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Flexible Generation: A Role for India's Stressed and Stranded Gas-based Power Plants?

Gas-based Plants Can Support Renewables as Peakers and Balance the Grid Until Battery Storage Scales Up

Executive Summary

As India ramps up renewable energy capacity, energy storage will be key. For the period until battery energy storage systems become cost-competitive some of the country's underutilised and stranded gas-based power plants can provide flexible power and ancillary services to maintain grid stability. With an increase in domestic natural gas supply on the anvil, the additional fuel should be allocated to existing gas-based power plants that can provide peaking power to support more variable renewable energy in the grid. Operating 12.5 gigawatts of gas-based capacity could be useful to meet maximum peak demand in FY2029/30, complemented with battery energy storage systems. The government should expedite using clean alternatives to natural gas, such as green hydrogen, for sectors like fertiliser production and allocate the required domestically produced gas to the power sector instead under a "no-cut" category. Any transitional use of gas should be limited to sectors with no competitive alternatives or where gas use supports renewable energy uptake or helps maintain grid flexibility.

India's 24.9 gigawatts (GW) of gas-based power plants are either stranded or operating at sub-optimal levels due to the non-availability of affordable fuel. A total of 31 gas-based power plants with a combined capacity of 14.3GW are stranded. These plants were built at a cost of almost Rs650 billion (US$8.2 billion), of which banks have funded Rs500 billion (US$6.3 billion).

In the early part of the 2000s, India was betting big on new gas discoveries. In 2002, Reliance Industries Limited (RIL) announced that it had discovered 10.5 trillion cubic feet of gas in the Krishna-Godavari (KG) basin off the country's eastern coast. The government's bullishness toward the fuel triggered a rush by private companies to set up gas-based power plants.[1]

As the years ticked by and the company dug more wells, the promise of domestic gas production kept growing. From an initial estimate of 40 Million Metric Standard Cubic Meters Per Day (MMSCMD), RIL raised production estimates to 80MMSCMD by 2009, when it actually began production.[2]

[1] Reliance Industries Limited. Annual Report 2002-2003. June 2003.
[2] The Economic Times. RIL KG-basin to produce 80-mmscmd gas by December: Pandey. 7 May 2009.

However, gas production from the KG-D6 basin, as it came to be known, fizzled out well before reaching the expected peak. In fact, the output of 69.44MMSCMD in March 2010[3] was the highest before it started dipping, reaching a low of 5.5MMSCMD in the fiscal year (FY) 2017/18.

The lack of domestic supply was the key reason for the decline in gas-based power production. Further, the explosive growth of coal-based thermal power plants and over-expectation of electricity demand growth also resulted in gas-based power losing out.

By 2013, the Indian government had even switched the priority allocation of domestic gas from the power sector to the city gas distribution (CGD) sector. Since then, gas-based power plants have not received any gas from the KG-D6 basin.[4] As a result, power plants had to depend on liquefied natural gas (LNG) to meet their fuel needs.

Doing so has made gas-based power uncompetitive against other fuel-based power and renewables, which have been on a declining cost trend in the last decade. In 2018, the power tariff from LNG at US$7.5-8.0/Metric Million British thermal units (MMBtu) came to Rs8/kilowatt-hours (kWh). On the other hand, the tariff for coal-based power was Rs1.97-5.73/kWh and for solar was Rs2.44-3.34/kWh. The global supply disruptions and rising global prices in recent times further weaken the case for using LNG for power generation.

Giving fresh impetus towards extracting natural gas from the KG-D6 basin along with its partner BP, RIL now expects to ramp up production from three new fields in the KG-D6 basin. At its annual general meeting recently, the company said it is exploring three new fields – MJ, R-Cluster and Satellite Cluster – that could raise production to 30MMSCMD by 2023, or 30% of India's domestic natural gas production.

But this is no longer 2009. India has ambitious goals for decarbonising its economy. So how do natural gas, another fossil fuel, and electricity produced by burning it fit in with the country's goals?

There is a case for directing domestic gas or blended gas to power plants to utilise them for meeting India's peak demand requirements. Even with the high rates of domestic gas of US$6.1/MMBtu in April 2022, gas-based power emerges as the most economical among the other prevailing short-term market options or

There is a case for directing domestic gas or blended gas to power plants to utilise them for meeting India's peak demand requirements.

[3] The Economic Times. Reliance says its main gas fields in KG-D6 block in late life stage. 21 July 2019.
[4] Standing Committee on Energy. Report on Stressed/Non-Performing Assets in Gas based Power Plants. 4 January 2019.

contracts of less than one-year period, including bilateral trades, trades through power exchanges and through deviation settlement mechanism (DSM). With the recently revised domestic gas prices of US$8.57/MMBtu from regular fields[5] utilising domestic gas would still be economical than other short-term options for supply of power during peak hours or grid imbalance with the power tariffs at around Rs 6.2/kWh.

