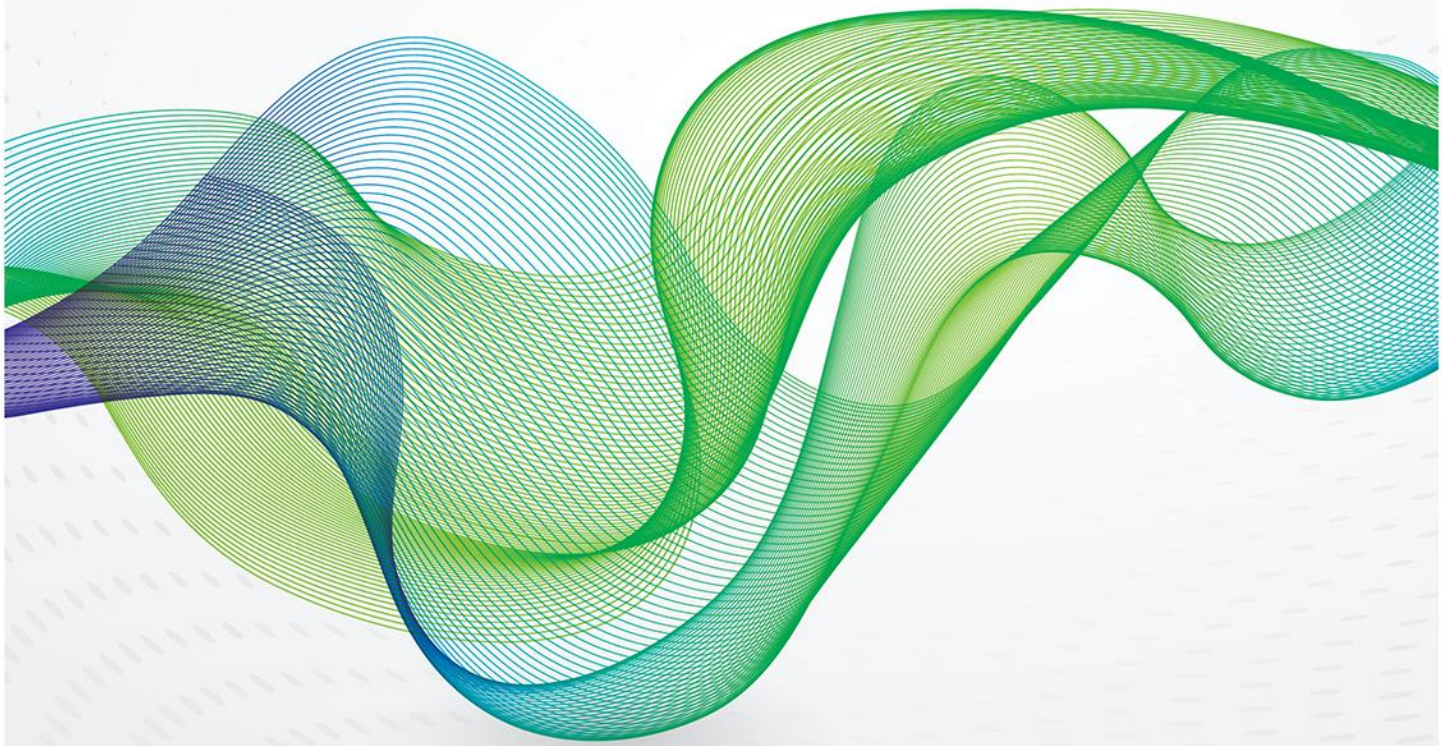
Iraqi Oil: industry evolution and short and medium-term prospects



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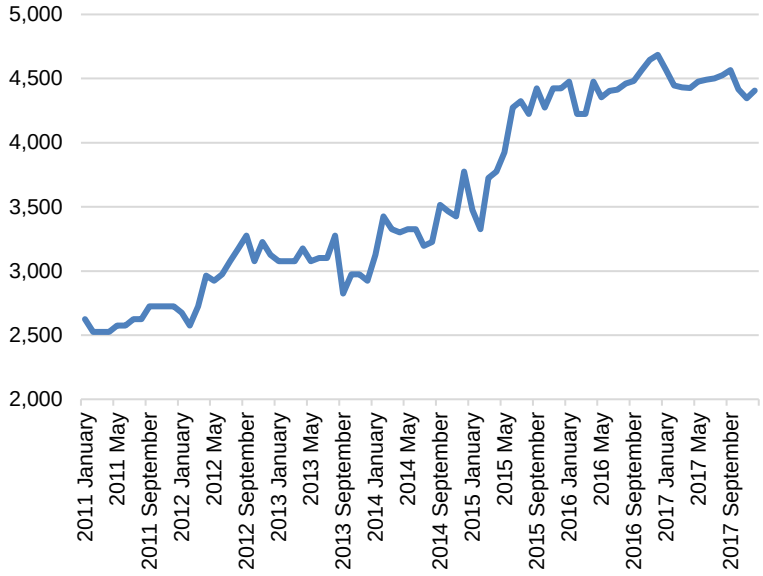
1. Introduction

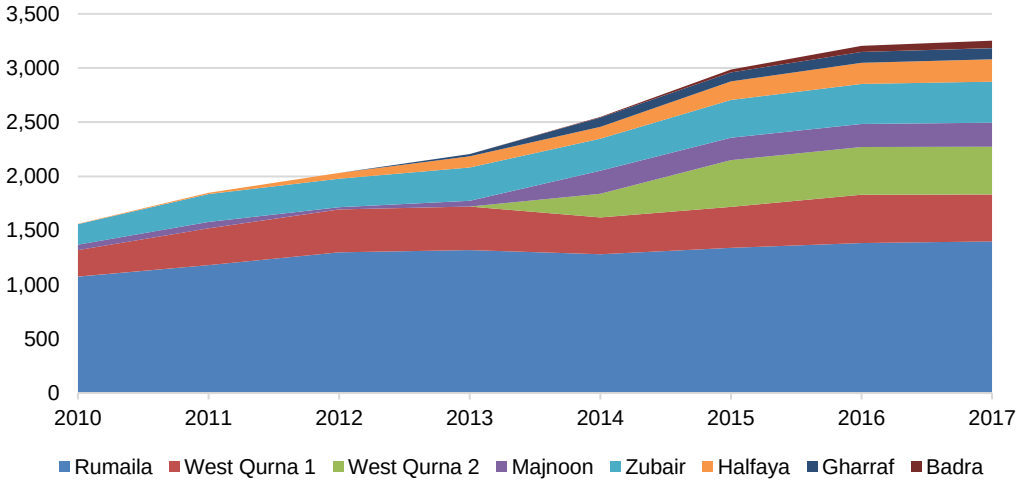
Iraq has been a key contributor to OPEC liquids growth, with IOCs in southern Iraq having added approximately 1.7–1.8 mb/d (million barrels per day) in the period 2010–17 (see Figures 1 and 2). Despite this upstream growth, Iraq's midstream and downstream have failed to keep pace – a dynamic that allows Iraq to occupy a peculiar position within the Middle East oil complex: it is the only major producer in the region where onshore pipeline development (including storage and pumping capacity) is undermining future output potential. Similarly, Iraq – unlike its upstream regional peers – is the only major producer heavily reliant on refined product imports, a reflection of an underdeveloped refining system and of a misalignment between the product yield of Iraq's refining output and its domestic demand.

Figure 1: Iraq oil production, kb/d



Source: EIA, BP Statistical Review

Figure 2: Iraq IOC fields growth, kb/d



Source: Companies

As Iraq increases its importance in global oil markets (particularly the medium–heavy sour physical market), the interplay between upstream, midstream, and downstream will have **major implications** for Iraq's short–medium production outlook. This interplay will take place against the backdrop of:

- Iraq's portfolio of future production becoming heavier as the importance of the Mishrif Reservoir (24–30° API)[1] grows over time;
- Delays to increasing onshore storage and pumping capacity, a dynamic impacting crude quality and export growth;
- The increasing importance of sourcing water for oil injection needs, particularly given complications surrounding mega-projects such as the Common Seawater Supply Project (CSSP);
- Requirements to upgrade existing refineries to meet both refined product demand and to manage the changing quality of crude feedstock as production growth gets heavier;[2] and
- A new period of political transition following Iraq's May elections – a dynamic with implications for the future direction of oil sector investment and fiscal reform.

Section 2 of this paper provides an outline of the history and development of Iraq's oil sector and the political and commercial drivers behind the mismatch between upstream and downstream development; **Section 3** assesses Iraq's short-term production outlook by field; **Section 4** considers factors constraining Iraq's medium–long-term output potential (including water supply for reservoir management, onshore storage and pumping capacity, and midstream pipeline development). **Section 5** contains an assessment of Iraq's refining capacity and future downstream strategy in light of production trends, domestic demand, and the changing sources of feedstock for power generation. The paper concludes with some final thoughts, and tables summarizing the bid rounds taking place between 2009 and 2018 are given in the Appendix.

[1] Iraq's southern reservoirs include: Yamama (API 37–44°, 0.5% sulphur), Mishrif (API 24–30°, 4% sulphur), and Zubair (API 34–36°, 1% sulphur), the most heavily drawn upon from the 1970s onward.
[2] The lack of complexity of Iraq's refineries has led to valuable lighter grades being used as a feedstock.

2. The historical evolution of the Iraqi oil sector: a brief overview

Two super-giant fields have dominated Iraq's historical production: Kirkuk (since the 1920s) and Rumaila (which began operations in the 1950s).[3] In the mid-1960s Iraqi oil output (1.3 mb/d) was somewhat less than that of Saudi Arabia (2.2 mb/d), but by the 1970s, Iraq's output had increased to 2 mb/d, reaching a peak of 3.5 mb/d in 1979 – the year of Saddam Hussein's rise to absolute power. In that year, Iraq issued tenders to develop its super-giant fields (Majnoon, West Qurna, Halfaya, and Nahr Umar); contracts for drilling and the expansion of the Al-Bakr terminal (now Al-Basra terminal) were signed with the US firm Brown & Root (now KBR), and the 16-tank complex at Fao had just been completed. These plans – designed to meet Iraq's five-year production plan of 5 mb/d – were, however, put on the back burner following the outbreak of Iraq's war with Iran in 1980.

The war with Iran reduced Iraq's production to 1 mb/d, with exports collapsing from 3 mb/d to 750,000 b/d. This was due to both the destruction of oil export facilities (Khor Al-Amaya and Al-Bakr) and damage sustained to storage terminals (particularly the Fao tank farm). At the same time, Iraqi oil moving to the eastern Mediterranean via Syria was blocked due to former President Hafez Al-Assad's support for Iran during the war.[4] The war also changed Iraq's pipeline map: with no viable export route for Iraqi barrels through Syria, Baghdad increased its reliance on Turkey via the Iraq–Turkey pipeline (where capacity was raised from 750,000 b/d to 1.5 mb/d).[5] Iraq also struck a deal with Saudi Arabia to have a pipeline linked with the Saudi system, allowing oil to be exported via the Red Sea. Despite these short-term measures, the costs to Iraq's oil sector were severe: a total loss of $120 bn in oil sector GDP, destruction of infrastructure ($33 bn), heavy depletion of foreign reserves (approximately $40 bn), and a large accumulation of external debt: foreign debt to GCC ($49 bn), non-Arab states ($56 bn), and commercial creditors ($15 bn).[6]

Iraq's attempts to rebuild following the Iran–Iraq war were again interrupted by the 1991 Gulf war and later by international sanctions. The damage to oil infrastructure due to Operation *Desert Storm* was severe: pumping stations (K3, Zb-1), gathering centres, and refineries were severely damaged. Alongside the series of interruptions to exports, the UN oil-for-food programme[7] encouraged corruption within Iraq's State Organization for the Marketing of Oil (SOMO) by encouraging oil sales to traders and brokers who took advantage of Iraq's geopolitical isolation and sanctions.[8] The 1990s also witnessed upstream problems: the cannibalization of equipment, which resulted in inefficient reservoir management, was a particular concern. The destruction of storage facilities and high water-cut rates at southern fields resulted in the emergence of water handling as a key problem, impacting both recovery rates and crude quality (the blending of Basra Light with heavier crudes resulted in Basra Light's gravity falling to 28–29° API, from its standard of 34 °API gravity).

In the early 2000s, Iraq's oil production was 2.5 mb/d, but this fell to approximately 1.4 mb/d following the US-led invasion of Iraq in 2003. From 2003 till end-2007, Iraq's oil facilities and pipelines were targeted with several hundred bomb attacks, causing significant damage.[9] Looters ransacked the headquarters of both South Oil Company (SOC)[10] and North Oil Company (NOC), stealing not only equipment, but also valuable data such as well logs, seismic data, and oilfield service equipment belonging to foreign oilfield service companies (such as Schlumberger, which maintained an office in Baghdad in the 1990s). The downstream sector fared no better: Iraq's refining capacity during the period

[3] IEA, *Iraq Energy Outlook*, 2012, p. 22.
[4] Fadhil Chalabi, *Oil Policies, Oil Myths: Observations of an OPEC insider*, (IB Taurus), p. 255.
[5] Ibid, p. 256.
[6] Thanks to Ahmed Tabaqchali for this data. See also: Ahmed Tabaqchali, *Understanding Iraq's debt: an overview of its status, outlook and origins*, Al-Bayan Center for Planning and Studies, August 2018.
[7] Established in 1995 by the UN (under UN Security Council Resolution 986) to allow Iraq to sell oil in exchange for food, medicine, and other humanitarian requirements.
[8] Reuters, 'Swiss firm Vitol pleads guilty in UN oil/food case', November 2007.
[9] MEES, 'A Realistic Outlook for Iraq's Oil Production in 2030', Volume: 54, Issue 27, 4 June 2011.
[10] Later renamed Basra Oil Company (BOC) from 2017 onward

(approximately 630,000 b/d) was running at around 50 per cent capacity, leading to product shortages and growing reliance on Kuwaiti and international product imports.[11]

2.1 Entry of IOCs

By 2006, oil production was falling, posing a challenge for Iraq's newly appointed Oil Minister, Hussain Al-Shahrastani.[12] Alongside falling production (and exports averaging 1.5 mb/d), a fuel crisis erupted some months after the minister's appointment in the summer of 2006. SOC, the largest company under the Ministry of Oil (MoO), reduced oil sector spending and failed to secure contracts with service companies for drilling. The problem was not cost: rather the issue was procurement capacity and restrictions on SOC's engagement with service companies. Weak institutional capacity within the Ministry of Oil and the ability of Iraq's inspector general to investigate suspected contract violations were key barriers to progress.[13] The sclerotic pace at which Iraq's Council of Ministers made decisions was also a problem for oil sector investment.

Despite this, from 2007 onward, Shahrastani began meeting with IOCs to discuss no-bid contracts, particularly at southern fields. However, before progress could be made with the IOCs, Iraq's Council of Ministers first sought to deal with legacy Production Sharing Contracts (PSCs) signed by Saddam during the 1990s. Saddam had signed two major PSCs with IOCs in the 1990s; these included one with Lukoil for West Qurna and another with CNPC for Ahdab.[14] Whilst Lukoil's contract was cancelled in 2002 for failure to perform, the PSC with CNPC was renegotiated as Iraq's first major Technical Service Contract (TSC) in 2008.

Shahrastani's charm offensive with IOCs met opposition from SOC officials, particularly Jabbar Al-Luaibi (head of SOC) and Karim Jabr al-Sa'idi, the head of Iraqi Oil Tankers Company – both were immediately replaced.[15] Their replacement also signalled the growing centralization of Baghdad's power over the affairs of SOC and of other Ministry companies, in attempting to restructure the Oil Ministry ahead of opening up Iraq's oil sector to foreign investment. Despite criticism from leading figures within SOC, the Kurds, nationalist politicians, and trade unions in Basra, Shahrastani launched Iraq's first bid round in 2009 at the Al-Rasheed hotel in Baghdad.[16] The first bid round included Iraq's largest southern fields, specifically, Rumaila, Zubair, and West Qurna. In order to win, IOC representatives had to place two envelopes in a box:

- the first held the figure the oil company proposed to charge for each barrel of incremental production above an agreed baseline (the **remuneration fee**);
- the second held a figure indicating the IOC's **Plateau Production Target** (PPT).

