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Bangladesh Must Plan for the Energy Transition to Renewables

Expectations From the Upcoming Integrated Energy and Power Master Plan

Executive Summary

The Bangladesh government's new 8th Five Year Plan (8FYP) provides strong evidence that the government has changed its thinking on power development since 2016.

From a reliance on coal and LNG which have put an unsustainable financial strain on the power system, the Plan shows the government now has an increased focus on renewable energy, energy efficiency and the financial sustainability of the power system.

The 8FYP clearly acknowledges many of the major issues impacting Bangladesh's fossil fuel-based power system – and solutions to fix them.

These identified solutions should inform the government's new Integrated Energy and Power Master Plan (IEPMP) that is now under development, which will drive energy development for decades. It would make no sense if the 8FYP and the IEPMP were not aligned.

The 8FYP clearly acknowledges many of the major issues impacting the power system – and solutions to fix them.

The Japan International Cooperation Agency (JICA) funded the IEPMP's predecessor – the 2016 Power System Master Plan (PSMP 2016), a plan which called for a major roll-out of power stations to be fuelled by imported coal and LNG. Unsurprisingly, coal- and LNG-fired power generation were technologies that Japanese companies were keen to sell to developing Asian nations like Bangladesh.

Indeed, JICA itself financed the Matarbari 1 coal-fired power plant which is currently under construction by Japanese company Sumitomo Corporation. JICA is also considering financing a second coal power plant in Bangladesh – Matarbari 2 – despite Matarbari 1 reportedly being three-and-a-half years over-schedule and almost 50% over-budget.

In March 2021, JICA signed a Record of Discussions with the Bangladesh

government for the development of the new IEPMP.

In its announcement of the signing of the Record of Discussions for the IEPMP, JICA talks of a "transformation to a low or zero carbon energy system", noting that its work will contribute to two of the 17 Sustainable Development Goals established by the United Nations General Assembly in 2015 - Sustainable Development Goal 7 (Affordable and Clean Energy) and 13 (Climate Action).

This change in tone from JICA gives rise to an expectation that the Matarbari 2 coal power proposal will not be funded by JICA.

Bangladesh's 8FYP gives insight into what the high level content of the new IEPMP should be:

> *"the Power Sector Master Plan 2016 (PSMP) will be updated and power expansion programmes will be based on updated demand projections, better use of existing capacity and selection of least-cost options for new generation."*

Furthermore, a key theme for the 8FYP is:

> *"increased focus on energy efficiency gain, renewable energy and financial sustainability".*

The 8FYP clearly acknowledges Bangladesh's power overcapacity problem as well as solutions to address it. The Plan also notes that a future in which Bangladesh becomes more reliant on imported coal and LNG risks seeing the cost of electricity rise even further, highlighting the price volatility risk that comes with LNG reliance.

The major LNG price spike in January 2021 ought to be a warning for any nation planning to become more reliant on LNG. Japan – which is highly dependent on imported LNG – saw its electricity prices surge to record levels in January 2021 as LNG prices rose dramatically.

The major LNG price spike in January 2021 ought to be a warning.

Significantly, the 8FYP acknowledges that the issues of overcapacity and the rising capacity payments that accompany it, as well as a rise in reliance on expensive fossil fuel imports jeopardise the financial sustainability of the power system.

The 8FYP has also identified that continued subsidisation of fossil fuels has contributed to Bangladesh not meeting its previous renewable energy targets. This means Bangladesh has not been able to capitalise on the ever-lower global cost of solar and wind power which can help Bangladesh reduce the average cost of power generation, improving the financial sustainability of the power system.

What Should Be Expected From the Integrated Energy and Power Master Plan

The 8FYP has insightfully identified the major issues faced by Bangladesh's power system.

The fact that the new IEPMP ought to be aligned to the 8FYP and that JICA has committed to planning for a "low or zero carbon energy system", means that high level expectations for the JICA's new plan can be listed:

The new IEPMP ought to be aligned to the 8FYP.

- Given that the 8FYP has clearly identified power overcapacity as a problem, the new IEPMP must address this by **prioritizing grid investments so that better use can be made of existing capacity**.