Gas-based power plants can also help in providing flexible power and help manage grid balancing while battery energy storage systems scale up and become more affordable. Operating 12.5GW of gas-based capacity could be useful to meet maximum peak demand in FY2029/30, complemented with battery energy storage systems.

The government may also look to adapt a scheme it had proposed in 2019 that sought to bundle gas-based power produced using LNG with solar power. For the blending scheme, the proposal was that GAIL would import the required gas. GAIL had indicated LNG would cost US$6/MMBtu at a delivery price of US$8/MMBtu for power generation at Rs4/kWh with proposed waivers. This was to be blended with solar power, which was about Rs2.75/kWh then, and the power ministry was hopeful of finding enough buyers for the scheme.[6]

This scheme could now be implemented for domestic gas and solar power instead of LNG. With the LNG prices expected to remain above US$25/MMBtu for the rest of the year and not below US$10 MMBtu till 2027, it would be impossible to make any economics of power supply work with LNG. Companies can benefit from blending domestic gas-fuelled electricity and solar power to reach an average rate way under Rs5/kWh rather than buying at Rs12/kWh as capped in the spot market for now. This would considerably increase power supply reliability, and the country will not have to go into bouts of load shedding witnessed in the summer months of April-July 2022.

The government should expedite efforts to utilise green hydrogen for fertiliser production instead of grey hydrogen produced from natural gas.

Finally, the government should expedite efforts to utilise green hydrogen for fertiliser production instead of grey hydrogen produced from natural gas. It could allocate the required domestic gas to the power sector instead under the "no cut" category.

[5] PPAC. Domestic Natural Gas Price for the period October 2022-March 2023. 30 September 2022.
[6] The Economic Times. Government plans new scheme to revive 24,000-MW gas power plants. 5 December 2019.

The government's proposal for setting up a separate higher price market to allow sellers with high variable costs, including gas-based power plants and battery storage developers, is an important step towards serving peak demand. Researchers have noted that the Time-of-Day Tariff will provide an incentive for gas-based capacity to operate, and this proposal of a higher tariff could be useful.

We believe any transitional use of gas should be limited to sectors with no competitive alternatives or where gas use supports renewable energy uptake or helps maintain grid flexibility. For instance, until storage options are more widely available and affordable, gas-based power plants could be used to serve the peak demand or provide grid-balancing ancillary services.

Any transitional use of gas should be limited to sectors with no competitive alternatives or where gas use supports renewable energy uptake or helps maintain grid flexibility.

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Gas-based Power Plants: India's White Elephant

Banks have put most of India's gas-based power plants in the 'stranded assets' category as they owe large sums of money, and there is no plan for optimal operation.

Debt from commercial banks and foreign institutional investors (FIIs) has funded a majority of the project cost (70-80%) for most of India's gas-based power generation capacity, which is 24.9 gigawatts (GW).[7] The lower than estimated domestic gas supply to gas power plants has led to the plants being either stranded (14.3GW) or operating at sub-optimal levels.

The lower than estimated domestic gas supply to gas power plants has led to the plants being either stranded (14.3GW) or operating at sub-optimal levels.

A total of 31 gas-based power plants are stranded, with 24 belonging to the private sector, six to the state sector and one to the central sector. An estimated cost of Rs40-50 million per megawatt (MW) (US$5-6.3 million)[8] means that nearly Rs650 billion (US$8.2 billion) worth of investments stay locked with these plants, of which banks have funded Rs500 billion (US$6.3 billion).[9]

Why did the banks take such a risk? The answer to that lies in the 2002 promise that natural gas could provide India with energy security. Back then, Reliance Industries Limited (RIL) discovered 10.5 trillion cubic feet of natural gas in the Krishna-Godavari basin, off the eastern coast of India.[10] The company estimated this would be enough to produce 40 Million Metric Standard Cubic Meters Per Day (MMSCMD).

As the years progressed, so did RIL's estimates. The estimated reserves soon ballooned to 14 trillion cubic feet translating to an output of 80MMSCMD.[11]

On the back of the government's bullishness toward natural gas, the private sector rushed to build gas-based power plants, and the banks were more than willing to oblige. As a result, from 11.16GW in 2002, gas-based power capacity more than doubled to 24.2GW within the next decade.[12]

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[7] Standing Committee on Energy. Report on Stressed/Non-Performing Assets in Gas based Power Plants. 4 January 2019.
[8] All currency conversion across report done at 1 USD = 79.5 (average for July 2022)
[9] Standing Committee on Energy. Report on Stressed/Non-Performing Assets in Gas based Power Plants. 4 January 2019.
[10] Reliance Industries Limited. Annual Report 2002-2003. June 2003.
[11] Forbes. The Mogul of Mumbai. April 2006.
[12] NITI Aayog. The Working of State Electricity Boards and Electricity Departments – Annual Report (2001-02). May 2002.