The lowest fee and the highest PPT would win.

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[11] A key reason for refined products shortages in the early–mid 2000s was not just the import of new vehicles (driving gasoline demand) but also the ill-designed subsidy programme of the post-2003 government: Iraq's gasoline prices averaged approximately US$0.25 per gallon and diesel sold for US$0.20 per gallon in the early 2000s. These low prices provided incentives for smugglers (often tied with militias) to export fuel to surrounding countries where market prices could be arranged. This situation was also not helped by the lack of metering at Iraq's export terminals – a situation not resolved until the late 2000s.

[12] A leading figure within Iraq's Da'wa party – famed more for his role as a nuclear physicist and opposition activist in the 1990s than for his knowledge of the oil industry.

[13] Gary Vogler, *Iraq and the Politics of Oil*, University Press of Kansas, 2017, p. 218.

[14] Russian and Chinese companies were chosen due to the sanctions.

[15] The National, 'Iraq removes state oil company head', 29 July 2009.

[16] According to Matthew Amitrano from the US State Department, another key factor incentivizing Shahrastani to act in opening up Iraq's southern fields to international investors was the role played by the Kurdish Regional Government (KRG) in signing contracts before 2007. Similarly, Shahrastani – according to Amitrano – did champion transparency ahead of the first bid round: he signed Iraq up to the Extractive Industries Transparency Initiative (EITI) and created a new directorate in the Ministry of Oil, the Petroleum Contracting and Licensing Directorate (PCLD), to handle the bid rounds. The leaders of the PCLD visited several countries including the USA to develop best practices. Email to author, 4 October 2018.

For IOC contractors, the TSCs allowed IOCs to recover costs through service fees. The remuneration fee – a bid made by the IOCs subject to a maximum set by the MoO – was adjusted over time by an 'R-factor': the ratio of aggregate cash receipts to aggregate costs. An R-factor of less than 1 would allow for the full fee; an R-factor of more than 1, however, would adjust the remuneration fee downwards.

Table 1: R-Factor and the Remuneration Fee

R-Factor	Remuneration Fee ($/bbl)
<1	100%
1 to less than 1.25	80%
1.25 to less than 1.5	60%
1.5 to less than 2.0	50%
2.0 and above	30%

Source: Iraq Oil Ministry, Sen

Alongside the remuneration fee, service costs were payable on a quarterly basis (IOCs could elect to be paid in either cash or crude) and the share of revenues available for cost recovery was fixed – a factor which overlooked the cyclicality of the oil price. Iraq's state companies would also take a 25 per cent share and the Ministry of Finance would implement a 35 per cent tax on the remuneration fee. The first field in the bid round, Rumaila, received two bids: one from a consortium which comprised ExxonMobil and Petronas; and the other, from BP and CNPC.[17] In the end, the first bid round resulted in just Rumaila being awarded (following renegotiations between BP and the MoO). There had been six other contracts where bids were placed, however these bids had remuneration fees higher than the maximum set by the Ministry of Oil.[18] Whilst Rumaila was the only award in the first bid round, the MoO later negotiated terms with consortia for Zubair, West Qurna-1, and the Missan group of fields (see Appendix, Table A1). In December 2009, a second round was held with seven contracts being awarded (unlike the first round, these were designed to develop new fields), see Table A2. The un-awarded gas fields from the first round were tendered in Iraq's third licensing round for gas fields (see Table A3). Following the two oil licensing rounds of 2009, Iraq held two further exploration rounds (in 2012 for 12 blocks, Table A4) and in 2018 (see Table A5).

The TSCs were primed for commercial conflict at the outset: at its most basic level, the first dispute between the IOCs and the MoO took place in determining the baseline production of the fields (in order to assess incremental volumes and the remuneration fee). A second problem with the bidding rounds was that they created a warped incentive structure: IOCs were rewarded for bidding unrealistically high PPTs in order to win[19] (with the subsequent aim of renegotiating them down later – a strategy which, in hindsight, ultimately worked). Third, as previously mentioned, if the R-factor was less than 1, the fee was equivalent to 100 per cent of the remuneration fee. As the R-factor increased (in other words, as cost recovery increased), the remuneration fee was adjusted downward. This created distorted outcomes: IOCs could gold-plate[20] their pipeline of expenditures allowing for an R-factor of less than 1, resulting in a higher remuneration fee. Fourth, as Fadhil Chalabi (a former OPEC Secretary General)

[17] Technically, ExxonMobil and Petronas had secured the best bid: a remuneration fee of $4.80 with a PPT of 3.1 mb/d. BP and CNPC's bid, on the other hand, was a remuneration fee of $3.99 with a PPT of 2.85 mb/d. The role of Shahrastani in the first bid round was integral to the course of events which took place. At the time, Iraq's Petroleum Contracts & Licensing Directorate (PCLD) had recommended a remuneration fee of $3.50. However, Shahrastani's uncompromising position was clear at the outset: his fee was $2.00.

[18] An example of the wild divergence in expectations between the IOCs and Shahrastani: the consortia bidding for Bai Hassan at Kirkuk in 2009 (Conoco, CNOOC, and Sinopec) submitted a bid for $26.7/390,000 b/d against the Ministry's maximum fee of $4.

[19] Interview with Thamir Al-Ghadhban, Iraq Energy Institute, December 2015.

[20] In other words, the more efficient the operation with greater cost control, the less cash the operator receives.

has pointed out, the PPTs at the time took no consideration of forecasts of global oil demand and non-OPEC production: both suggested that the call on incremental Iraqi oil growth was small.[21]

At a more serious level, the IOCs immediately recognized both the impossibility of reaching their contractual PPTs without water access, and the need for the MoO to invest in midstream infrastructure (including export facilities). The water access challenge prompted the MoO to approach ExxonMobil in 2010 to discuss what later became known as the Common Seawater Supply Project (CSSP), a water-injection project designed to enhance oil recovery at southern fields.

2.2 Political dynamics and mismanagement

The IOCs entered Iraq's upstream at a time of political transition in Iraq. Having held elections in 2005, Iraq's ruling coalition was dominated by various Shi'ite parties who had fought the election under a single list (United Iraqi Alliance). The UIA's main parties included the Supreme Council for the Islamic Revolution in Iraq (ISCI), the Islamic Da'wa Party, the Iraqi National Congress, the Islamic Virtue Party, and the movement of Moqtada Al-Sadr. Following several months of negotiations, a government was formed between the UIA and other coalition groups: the Iraqi Accord Front, the Kurdistan Alliance (made up of PUK and KDP), and Ayad Allawi's Iraqi National List. Iraq's first post-occupation government was mired in a series of issues: debating the future of federalism in Iraq, seeking to agree on a hydrocarbons law, and dealing with high levels of sectarian conflict and civil war (2006–8).

As prime minister during this period, Nouri Al-Maliki's first term (2006–10) was defined by various political strategies: first, balancing the interests of the USA and Iran (given the latter's ideological support of the Da'wa party); second, managing Kurdish ambitions for greater autonomy; and third, capitalizing on Iraq's civil war by targeting various non-state actors, whether they be Sunni (AQI) or Shi'ite (Operation *Knights Charge* – a special forces operation against Moqtada Al-Sadr's Mahdi Army in 2008[22] – being the most celebrated such exercise).

By 2010 however – a year after Iraq's first bid round – Maliki's power base was waning; growing protests due to power shortages and the emergence of rival political aspirants, particularly *Al Iraqiya* (an Iraqi coalition led by Ayad Allawi) and Moqtada Al-Sadr changed the balance of power in Baghdad. With decreased US pressure (following their departure in 2011) and growing Iranian support, Maliki moved to take control. His power grab was firmly put in place from 2011 onwards: rivals were removed (the most celebrated examples being Maliki's issuing of the arrest warrant for Deputy President Tareq Al-Hashimi, and the removal of Finance Minister, Rafi Al-Issawi); while ministries such as the MoO were used to maximize political power (for example, federal budget transfers to Kurds were withdrawn and the power of the South Oil Company was diluted[23]).

In many respects, the political dysfunction of Maliki's premiership from 2006 to 2014 was a result of Iraq's *muhassasa* system – the political system of quota-sharing whereby the Iraqi state and its institutions are divided on ethnic and sectarian lines – which became an invitation for Iraq's Shi'ite exiles (often with little experience) to build networks of patronage to consolidate power over ministries. The *muhassasa* system also encouraged corruption: key positions within strategic ministries (Oil, Defence, Interior) were distributed according to a sectarian logic.[24]

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[21] Fadhil Chalabi, *Oil Policies, Oil Myths: Observations of an OPEC insider*, p. 264.

[22] Thamir Ghadhban does, however, make the point in an email to the author that the crackdown by Maliki on armed militias in the south was welcomed and considered a positive move towards law and order.

[23] It is also the case that a number of 'handshake deals' took place between Baghdad and Erbil over federal budget transfers in return for oil export via the KRG. See also: Ahmed Mehdi, Luay Al-Khateeb, 'The Kurds Can't Afford to Leave Iraq', *New York Times* op-ed, 9 November 2014.

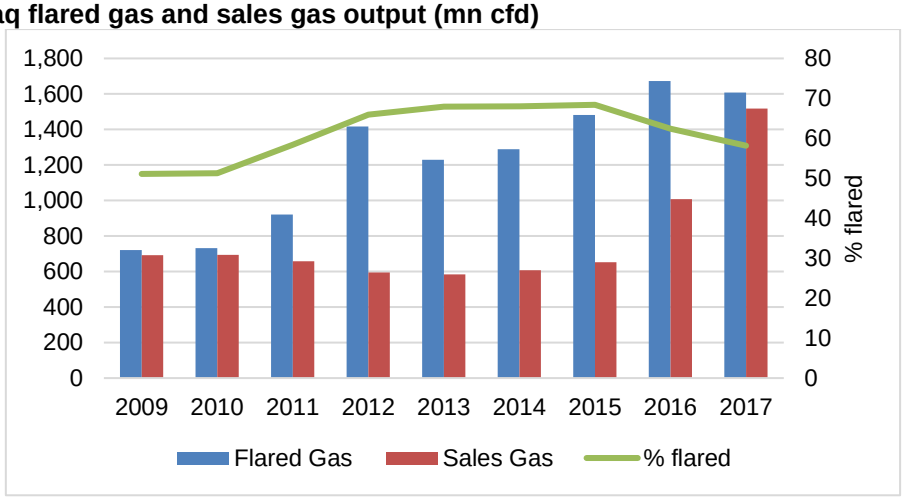
[24] As Faleh Al-Jaber, the eminent Iraqi sociologist, has written: 'The party that runs a ministry then makes sure that within this sectarian quota system, the ministry is staffed with cronies, followers and relatives, with almost complete disregard for competence or merit … the distribution of appointments is also a distribution of resources'. Faleh Jaber, 'The Iraqi Protest Movement: From identity politics to issue politics', LSE Middle East Centre Paper Series 25 June 2018, p. 15.

Higher oil prices also encouraged a deepening of the social and ethnic divides inherent within the *muhassasa* system: Iraq's public sector (including the Kurdish Regional Government, or KRG) grew significantly during the mid–late 2000s. According to the IMF, public sector employment tripled from 2004 to 2013 (from one million to three million jobs[25]), but despite this, public service provision (health, education, and electricity) remained inadequate. The bloated public sector also depended on fuel and electricity subsidies. Some estimates suggest that between 2011 and 2014, fuel subsidies accounted for around 10–11 per cent of Iraq's GDP.[26] The subsidy system also dented the development of Iraq's gas and power sector, with low end-user prices remaining below the opportunity cost of supply (in 2017, for example, despite having spent just under $13 bn on electricity, Iraq collected just under $1 bn from consumers[27]). Another factor stunting electricity-sector reform has been the role of political elites with interests in the private diesel generation business, otherwise known as 'electricity mafias'.

Notwithstanding a series of ministerial exits (often on charges of corruption) since 2011, policy stasis has continued to bedevil the sector; for example, from 2003 to 2011, having spent over $27 bn, ministry-operated electricity generation actually *fell* – from 4.88 GW in August 2009 to approximately 4.7 GW in 2011.[28]

The mismanagement of Iraq's public finances, together with large budgetary outlays for fuel subsidies, also coincided with a failure to drive any investment in Iraq's downstream sector. By the time of Maliki's second term (2010), Iraq's MoO was seeking to double downstream capacity to 1.5 mb/d. Yet Iraq failed to bring online any significant downstream capacity. One major IOC the author spoke to discussed a range of factors that put investors off Iraq's downstream sector. These included: bureaucracy, a lack of government financial backing, and the sub-optimal locations of refineries.[29] In the gas sector, the issue of gas flaring and the lack of facilities to handle associated gas volumes, as oil production increased, led to multi billion-dollar opportunity costs (see Figure 3).

Figure 3: Iraq flared gas and sales gas output (mn cfd)



Source: MEES, Author analysis

[25] IMF Iraq Country Report No.17/251, July 2017, p. 6.
[26] IMF, 'Energy Subsidies in the Middle East and North Africa: Lessons for Reform', March 2014.
[27] Iraq Oil Report, 'Iraq pushes electricity reform, prompting protests', 18 January 2018.
[28] MEES, 'Storm Clouds Gather over Iraqi oil Development' Volume 54, Issue 40, 3 October 2011. The level of mismanagement was not confined to the oil and energy sector alone. According to figures cited by Jaber, government ministries during the Maliki period had signed contracts to build 6,000 projects (with 5,000 of these either non-existent or not implemented) worth $220 bn.
[29] One example of poor planning was the Karbala refinery. Originally awarded in 2011, the project was delayed due to the Front-End Engineering and Design (FEED) having to be redesigned after the fuel source for a power plant (near the refinery) was changed from fuel oil to gas. Other examples of mismanagement included the 2013 deal for the Missan refinery signed with Satarem, a company which courted significant controversy at the time due to its financial difficulties and lack of experience.

Seen in this light, it is clear that whilst Iraq's upstream performed strongly during the period 2010–14 (with higher oil prices supporting the cost recovery mechanism), the period 2010–14 (outside the upstream) fared worse: gas flaring, a bloated public sector, the lack of midstream and downstream investment – all these factors circled Iraq's political class following the oil price crash of 2014. The fall in oil prices exposed both Iraq's budgetary outlays (such as expenditure on refined fuel imports and gas shortages) and the level of corruption in previous years. The discovery in 2014 by Maliki's successor, Hayder Al-Abadi, of 'ghost soldiers'[30] (in other words, those receiving salaries but absent from work) in the security and interior ministries was a latent microcosm of these 'wasted years'. The IOCs were also casualties of mismanagement and corruption in the over-bloated public sector, where significant bureaucratic delays in basic tasks such as visa-processing for IOCs, led to delays.

2.3 The perfect storm: oil prices and ISIS

Even before the oil price collapse of 2014 (see Figure 4), the legacy flaws of Iraq's TSCs were beginning to emerge – unrealistic PPTs coincided with delays in government bureaucracy, inadequate infrastructure, and water injection issues. As a result, in January 2013, Iraq's MoO renegotiated PPTs at the following fields: West Qurna-2, Halfaya (from 0.535 mb/d to 0.4 mb/d); and Zubair (from 1.2 mb/d to 0.85 mb/d). This was followed by renegotiations in February 2014 at West Qurna-1 (from 2.325 mb/d to 1.6 mb/d); and Rumaila in August 2014 (from 2.85 mb/d to 2.1 mb/d). The renegotiations also included contract extensions and the elimination of the R-Factor, see Table 2.

