



## Accelerating the Monetisation of newly discovered fields: Experience of Mumbai Offshore

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### **Abstract:**

*Mumbai Offshore is the most prolific basin of India and has been producing Oil & Gas since 1975. During its initial phase of exploitation history the major contributors were the large Oil & Gas fields. After more than 45 years of exploitation, most of the major fields have matured and entered into their declining phase. To compensate the declining production from these matured fields, ONGC strategized to monetise new discoveries which are in general marginal in nature. In the last 15 years, 43 new discoveries of Mumbai Offshore have been monetised. The monetisation efforts helped in maintaining total gas production of the Mumbai offshore despite considerable decline in gas production from the giant Bassein gas field. Moreover, the decline rate of oil production from the Mumbai Offshore has been restricted to 2% pa. Adoption of this strategy has enriched ONGC in its experience of developing small fields. Lessons learnt from the Mumbai offshore experience in the field of “Accelerating the Monetisation of newly discovered fields” may help in planning future monetisation process in a more robust manner so that not only from production point of view but even on return on investment, ONGC may reap higher dividends. This paper provides an insight as to what the industry may have to do in the case of monetization of new discoveries as they involve higher uncertainty and risk. However, in the near future the sector has no option but to move ahead with the present strategy after having incorporated lessons learnt from past experience.*

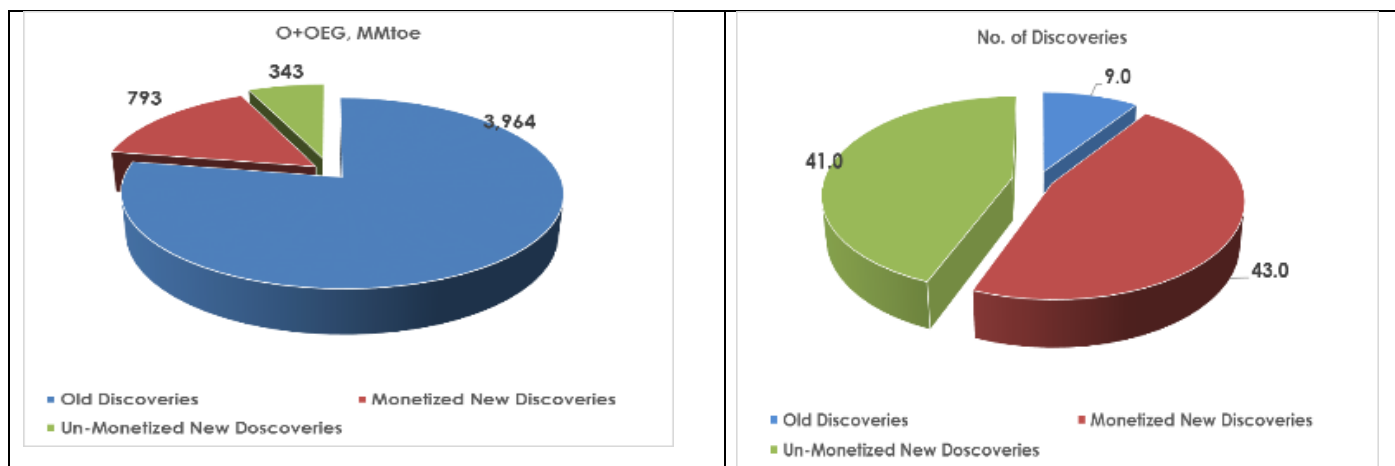
### **Introduction:**

The Mumbai offshore Basin is the most prolific basin of India, hosting most of its major giants like Mumbai High, Neelam, Heera, Bassein, Panna and NBP. But since inception of its production history beginning 1975, these fields have withstood more than 45 years of exploitation and are today at various stages of their matured life. More often than not, the fields have entered their declining phases with consequent decline in production from the Mumbai Offshore. For arresting this diminishing production trend, various efforts like augmentation of facilities, infill drilling, Water Control technology, EOR identification, Improvement of Water Injection facilities etc. are being extensively implemented and have met with a reasonable degree of success.