- To further address overcapacity, the new IEPMP must **employ more realistic power demand growth forecasts to prevent the continued over-build of new power capacity**.

- The 8FYP has clearly targeted a least-cost power generation system. This means that the new IEPMP must **abandon the expensive pipeline of coal-fired power plants that are yet to begin construction**. This would also help address the overcapacity problem by limiting further additions of large power plants. **It should be expected that JICA will not provide funding for the Matarbari 2 coal power proposal**, and that this project will be amongst those cancelled.

- Furthermore, **a least-cost power system cannot be achieved by replacing coal power proposals with LNG-fired power**. To be aligned with the 8FYP, the new power plan must *not* include increased emphasis on LNG-fired power. Given the full life cycle emissions of LNG are comparable to that of coal, JICA cannot contribute to "a transformation to low or zero carbon energy system through formulating a comprehensive, long-term energy plan" if that plan calls for increased import and combustion of LNG.

- The 8FYP has clearly identified energy efficiency gains as a key goal. Energy efficiency can help limit the amount of new power capacity needed to meet demand growth, meaning low-cost renewable energy can fulfil a greater proportion of that growth. Fortunately, **Japan is an energy efficiency world leader and well placed to help Bangladesh planned for increased efficiency** as well as being able to provide many of the efficient products that can achieve it.

- A least-cost power system needs to embrace the plunging cost of renewable energy. **A significant scaling up of renewable energy ambition** would see Bangladesh enjoy the rapid decline of solar power tariffs seen in globally.

- In addition to solar, **wind power potential should not be neglected** by the IEPMP, particularly given that the most recent technology can utilise wind resources considered unexploitable several years ago. The potential for offshore wind also needs to be considered by the JICA.

- The long term outlook of the IEPMP means that **plans should be put in place for the roll out of power storage technologies** like batteries that can store renewable energy in the future.

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Introduction

In March 2021, the Japan International Cooperation Agency (JICA) signed a Record of Discussions with the Government of Bangladesh for the Integrated Energy and Power Master Plan (IEPMP) project[1] – Bangladesh's new long term power and energy plan that will drive development in these sectors for decades.

JICA previously funded the IEPMP's predecessor – the 2016 Power System Master Plan (PSMP 2016), a plan developed with the assistance of Japanese power utility TEPCO which called for a major roll-out of power stations to be fuelled by imported coal and LNG. Unsurprisingly, coal- and LNG-fired power generation were technologies that Japanese companies were keen to sell to developing Asian nations like Bangladesh. Indeed, JICA itself financed the Matarbari 1 coal-fired power plant which is currently under construction by Japanese company Sumitomo Corporation.[2] JICA is also still considering financing a second coal power plant in Bangladesh – Matarbari 2.[3]

The construction of Matarbari 1 is reportedly facing significant issues with the project said to be running three-and-a-half years behind schedule and 46% over-budget.[4] In addition, Sumitomo Corporation released a new policy on coal-fired power in May 2021, stating that it will no longer be involved in new projects of this type.[5] However, Sumitomo made one exception to this – it is still considering its involvement in the Matarbari 2 project.

Meanwhile, in May 2021 Sumitomo-Mitsui Financial Group announced it was ending all finance for coal-fired power plants including ultra-supercritical (USC) plants that it had previously made an exception for. A general manager of the bank's corporate sustainability department stated: "We have gotten rid of the criteria as some study showed even USC power plants would not reduce CO2 emission dramatically."[6] The Matarbari coal power projects are of the USC type.

Sumitomo-Mitsui Financial Group announced it was ending all finance for coal-fired power plants.

Bangladesh already has a significant overcapacity problem.[7] This is resulting in substantial capacity payments being made to power plants standing idle much of the

[1] JICA. Signing of Record of Discussions on Technical Cooperation for Development Planning with Bangladesh. 15 March 2021.
[2] IEEFA. ¥26 billion loss on Australian coal power plant raises questions for Sumitomo and its investors. 24 November 2020.
[3] Bloomberg. Japan Ignores Climate Pressure, Eyes New Overseas Coal Units. 23 March 2021.
[4] Financial Express. Matarbari fast-track power project in need of more fund and time. 22 April 2021.
[5] Sumitomo Corporation. Revision to "Policies on Climate Change Issues". 7 May 2021.
[6] Reuters. Japan's SMFG to halt all new financing of coal-fired power plants. 12 May 2021.
[7] IEEFA. Bangladesh's power system overcapacity problem is getting worse. 20 January 2021.

time. This increases the average cost of generation, raising the financial pressure on the Power Development Board (PDB). The completion of the Matarbari 1 coal power plant - and the addition of Matarbari 2 if it proceeds – will worsen the overcapacity problem and increase financial stress within the power system even further.