Table 2: Renegotiated terms at TSCs

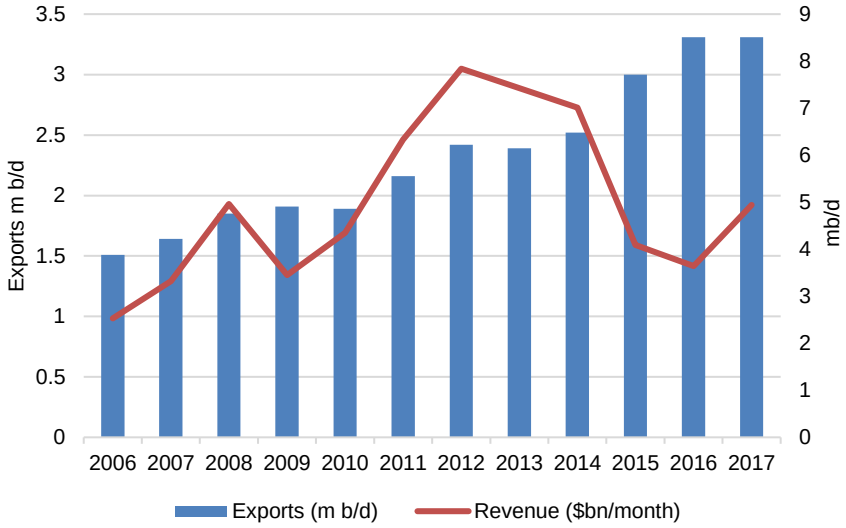
Project	Previous PPT	Revised Plateau Target (mb/d)	Licence extension (years)	Revised state equity	Notes
Halfaya	0.535	0.4	10	10	
Rumaila	2.85	2.1	5	6	No R-factor
West Qurna-1	2.325	1.6		9.6	
West Qurna-2	1.8	1.2	5	No change	Construction of pipeline from Tuba to Fao.
Zubair	1.2	0.85	5	No change	No R-factor
Gharaf	0.23	0.23			

Source: Wood Mackenzie[31]

The fall in oil prices had a series of negative impacts on Iraq, not least that the country's foreign currency reserves fell from $77.8 bn in 2013 to approximately $45 bn in 2016. With a growing budget deficit (more than doubling from 6 per cent of GDP in 2013 to 14 per cent of GDP in 2016), Iraq approached the IMF and World Bank for loans, including a $5.4 bn standby arrangement with the IMF in May 2016.

[30] Reuters, 'Iraq says it found 50,000 "ghost soldiers" on its payroll', December 2014.
[31] Wood Mackenzie, Iraq Upstream Summary Report, December 2015

Figure 4: Iraq oil exports and revenues



Source: MEES

For IOCs, the price collapse had two major effects: late payments and MoO requests for reductions in their field development budgets (for which IOCs are paid through the cost recovery mechanism). Demands for IOCs to reduce their capital spending led upstream investments to fall from $21 bn in 2014 to $11 bn in 2016. On the issue of payments, arrears owed to IOCs amounted to approximately $3.5 bn at the end of 2015. At the time, the cash crunch on Iraq's finances led IOCs to increase payment nominations via crude, particularly Basra Heavy – the new crude grade that was launched by SOMO in 2015. The payment schedule to IOCs improved in 2016 (amounting to $1.2 bn) but fell to zero as of March 2017.

Politically, the fall in oil prices also coincided with the fragmentation of Iraq's ruling Shi'ite parties. Whereas Iraq's Shi'ite bloc fought the 2005 elections under a single list (United Iraqi Alliance – a political alliance backed by Iraq's Ayatollah Ali Sistani), this list split into two blocs in 2010 and by 2014 was split into four blocs.[32] This fragmentation was also driven by growing tension between Shi'ite 'insiders' (namely those who had stayed in Iraq during the 1990s) and 'outsiders' (those who had lived in exile – usually in London, Tehran, or Damascus). Iranian policy during the period also added to the rift, in particular Tehran's policy of supporting the establishment of Asa'ib al-Haq[33] (established in 2013 as an offshoot of Sadr's wing) and the Badr organization (an Iranian-backed group formed in the early 1980s as the military wing of the Supreme Council for Islamic Revolution in Iraq).

This inter-Shi'ite political competition was also taking place against the backdrop of Sunni disenchantment and political alienation; by the time of the oil price decline, protests were sweeping across Sunni parts of the country – a dynamic which fed the gradual emergence of ISIS. The escalating security problem facing Iraq by the end of 2014 not only drove a series of bargains between Baghdad and Erbil (on the use of the KRG pipeline in return for federal transfers[34]) but also a political transfer of power from Maliki to Hayder Al-Abadi; a move supported both by Iraq's highest religious authority (*marjaiya*) and Tehran's officials who, by 2015, had become disenchanted by Maliki.

[32] Faleh Jaber, 'The Iraqi Protest Movement: From identity politics to issue politics', LSE Middle East Centre Paper Series 25 June 2018, p. 12.
[33] A shi'ite paramilitary group funded by Iran's Quds forces.
[34] In December 2014, the KRG agreed that SOMO could market 550,000 b/d of KRG crude in return for federal budget transfers. The deal only lasted several months.

It is not the purpose of this paper to discuss in detail the origins of ISIS and its devastating impact on Iraq's social and economic fabric (internal displacement, cultural and physical sabotage, and violence); however, several important oil sector dynamics did take place as a result of their emergence (and eventual defeat):

- Severe damage was sustained to the federal Iraq–Turkey pipeline, resulting in an agreement between Baghdad and Erbil to use the KRG–Turkey pipeline (with a capacity of 700,000 b/d) for the evacuation of northern production (particularly Kirkuk);
- The defeat of Iraqi army forces in Mosul, and the Peshmerga's advance into Kirkuk, led to a change of control from NOC-operated fields to those run by smaller Kurdish companies (particularly the KAR Group);
- The attack against the Baiji refinery – Iraq's largest refinery with a nameplate capacity of 310,000 b/d – severely affected Iraq's refining capacity. Baiji's significance lay not only in it being Iraq's largest refinery (producing around a third of the country's gasoline and diesel) but also in its importance to the local economy of Salah Al Din province. The refinery was the largest employer in the province, with a payroll of approximately 4,000–5,000 employees.[35]

The war against ISIS also led Iraq to expand its war economy: oil sector investments were cut and government spending on defence and the military increased. The decision of Ayatollah Ali Sistani to call for the *en masse* mobilization of Iraq's Shi'ite population to take up arms (*Hashd Al-Shaabi*) not only reinforced the lack of a monopoly on the use of violence within Baghdad's power centres, but also created the problem of how to re-integrate the *Hashd* following the eventual defeat of ISIS in 2017 – a situation Iraq continues to face following elections in May 2018. Similarly, the support of Iran in defeating ISIS (providing such assistance as military advisors and logistical support) has led Tehran to expect a security dividend following their defeat – a situation which complicates Baghdad's position as it seeks to balance both US and Iranian interests at a time of President Donald Trump's aggressive anti-Iran policy.[36] Finally, Abadi's attempt to maximize electoral gains ahead of the May 2018 elections on a ticket of defeating ISIS did not prove to be effective.

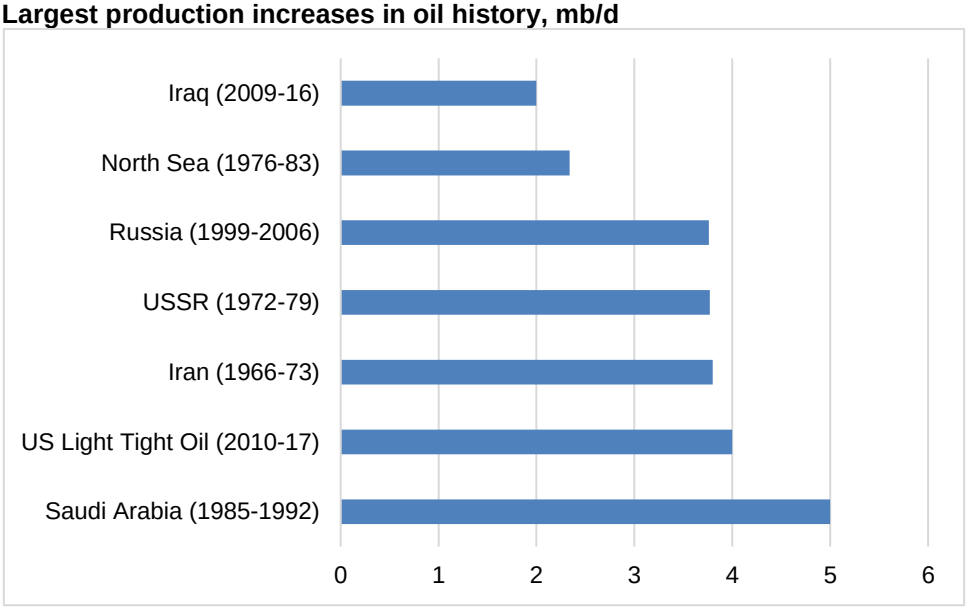
The rejection of Iraq's post 2003 political system was perhaps best reflected in voter turnout figures in the May 2018 elections – approximately 44.5 per cent across the country, and even lower in the south (Dhi Qar turnout was 39 per cent and Basra just 40 per cent). The success of Moqtada Al-Sadr's Sairoun bloc – which ran on a platform of anti-corruption – was a further reflection of the rejection of Iraq's post-2003 political elite system and, most damningly, of the *muhassasa* system. The latest reincarnation of this political rejection has been the protest movement in Iraq's south (active since July this year).

[35] Gary Vogler, *Iraq and the Politics of Oil*, University Press of Kansas, 2017, p. 190.
[36] Iraq is also negotiating with the USA to seek waivers related to its imports of gas and electricity from Iran. Iraq Oil Report, 'Iraq Seeks Sanctions waiver on vital Iran energy trade', October 2018.

3. Oil production dynamics

From 2014 to 2016, Iraq was one of the largest contributors to incremental production growth in the global oil market, having added approximately 2 mb/d between 2009–16, see Figure 5.

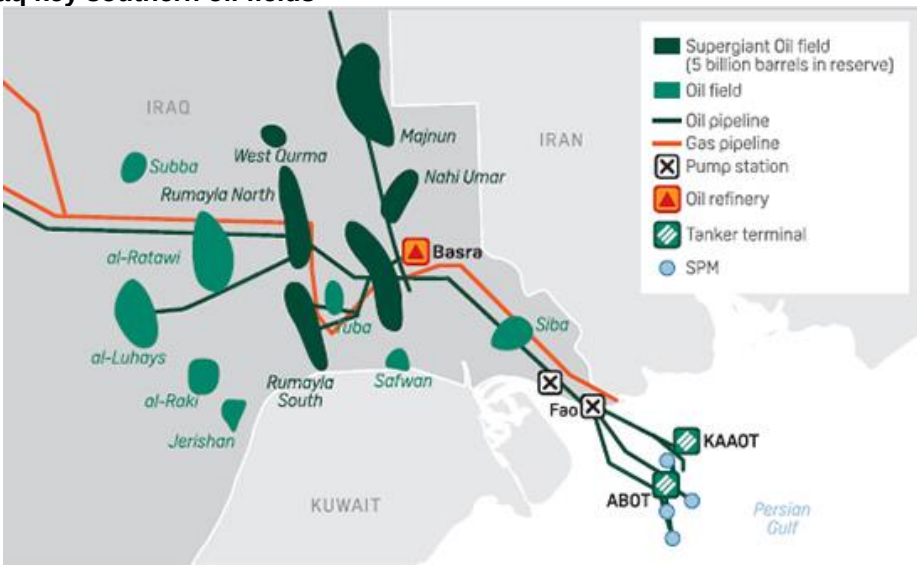
Figure 5: Largest production increases in oil history, mb/d



Source: IEA

As previously mentioned, the period 2012–14 saw a number of delays to production gains (due to storage and export bottlenecks, despite active drilling). However, the decision in May 2015 to split Basra into light and heavy crude grades contributed to production growth, following the commissioning of new Single Point Mooring (SPM) buoys in 2014 and 2015. Given the specific challenges, project economics, and crude grade of each field, a deeper understanding of the southern fields can help discern the dynamics of Iraqi oil production.

Figure 6: Iraq key southern oil fields

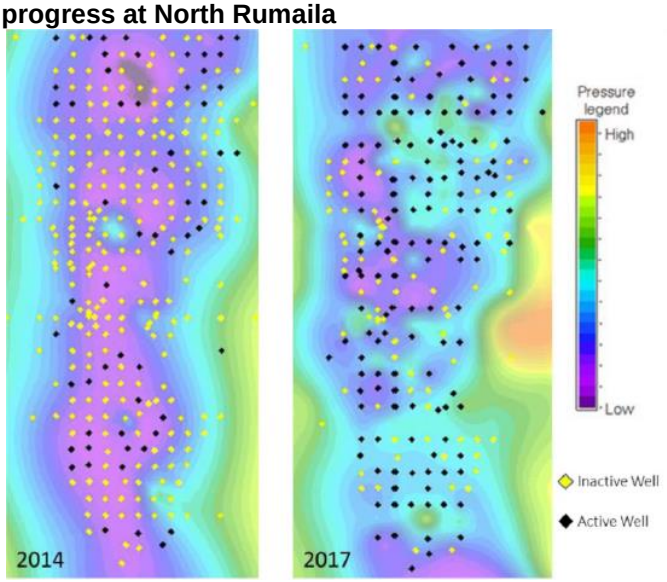


Source: S&P Global Platts, ©2018 by S&P Global Inc.

Rumaila (see Figure 6) is Iraq's largest contributor to liquids production, with Rumaila Operating Organization (ROO) JV having added approximately 650,000 b/d of incremental production since 2009;

current production stands at approximately 1.45 mb/d (considering an 18 per cent base decline at the field). Since 2009, ROO JV has drilled approximately 200 new wells and conducted renovations to the Qarmat Ali water plant (a casualty of post-2003 looting), allowing water injection to increase from 60,000 b/d (in 2013) to approximately 1 mb/d in 2018 (see Figure 7 and Figure 10).

Figure 7: Waterflood progress at North Rumaila



Source: Mahmood[37]

Historically, most of the oil produced from Rumaila has come from the Main Pay (Zubair formation) which has high permeability and an average API of 34°. Future volumes, however, will focus on the northern section of the field, tapping into the Mishrif reservoir, which is defined by much lower permeability. Both weak aquifer support and the increasing water volumes required for pressure will present a challenge to the northern section in the future. Other problems include handling both produced and injected volumes, together with the need for water separation technologies to handle increasing associated water production with oil. As a result, there is a possibility that BP and its partners will seek a further reduction to its PPT from 2.1 mb/d to 1.7–1.8 mb/d.

The ENI-operated Zubair field was producing at approximately 192,000 b/d in 2009, with production doubling to 390,000 b/d in 2017 – a development supported by additional oil processing and oil-to-gas separation, together with increased storage facilities. Current production at the field is approximately 475,000 b/d. It is expected that production will reach 620,000–625,000 b/d by early 2019, this increase being supported by the construction of additional oil processing facilities.

Phase-1 development of West Qurna-1 started towards the end of 2009 with production levels of approximately 250,000 b/d. Despite the installation of a water injection unit in 2013, production fell in 2014 (from 400,000 b/d to 340,000 b/d). Current production at the field is approximately 455,000 b/d. The Lukoil-operated West Qurna-2 is currently producing between 380,000 and 390,000 b/d. Production started in 2014 at a rate of 220,000 b/d, almost doubling to 432,000 b/d in 2015. Both the cut in capex in 2015 (from $2.1 bn to $1.26 bn) and longer-term water injection requirements have led to production declines, prompting a PPT amendment in May 2018 (from 1.2 mb/d to 800,000 b/d). It is expected that production at West Qurna-2 will remain flat this year.

Since its discovery in the 1970s, the Majnoon field has seen limited production growth; Shell – who took operatorship of the field during the bidding rounds – faced the initial challenge of clearing a large number

[37] S. Mahmood et al., 'Waterflooding in Giant Carbonate Reservoir: Success and Challenges', *SPE*, 13 November 2017.

of landmines (a legacy of the Iran–Iraq war). With production in 2010 at 50,000 b/d, Shell and its JV partners managed to increase production in 2014 to 211,000 b/d, a production increase supported by oilfield services from Petrofac and Wood Group. Despite a number of attempts to renegotiate its PPT with Iraq's MoO, Shell decided to exit Majnoon in 2017 – this was due both to the poor terms of the TSC and to the IOC's wider transformation into the gas business (following the acquisition of BG Group). Following Shell's exit, Iraq is set to take over the field and has contracted a number of oilfield service companies to support production.[38] A deal in early 2017 with Halliburton to drill 30 wells will also support production at the field, particularly since it is unlikely that Majnoon will need reservoir support for water needs until production increases above 700,000–800,000 b/d.