Given this scenario, ONGC has, of late adopted a strategy to monetize the un-monetized discoveries/new discoveries which are small and marginal compared to the old fields to improve the production graph of the Basin.

### **A comparison of the Reserves Base of old Discoveries vis-a-vis new Discoveries in Mumbai Offshore:**

As on 01.04.2021, Mumbai Offshore has 93 discoveries reported. As shown in fig-1, the old discoveries account for an inplace volume of around 3964 MMtoe which is ~78% of the total inplace spread over only 9 fields. Against this, the new discoveries which have been monetized hold 793 MMtoe of inplace volume distributed in 43 discoveries. Significantly, the un-monetized “new discoveries” hold 343 MMtoe of inplace volume in 41 discoveries.



**Fig-1: Distribution of categories of Discoveries & Reserves**

Category	No. of Discoveries	Oil, MMt	Gas, BCM	O+OEG, MMtoe	O+OEG, Mmtoe/ Discoveries	% of Total
Old Discoveries	9	2872	1092	3964	440	78%
Monetized New Discoveries	43	383	410	793	18	16%
Un-Monetized New Discoveries	41	193	149	343	8	7%
	93	3448	1652	5100	55	

**Table-1: Distribution of reserves in different categories of discoveries**

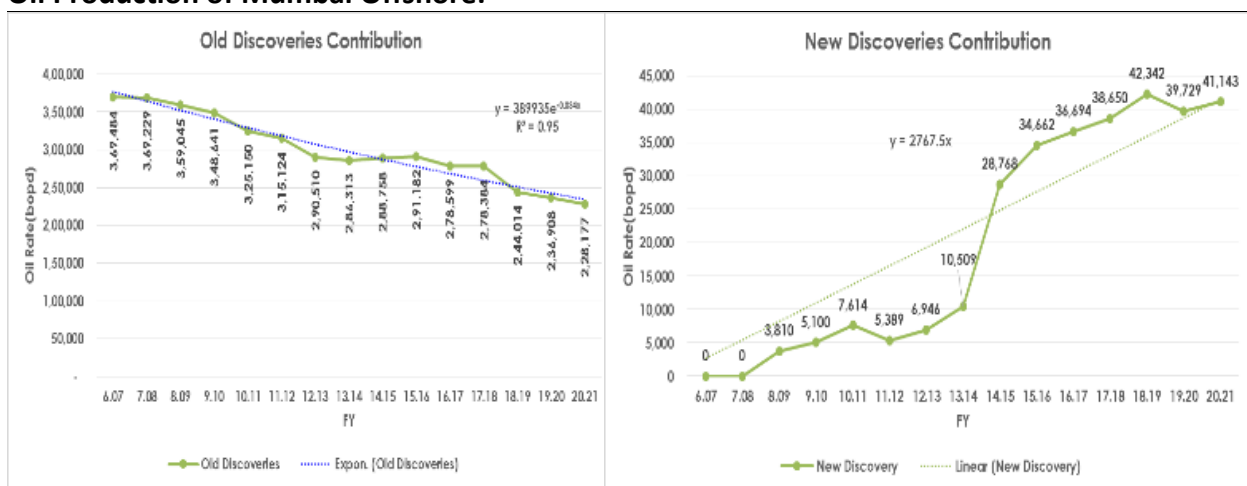
Table-1 clearly is indicating that the monetized new discoveries have higher O+OEG/discoveries compared to un-monetized discoveries.

**Projects implemented in the Mumbai Offshore for monetizing new Discoveries:**

ONGC has in its pursuit of meeting the ever increasing energy needs of the country so far implemented 19 different development Schemes integrating 43 discoveries over the last 15 years. Numerous other development plans are under implementation and a few more under formulation. This perseverant and judicious approach to monetising small and marginal discoveries is a conscious step that ONGC took so that a decline in production from the large fields could be supplemented through production from the new and marginal ones.