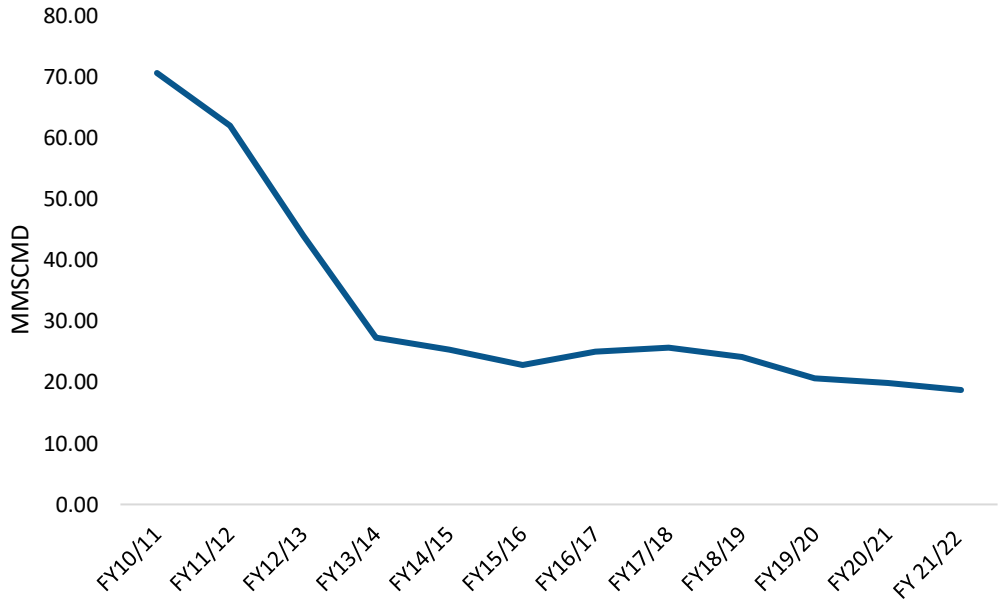
Meanwhile, the promise of bountiful domestic gas production would soon turn sour.

Back in 2010, the KG-D6 basin was producing record-high levels of domestic gas, and the domestic gas supply in the country reached an all-time high of 143 MMSCMD. The power sector and the Indian industry at large expected gas supply to increase further on the back of policy impetus and forecasted increase in KG-D6 flows. However, domestic gas production from the field peaked before reaching the projected capacity.

The KG-D6 was to hit peak production of 80MMSCMD in 2010, but it only reached 69.44MMSCMD before it started declining drastically and reached a low of 5.5MMSCMD in the fiscal year (FY) 2017/18.

These miscalculated gas production forecasts led to a sudden decline in domestic gas supply to power plants, forcing them to either produce expensive power on imported liquefied natural gas (LNG) or operate at sub-optimal levels – both being loss-making options.

Figure 1: Domestic Gas Supply to Power Sector Per Day From FY2010/11 to FY 21/22 (MMSCMD)



Source: IEEFA analysis based on MOPNG's Natural Gas Statistics 2014-15, PIB Press Release and Monthly Report on Natural Gas Production, Availability and Consumption.

More natural gas, though, may be on the anvil. RIL and its partner BP are exploring three new fields in the KG D6 basin, two of which – R-Cluster and Satellite Cluster – have already started production. RIL expects the three fields, including the MJ field that the company plans to operationalise in late 2022, to produce 30MMSCMD of gas

in FY2023/24 or 30% of India's natural gas production. Currently, the operational fields are producing 19 MMSCMD of gas.[13]

Shifting Sectoral Priority Allocation of Domestic Gas

The real blow to the gas power plants came when the government bumped down the sector in the priority allocation list for domestic gas. Domestic gas production is limited in India, and allocations made by the government regulate the market on the demand side.