A significant contributor to liquids growth this year is expected to come from the Halfaya field (located in Missan province), operated by PetroChina. With current production of approximately 250,000 b/d, the third-phase development of the field was sanctioned in early 2017. The expansion of Halfaya will also be supported by the Halfaya–Fao pipeline (completed in 2014) which has capacity of 1 mb/d. The ramp-up from Halfaya will also support Basra Heavy exports out to 2020.

Iraq's state-owned oil companies also operate a number of fields which can support production growth in the short–medium term. In July 2018, Iraq's oil minister ordered the state-run company, Dhi Qar oil company, to develop the Nassiriya oilfield where production currently averages 80,000 b/d. Multiple attempts to award Nassiriya to international investors have failed, largely as a result of Iraq's MoO tying the upstream development of the field with the construction of a refinery (300,000 b/d) with poor project economics. Nevertheless, the allocation of a $140 mn budget to Dhi Qar could allow for an increase of up to 200,000 b/d by the early 2020s.

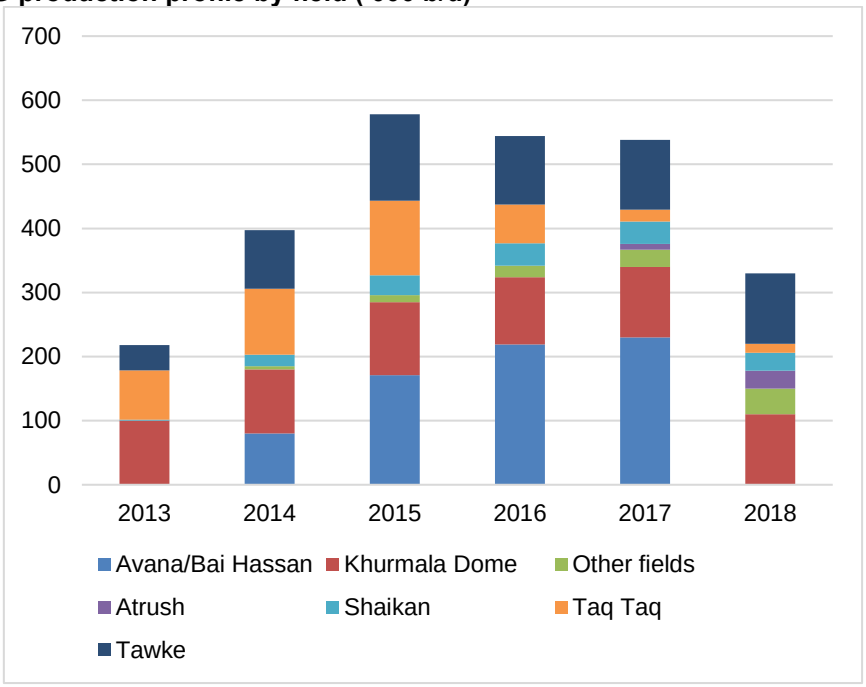
Other smaller fields that can support production include: Luhais, Tuba, Nahr Bin Umar (currently producing 35,000 b/d), and Ratawi. These fields were initially earmarked for ExxonMobil and PetroChina (as part of an upstream equity deal for development of the Common Seawater Supply Project, otherwise known as the South Integrated Project). However, the sclerotic progress on CSSP has meant that the state-run companies will operate them. Luhais and Tuba have supported production growth in 2018: Luhais production was around 34,000 b/d in mid-May, increasing to 90,000 b/d in July; similarly, production at Tuba (which averaged 31,000 b/d in 2017) rose to 39,000 b/d in July 2018. Given the size of the resource base of these fields, production can be increased significantly. Iraq also launched a fifth bid round in 2018 for blocks in Basra, Maysan, Wasit, Karbala, and Baghdad.

Despite state-run companies having improved their production performance this year, expectations have been tempered at other fields. For example, Subba – a field operated by Dhi Qar – came online toward the end of 2017. This field started production at around 29,000 b/d in 2017 and is now producing at just half this level (15,000 b/d). There is a possibility that Chevron will work with Dhi Qar in the development of this field, following an MoU signed with Dhi Qar in 2018.[39]

The largest production wildcard this year is Kirkuk (see Figure 8). As previously mentioned, a number of Kirkuk fields were under KRG control from 2014 to 2017 (Avana/Bai Hassan and Khurmala Dome). Kirkuk production represented just under 300,000 b/d of the KRG's production profile.

[38] In May 2018, it was announced that Kellogg Brown & Root (KBR) had been awarded a contract by Basra Oil Company to provide project management and engineering support for the development of the field; this followed an agreement in April with the Chinese company, Anton oilfield services, to handle operations and management of the field under a two-year agreement.
[39] Reuters, 'Iraq's Basra Oil, Chevron agree to implement MoU to develop Oil fields', 19 August 2018.

Figure 8: KRG production profile by field (’000 b/d)



Source: MEES, Author analysis

Since the federal recapture of Kirkuk fields, production has been stymied by the lack of agreement between Baghdad and Erbil over use of the KRG’s export pipeline. This has led NOC (who took over operator status of the fields from KAR group) to reinject production volumes, a situation causing damage to the reservoir. Whilst Baghdad has discussed a swap deal with Iran this has not progressed, due to security and logistical issues.[40] Some short-term measures have taken place to help offset the problem: in July 2018, a 40,000 b/d pipeline was made operational, connecting the field to the Daura refinery in Baghdad, enabling production to increase slightly. Similarly, the re-start of one of Baiji’s refinery units in September 2018 will help increase flows to around 10,000 b/d initially, rising up to 70,000 b/d by year-end.

The appointment in October 2018 of a new prime minister, Adel Abdul-Mahdi (a figure with close links to Kurdistan’s ruling parties and a key figure behind the 2014 oil export deal between Baghdad and Erbil), could help unlock the current impasse. A future deal with the KRG would also help give confidence to BP, who signed an MoU with Iraq’s MoO to increase Kirkuk’s output to 700,000 b/d (from its current production capacity of 440,000 b/d).[41] Alongside BP, Rosneft – the Russian energy champion – has also indicated interest in developing Kirkuk, particularly given its 60 per cent equity stake in the KRG–Turkey pipeline and its interest in developing a gas plan for northern Iraq.[42]

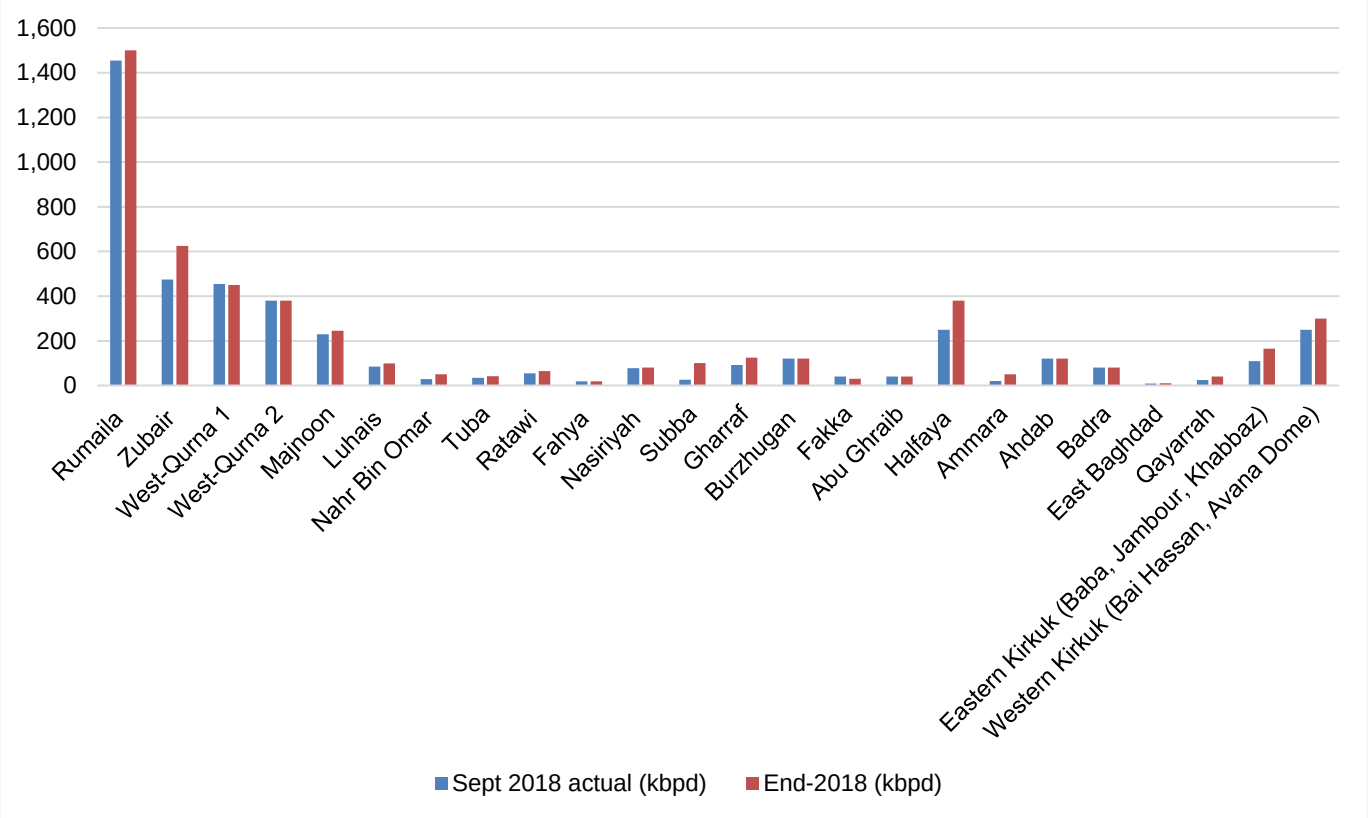
Other fields recaptured by Baghdad following the defeat of ISIS include fields in Salah Al Din province (Ajeel, Hamrin, Qayarrah). However, despite the re-entry of Sonangol at Qayarrah and Najma (which has medium quality oil), these fields’ crude is very heavy (15–18° API) and production will depend on the rehabilitation of refineries, treatment facilities, and ongoing insecurity concerns.

[40] In an interview with Iraq Oil Report, SOMO’s chief highlighted bureaucratic delays with Iraq’s customs officials on the border as a logistical barrier. See: Iraq Oil Report, ‘Q&A: SOMO Director General Alaa al-Yasiri’, October 2018.
[41] Financial Times, ‘BP strikes deal with Iraq to exploit giant Kirkuk field’, 18 January 2018.
[42] For a wider understanding of Russia’s increasingly active role in the Middle East energy sector, see: Ahmed Mehdi, James Henderson, ‘Russia’s Middle East Energy Diplomacy’, *Foreign Affairs*, 20 June 2017.

4. Factors constraining long-term output potential

Based on the above, it is expected that Iraq's production *capacity* can reach a level of just above 5 mb/d by early 2019. This will come from incremental gains at Halfaya, state-operated fields in the south, and the gradual increase in output from NOC-operated Kirkuk (see Figure 9). Iraq's target of 6.5 mb/d by 2022 will, however, prove more challenging due to multiple factors including water injection requirements, midstream capacity constraints (as production growth gets heavier), and export capacity issues.

Figure 9: Iraq's September 2018 production capacity and year-end forecast by field (Federal Iraq only)



Source: Author Analysis, Companies, Iraq Oil Report, MEES

4.1 Water supply

As IOCs sought to ramp up production, the main techniques used to achieve large-scale increases in production (whilst maintaining reservoir pressure) have been via gas or water injection. However, given that much of Iraq's gas was (and continues to be) flared rather than re-injected (despite growing processing volumes from Basra Gas Company), and given that sales gas volumes are earmarked for power and electricity generation, this has left water as the preferred option for maintaining reservoir pressure and improving oil recovery. Also, based on flooding experiments and reservoir studies, it has been proven that water injection is a far superior method to gas injection, from a recovery point of view, for Iraq's southern fields (except for the light Yamama oil in Bin Umar and Ratawi fields[43]).

A key challenge to future production growth therefore remains the availability of water for reservoir pressure support. As previously mentioned, part of the reason for IOCs renegotiating their PPTs in the

[43] I would like to thank Thamir Ghadhban for this point.

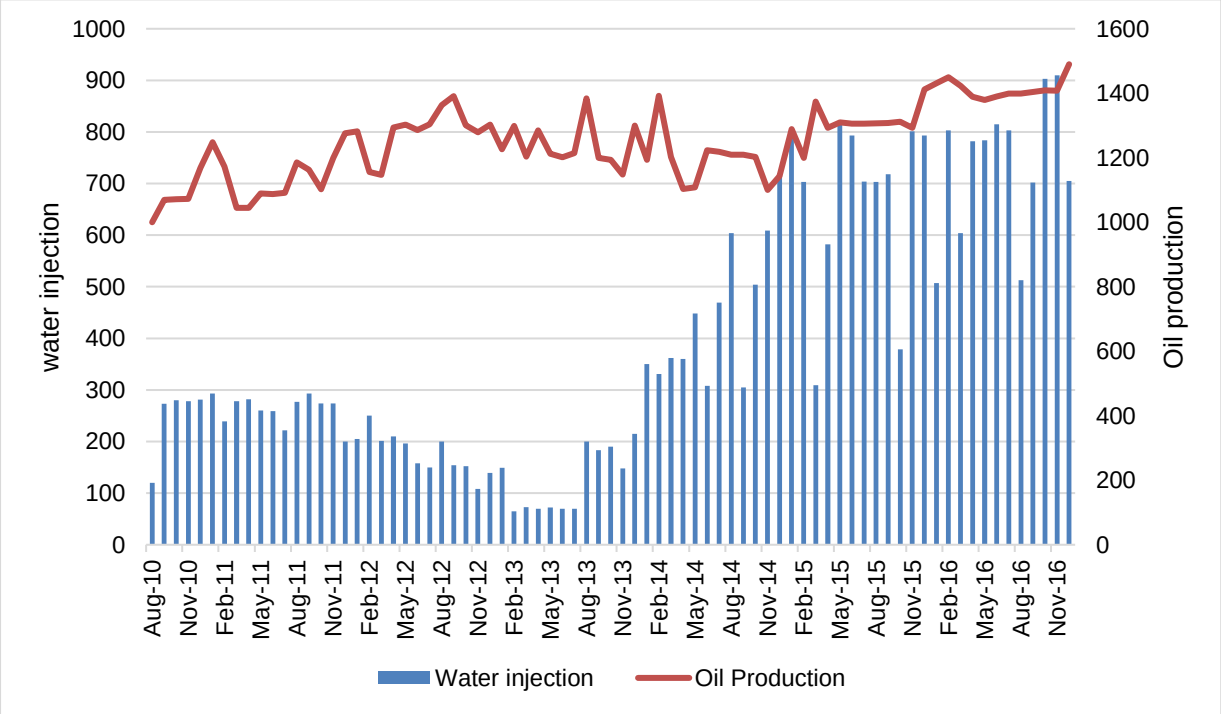
late 2000s was water-injection requirements. Within the Middle East, Iraq has one of the lowest secondary recovery factors. The IEA estimates that, as a general rule, Iraq needs 1.5 barrels of water injection for every barrel of oil produced.[44]

Given the difficulties of sourcing water from the Euphrates and the Tigris – due to the demand from local agriculture and a lack of volume (only 10 per cent of the quantities required can be provided) – seawater has been identified as the only source of water available in sufficient quantity for oil-injection needs. Furthermore, the upstream river policies of Iran and Turkey (heavy dam construction is in progress[45]) are set to make matters worse for Iraq.

In 2010, just as BP started water treatment for Rumaila, the ExxonMobil-operated West Qurna was suffering water-injection shortages. As a result of negotiations between Iraq's MoO and Exxon, the IOC was awarded what later became known as the Common Seawater Supply Project (CSSP) – a mega project designed to deliver 12.5 mb/d of treated water to southern oil fields, at a cost of $10–12 bn. The incremental production growth at IOC-operated fields from 2009 onward (particularly from Rumaila and West Qurna 1 and 2) was supported by water supply from the Qarmat Ali treatment facility (1.3 mb/d) and the Shatt-Al Arab water facilities.