✓ **Impact on production:**

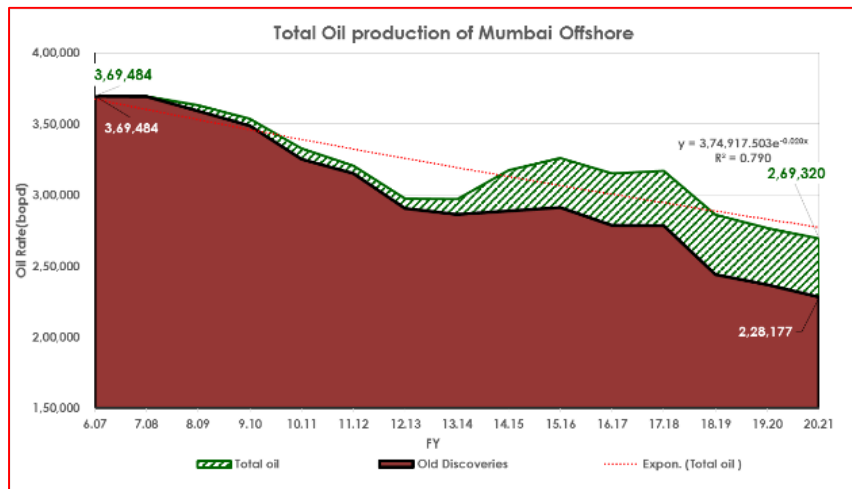
➤ **Oil Production of Mumbai Offshore:**



**Fig-2: Oil production performance of Old discoveries & new monetised discoveries**

Although, the decline rate of older discoveries was maintained at -3.4% pa, the oil production of Mumbai Offshore declined from ~3,70,000 bbl/d (during 2006-07) to ~2,28,000 bbl/d (2020-21) which amounts to a production decline of ~1,42,000 bbl/d. Due to maturity of old discoveries the decline in production @3.4% pa is expected.

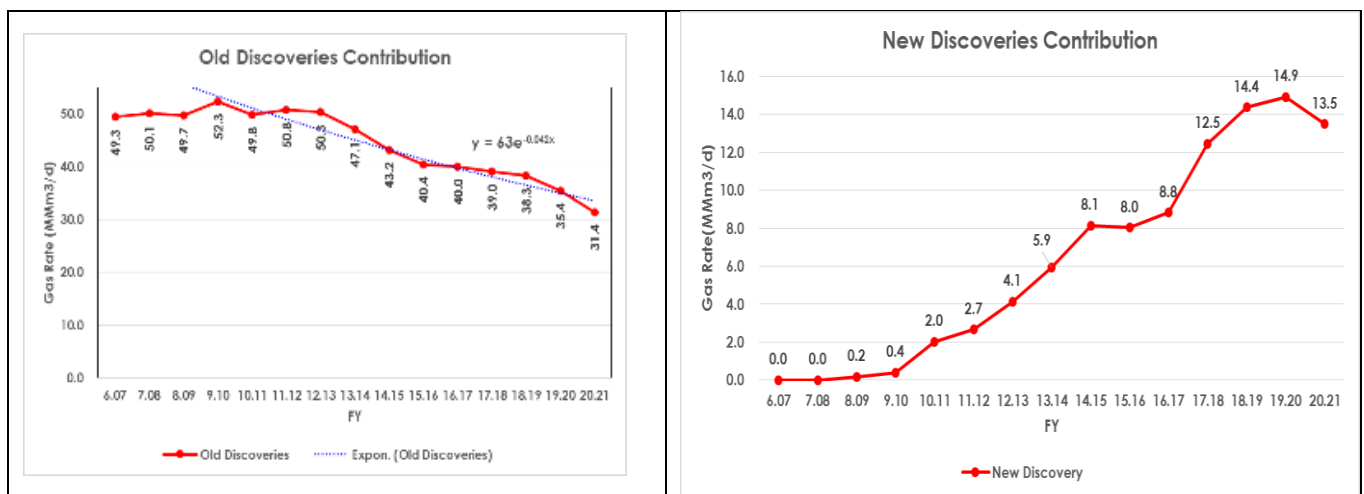
The strategy of monetising 43 new discoveries in last 15 years, yielded rich dividends as seen in the contribution of oil production from new discoveries. Oil production increased from nil in 2006-07 to ~41,000 bopd in 2020-21.