In 2010, gas-based power plants supplying to the grid were high on the priority list, only after gas-based fertiliser plants (which were limited in number at that time, unlike now) and LPG plants (which require only a small supply of gas).[14]

In 2013, however, the government brought the power sector below the city gas distribution (CGD) sector in the priority list.[15]

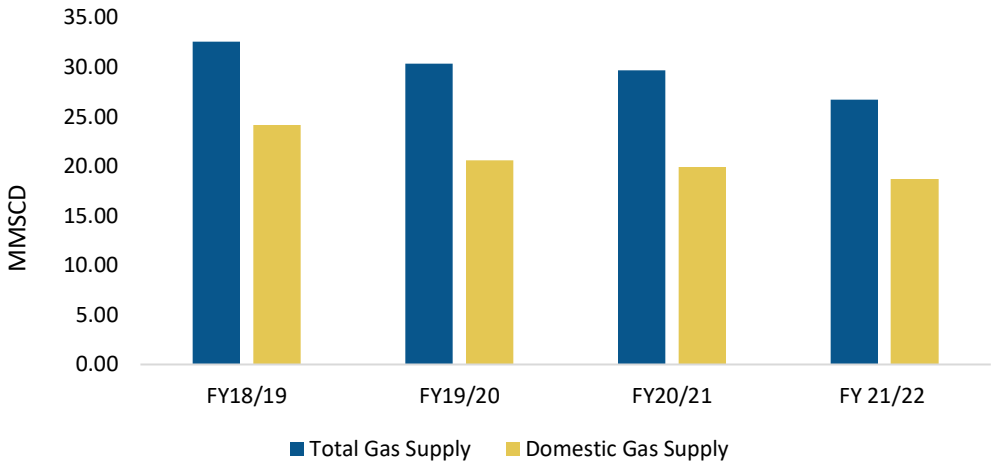
The depleting production levels of KG-D6 and no production from new discoveries also led to the government applying pro-rata cuts in the supply of natural gas to all stakeholders. Non-core sectors like the power sector were the worst affected as the government notified that it would impose cuts in reverse order of priority if there was insufficient gas for the core sector.

As a result, the domestic gas allocation to power plants further depleted over the years. Operating the existing gas-based power plants at 85% plant load factor (PLF) requires about 102MMSCMD of gas. This is higher than the allocated 87.12MMSCMD, which has not been met for several years.

The average domestic gas supplied during FY2017/18 was almost one-fourth of the requirement at 25.71MMSCMD. This went down to 19.9MMSCMD in FY2020/21 and 17MMSCMD in FY2021/22. As a result, gas-based power plants operated at an annual average of 16.54% PLF in FY2021/22.[16]

[13] Mint. Mukesh Ambani says, KG-D6 to contribute 30% of India's gas production. 29 August 2022.
[14] Standing Committee on Energy. Report on Stressed/Non-Performing Assets in Gas based Power Plants. 4 January 2019.
[15] This priority allocation to the CGD sector continues, but the actual allocation is at present higher to the fertiliser sector. This is because allocation depends on the last six months of consumption, during which the COVID-19 pandemic severely impacted the CGD sector.
[16] CEA. Energy Generation, Programme, And Plant Load Factor For Gas / Liquid Based Stations.

Figure 2: Total Gas (Domestic+LNG) and Domestic Gas Supplied to Power Sector from FY2018/19 to FY2021/22 (in MMSCMD)



Source: IEEFA analysis based on Monthly Report on Natural Gas Production, Availability and Consumption.

In FY2021/22, gas-based power plants generated 36,039 gigawatt-hours (GWh) of electricity. With the total generation at 13,20,880GWh in the same year, gas-based power's share was about 2.7%.[17]

Economics Does Not Support R-LNG Use for Power

The limited domestic gas supply has forced gas-based power producers to depend on LNG to meet their fuel needs. However, the high cost of LNG has resulted in an increase in the variable cost of power compared to that produced from domestic gas, making it difficult to schedule in merit order dispatch.

A recent IHS Markit report noted that India's offtake of gas for the power sector is declining and will remain low in the near future. It notes:

> *"In fourth quarter 2021, gas offtake from the power sector dipped to multiyear lows, owing to record high spot LNG prices and limited availability of domestic gas. This trend is anticipated to continue over the next few quarters owing to volatility in the spot LNG prices and declining gas output from nominated fields."*[18]

A report published by IEEFA also noted that emerging Asia's LNG-to-Power value chain is fraught with risks, with "LNG being a bridge that would be never built". The report found that LNG's price volatility, seen over the past two years, can raise the cost of power delivered to nearly US$300 per megawatt-hour (MWh) or

[17] National Power Portal. Energy Generation from Gas Based Station. March 2022.
[18] IHS. India Natural Gas Market Briefing. 13 April 2022.

Rs23,850/MWh.[19] Foreign exchange risks further exacerbate this – a 10% volatility can impact prices to the tune of US$18/MWh or Rs1,431/MWh.

We present the Ministry of Power's 2018 estimation of the cost of generation from different sources of gas types in Table 1.