The impact of increased water injection from Qarmat Ali at Rumaila can be seen in Figure 10, which shows the impact of increased water injection in Mishrif reservoir from 2013 onward. Future Rumaila growth will come from Mishrif, but this oil is medium–heavy and will require further water injection rates beyond 1 mb/d to sustain production, particularly given the heavy decline rate at the field. In this light, the first phase of the CSSP (initially 5 mb/d, but capable of being increased to 7.5 mb/d at a later date) will support water injection rates at the following fields: Rumaila, Zubair, West Qurna-1, West Qurna-2, Tuba, Majnoon, and Halfaya.

Figure 10: Rumaila oil production and water injection ('000 b/d)



Source: Author analysis, BP ROO

[44] IEA, *Iraq Energy Outlook*, 2012, p. 67.
[45] Reuters, 'Turkish Dam project threatens rift with Iraq over water shortages', 5 June 2018.

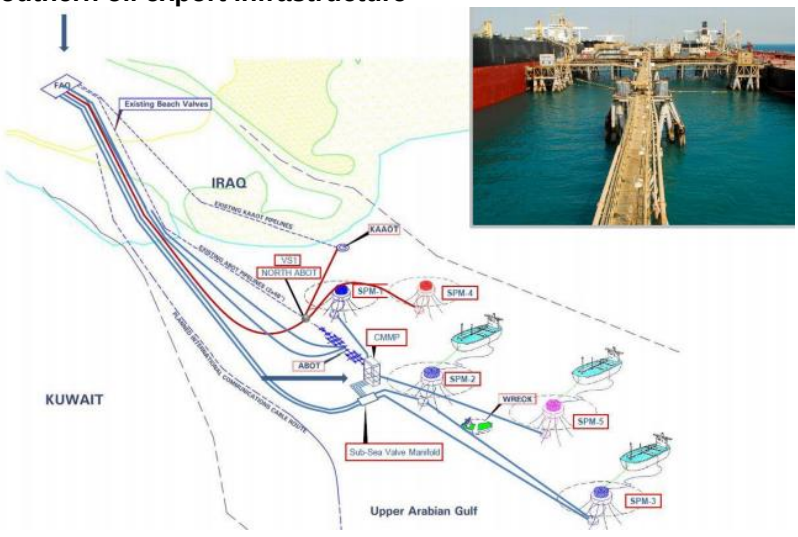
Despite recognition by Iraq's MoO of the necessity for fast-tracking development of the CSSP (or of a reconfigured version[46]), forward development of the project continues to remain in abeyance. Political developments have not helped. In 2012, Exxon was removed from the project due to its involvement in KRG contracts; subsequent delays to the project included changes to the project design, encouraging cost creep issues. The collapse in oil prices caused further delays to the project. Whilst Exxon did re-enter talks with Iraq in 2015 to discuss resuming its position on the project, negotiations have focused on bundling a scaled-back version of the CSSP with other projects: gaining operator rights for Nahr Omar and Ratawi fields and the development of midstream and export infrastructure (the 'Integrated South Project'). Despite this, Exxon has now abandoned negotiations with Iraq's MoO on developing the CSSP,[47] with the agenda now firmly focused on both upstream and export infrastructure issues. To compensate for this drawback, the Basra Oil Company[48] (BOC) has started the process of selecting EPC contractors to develop the CSSP as a standalone project.[49]

4.2 Southern midstream network and storage capacity

Analysis of Iraq's production dynamics often ignores the role of midstream and export infrastructure; this includes onshore pipeline development, storage tanks (at fields and ports), pump stations, and offshore loading. Whilst IOCs have been responsible for upstream development, Iraq's state-owned companies (particularly Basra Oil Company and the State Company for Oil Projects) are responsible for midstream and export infrastructure build out.

Iraq has made some inroads in expanding export infrastructure since 2012. Alongside the 1.6 mb/d Basra Oil Terminal (BOT) and the 350,000 b/d Khor Al-Amaya oil terminal (KAOT), Iraq has added a number of Single Point Mooring buoys (SPMs),[50] each with an individual capacity of 900,000 b/d (see Figure 11).

Figure 11: Iraq southern oil export infrastructure



Source: Lukoil [51]

[46] The most recent figure suggests 5 mb/d of water in two phases: Platts, 'Iraq shortlists five companies for critical Basra oil fields water-injection project', 9 April 2018.
[47] Reuters, 'Iraq, Exxon talks on water treatment project end', 20 June 2018.
[48] BOC was formerly known as South Oil Company having changed its name in 2017
[49] I would like to thank Ben Lando for this information.
[50] In 2010, Iraq awarded a contract to Leighton Offshore to install 3 SPMs. At present, there are 4 SPMs. The fifth SPM has been delayed due to differences between Basra Oil Company and the contractor.
[51] Thanks to Gati Al-Jebouri, Lukoil's Head of Middle East Upstream for permission to use this image

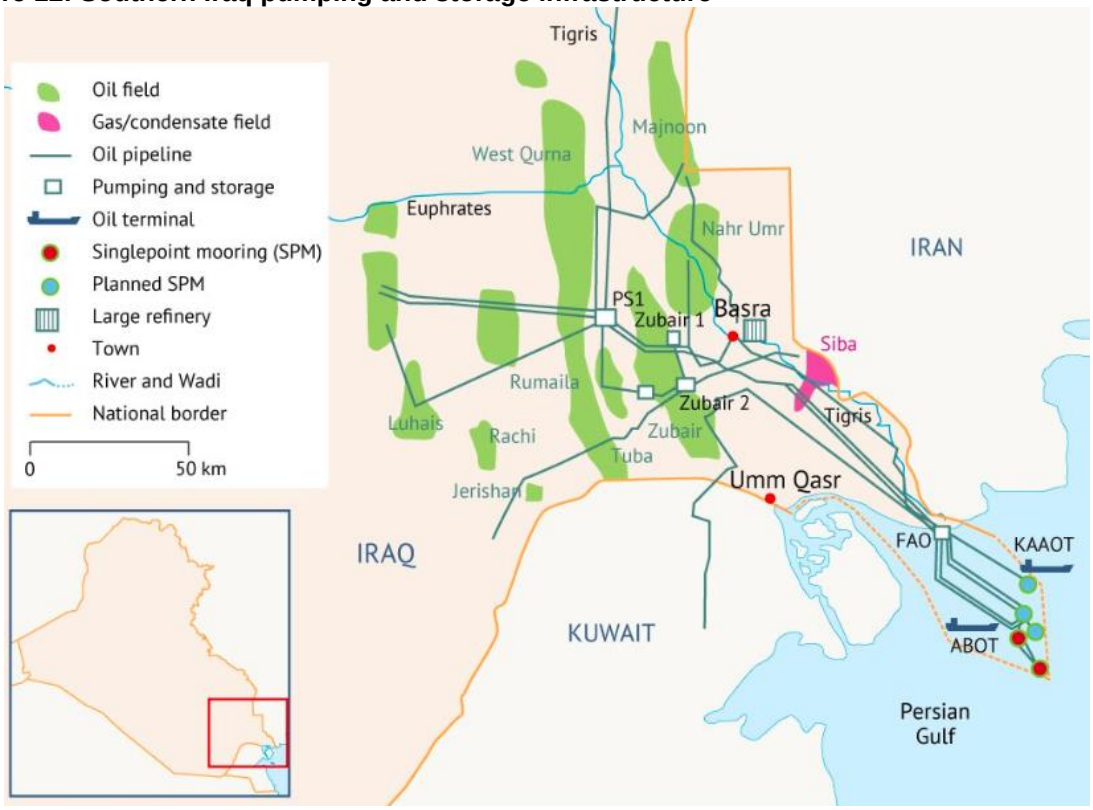
Full utilization of the SPMs has, however, been undermined by onshore infrastructure and pumping capacity at Al-Fao. Alongside the problem of supplying SPMs, a future risk concerns the two 48-inch subsea pipelines running from Al-Fao to BOT. Given the lack of regular maintenance and routine inspections (the last one having been conducted in the early 1990s), BOC has not utilized BOT at full pressure, instead operating the pipelines at low pressure (due to significant corrosion in the pipe).[52] With KAOT having remained offline for almost two years (due to delayed rehabilitation work, infrastructure leaks, and ongoing disputes with contractors), export capacity additions will depend heavily on increasing pumping capacity to underutilized SPMs.

4.3 Onshore storage

In terms of onshore storage, southern Iraq's major crude storage depots include: Zubair (Z-1), Zubair-2 (Z-2), Tuba, PS-1, and Fao. Iraq's total southern storage design capacity is currently around 18 million barrels and operating capacity at around 11 million barrels). Oil production in the southern fields (Rumaila, Zubair, West Qurna, Majnoon, Gharraf, Ahdab, Buzurgan, and Subba) is delivered to the Z-1, Z-2, PS-1, and Tuba depots, and then to the Fao export depot. From there it passes to the ports of Al-Basra Oil Terminal and KAOT for export (when operational). (See Figure 12.)

Iraq's main pumping capability comes from Zb-1 which has three 1 mb/d capacity pumps; PS-1 storage and pumping capability was significantly damaged before 2003 and require upgrades to allow oil to be moved from PS-1 to Fao.

Figure 12: Southern Iraq pumping and storage infrastructure



Source: IEA

[52] Interview with Gary Vogler, *Iraq Oil Report*, 22 May 2018.

From 2009, following Iraq's bidding rounds, southern onshore storage capacity hovered at around 11 million barrels. The increase of oil production from 2009 onward – following the bid rounds – added increasing pressure to storage tank capacity. The problem became particularly acute from the end of 2013 as production from West Qurna-2 (API of 22.8°) and Halfaya (22.5°) began to increase; the gradual ramp-up in heavier production was not met by sufficient capacity to enable crude segregation, leading to a deterioration in the quality of Iraq's flagship Basra Light grade. The lack of segregated tanks to account for crude quality, together with the lack of professional blending, led to volatility in the API of Basra Light (in April 2014, the API fluctuated between 28.07° and 32.37°), a dynamic that was not helped by the practice of dumping fuel oil with the export streams. The deterioration of Basra Light from 2012 to 2014 also impacted Iraq's revenues, as the fall in quality meant that SOMO had to pay a compensation rate of $0.4/bbl for each degree of API below specified volumes contracted by offtakers – a situation which led to a greater discount mechanism for Basra Light compared to other regional sour grades.

The situation did, however, begin to improve from 2014 onward, with the increase of storage capacity at Fao where three storage tanks (58,000 m^3 each) were added, with connections to SPMs at southern loading facilities. This allowed SOMO to launch a new Basra Heavy crude grade (with two SPMs dedicated to its loadings). Despite having faced initial resistance from Asian refiners (due to poor OSPs and large parcels) the grade – made up of volumes from West Qurna-2, Halfaya, and Gharraf – has gained favour in sour markets and amongst IOCs who increased their allocation of the grade as payback oil.

Table 3: Current southern oil storage

Storage facility	No. of tanks	Capacity per tank (m^3)	Total design capacity (m^3)	No. of rehabilitated tanks
Zubair-1	12	6 × 34,000 6 × 23,000	342,000	2
Zubair-2	10	58,000	580,000	10
Tuba	4	66,000	264,000	4
PS-1	10	82,000	820,000	10
Fao	16	58,000	928,000	16
Total			**2,934,000**	

Source: Author analysis, SCOP

Despite the success of launching Basra Heavy, a problem facing SOMO in the future is the changing pattern of production. Most of Iraq's production has come from the Zubair formation; however, from 2020, Iraq's production profile is set to get heavier as more oil comes from the Mishrif reservoir (24–28° API, 4 per cent sulphur). This will require even more infrastructure spending on crude segregation. To accommodate this change in crude quality, SOMO has touted the idea of launching a new grade, Basra Medium, to help stabilize Basra Heavy and Basra Light. The new grade would effectively replace the current specifications of Basra Light (with an API of 29–30°, 2 per cent sulphur), while Basra Heavy would remain the same (24°, 4 per cent sulphur) and Basra Light would be lighter at 34° API, sourced from lighter Yamama reservoir fields (such as Luhais and Tuba).[53] Whilst this move should be welcomed, particularly given Asian refining runs and SOMO's successful track record of marketing in Asia (including the development of new JVs with Chinese partners), the launch of the new grade is not

[53] I would like to thank SOMO's Deputy Director, Ali Nazar Al-Shatari for this information

expected until at least 2020 (the timetable of the launch being heavily dependent upon the build out of existing storage and facilities for crude segregation and export infrastructure, see Table 4).

Table 4: Planned storage capacity increases

Storage facility	No. of tanks	Capacity per tank (m^3)	Total Capacity (m^3)
Bin Umer	22	66,000	1,452,000
Nassiriyah	7	75,000	525,000
Fao	8	58,000	464,000
Tuba	8	66,000	528,000
Total			**2,969,000**

Source: Author analysis, SCOP

4.4 Midstream pipeline network

The majority of Iraq's network of pipelines were built in the 1970s. The most important post-2003 developments are the expansion of pipeline networks from Zubair to Fao (built in 2012) and the Halfaya–Fao network which can handle up to 1 mb/d of heavy production from the Missan cluster of fields (primarily Halfaya volumes). Inaugurated in 2014, the Halfaya–Fao pipeline allowed Iraq to segregate its light and heavy crude grades following tank upgrades at Fao and improved pumping station capacity to SPMs.

Table 5: key midstream pipelines

Pipeline	From	To	Capacity ('000 b/d)	Notes
Badra–Gharraf	Badra	Gharraf	200	The 165km pipeline was completed in 2014. Badra production is currently 80,000 b/d.
Gharraf–Nasiriyah oil storage	Gharaf	Nasiriyah oil storage	300	Gharraf production currently around 220,000 b/d.
Ahdab–Nasiriyah	Ahdab	Nasiriyah oil storage	200	Ahdab production is currently 120,000 b/d.
Nasiriyah–PS-1	Nasiriyah oil storage	PS-1 pumping station	500	Increased storage at Nasiriyah could allow increased volumes from Ahdab (feedstock for refinery)
PS-1–Fao	PS-1	Fao	800	
Buzurgan–Halfaya	Buzurgan	Halfaya	450	Completed in August 2014
Halfaya–Fao	Halfaya	Fao	1000	Completed in August 2014, helping support launch of Basra Heavy volumes
North Rumaila–Zubair-1	Rumaila	Zubair-1	Unknown	
Majnoon–Zubair-1	Majnoon	Zubair-1	Unknown	
Zubair-1–Fao	Zubair-1	Fao	800	Completed in 2012. More storage is required at Zubair and pumping capacity
Fao SP1–4	Fao	Al-Basra Oil Terminal	1800	
Fao–KAOT	Fao	KAOT	Unknown	
K3–Rumaila (Strategic Pipeline)	K3 pumping station	Rumaila	700	

Source: Author analysis, SCOP

Whilst Iraq more than doubled its southern export capacity from 2010 to 2017 (from 1.8 mb/d to 4.2 mb/d) – a feat achieved through the commissioning of three SPMs – pumping station capacity at Fao, Zubair-1, and Tuba requires upgrades. In particular:

- although the Halfaya–Fao pipeline can accommodate increased volumes from Missan province over the next year, pumping stations will be at full capacity to move Basra Heavy volumes (set to reach close to 1 mb/d by year-end) from Fao to underutilized SPMs;
- production increases from West-Qurna-2 will be dependent on a newly proposed Tuba–Fao pipeline (which Lukoil will build[54]), designed to feed volumes from West Qurna-2, Ahdab, and Tuba to Fao;
- until further storage tank farms are built at Fao, oil will continue to be pumped from Zubair-1, Zubair-2, Tuba, and PS-1 – all of which are more than 100 km from offshore loading points – a situation which increases the risk of onshore bottlenecks.