However, in its announcement of the signing of the Record of Discussions for the IEPMP, JICA talks of a "transformation to a low or zero carbon energy system", noting that its work will contribute to Sustainable Development Goals 7 (Affordable and Clean Energy) and 13 (Climate Action). This change in tone from JICA, along with the Japan Bank for International Cooperation's recent statement that it will no longer finance coal-fired power overseas[8], gives an expectation that the Matarbari 2 coal power proposal will not be funded by JICA.

Considering full life-cycle emissions, LNG releases greenhouse gases at a similar level to coal-fired power[9] and so does not fit into a "low or zero carbon energy system" that JICA refers to either.

In addition, the Bangladesh government's new 8th Five Year Plan (8FYP) provides strong evidence that the government has changed its thinking on power development since 2016. The Plan clearly acknowledges many of the major issues impacting Bangladesh's fossil fuel-based power system. It is expected that the new five-year plan and the new energy and power master plan will be aligned with one another.

LNG releases greenhouse gases at a similar level to coal-fired power.

This report considers the content of the 8FYP and how it gives strong clues and expectations as to what the contents of the IEPMP should be.

Recognising the Issues in the New 8th Five-Year Plan

Bangladesh's new 8FYP recognises many of the issues faced by the nation's power sector and the developments needed to address them. It also directly gives insight into what the high level content of the new IEPMP should be:

> *"the Power Sector Master Plan 2016 (PSMP) will be updated and power expansion programmes will be based on updated demand projections, better use of existing capacity and selection of least-cost options for new generation."*[10]

[8] NHK. JBIC backs away from funding coal-fired plants. 3 March 2021.
[9] IEEFA. Is the Gas Industry Facing its Volkswagen Moment? Gas is More Emissions Intensive Than The Gas Industry's Marketing Arms Suggests. 5 March 2020.
[10] Government of Bangladesh. 8th Five Year Plan July 2020 – June 2025. December 2020.

IEEFA notes improved demand projections would help deal with Bangladesh's overcapacity problem which has seen power capacity construction in excess of demand growth. The country can make better use of existing capacity through transmission and distribution investment which can also prepare the grid for higher capacities of renewable energy, a key theme for the 8FYP:

> *"increased focus on energy efficiency gain, renewable energy and financial sustainability".*

Overcapacity in the Power Sector

IEEFA has been warning about the worsening overcapacity situation in Bangladesh for some time[11], so it is refreshing to see that the 8FYP is candid in discussing the issue:

> *"at this point of time Bangladesh has surplus installed capacity."*

The Plan also acknowledges some of the key problems that overcapacity causes for Bangladesh:

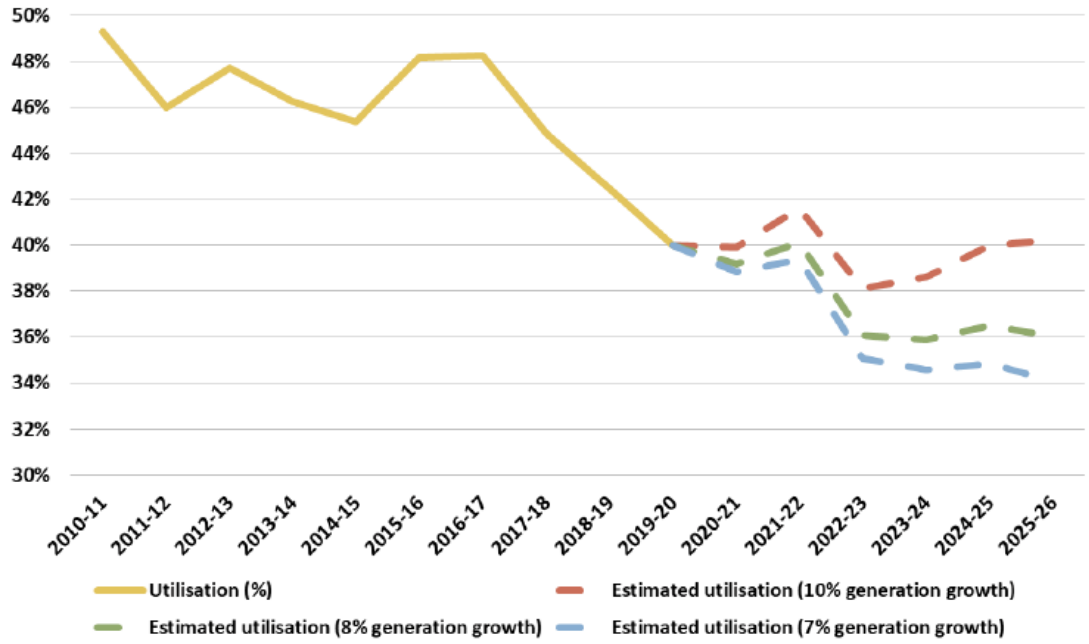
> *"All future generation plan needs to factor in this surplus generation position, as it will have implications on long-term sustainability of the sector, particularly in moving towards a least-cost generation scenario and increased use of renewable energy (RE) during the 8FYP period."*

An immediate, partial solution to the growing overcapacity problem is offered by the 8FYP:

> *"there should be review on the higher cost and less efficient rental and other power plants, and look for ways to closing those and replacing them with more efficient ones including increased generation from RE [renewable energy]."*

[11] IEEFA. Bangladesh's power system overcapacity problem is getting worse. 20 January 2021

Figure 1: Actual and Estimated Future Total Power Capacity Utilisation (%)



Source: Bangladesh Power Development Board, IEEFA estimates.

It appears that the Bangladesh government is already taking action along these lines with plans to shut down more 1GW of rental power plants by 2024 in order to lessen power overcapacity and reduce the burden of capacity charges that threaten the financial sustainability of the power sector.[12]

However, the shutdown of these plants won't on its own be enough to fix the overcapacity problem given that current plans for new power plant additions are likely to see capacity rise in excess of power demand growth. Overall power capacity utilisation was only 40% in 2019-20 and IEEFA has estimated that power generation growth will have to grow at least 10% per annum in order to prevent utilisation dropping even further (Figure 1).

However, the 8FYP states that power demand growth will be 8% over the Plan period to 2025. This scenario is likely to see overall power capacity utilisation decline further.

High Cost of Imported Coal and LNG

In preparing the IEPMP, JICA should also take note of the 8FYP's comments on the cost of reliance on imported coal and LNG.

The 8FYP notes that the cost of power in Bangladesh rose 41% between FY2015 and

[12] Dhaka Tribune. Government to shut down rental, quick rental power plants by 2024. 11 March 2021.

FY2020 due to the increased use of oil and diesel in the power system's fuel mix over the period. Significantly, it also notes that a future in which Bangladesh becomes more reliant on imported coal and LNG risks seeing the cost of electricity rise even further:

> *"It appears that the increasing reliance on imported fuel… (higher priced LNG and imported coal) will continue in the future, and so will increase the production cost of electricity, unless efficiency and other cost measures are taken."*

Although the Bangladesh government now seems to be preparing to abandon the pipeline of coal-fired power plants, suggestions that these projects will be replaced by more LNG-fired power projects risks exposing the country to a fossil fuel that has even higher price volatility.

The 8FYP notes the price risk that comes with LNG reliance:

> *"The LNG price will face the international price volatility, and will be requiring regular price adjustments for sustainability."*

The 8FYP also includes a table showing the relative cost of power generation from each source, highlighting that only oil and high speed diesel (HSD) are more expensive than LNG (Table 1).