**Fig. 3: Impact of monetization of new discoveries on oil production performance of Mumbai Offshore**

This effort in turn resulted reduction in the decline rate of oil production from the Mumbai offshore from **-3.4% pa to -2.0% pa**. As production figures stand today, contribution from new discoveries is 15% of the total oil production of Mumbai Offshore.

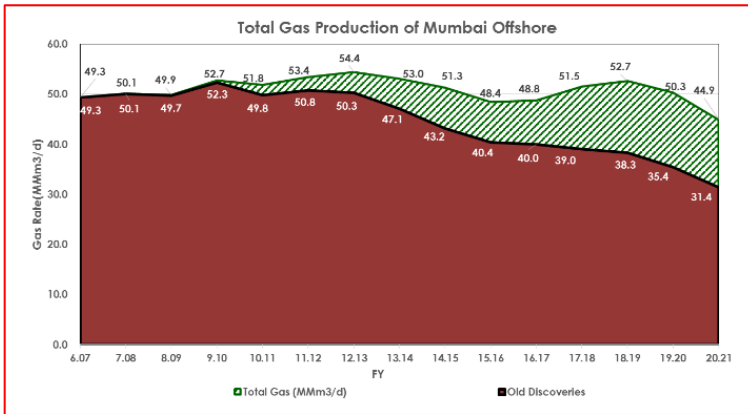
➤ **Gas Production of Mumbai Offshore:**



**Fig-4: Gas production performance of Old discoveries & new monetised discoveries**

More than three decades of gas production from giant fields like Bassein have reached a stage wherein gas production is declining with an average decline rate of 4.2% pa in last 15 years. The gas production from old discoveries reduced from 49.3 MMm3/d (during 2006-07) to 31.4 MMm3/d (2020-21) which amounts to a production decline of 17.9 MMm3/d. This is mainly due to continuous reservoir pressure decline in Bassein Field.

Maintaining congruity with the oil case, monetising new discoveries resulted in a production increase from nil in 2006-07 to 13.5 MMm<sup>3</sup>/d during 2020-21 and gas production of the Mumbai offshore is maintained around 49-50 MMm<sup>3</sup>/d since last 15 years. Although the gas production during the year 2020-21 was adversely affected due to a sharp drop in gas demand in the market due to outbreak Covid-19 pandemic. During the year 2020-21 the contribution of the new discoveries is 30% of the total Gas production of the Mumbai Offshore.