Table 1: Average Energy Charge Rate for Varying Gas Types (historical)

Type of Gas	Delivered Gas price (US$/MMBTU)	Energy Charge Rate (ECR) (Rs./kWh)
APM Gas	5.08	2.86
PMT Gas	8.27	4.65
Non APM Gas	5.87	3.3
GAIL Spot LNG*	12.34	6.53

Source: 42nd report of Standing Committee on Energy (2018-19)
** LNG price is US$7.5-8.0/MMBtu, US$1-1.5/MMBtu regasification cost, US$1.0/MMBtu transportation cost, US$0.5/MMBtu marketing margin and taxes.*

In 2018, the power tariff from LNG for US$7.5-8.0/Metric Million British thermal unit (MMBtu) or landed cost after regasification and taxes of US$10-12/MMBtu came to Rs8/kilowatt-hour (kWh). Of the total tariff, Rs6.5/kWh is a variable charge, and Rs1.5/kWh is a fixed charge.

On the other hand, the power tariff in the same year for coal was in the range of Rs1.97/kWh to Rs 5.73/kWh[20] and for solar was around Rs2.44/kWh[21] – Rs3.34/kWh[22] making power production from LNG an unviable proposition.

Extrapolating the power tariff from LNG to the ongoing average price at Dahej port of US$56.15[23] would bring it to an uneconomical Rs36.5/kWh.[24] The solar tariff has now reached a low of Rs1.99/kWh, while the average power purchase cost in the country is Rs3.85/kWh.[25] Table 2 indicates the power tariff for recent gas prices from varying sources.

[19] IEEFA. Examining Cracks in Emerging Asia's LNG-to-Power Value Chain. December 2021.
[20] CERC. Report on Short. Term Power Market. 2018-19.
[21] PIB. Year End Review 2018 – MNRE. December 2018.
[22] Mercom India. Solar Auctions in 2018: Who Had the Biggest Share of the Pie?. 23 January 2019.
[23] On 17 August 2022 as per IHS Markit.
[24] Calculated using US$56.15/MMBtu of ongoing average imported price, freight, regasification & marketing margin of US$3/MMBtu, taxes and duties at 12% multiplied by a factor of 0.55(same as MoP's 2018 calculation).
[25] Mint. Centre plans green tariff in bid to expedite energy shift. 19 February 2022.

Table 2: Average Energy Charge Rate for Varying Gas Types (current)

	Time	Delivered Gas price (US$/MMBTU)*	Energy Charge Rate (ECR) (Rs./kWh)**
Domestic Gas	Oct-21	4.93	2.71
	Apr-22	8.51	4.68
Domestic Gas - Deep Water Fields	Oct-22	11.28	6.20
	Oct-21	8.55	4.70
LNG	Apr-22	12.79	7.03
	Oct-22	15.79	8.69
LNG	Oct-21	23.96	13.18
	Apr-22	45.68	25.13

**For domestic gas, the delivered price includes US$1.0/MMBtu freight cost, US$0.5/MMBtu marketing margin and taxes. For LNG, it also includes US$1.5/MMBtu regasification cost.*
***Conversion rate of 0.55 calculated based on typical cost of generation submitted to Standing Committee of Energy*
**** As on August 25, 2022*
Source: IEEFA Analysis based on PPAC & IHS LNG Analytics

The wide gap in the power tariff clearly shows that using LNG, especially in the ongoing volatile gas price market, is not possible. The volatility in the gas market, in any case, lowers the reliability of LNG as an input fuel. It is worse in the power sector, where the energy charges are high versus domestic gas and other fuels. The global supply disruptions and high prices witnessed across countries in recent times further weaken the case for using LNG for power generation. Many Asian countries are scouting for alternative energy sources in response to the high LNG prices, which are not expected to be near US$10/MMBtu[26] by 2027.[27]

Cascading Effect of Stranded Gas Power Assets

While it is clearly unviable to utilise LNG at high prices right now, under-utilising the commissioned power plants also leads to various economic and financial risks.

Investment worth more than Rs1 trillion[28] (US$ 12.6 billion) is stressed due to policy lacuna and insufficient gas supply resulting in a large amount of non-performing assets for banks.

Without a clear policy for the utilisation of these plants, there is no hope of recovery of bank debt, as, without an assured supply of gas, these power plants will not even find buyers in case of bankruptcy.

Apart from the lack of projected power and stress on the banks, India's risk perception among domestic and foreign investors has also increased. South Korean company Korea Western Power Co (KOWEPO) made its first investment in India in a

[26] CME Group. LNG Japan/Korea Marker Future Quotes. 20 September 2022.
[27] IEEFA. The economic case for LNG in Asia is crumbling. 15 August 2022.
[28] Calculated as per the Rs 40-50 million investment per MW informed to the Standing Committee

gas-based power plant based on the stated position of gas availability and comfort letter received from the Indian government but is now suffering losses on the project. The company has taken the issue to arbitration and seeks US$400 million in compensation.[29]

Gas Power Plants Can Serve Peak Demand

With the revival of economic activities and intensifying heat conditions, India's peak demand in April 2022 reached an all-time high of 215.8GW. The peak demand will rise in the future due to increased economic activity, manufacturing base, disposable income, and extended summers due to global warming.

