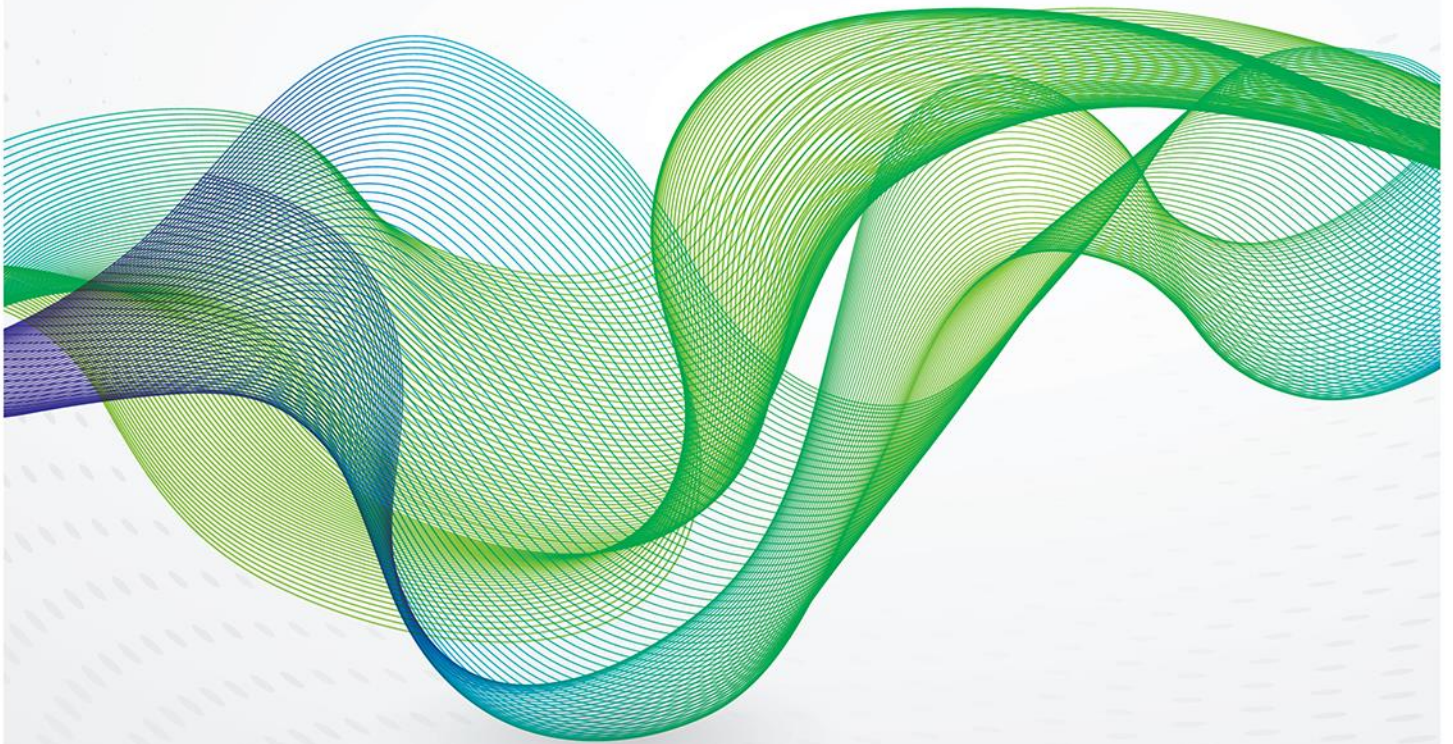


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Saudi Arabia's Oil Productive Capacity: The Trade-Offs