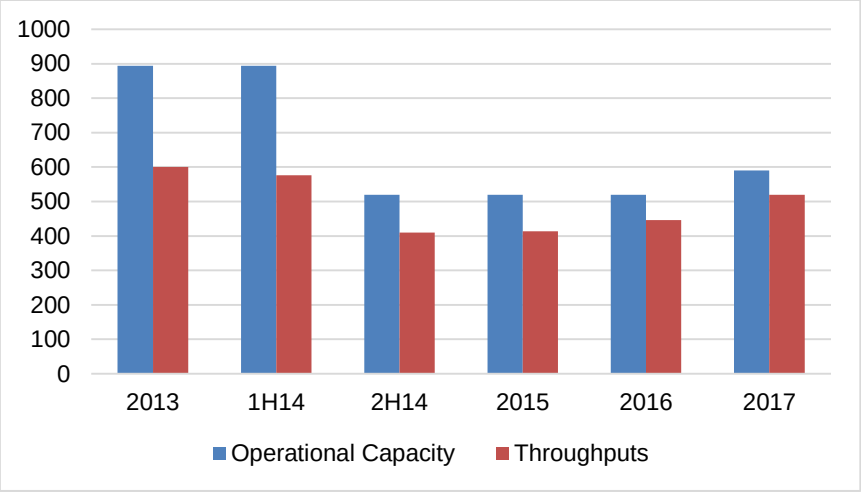
Whilst Iraq has touted the idea of diversifying its export outlets, these attempts rely on state-backed financing and political stability in the region. Despite talk of reconnecting Iraq to the Saudi system, this is unlikely, particularly since Saudi Aramco has already recommissioned the IPSA (Iraqi Pipeline in Saudi Arabia) pipeline for its own use. Similarly, exports through Syria are highly unlikely given the current security situation. Whilst there has been discussion around rebuilding the Kirkuk–Baiji–Ceyhan pipeline (with a number of contractors having presented both technical and commercial offers to the State Company for Oil Projects, or SCOP), no firm timetable has been put in place and the resumption of terror attacks in Kirkuk will likely delay this. Another much-discussed idea is the construction of a 2.25 mb/d pipeline to Jordan for export to Aqaba port. However, this remains delayed and the pipe would have to go through western Iraq, which still has a fragile security situation.

[54] Gati Al-Jebouri, Lukoil's Head of Middle East Upstream told the author that Lukoil agreed to build this pipeline in return for certain Iraqi obligations (largely related to better contract terms) that have not been met yet. Email to Author, 20 October 2018

5. The refining complex

Iraqi refining runs reached their highest levels in early 2014 (before the onslaught of ISIS) with runs of around 600,000 b/d (see Figure 13).

Figure 13: Throughputs at Iraqi refineries ('000 b/d)



Source: Author analysis, MEES

Notwithstanding the small gains in refining capacity since 2014, Iraq's refining complex has barely increased from pre-2003 levels. Despite rising population growth, growth in light-passenger vehicles, growing middle distillate demand growth, and the growing use of gas for power generation (helping displace high-sulphur fuel oil), Iraq's refining complex has significantly underperformed over the past decade.

5.1 Limited expansion in refining capacity

Plans to double downstream capacity in 2010 to 1.5 mb/d have been unmet. In fact, the lion's share of Iraq's refining complex was built pre-2003: the country's first hydro-skimming refinery was Daura (1955), while both the Basra refinery and Baiji complex were built in the 1970s and 1980s. As previously mentioned, attempts to solicit foreign investment have floundered: investors have been wary of a subsidized fuel market as well as the prospect of having little control over FEED plans.

Iraq's refining complex has a number of characteristics: first, all Iraq's refineries are simple hydro-skimming refineries with high fuel oil surpluses; second, they lack upgrading facilities. The failure of Iraq's downstream to play 'catch-up' with its upstream has highlighted a number of stresses in the country's oil sector:

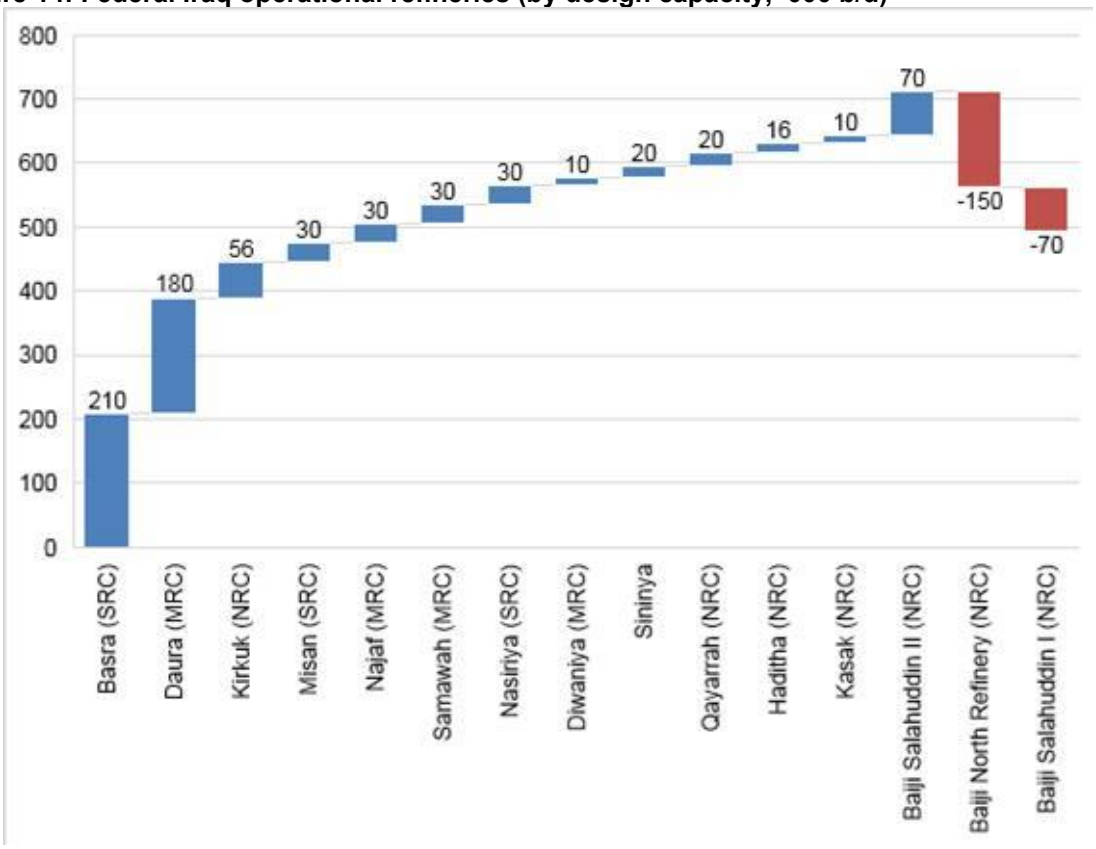
- Higher domestic crude production has led to higher volumes of associated gas production. As sales gas volumes increase (due to gas capture technologies), liquids (particularly HSFO) have been slowly displaced as a source of power, thereby warranting the need for higher refining complexity.
- As incremental production gets heavier, desulphurization units are required.
- As previously discussed, Iraq's midstream challenges pose a problem for crude segregation and storage.

To avoid lowering the quality of Basra Light (via blending), Iraq will need to upgrade refineries to process heavier grades. The inland upgrading of refineries will take place against the backdrop of Iraq's future portfolio of production growth becoming heavier. An example of this problem can be seen at the Daura refinery: this is designed to operate on crudes with API of 33–35° (primarily Kirkuk) but over time, it will

process heavy crude feedstock (for example, East Baghdad with API of 20–24°). Such a change could impact furnace operations and cause corrosion. The economics of Iraq's refining complex are also being undermined by demand-side drivers, particularly growing gasoline demand and the changing feedstock sources for power generation.

Federal Iraq's refining capacity currently stands at approximately 650,000 b/d with refining runs at around 550,000–600,000 b/d (see Figures 14 and 15). In 2018, incremental refining gains were made at the 15,000 b/d Qayarrah refinery (which currently receives approximately 5,000 b/d from the Qayarrah field[55]); Anbar's Haditha refinery came back online toward the end of 2017 and is processing around 10,000 b/d (where feedstock crude is delivered from Kirkuk following the re-opening of the Haditha–Baiji–Siniya road); approximately 3,000 b/d is feeding the 20,000 b/d Siniya refinery; and 10,000 b/d is feeding the Kasak refinery. The Daura refinery is also set to increase runs following the opening of a new 40,000 b/d pipeline from Kirkuk to Daura (via Baiji). The re-start of the war-damaged Salahuddin-2 unit (Baiji refinery) in September 2018 will help increase output from Kirkuk and meet product shortages. Whilst current runs are quite low at around 10,000 b/d, this is set to increase over the next several months. The Salahaddin-1 unit (70,000 b/d capacity) is currently non-operational, with plans for its re-start in 2019 – which will assist increased output from the Avana Dome and Bai Hassan fields. Additional refining capacity gains are also set to come from upgrading the Basra refinery (by 70,000 b/d), the completion of the 140,000 b/d Karbala refinery, and arranging a deal with the KRG to use underutilized refineries.

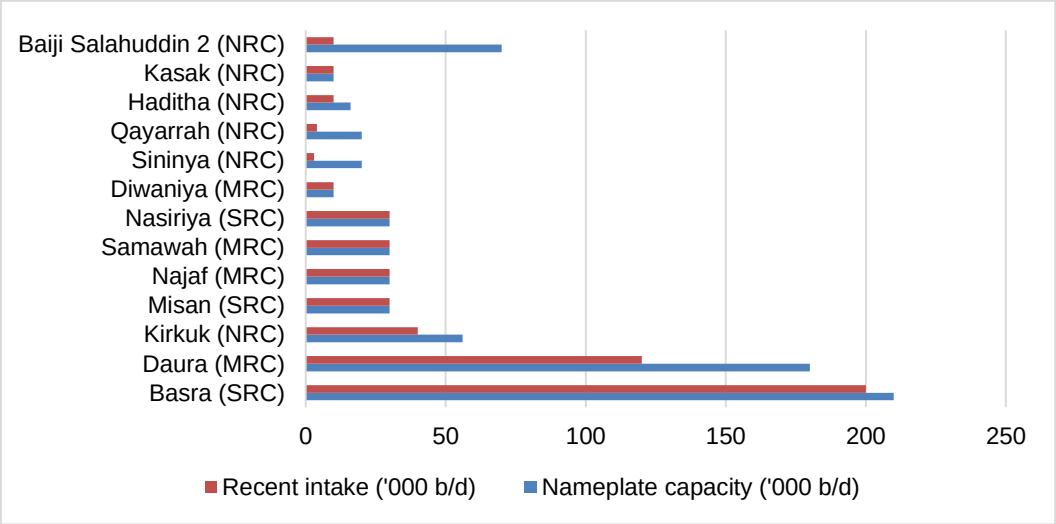
Figure 14: Federal Iraq operational refineries (by design capacity, '000 b/d)



Source: Author analysis

[55] This is very heavy crude with API of 16–18°.

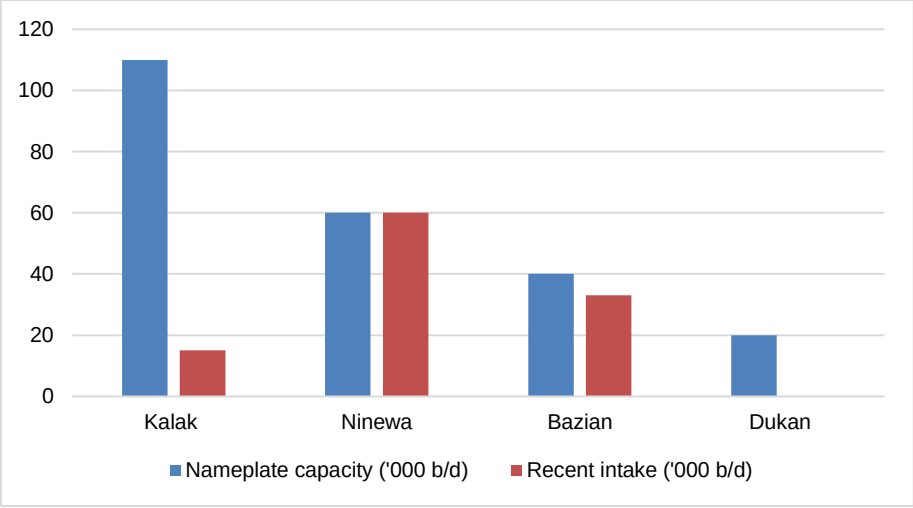
Figure 15: 2018 average intake* of Federal Iraq refineries and nameplate capacity (’000 b/d)



Source: Author analysis, Iraq Oil Report
*Iraq’s refineries operate below nameplate capacity

Whereas Federal Iraq lacks refining capacity; the KRG has idle refining capacity (see Figure 16) – an imbalance that could help kickstart a political deal between Baghdad and Erbil. Such a move would not be unprecedented. In early 2017, Baghdad agreed to send Kirkuk volumes to refineries in KRG (particularly Ninewa refinery and Bazian refinery). However, the tensions between KRG and Baghdad following the federal recapture of Kirkuk fields stemmed flows from Kirkuk. Despite this, since early 2018 some Kirkuk volumes have again begun to flow to these refineries: approximately 20,000 b/d to Bazian refinery (operated by Qaiwan group); around 60,000 b/d to the Ninewa refinery at Erbil (operated by KAR group); and around 40,000 b/d to Kirkuk refinery.[56] Given the shut-in volumes of NOC fields and the spare refining capacity in KRG, volumes can be increased – a way to both reduce fuel shortages in northern Iraq and avoid further reservoir damage from re-injection.

Figure 16: KRG average 2018 intake and nameplate capacity (’000 b/d)

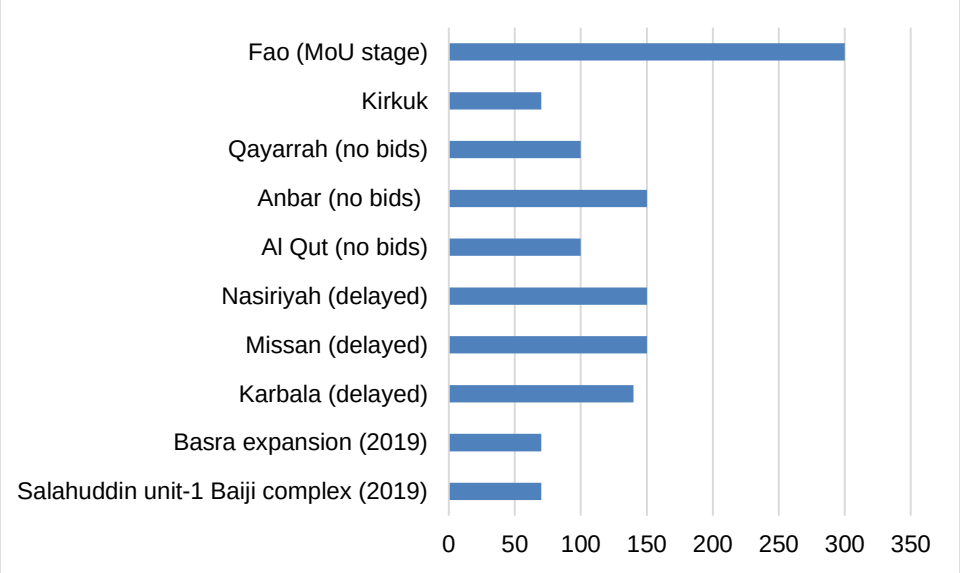


Source: Author analysis, Iraq Oil Report

[56] Iraq Oil Report, ‘Iraq refineries resurgent’, 20 February 2018.

Looking at Iraq's wider refinery expansion plans in detail (see Figure 17), the refining upgrade nearest completion is set to be at Basra. The two projects with the most advanced FEED are Karbala and Missan, although each has its own set of challenges. Whilst Iraq has bullish estimates (1.4–5 mb/d capacity by 2021[57]) for its refining expansion strategy, the lacklustre enthusiasm shown at the Kuwait conference – a donor conference launched by Iraq in early 2018[58] – is likely to temper expectations. A more realistic projection is that Iraq (excluding KRG) will reach refining capacity of approximately 800,000 b/d by 2019 (driven by the expansion at Basra and the re-start of Salahuddin-unit 2 at Baiji); assuming a run rate of 80 per cent (given water and power challenges), this leaves throughputs at around 650,000 b/d.