The proposed increase in renewable energy capacity and integration in the grid would require a higher injection of flexible generation sources. To enable 24x7 power, regulators will need to ensure peak supply and flexible generation options.

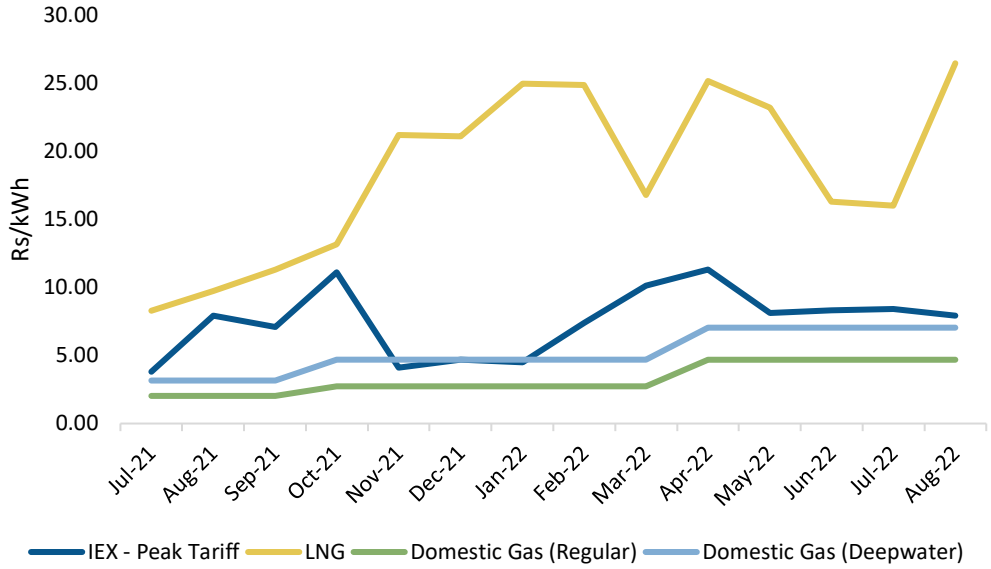
Of late, bilateral trades have been a key feature of short-term electricity transactions along with the trade on power exchanges. Solar Energy Corporation of India's (SECI) round-the-clock (RTC) tender is also a step to support peak supply with renewable energy integration.

With their higher ramp-up rate and quick start time, gas-based power plants can meet the peak power demand with a peaking power tariff incentive. The economics of using domestic natural gas to meet peak demand also makes a strong case for using gas-based power plants as peakers, as shown in Figure 3.

With their higher ramp-up rate and quick start time, gas-based power plants can meet the peak power demand with a peaking power tariff incentive.

[29] The Economic Times. Korean company starts arbitration against India. 10 December 2019.

Figure 3: Recent Power Tariffs Across Different Supply Options



Source: IEX Market Snapshot, PPAC, IHS LNG Analytics Note: IEX yearly Market Clearing Price (MCP) for peak times from July 2021-August 2022, energy charge rate calculated for delivered domestic gas price and Asian spot LNG.

Even with the high domestic gas rates of US$6.1/MMBtu in April 2022, gas-fuelled power is the most economical among the other prevailing short-term market options. If the trend continues, then with the revised domestic gas prices of US$8.57/MMBtu also, utilising domestic gas would be more economical with the tariffs coming around Rs 6.2/kWh.

It is evident that in September-October 2021 and April-June 2022, when there was a demand-supply mismatch, gas-based power production could have served the requirement at much lower rates than the short-term market. This, if complemented with a Time-of-Day tariff system, would make gas-based power viable.

The Standing Committee on Energy reviewing the stressed gas assets had also made a recommendation to this effect, noting that:

> *"Gas based plants can be operated as Peaking Plants as they can switch on quickly when there is high demand and running these plants as Peaking Plants will also optimize the use of scarcely available domestic natural gas."*

In addition, gas-based power plants can play a key role in providing ancillary services as India plans to add more renewable energy to the grid. A recent study by Wartsila and KPMG on electricity market reforms notes that for reliable integration of the targeted 450GW of renewable energy, India would require 38GW of four-hour battery storage and 9GW of gas-based power generation.[30]