1. Introduction

In a series of recent speeches and interviews, a consistent message coming from Saudi Aramco is that the focus of the company will be on the development of its natural gas and downstream business and that 'future profit growth will be more from diversification into integrated oil refining and petrochemicals, besides natural gas production and supply for both the domestic and international markets'.¹ Indeed, Saudi Aramco has very ambitious plans to boost its domestic gas production to 230 bcm and become a gas exporter by 2030 and has been exploring investment opportunities in overseas gas projects including the US and Russia.² Recently, Saudi Aramco and Saudi utilities developer Acwa Power signed a memorandum of understanding (MoU) with the government of Bangladesh to develop a \$3bn LNG terminal and power plant. Saudi Aramco has also been making huge investments in downstream assets (refining and petrochemicals) both domestically and overseas, though returns from such overseas investments seem to constitute only a small proportion of the company's profits to date.³ But what about opportunities in the upstream oil sector and the potential expansion of oil productive capacity? How does upstream oil fit within the future portfolio of Aramco and the Kingdom's role as the 'central bank of oil' as some describe it?⁴ These are key questions, which don't only have implications for Saudi Aramco's capex budget and how the budget is allocated across the various business segments and the company's future sources of profitability growth, but also on oil market dynamics and the future of the Kingdom's revenue paths.

2. Expanding Oil Productive Capacity: The Trade-offs

Given the large size of its oil reserve base, the relatively low cost of developing these reserves, its stable investment environment, and a competent national oil company that has a strong record in executing mega projects, there are no technical, financial, or geopolitical barriers that would prevent the Kingdom from increasing its productive capacity above the stated current level of 12.5 mb/d. The investment cycle however is longer than for US shale and any plans to expand capacity beyond the current levels would take time to implement and require heavy investment, not only in the upstream sector but also in calibrating the entire system including increasing the capacity of gas processing plants, building storage facilities, pipelines, and terminals. For instance, in 2004, when Saudi Arabia decided to gradually increase its sustainable productive capacity from 11 mb/d to 12.5 mb/d, the expansion was completed by approximately 2010. This involved the development of mega projects including the Haradah Increment III (0.3 mb/d), the Abu Hadriya, Fadhili, and Khursaniya (AFK) Project (0.5 mb/d), Khurais (1.2 mb/d), the Shaybah Increment (0.3 mb/d) and Nuayyim (0.1 mb/d). During this period, the gross additions amounted to around 2.35 mb/d with 0.8 mb/d of this earmarked to make up for decline rates in mature fields. Of the new capacity additions, 1.1 mb/d was Arab Light quality while the rest consisted of Arab Extra and Arab Super Light crudes.⁵

Thus, the decision to expand productive capacity is one of policy first and foremost. A key decision facing Saudi policymakers is how fast to develop the reserve base, the optimal size of its sustainable oil productive capacity, and how much spare capacity should be maintained. This decision is linked to key trade-offs. On the one hand, spare capacity should not be so small that Saudi Arabia loses control of the market on the upside, and risk that higher and more volatile prices would cause demand destruction in times of disruptions. The ability to ramp up production could also serve at times as a key mechanism to enforce discipline within OPEC. Also spare capacity allows the Kingdom to offer additional supplies during disruptions when prices are usually high, boosting its revenues and its geopolitical standing. It is estimated that by utilizing its spare capacity, Saudi Aramco generated \$35.5 billion of additional revenues from 2013 to 2018. On the other hand, productive capacity should not be

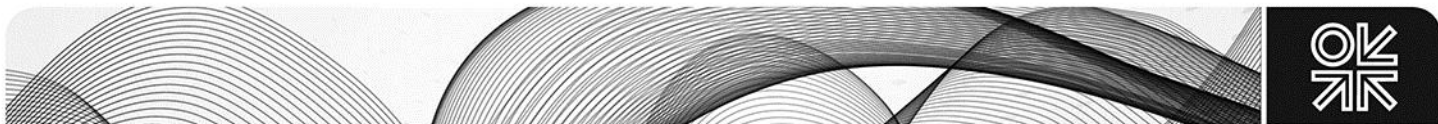
¹ Eric Ng (2019), 'Saudi Aramco, planning to launch world's largest IPO, says its growth lies in natural gas, refining and chemicals', South China Morning Post, 11 October 2019.