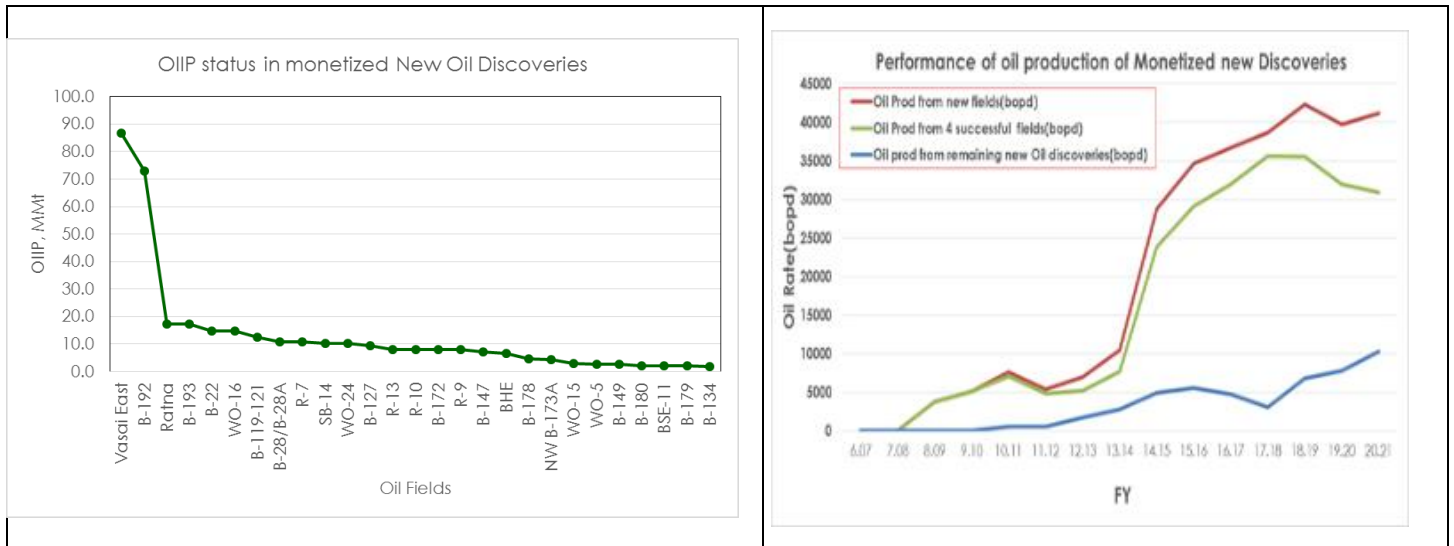


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**Fig. 5: Impact of monetization of new discoveries on gas production performance of Mumbai Offshore**

**New Oil Discoveries and Monetization Experiences:**

As mentioned, 27 of the 43 discoveries, are oil fields with an OIIP of ~360.0 MMt. Of the available OIIP, more than 50% of the inplace is held in only 4 fields' viz. Vasai East, B-192, Ratna & B-193.



**Fig.6: Reserve base of new monetised oil discoveries & Contribution in production**

And of the 27 monetized oil fields, sustained production has been realized from some of these very fields viz. Vasai East, B-192, B-193 & SB-14. These fields contribute about 75% of the production under the new oil discoveries monetisation. The total production trend is also dominated by these 4 fields.

Fig-6 is shows that the contribution from the rest of the field is increasing in last 2-3 years that is mainly due to good & sustained oil gain from two new fields of R-Series cluster which seems to have good potential for sustained potential. Hence, it may be concluded that majority of the fields are contributing marginally.

**Challenges in majority of new oil discoveries:**

The monetization experience in Mumbai Offshore, has shown that a majority of the discoveries i.e 85% are of a challenging nature. The challenges as demonstrated in Fig.7 can be broadly classified in four types:

- i) Sharp decline in production
- ii) Very short plateau period
- iii) Non Sustained production
- iv) Late realisation of upside potential

Besides the sharp decline and shorter plateau period a major challenge is fluctuating production which needs frequent intervention leading to higher Opex and Capex for development. Moreover, some fields like B-134 & B-172 takes long time to realise the upside/true potential by integrating development wells data, production performance, seismic data and improved reservoir characterisation.