Figure 17: Reality of Iraq's refinery plans – capacity ('000 b/d)



Source: Author analysis

The planned Karbala refinery (capacity of 140,000 b/d) started construction in February 2014 (and was targeting completion in 2016). Progress stalled at the refinery earlier this year due to non-payment issues (to a Korean consortium headed by Hyundai) and it is unlikely that the refinery will be operational until at least 2021. In 2013, Iraq's government signed an MoU with a Swiss company, Satarem, to build the 150,000 b/d Missan refinery (backed by Chinese financing). In early 2018, Iraq's MoO signalled its dissatisfaction with the Swiss-based company for failure to perform.[59] The project's status remains unclear. Similar uncertainty exists at Nasiriyah refinery (where the original FEED was for a 300,000 b/d refinery, now changed to 150,000 b/d). At the Kuwait Conference, the following refineries received no bids: Qayarrah, Anbar, and Al-Qut.[60] Whilst Iraq's MoO did sign a contract for Fao refinery with two Chinese companies – PowerChina and Norinco International – this remains at the MoU stage. With both Karbala and Missan looking to be delayed, Iraq's refining capacity is not expected to exceed 1 mb/d until 2021, leaving Iraq in gasoline, diesel, and kerosene product deficit and fuel oil surplus. This situation adds both further stress to Iraq's budget and potentially undermines future crude quality, as heavy fuel oil surpluses stress Iraq's infrastructure network.

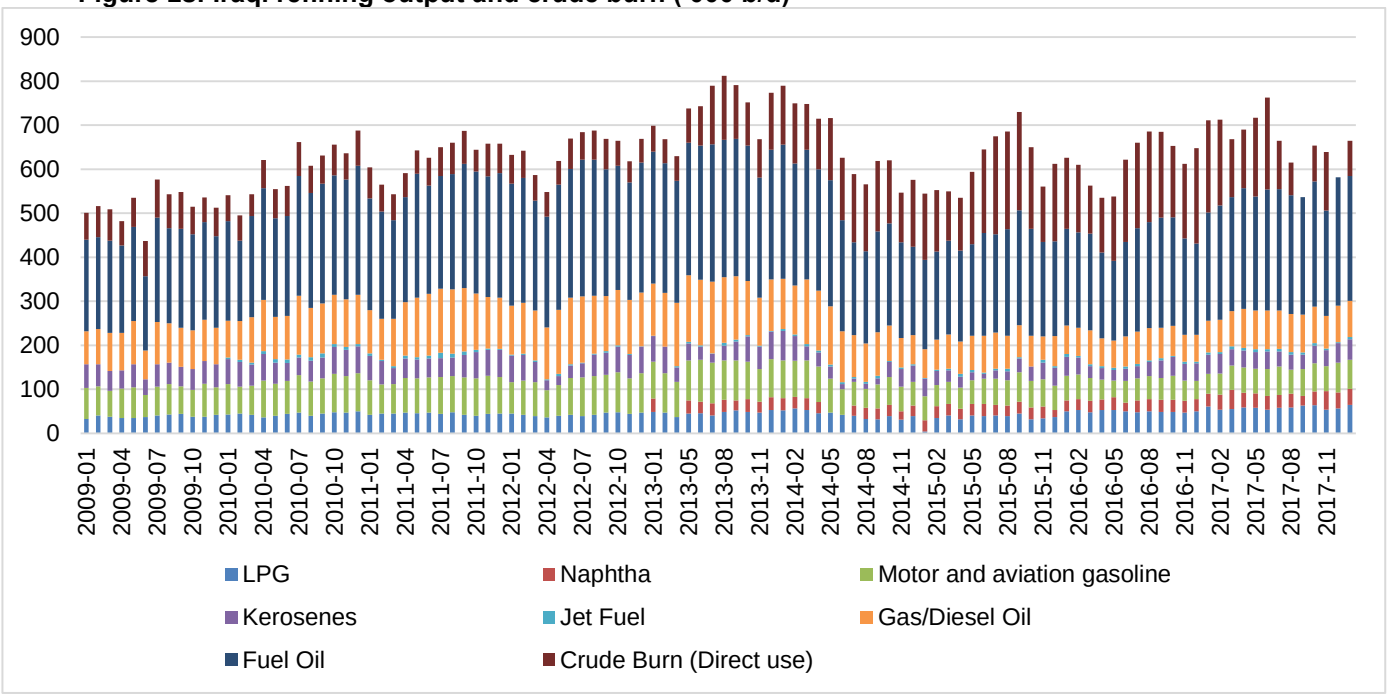
[57] Bloomberg, 'Iraq seeks to Triple Refining Capacity with slew of projects', June 2017.
[58] Tabaqchali told the author that a key reason for the failure of Iraq to solicit downstream investment at the conference was the Iraqi delegation's focus on a 'shopping list' of projects that would require $88 bn in investments with no adequate focus on investor returns and Internal Rates of Return (IRRs).
[59] Youroilandgasnews, 'Baghdad refining plans inch forward', 15 February 2018.
[60] Iraq's MoO has earmarked $4 bn for downstream rehabilitation.

5.2 Domestic Iraqi oil demand

Iraq's delays in the upgrading and expanding of its refining complexity will be further complicated by domestic demand dynamics, as well as by the future role of fuel oil pricing and developments in the gas and power sector.

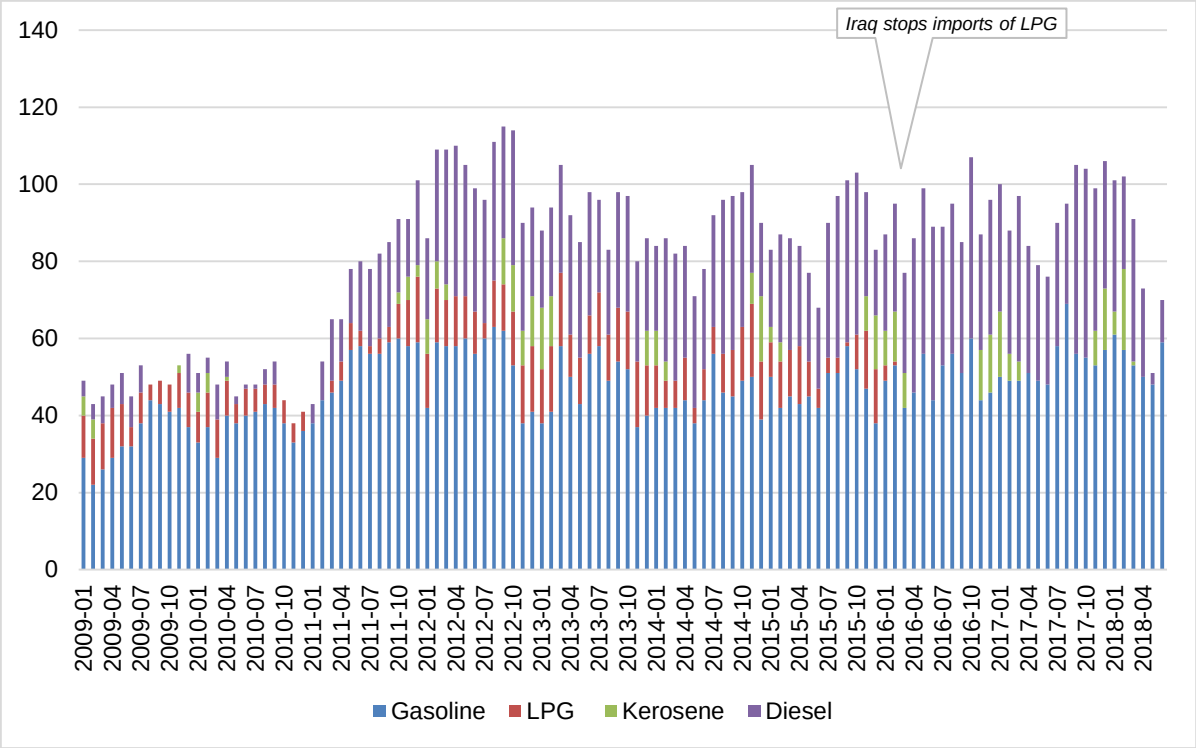
Looking at domestic demand drivers, from 2009 to 2013 Iraq's oil demand was rising up to 550,000–600,000 b/d, with the largest gains posted in 2012–3, driven by rising gasoline and diesel demand. As previously shown, whilst Iraq's refining capacity of around 650,000 b/d can meet domestic demand, the mismatch between product demand and output (see Figure 18) has led to a fuel oil surplus and shortages of diesel and gasoline; this means that Iraq imports products worth approximately $2.5 bn per year. These imports are light products, with an average of 55,000 b/d of gasoline imported in 2017, 35,000 b/d of diesel, and 5,000 b/d of jet fuel and kerosene (see Figure 19).

Figure 18: Iraqi refining output and crude burn ('000 b/d)



Source: Author analysis, JODI

Figure 19: Iraq product imports (’000 b/d)



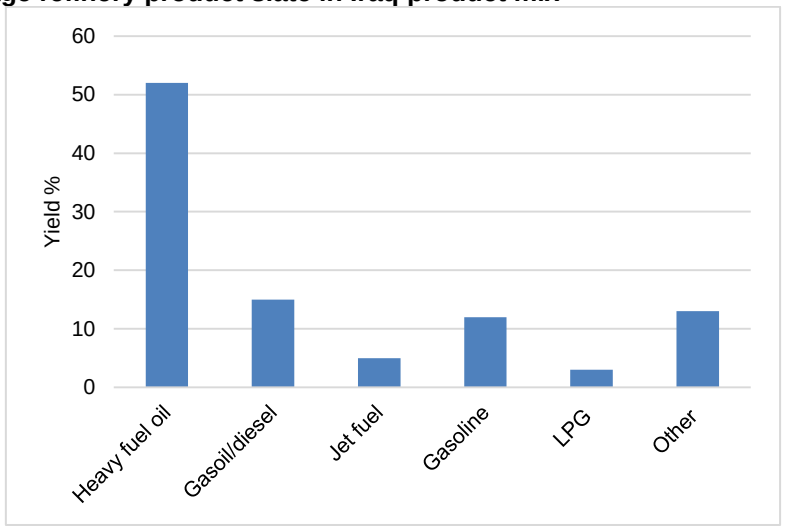
Source: Author analysis, JODI

Iraq’s distillate demand growth has been driven by increased vehicle ownership, particularly in major urban hubs, and by the growth of the secondary car market. Despite a dip in demand from 2014 onward (due to the increased security risks from ISIS), gasoline demand picked up again in 2017, reaching a three-year high of 114,000 b/d. Other changes to Iraq’s demand mix include LPG: imports from Iran have dropped due to increased supplies from the Basra Gas Company (which allowed Iraq to export LPG from 2017 onward, mainly to Pakistan).

5.3 Iraq’s fuel oil problem

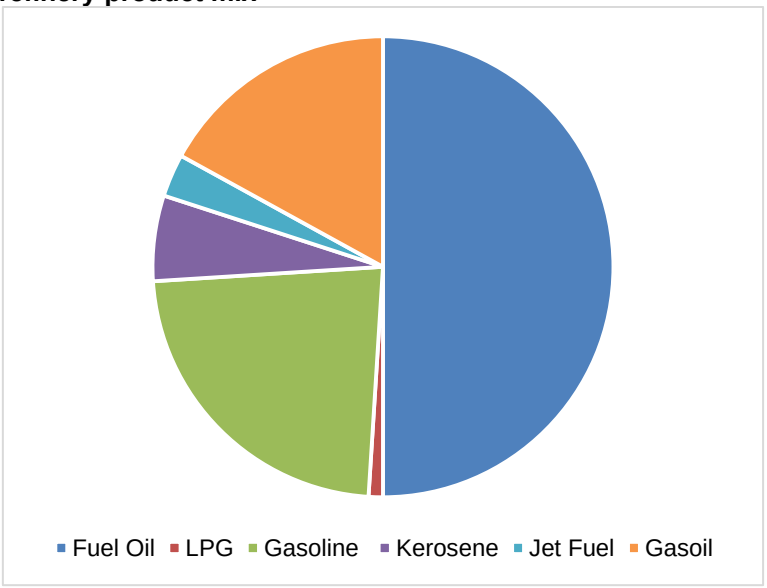
The lack of investment in cracking capacity at Iraq’s refineries has meant that processing Iraqi crudes has led to high fuel oil yields on distillation (with 50 per cent of every barrel processed coming out as fuel oil, see Figures 20 and 21).

Figure 20: Average refinery product slate in Iraq product mix



Source: Author analysis, Midland Refineries Company

Figure 21: Daura refinery product mix



Source: Author analysis, Midland Refineries Company

Since 2009, Iraq has produced on average 265,000 b/d of fuel oil (see Figure 22). Despite this, demand (see Figure 23) has oscillated between 140,000 b/d to 190,000 b/d (leaving Iraq net long in fuel oil).

Figure 22: Iraqi fuel oil production (’000 b/d)

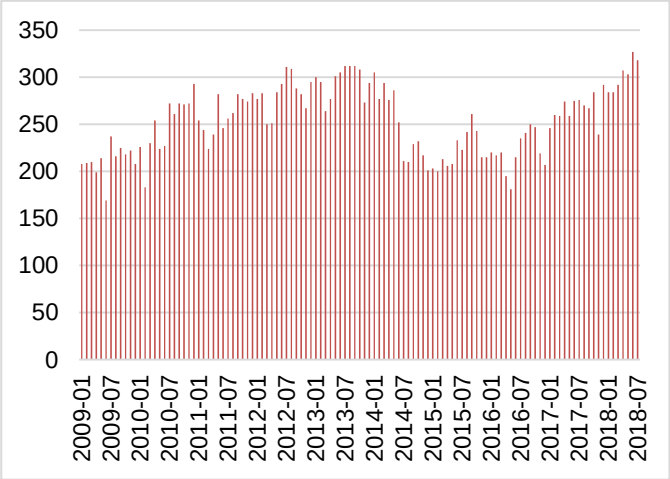
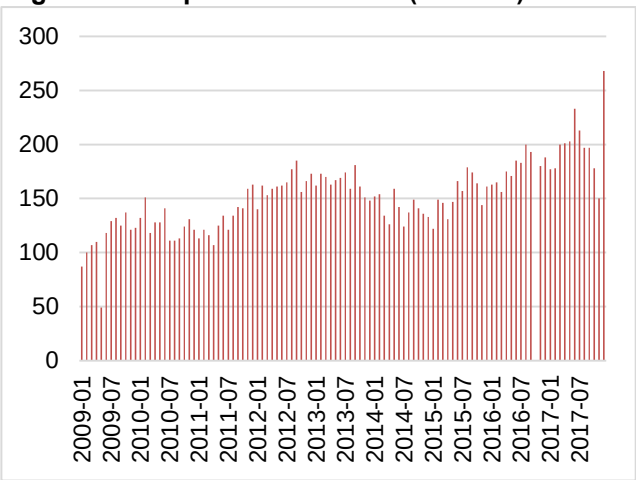


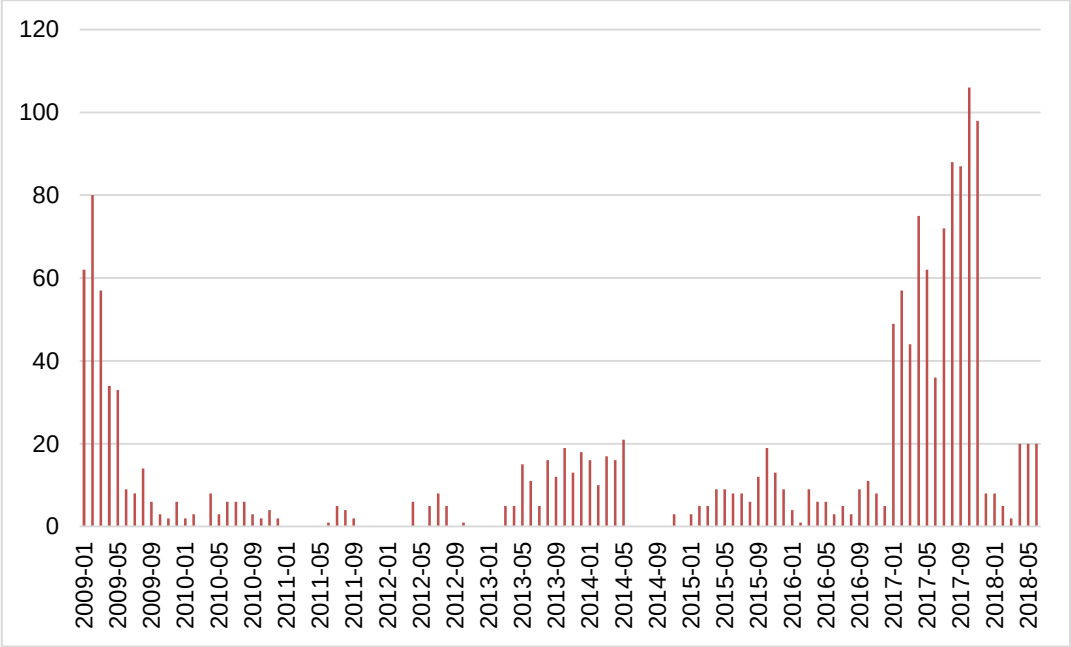
Figure 23: Iraqi fuel oil demand (’000 b/d)



Source: Author analysis, JODI

Whilst Iraq did export some of its surplus from 2009, particularly in 2017 (see Figure 24), it is clear that as Iraqi crude production increased from 2009 onward (increasing refining runs and throughput), the surplus found three major outlets: reinjection, blending with lighter crudes, and smuggling.