² 'Aramco showcases competitive edge, gas focus', Petroleum Argus, Volume XLIX, 40, 11 October 2019

³ 'Aramco makes relatively little from foreign refining – documents', Reuters, October 18, 2019

⁴ Saudi Gazette, 'Saudis emerge as oil's new central bankers', October 19, 2019

⁵ For more details see, Nawaf Obaid and Nathaniel Kern 'Saudi Arabia's Upstream and Downstream Expansion Plans for the Next Decade: A Saudi Perspective', CSIS Foreign Reports.



so large that Saudi Arabia ends up with idle capacity that is costly to maintain and could adversely affect the Kingdom's long-term revenues by putting downward pressure on prices. Also as Saudi Arabia increases its productive capacity, its willingness and ability to cut production becomes more challenging, as no producer wants to be operating well below its maximum sustainable capacity.

Managing this trade-off in the current context of increased uncertainty about oil demand prospects is extremely challenging. Factors such as the speed of the energy transition, the potential growth in US tight oil production and other sources of supply, and the dynamics within OPEC are generating a high degree of uncertainty regarding the medium and long-term demand for Saudi crude. The decision is also shaped by internal factors, particularly the expected growth in domestic energy demand, which in turn is closely tied to a wide range of policies including energy pricing reform, energy efficiency measures and changing the energy mix to increase the share of gas and renewables in the power mix. Such policies in turn will determine the volumes of crude available for exports and thus the Kingdom's foreign currency receipts.

In this environment when demand prospects are highly uncertain, Saudi Arabia has no plans to increase its productive capacity above 12.5 mb/d. The National Transformation programme sets a target of upstream capacity of 12.5 mb/d through 2020. Also, in a number of interviews the former Saudi energy minister Khalid Al-Falih stated that the crude programme is designed to maintain capacity at 12.5 mb/d and although he did not rule out building incremental capacity, this would depend on the expected call on Saudi crude.

This however does not imply that the Kingdom is not investing in new projects and developing new fields. In addition to demand considerations, the investment decision is guided by the availability of oil development opportunities and by oil field and reservoir factors. In 2017, Saudi Aramco announced plans to raise its spending to \$414 bn over the next 10 years, including \$134 bn on drilling and well services and \$78 bn to maintain oil output potential.⁶ Saudi Aramco regularly brings on fields to relieve pressure and output from mature fields, and maintains production plateaus for longer, thereby optimizing the utilization of the reserve base over the longer-term and achieving higher ultimate oil recovery rates.

Also, by bringing on new projects, Saudi Arabia can rebalance the quality of its crude production mix so it matches domestic refineries' needs and the changing conditions in international markets. In 2019, Saudi Aramco awarded \$18 billion worth of contracts aimed at increasing production capacity by 0.55 mb/d at its Berri and Marjan fields. The Berri field, which is expected to start producing in early 2023, will add 0.25 mb/d of Arabian Light capacity. There is no specific date as to when Marjan will start production, but once on stream, it will increase Arab medium capacity by 0.3 mb/d. In 2018, Saudi Aramco awarded the contract for the development of the Zuluf increment of 0.6 mb/d of Arab Heavy crude. These plans come on the back of the completion of some recent mega projects such as Sheybah and Manifa. Following a major oil field expansion project, Sheybah boosted Arabian Extra Light production by 0.25 mb/d in 2016 to reach 1 mb/d. Arab Heavy production from Manifa started in 2013 and reached the target of 0.9 mb/d in 2017.

Another factor that has affected the crude quality mix has been the shut down of production from the shared fields in the Neutral Zone in 2014 and 2015 after disagreements between Saudi Arabia and Kuwait. Before the Neutral Zone production was shut down, production had fallen to below 0.5 mb/d across the offshore Khafji and onshore Wafra fields despite the fields' overall capacity of 0.6 mb/d. The two main oil fields produce Arab heavy sour crude. The impact of the shutdown of these two fields on oil markets has been magnified given that the sanctions on Venezuela and Iran have tightened the supply of sour-medium/heavy crude. But according to recent media reports, Saudi Arabia and Kuwait are currently working to restart production from the Neutral Zone in January 2020.⁷

⁶ 'Saudi Aramco raises spending to \$414bn over next decade', Gulf Business, 12 December 2017, <https://gulfbusiness.com/saudi-aramco-raises-spending-414bn-next-decade/>

⁷ 'Kuwait says talks with Saudi to restart Neutral Zone oil output ongoing', Reuters, October 19, 2019.