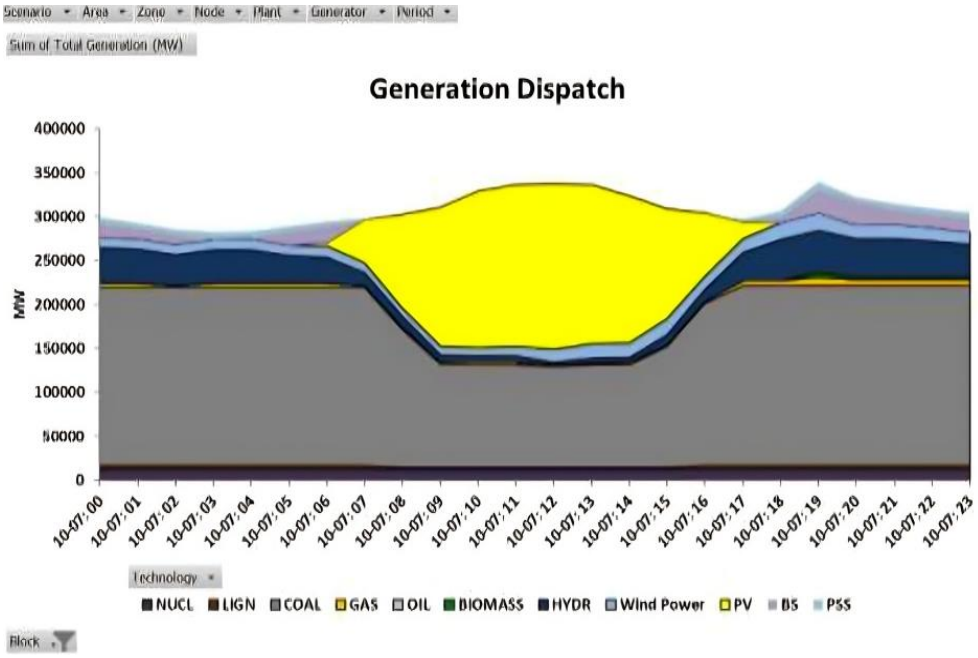
[30] Wartsila. Electricity market reforms for procurement of ancillary services can deliver economic benefits. November 2021.

Operating 12.5GW Gas Plants for Peak Demand

The Central Electricity Authority's (CEA's) Report on Optimal Generation Capacity Mix for FY2029/30 shows that on the predicted peak day of October 7, 2029, gas-based power and battery storage would be useful for meeting the peak demand.[31]

The graph below shows the hourly generation dispatch for the peak day for FY2029-30, as depicted in CEA's report.

Figure 4: Forecasted Peak Day Hourly Generation Dispatch, 7 October 2029



Source: CEA's Report on Optimal Generation Capacity Mix for FY 2029-30.

At the peak 19th hour, gas-based power and battery energy storage systems (BS) display a peak in the generation, indicating their role as peakers. A detailed reading of the graph informs the requirement of 12.5GW of gas-based capacity to meet the maximum peak demand anticipated in FY2029/30. This would be complemented using 20GW of four-hour battery storage systems.

The use of gas to provide peaking power, however, would make sense if the gas price decreases over the years and domestic gas or LNG or a mix of both could be delivered at a maximum rate of US$11/MMBtu to enable an energy charge of Rs6.12/kWh. This is the peak power tariff discovered in a SECI tender of a 1.2GW wind-solar hybrid power project with energy storage and guaranteed peak power

[31] CEA. Report on Optimal Generation Capacity Mix for FY 2029-30. January 2020.

supply.[32] In addition, a Time-of-Day tariff would also incentivise using gas-based power plants as a peaking power resource.

Gas-based power plants can also play a role in the Frequency Control Ancillary Services (FCAS) market in maintaining the grid's power quality, reliability and security. A recent IEEFA report notes:[33]

> *"Opening up a formal FCAS market will allow competitive price signalling for investment into important flexibility tools such as batteries and PHS projects that are extremely important to integrate large-scale, ultra-low-cost VRE sources."*

In June 2022, the highest variable cost on a day for ancillary service was Rs27.5/kWh, and all services were provided by thermal generation.[34] Using gas-based power to meet these balancing needs could improve speed and accuracy, reduce cost and utilise the stressed gas capacity.

Way Forward

Gas-based power plants can be used to meet peaking power requirements until battery storage systems become cost-competitive. They can also play a crucial role in balancing the grid by maintaining an uninterrupted electricity supply with a higher injection of renewable energy in the grid. A 2018 paper by Brookings Institution also notes that using existing capacity is the most cost-effective way to meet peaking power and signalling gas-based power plants' use with a Time-of-Day tariff, even if cheaper domestic gas is unavailable.[35]

Gas-based power plants can balance the grid by maintaining an uninterrupted electricity supply with a higher injection of renewable energy.