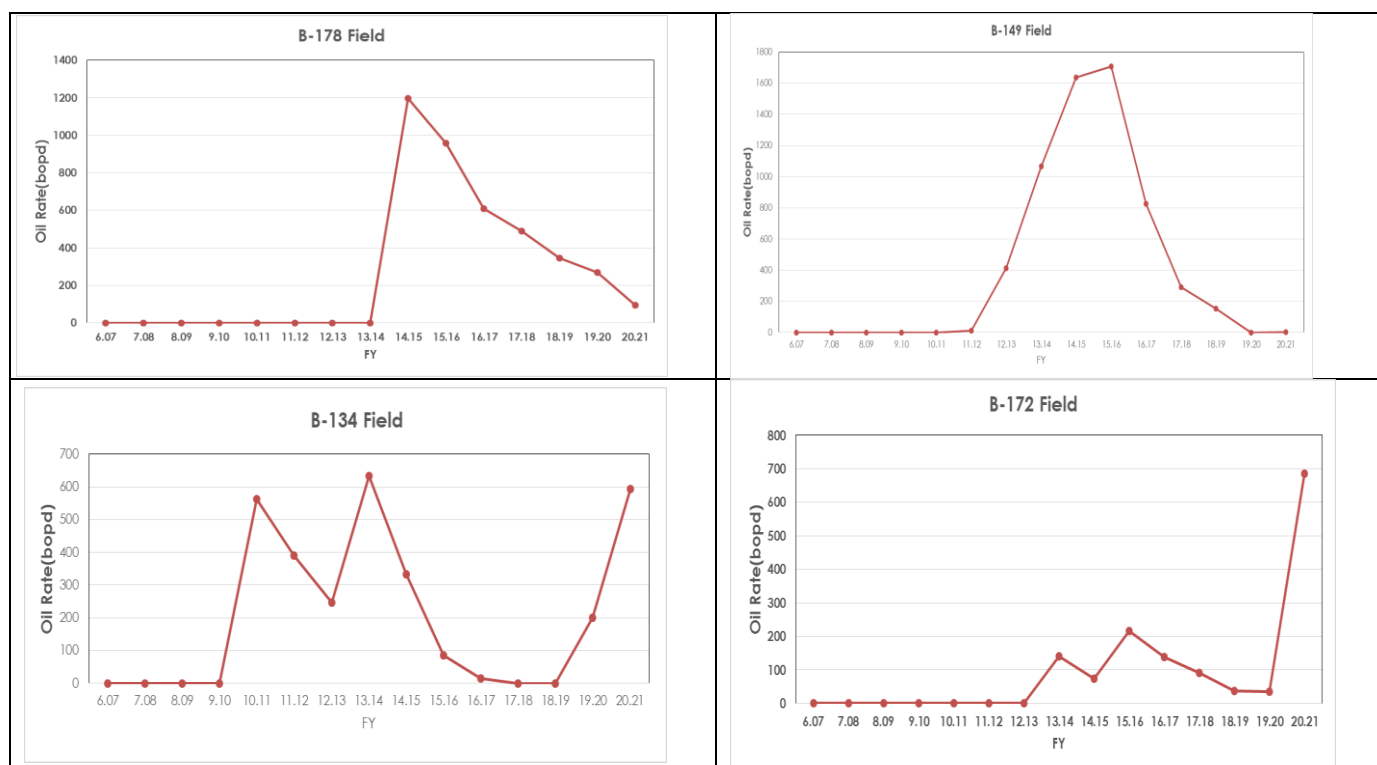


Fig. 7: Examples of production behaviours of new oil discoveries

### New Gas Discoveries and Monetization Experiences:

Out of monetized 16 discoveries, 9 discoveries (Dahanu, Dahanu North, North Tapti, C-26, C-22, C-23 & C-39) are concentrated in Tapti-Daman area having majority of the GIIP i.e. ~86%. Most of the free gas production is also coming from the Tapti-Daman area.