3. To Increase or not to Increase

Much of the recent discourse has focused on the upside potential of Saudi Arabia's productive capacity and every time Saudi Aramco announces plans to expand an existing field or develop a new field, there is much speculation whether this would represent a net capacity addition. Also, at times when expectations about global oil demand peaking soon are rife, many have argued that this would induce a shift in the output strategies of large resource owners. Specifically, large reserve holders will focus on monetizing their reserves as quickly as possible so as not to be left with any stranded assets. And who is better placed than Saudi Arabia to pursue such a strategy given the size of its reserves, its stable investment environment, Saudi Aramco's technical capability, and its strong financial position?

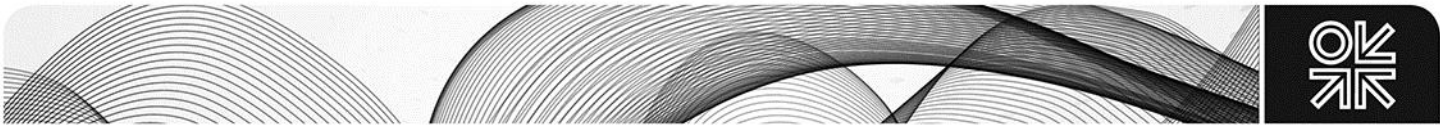
Those who recommend a fast monetization strategy however fail to appreciate the constraints that Saudi Arabia faces in pursuing such a strategy given the heavy reliance of the government's income on oil revenues.⁸ Aggressive monetization strategy, alongside slower demand growth, would result in a sharp decline in oil prices and oil revenues and thus act as a constraint on high investment-high output policy. It would also induce a reaction from some OPEC producers who will also have the incentive to monetize reserves quickly by improving the fiscal terms and the investment environment. Under this strategy, there is no room for cooperation among low cost producers, competitive forces will prevail and margins will fall. Thus, for Saudi Arabia to pursue a strategy of fast monetization, it needs to diversify its sources of income away from oil exports, for instance by heavily taxing its businesses and individuals, without jeopardizing political and social stability.⁹ This requires deep economic and political structural transformations, which will take a long time to implement with no guarantee of success. Were Saudi Arabia's economy highly diversified and its income less reliant on oil revenues, adopting a fast monetization strategy would become more feasible and given its status as one of the world's lowest cost producers, it could continue to put more oil in the market though the rents generated from the oil sector would be lower.

Rather than pursuing an aggressive monetization strategy, the question perhaps should be posed differently. In the current context of wide uncertainties about global oil demand and the speed of the energy transition and the limited diversification of government's income, is there a case for Saudi Arabia to reduce its capacity to lower levels and/or let its spare capacity erode?

To formally explore this point, consider a medium-term scenario where global oil demand growth plateaus in 2021 and shifts to a permanent decline towards 2024 (*to be clear, the authors don't think demand will peak in 2021; this date is hypothetical and used only for the purposes of this exercise*). Saudi Arabia could then be faced with the following three options, (amongst others): It can pursue a fast monetization strategy in which it ramps-up its production to 12.0 mb/d in 2020 and sustains that level of production towards 2024 (referred to as *monetize capacity scenario*). An alternative would be for Saudi Arabia to limit its production to 10.0 mb/d throughout and let its spare capacity cushion of more than 2.0 mb/d erode, for example, by not offsetting decline rates (referred to as *reduce capacity scenario*). Lastly, Saudi Arabia could maintain its current balancing role and keep managing its capacity and output conditional to the prevailing supply and demand conditions, in which case as oil demand deteriorates after 2021 Saudi Arabia progressively cuts its output from 10.7 mb/d to 9.5 mb/d by 2024, while maintaining its productive capacity at 12.0 mb/d (referred to as *manage capacity scenario*).