More importantly, the government should plan to come up with a peak power requirement that gas-based power plants fulfil. Allocation of domestic gas could be made in line with that requirement. In addition, efforts could be made to lower the price of gas-based electricity by bundling it with other generation sources

[32] Saur Energy. Greenko, ReNew Power win SECI's 1.2 GW Hybrid Plus Storage Tender. January 2020.
[33] IEEFA. Finessing India's Power Market to be More Competitive. 1 September 2022.
[34] POSOCO. Implementation of RRAS Mechanism, June 2022.
[35] Rahul Tongia. Gas for the Power Sector: Fundamentals Suggest a Niche Role. May 2021.

and avoiding future debts for gas-based assets with proper due diligence and policy consistency.

Bundling with Solar Power

In 2019, the government proposed a scheme to revive stranded gas power assets by bundling gas power produced using LNG with solar power. For the blending scheme, the proposal was that GAIL would import the required gas. GAIL had indicated LNG would cost US$6/MMBtu at a delivery price of US$8/MMBtu for power generation at Rs4/kWh with proposed waivers. This was to be blended with solar power, which was about Rs2.75/kWh then. The power ministry was hopeful of finding enough buyers for the scheme.[36]

Instead of a subsidy contemplated earlier, the waivers in the blending scheme were of state and central taxes on LNG, waiver of Goods and Services Tax (GST) on regasification and transportation of the fuel, reduction of pipeline tariff charges and marketing margin by GAIL. It was also proposed to do away with electricity transmission charges for stranded gas-based projects.

This scheme can now be implemented for domestic gas and solar power. With the LNG prices expected to remain above US$25/MMBtu for the rest of the year, it would be impossible to make any economics of power supply work with LNG. Companies can benefit from blending domestic gas and solar power to reach an average rate below Rs5/kWh rather than buying at Rs12/kWh as capped in the spot market for now. This would considerably increase power supply reliability, and the country will not have to go into bouts of load shedding witnessed in the summer months of April-July 2022.

Companies can benefit from blending domestic gas and solar power to reach an average rate below Rs5/kWh rather than buying at Rs12/kWh.

The Ministry of Power is proposing a High Price Day Ahead Market segment (HP-DAM), which would allow sellers with high variable costs, including gas-based power plants, to sell power above the ceiling rate.[37] This would allow producers to secure LNG for power production in case domestic gas is unavailable. The introduction of a separate market with higher tariffs[38] will incentivise developers and investors to use existing gas-based capacity and deploy more storage

[36] The Economic Times. Government plans new scheme to revive 24,000-MW gas power plants.
[37] Ministry of Power. High Price Market Segment for Day Ahead Market. 1 August 2022.
[38] The Economic Times. Power demand will be higher next year, challenges ahead: Minister RK Singh. 12 September 2022.

technologies. But once gas prices soften, gas-based power plants should not be allowed to sell power in the high price market segment.

The government is also looking at bundling coal with renewable energy. However, it should reconsider its earlier proposal of bundling gas power with renewable energy to enable utilisation of stranded assets and due to faster ramp up and winding up abilities of gas plants.

Screening Loans and Target-Based Disbursal

It is also imperative that some clear and proper screening methods for loan approval and covenants for loan disbursal are put in place to ensure that banks are more responsible in their lending activities and are not only depending on policy assurance while funding. The Standing Committee on Energy had expressed dismay at banks' willingness to write off the investment in gas-based plants. The Committee noted:

> *"The Ministry owe the responsibility for superfluous projections regarding production of gas from KG D6 and the banks for unrealistic lending of public money. Instead of ensuring how these stranded power plants can be efficiently utilized, there is an air of despondency and increasing clamour to send these plants to NCLT."*

Explore Alternate Technologies for Other Gas-Dependent Sectors

Efforts should be expedited to utilise green hydrogen for fertiliser production instead of grey hydrogen produced from natural gas and allocate the required amount of domestic gas to the power sector under a "no cut" category.

A recent IEEFA report notes that fertilisers are the best use case for green hydrogen. The incentives provided for green ammonia in the government's recent green hydrogen policy, such as single-window clearance, allocation of land in renewable energy parks, priority access to the interstate transmission network, and open access procurement within 15 days, among others, could prove helpful in expediting hydrogen use. This could then be extended to the hard-to-abate sectors such as cement and steel.[39]

Any transitional use of gas should be limited to sectors with no competitive alternatives or where gas use supports renewable energy uptake or helps maintain grid flexibility. For instance, until storage options are more widely available and affordable, gas-based power plants could be used to serve the peak demand or provide grid balancing ancillary services.

[39] IEEFA. Green Ammonia: Low-Hanging Fruit for India's Green Hydrogen Dream. April 2022.

About the Author

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