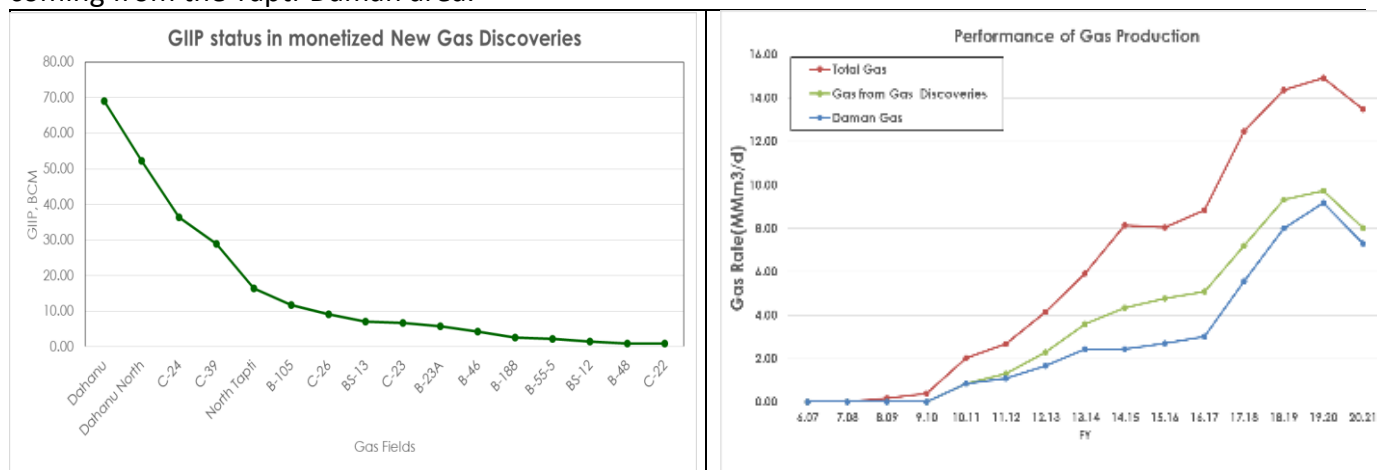
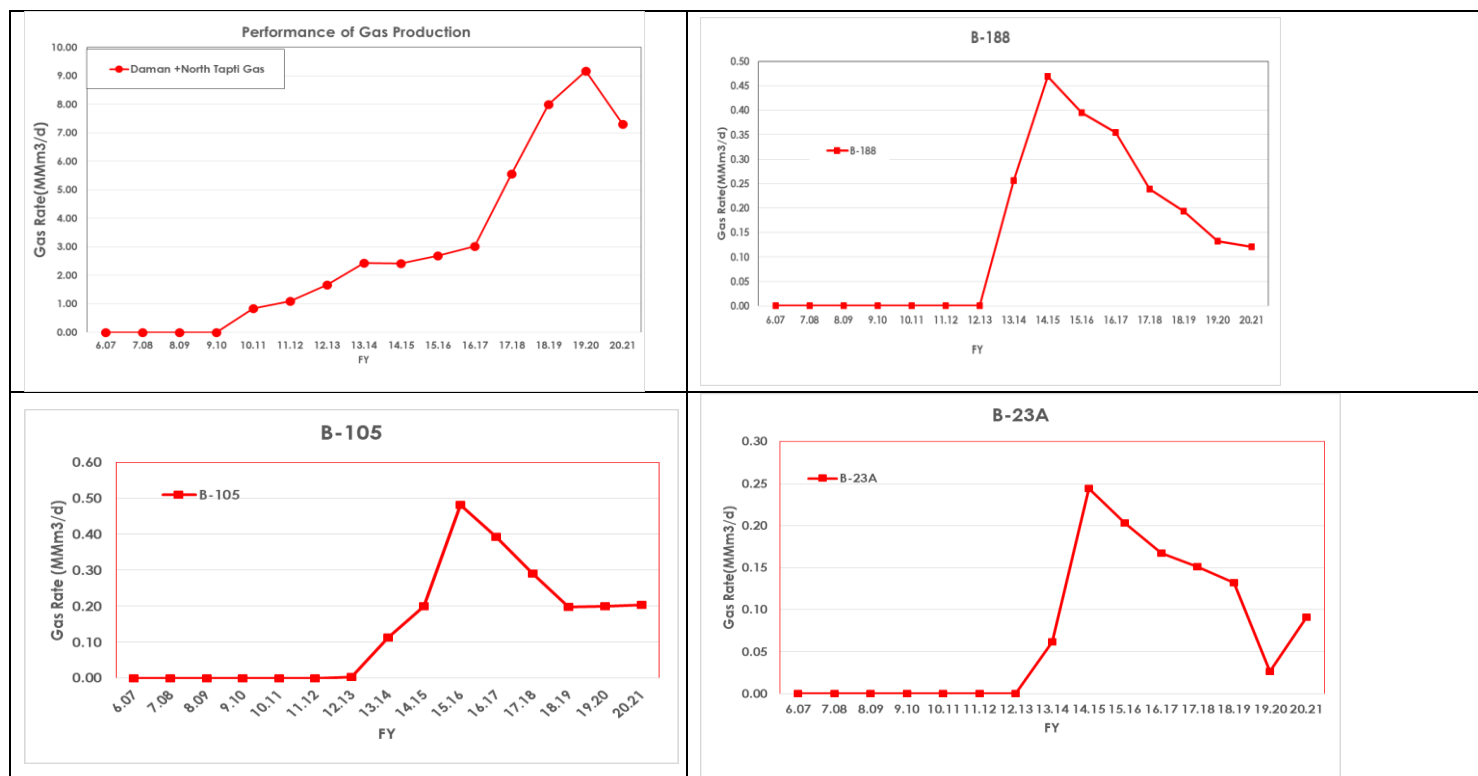