⁸ Dale S., Fattouh B. (2018), 'Peak Oil Demand and Long-run Oil Prices', Oxford Energy Insight 25, Oxford: Oxford Institute for Energy Studies. <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/01/Peak-Oil-Demand-and-Long-Run-Oil-Prices-Insight-25.pdf?v=79cba1185463>

⁹ Fattouh, B. and Shahabi, M. (2019), The Gulf Economies' Long Road towards better Diversification, World Energy WE, https://www.aboutenergy.com/en_IT/topics/spacial1-middle-east.shtml;



As Figures 1 and 2 show, the aggressive monetization strategy is expected to result in a higher market share for Saudi Arabia to around 14 per cent on average through 2019 to 2024, albeit at a detrimental cost for its oil revenues as oil prices are expected to slide to \$25/b by 2024. In particular, Saudi Arabia's gross oil revenues are expected to fall below \$100 billion after 2022 and stand \$138 billion lower in 2024 compared to 2019 (\$230 billion). It is important to stress that this simple scenario ignores important market feedbacks. For instance, the lower oil price under rapid monetisation is likely to improve the long-term survivability of the oil sector even in the presence of carbon taxation, as demand will be higher. Also in a low price environment, there will be limits on how fast high cost producers will be able to expand their capacity and the higher share will compensate for some of the revenue losses.

Figure 1: KSA market share, 2014–2024E

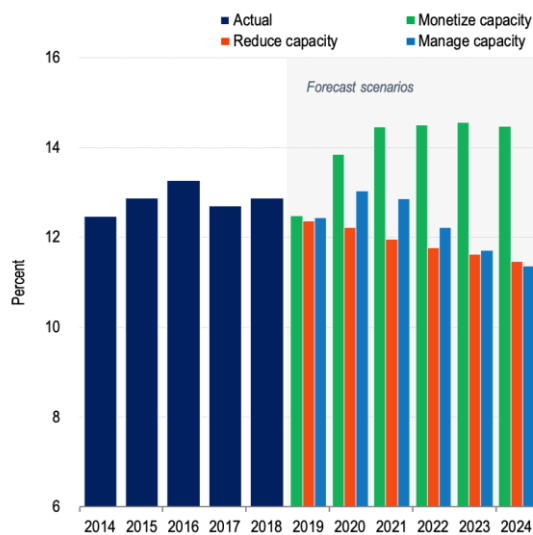
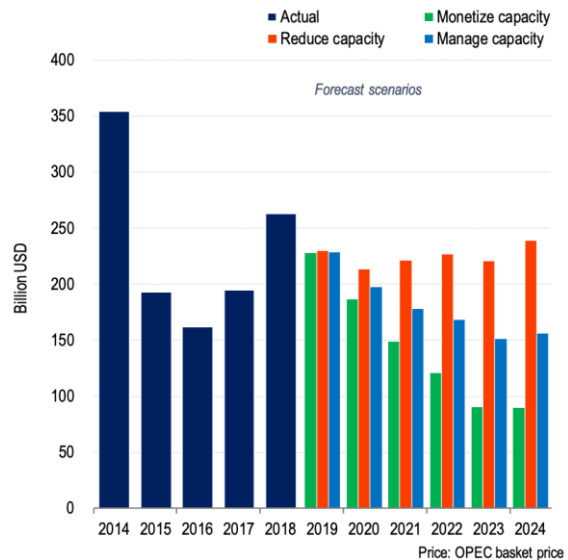


Figure 2: KSA gross oil revenues, 2014–2024E



Source: Authors' own calculations

If Saudi Arabia pursues a managed reduction of its output capacity, its market share is expected to decline towards 11 per cent by 2024, but the Kingdom will manage to preserve a constant flow of revenues of \$225 billion on average between 2019 and 2024, netting almost \$150 billion more in 2024 as compared to the fast monetization scenario. This is due to the fact that the oil price is expected to average around \$64/b in the same period, as the impact of the deterioration in global demand is offset by the erosion of spare capacity. In this scenario, there is also more room for cooperation with other low cost producers who could engage in a similar strategy.