Figure 24: Iraq fuel oil exports (’000 b/d)

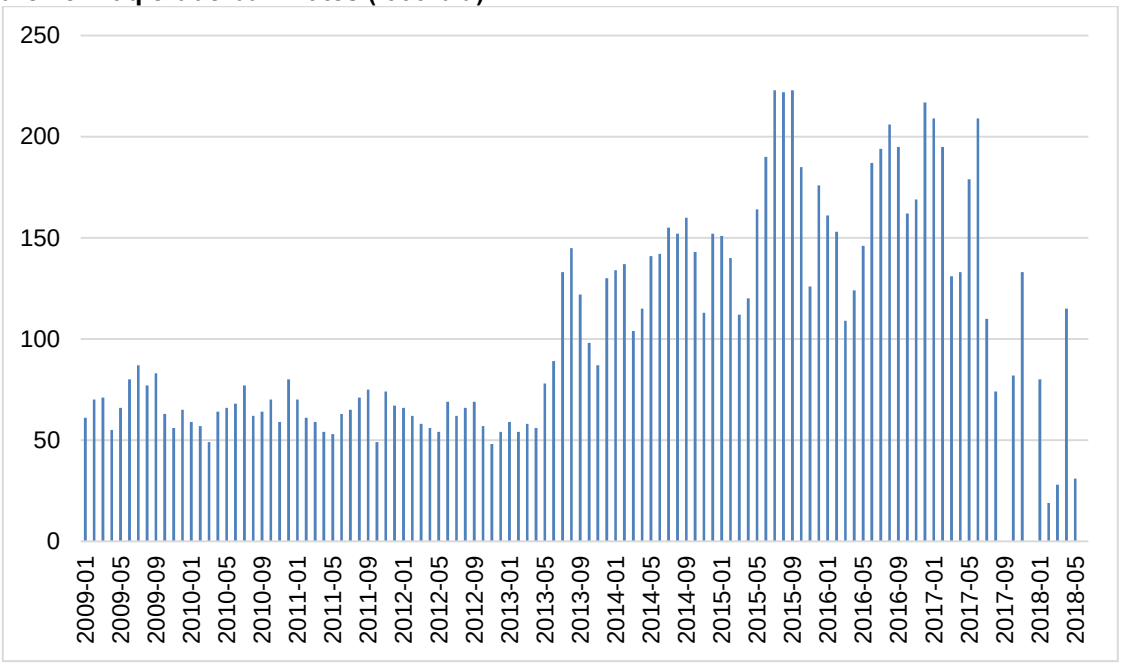


Source: Author analysis, JODI

The re-injection of fuel oil into Iraqi oilfields has been a feature of the industry since the 1980s, destabilizing the API of Kirkuk, Rumaila, and other southern fields. Smuggling routes for fuel oil have existed since the early 1990s, particularly from Baiji to Iran and Turkey. The use of blending has been ongoing since at least 2009. In the south, limited fuel oil tank storage at refineries and the lack of dedicated fuel oil pipelines (running in parallel with crude pipelines) has led to excess fuel oil being pushed into the crude export system.

Moving forward, Iraq's fuel oil problem could be resolved in two ways: increased exports or by the use of fuel oil in power generation. Let us examine each option in turn. First, the economics of fuel oil exports will be impacted by IMO 2020, which will both create significant discounts for HSFO prices and widen HSFO–LSFO differentials. Whilst trading opportunities will exist beyond 2020 for HSFO, it is likely that a more economic option for Iraq would be to increase fuel oil use for power generation to reduce crude burn rates; if crude burn were to be eliminated altogether, Iraq could gain approximately $2 bn/year. In fact, Iraq's crude burn rates in 2017 and 2018 (see Figure 25) suggest that this is already being done slowly (an unusual drop to zero was registered in September and December 2017).

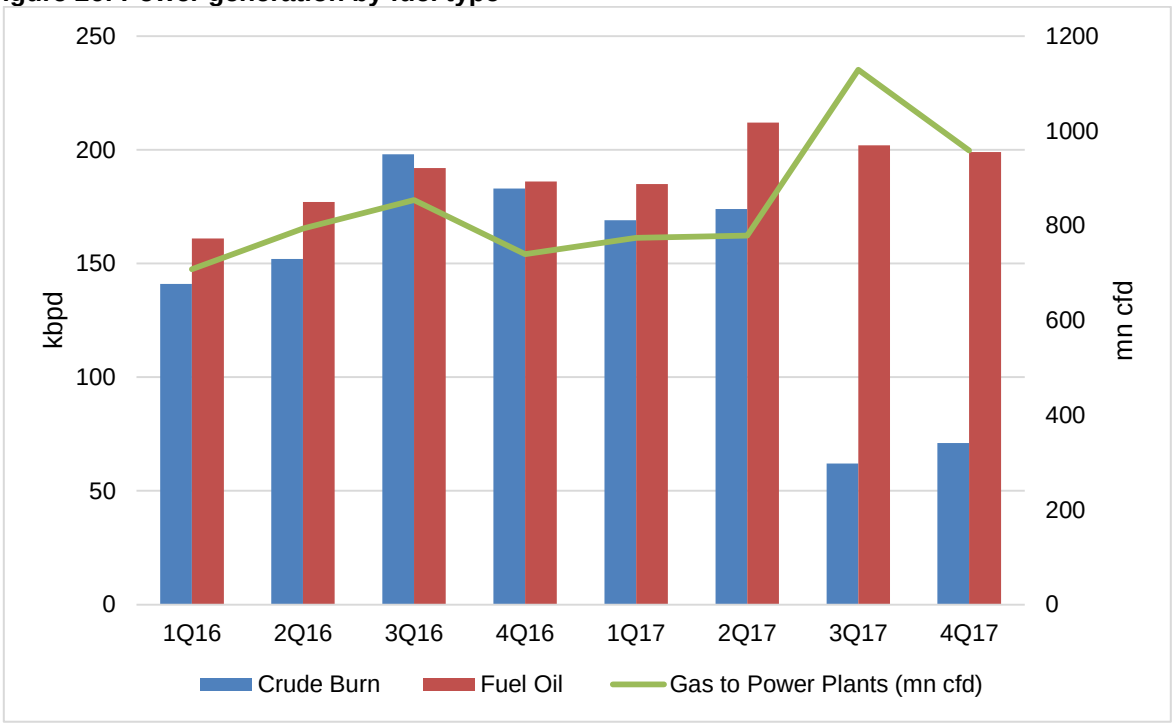
Figure 25: Iraq crude burn rates ('000 b/d)



Source: Author analysis, JODI

The misalignment of Iraq's product yields with its domestic demand, spurred by both delays to refinery upgrades and the heavier portfolio of crude production, will increase the gap between fuel oil supply and demand. Whilst the domestic power segment could take up more volumes of fuel oil over time, two factors will impede this: first, Iraq's power sector is being geared to gas-fired power generation (see Figure 26); second, poor fuel oil infrastructure between refining hubs and power demand centres will make this difficult to achieve.

Figure 26: Power generation by fuel type



Source: Author analysis, MEES

Concluding thoughts

This paper has aimed to provide a comprehensive overview of the dynamics in Iraq's upstream, midstream, and downstream, together with the impact on short- to medium-term production prospects. We find that:

- In the short term, Iraq (excluding KRG) has strong potential to reach just above 5 mb/d production capacity by early 2019. Incremental gains this year will be driven by production from Halfaya, particularly given the spare capacity in the Halfaya–Fao pipeline, while further gains are set to come from state-operated fields and Kirkuk output. Additional volumes here can be unlocked due to the re-start of refining operations at Baiji, extra volumes being fed to Daura refinery. Flows could also be increased to the underutilized KRG refineries, and a new deal negotiated with the KRG to market Kirkuk crude via the KRG's pipeline – a more realistic possibility now given the strong ties between Iraq's new prime minister (Adel Abdul-Mahdi) and the KRG's ruling parties. Despite stretched export capacity, due to the repairs required at the Fao and Zb-1 pumping stations, current onshore storage and pumping capacity can handle an increase of around 150,000–200,000 b/d of heavy exports via underutilized SPMs.
- However, in the longer term, Iraq's production target of 6.5 mb/d will prove more challenging due to delays on water injection (particularly given natural decline rates). Whilst Basra Oil Company is in the process of selecting contractors for a reconfigured version of the CSSP (with a first phase targeting 5 mb/d of seawater injection), this is unlikely to take place until at least 2023. The rise in oil prices throughout 2018 has supported Iraq's fiscal outlook, with a cumulative budget surplus of approximately $24 bn expected this year (assuming an average Iraqi oil price of $65/bbl). Whilst this positive surplus can support infrastructure projects such as water injection, onshore storage, and pumping capacity requirements (particularly at Fao), both weak institutional capacity and the need for co-ordinated planning present downside risks. The need for both midstream and downstream investment is also taking place against the backdrop of an ongoing political transition. The selection of Abdul-Mahdi (a political independent with reformist ambitions) as prime minister represents a break from Iraq's *muhassasa* system – particularly given Al-Sadr's decision not to nominate figures from his party to any ministerial portfolio. It has yet to be seen if Abdul-Mahdi will have the independence to push through a reform of Iraq's fiscal policy – particularly in relation to its high public sector spending, subsidies, and the diversion of funds toward salaries.
- Looking at Iraq's refining outlook, it is expected that the country is unlikely to reach its planned 1.4–5 mb/d refining capacity by 2021. Both the lack of enthusiasm shown by foreign investors for Iraq's refining projects (due to poor internal rates of return) and delays to refining projects (Karbala and Missan) imply that a more realistic projection would see Iraq reaching a refining capacity of approximately 800,000 b/d by 2019 (driven by the addition of a fourth crude oil distillation unit at Basra refinery and the re-start of Salahuddin-unit 2 at Baiji).
- As product demand increases over the short–medium term, driven by the reconstruction and liberation of areas previously controlled by ISIS, Baghdad's new political leadership will be left with a higher import bill (driven by higher middle-distillate demand). It is expected that delays in upgrading Iraq's refineries (along with heavier crude production) will leave Iraq with a high-sulphur fuel oil problem; it will be increasingly difficult to find a home for these surpluses in power generation (due both to increased use of gas-to-power generation and to the lack of adequate infrastructure capable of moving fuel oil from refining hubs to demand centres). Similarly, the downward trend in high-sulphur fuel oil prices (due to changes in marine fuel demand) will further reduce incentives for export. There will probably be a timing mismatch between delays to Iraq's refining upgrades and the gradual

displacement of fuel oil from the power sector (as gas flaring reduces over time). The limited infrastructure build for midstream fuel pipelines could lead to a replay of Iraq's fuel oil problem of 2012–14: further re-injection into fields and blending with lighter grades, a situation that could destabilize crude quality.

Appendix: Iraq bid rounds

Table A1: Round One results

Project	Production in 2009 ('000 b/d)	Plateau Production Target ('000 b/d)	Remuneration fee bid (US$/bl)	Remuneration fee agreed (US$/barrel)	Signature bonus (US$ mn)	Contractor
Akkas (gas)					200	No award
Bai Hassan	175		26.7		300	No award
Kirkuk	360		7.89		400	No award
Mansuriyah (gas)						No award
Missan Group	87	450	21.4	2.30	300	CNOOC (63.75%), TPAO (11.25%), Iraq Drilling Company (25%), BP (38%), CNPC (37%), SOMO (25%)
Rumaila	1,100	2,850	3.99–4.80	2.00	500	BP (38%), CNPC (37%), SOMO (25%)
West Qurna-1	250	2,325	2.60–19.30	1.90	100	ExxonMobil (60%), Shell (15%), North Oil (25%)
Zubair	190	1,200	4.09–9.90	2.00	100	Eni (32.81%), Occidental (23.44%), KOGAS (18.75%), Missan Oil (25%)

Source: Wood Mackenzie[61]

[61] Wood Mackenzie, Iraq Upstream Summary Report, December 2015

Table A2: Round Two results

Project	First Commercial Production ('000 b/d)	Plateau Production Target ('000 b/d)	Renumeration fee bid (US$/bl)	Signature bonus (US$ mn)	Contractor
Badra	15	170	5.5	100	Gazprom (30%), KOGAS (22.5%), Petronas (15%), TPAO (7.5%), Midlands Oil (25%)
Diyala					No award
East Baghdad					No award
Euphrates					No award
Gharraf	35	230	1.49	100	Petronas (45%), JAPEX (30%), North Oil (25%)
Halfaya	70	535	1.4	150	PetroChina (37.5%), Petronas (18.75%), Total (18.75%), South Oil (25%)
Majnoon	175	1,800	1.39	150	Shell (45%), Petronas (30%), Missan Oil (25%)
Najmah	20	110	6.0	100	Sonangol (75%), Nineveh Oil (25%)
Qayarrah	30	120	5.0	100	Sonangol (75%), Nineveh Oil (25%)
West Qurna-2	120	1,800	1.15	100	Lukoil (56.25%), Statoil (18.25%), Oil Exploration Company (25%)

Source: Wood Mackenzie[62]

[62] Wood Mackenzie, Iraq Upstream Summary Report, December 2015

Table A3: Round Three results – gas (2010)

Project	Plateau Production Target (mmcfd)	Plateau Production Target (mmcfd)	Renumeration fee bid (US$/boe)	Contractor
Akkas	400	100	5.50	KOGAS (37.5%), KMG (37.5%), Midland Oil (25%)
Mansuriyah	300	75	7.00	TPAO (37.5%), Kuwait Energy (22.5%), KOGAS (15%), Midland Oil (25%)
Siba	100	25	7.50	Kuwait Energy (45%), TPAO (30%), Missan Oil (25%)

Source: Wood Mackenzie[63]

Table A4: Round Four results (2012)

Block	Acreage	Remuneration fee (US$/boe)	Signature bonus (US$ mn)	Contractor
1	7,300		15	No award
2	8,000		25	No award
3	7,000		20	No award
4	7,000		20	No award
5	7,000		20	No award
6	9,000		20	No award
7	6,000		20	No award
8	6,000	5.38	15	Pakistan Petroleum (100%)
9	900	6.24	25	Kuwait Energy (40%), TPAO (30%), Dragon Oil (30%)
10	5,500	5.99	25	Lukoil (60%), Inpex Corp (40%)
11	8,000		15	No award
12	8,000	5.00	15	Bashneft (70%), Premier Oil (30%)

Source: Wood Mackenzie[64]

Table A5: Round Five Results (2018)

Awarded	No Bid
Naft Khana (GeoJade)	Shihabi
Huwaiza (GeoJade)	Zurbatiya
Sindbad (UEG)	Jebel Sanam
Khider Al-Mai (Crescent Group)	Fao
Gilabat-Qumar (Crescent Group)	Arabian Gulf
Injana Khashm Al Ahmar (Crescent Group)	

Source: Iraq MoO

[63] Wood Mackenzie, Iraq Upstream Summary Report, December 2015
[64] Ibid