Fig. 7: Reserve base of new monetised oil discoveries & Contribution in production



**Fig.8: Examples of production behaviours of new gas discoveries**

Since, the gas realization from the new discoveries of Mumbai Offshore is dominated by the discoveries from the Tapti-Daman area, production from the Daman area is seen to be on a continuous increasing trend due to constant reworking of the development plans with simultaneous exploration inputs. This in fact has compensated the decline of gas production from the major Gas field Bassein and helped in maintaining the gas production of the Mumbai Offshore.

The rest of the new gas discoveries lies scattered in various sectors and are far smaller in size. However, production from these gas fields was more or less as per the expectation and sustained for about 7-8 years after initial decline. Moreover, these field needed lesser well intervention, once they were put on production which makes good return on investment, if the gas price remains in comfortable territory. The major advantage of these new marginal gas discoveries is that they are located near existing major fields.

In the effort to monetise new gas discoveries particularly those located in isolated areas, it was found that high initial Capex and low gas price was the biggest impediment in bringing fields on production.

However, with an expected increase in gas prices, more gas discoveries may be planned for future monetisation.

**Lessons Learnt & Challenges**

All major producing fields of Mumbai Offshore are in their declining phase. Hence, to maintain production, accelerated monetisation of new discoveries is the only choice available. Accordingly, ONGC started monetisation of these new discoveries. These monetisation efforts have arrested the decline rate in case of gas production and also positively impacted the oil production of the Mumbai Offshore.

Despite the fact that in global sense, monetising small discoveries has a positive impact, finer analysis indicates that there exists a lot of scope for improvement to reap fuller benefit of the strategy.

There are a few instances of unsuccessful monetisation efforts, causatives of which may be summarised as follows:

- ✓ Smaller in size
- ✓ Heterogeneous reservoir
- ✓ Faster decline with shorter life
- ✓ Delay in deployment of infrastructure for monetisation



With passage of time the size of discoveries have become smaller along with dynamics of the market making the monetisation process more challenging compared to earlier days.

### **Conclusion & Way forward**

It may be stated here that ONGC has a vast and rich experience in management of large fields. However, managing marginal fields is new to ONGC, and based on the experience of last 15 years, it is felt that small field management lies in an altogether different genre requiring more incisive geological insights and state of art interpretation techniques.

Moreover, with a low magnitude of production and faster production decline the rate of return on investment is low. Therefore precise Reservoir characterisation prior to implementation of the projects is imperative to mitigate risks. Close monitoring during the development drilling along with the immediate up-dation of the G&G model becomes an essentiality to reap benefits of the monetisation efforts and optimise remaining locations.

In case of unexpected production behaviour, there should be a robust preparedness by the operators for immediately adoption of remedial measures through implementation of latest production technology.

Hence, the close monitoring and immediate remedial measures are the keys to making the strategy successful.

Hence, a dedicated and empowered group may be required in each Asset of Mumbai Offshore so that maximum benefits can be realised from accelerated monetisation of newly discovered fields.

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### **References**

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