Finally If Saudi Arabia maintains its current balancing role (the *manage capacity scenario*) and reacts only to an impact on the weakening global demand, not only would it fail to offset the price decline towards the low \$40/b by 2024 but both its market share and revenues would fall by 11 per cent and \$155 billion, compared to 13 per cent and \$220 billion in 2020, while spare capacity will continue to build amid unfavourable market conditions.

4. Costs and Benefits

Thus, the strategy to manage a reduction of its output capacity (the *reduce capacity scenario*) could maximise revenues over the medium-term especially given that the capital costs are low in implementing such a strategy. However, there are adverse consequences for the Kingdom as a result of this strategy. For instance, Saudi Arabia would become a price taker; it would end up with a lower market share; it would undermine the Kingdom's geopolitical status; and it would lose an important discipline mechanism. These are all significant costs. It may also require coordination with other low cost producers that would be eager to increase capacity. Such coordination is extremely difficult if not impossible.

But it is important to make a few points. First, the alternative strategy of fast monetization of reserves is also associated with a high cost in terms of lower revenues. Second, what induces all of these effects in the first place is the decline in importance of oil in the energy mix through a continuous series of negative oil demand shocks. In a world of declining demand, these costs cannot be large. For instance, if oil is no longer a strategic commodity, the value of holding spare capacity is reduced. Third, Saudi Arabia cannot afford to be reactive in the event that the impacts of energy transition fully materialize, as the costs of absorbing such a shock are too high, not only in absolute terms, but also relative to other options.

5. Timing is Key

For now, Saudi Arabia's stated official policy is neither to increase nor decrease its productive capacity of 12.5 mb/d and while it will continue to develop and expand new fields, these will not represent net additions, but they will have the impact of changing the quality mix of the Kingdom's production. In the current context when Saudi Arabia is producing below its OPEC quota and there is ample spare capacity in the system (notwithstanding the recent attacks on Saudi Aramco which temporarily reduced the size of available spare capacity), there is even lower incentive to increase capacity.

But the above discussion shows that in an environment of high uncertainty about demand and the speed of the energy transition, as much as there might be a case for Saudi Arabia to increase its productive capacity for instance to monetize its reserves, and/or manage prices on the upside and/or fill the gap during disruptions which has been shown to improve global welfare, there is also a case for a managed reduction of output capacity for instance by not offsetting the decline rates from some mature fields. The latter strategy does not involve high direct costs (in the sense that Saudi Arabia does not need to invest in new capacity) and if demand turns out to be stronger than expected, the payoffs could be even higher than in our scenario. It also shows that the trade-off would change over time depending on changes in global oil market conditions but also on transformations in the domestic economy. These of course are polar strategies and Saudi Arabia does not need to commit to one or the other. Also any decision that Saudi Arabia takes can't be taken in isolation of the potential response of other market players nor in isolation of the influence of domestic constituencies who could favor one policy over another.

In this environment where prospects for global oil demand have changed but where almost all projections still hold to the premise that oil demand will continue to grow, or at least we will not witness a sudden sharp fall in oil demand whether in a carbon-constrained scenario or otherwise, the option to wait has increased in value and most likely Saudi Arabia will continue to exercise this option until some of the key uncertainties are resolved or subside, especially given that investments in new productive capacity are irreversible. But once (and if) this uncertainty is resolved, the strategy of doing nothing will become very costly and thus Saudi Arabia will need to be proactive and adjust its investment programme to a changing world sooner rather than later. In other words, the picture is much more complex than has been suggested in our simple scenarios, as the decision does not only involve whether to increase productive capacity or not; but also, and perhaps most importantly, the timing of the implementation of any particular strategy.