Table 1: Per Unit Cost of Power Generation Per 8th Five Year Plan (Tk/kWh)

Fuel Type in Generation	Unit Cost (Tk/kWh)
Furnace Oil (FO)	17
HSD	26
LNG	13
Imported Coal	8.1
Domestic Coal	6
Domestic Gas	2.57
Hydro	1
Solar Power Plant	12
Imported Power	6.48

Source: Power Division.

LNG-fired power will remain expensive and exposed to the price spikes that LNG is particularly prone to, in part due to the logistics of LNG transport and storage.[13] In contrast, while solar power is shown to be relatively expensive in this table, a key difference is that the cost of solar is declining fast around the world.

[13] S&P Platts. JKM spike again shows extent of gas exposure to winter uncertainty. 22 January 2021.

The major LNG price spike in January 2021 (Figure 2) ought to be a warning for any nation planning to become more reliant on LNG. As JICA would be aware, Japan – which is highly dependent on imported LNG – saw its electricity prices surge to record levels in January 2021 as LNG prices rose dramatically.[14]

Figure 2: Spot Price for LNG in Japan (per Million British Thermal Units)

Source: Quartz, S&P Global.

Bangladesh – along with Pakistan and India – cancelled LNG shipments in January 2021 amidst the price surge due to the high costs, and gas had to be rationed as a consequence.[15] This followed the cancellation of several Bangladesh LNG tenders in 2020 on the basis that bid prices were too high even before the January price spike.[16]

The need for new associated, additional infrastructure – regasification, storage, pipelines, and market development – also adds to the expense of LNG. Bangladesh is already faced with major delays and cost rises at the Payra Port, through which coal is supposed to be imported to fuel power stations in the area.[17]

Bangladesh does *not* need the added risk of delays and spiralling costs from even more major fossil fuel infrastructure projects via a misguided move to become more reliant on LNG.

[14] Quartz. Japan's surging electricity prices are a warning for Asian countries. 30 January 2021.
[15] Reuters. Record LNG prices push South Asian nations to ration gas, seek other fuels. 15 January 2021.
[16] Reuters. Bangladesh scraps two more LNG import tenders over high prices. 10 November 2020.
[17] Daily Star. Payra Port continues to witness delays, cost spiral. 16 February 2021.

Financial Sustainability of the Power System

Overcapacity, rising capacity payments to idle power plants, and the expense of fossil fuel imports are placing unsustainable financial pressure on Bangladesh's power system.[18]

The Power Development Board (PDB) makes significant financial losses each year as power is sold at less than the cost of generation. These losses have to be covered by government subsidies. The situation is being made worse by overcapacity, which is seeing capacity payments to power generators rise, increasing the average cost of power generation.

This issue has been recognised in the 8FYP:

> *"It has already been shown… that over the years the actual generation has been increasingly falling short of the installed capacity. This has resulted in large sized capacity payments to private power producers for not buying their power. This can have serious adverse financial implication on PDB that could challenge the sectors long-term financial sustainability."*
>
> *"This means that actual generation has been about 50% of installed capacity relative to the peak demand points. This gap, which has been increasing between the years… is likely to grow bigger with some large sized power plants nearing completion."*

The large power plants nearing completion referred to in the 8FYP include the Matarbari coal-fired power plant that is being financed by JICA.

The first of the planned fleet of coal-fired power plants to run on imported coal to reach commercial operation was the Bangladesh-China Power Company (Pvt) Ltd's Payra plant whose first unit entered service in May 2020. BCPCPL's 2020 Annual Report highlights how capacity payments will increasingly endanger the power system's financial sustainability if Bangladesh remains on the current path. Payra unit 1 was operational for the last six weeks of fiscal year 2019-20 during which it made Tk. 1,066 million (US$13m) in power sales revenue and Tk. 1,906 million (US$23m) from capacity payments.[19] The unit's utilisation rate over the period was just 43%.

A switch from coal to LNG will *not* avoid this problem.

[18] IEEFA. Bangladesh's power system overcapacity problem is getting worse. 20 January 2021.
[19] Bangladesh-China Power Company (Pvt) Ltd. Annual Report 2020.

Although a small sample size, the experience so far at Payra is an indication that the addition of Matarbari 1 and possible addition of Matarbari 2 will see the coal plants standing idle much of the time whilst capacity payments rise significantly, raising the cost of power generation and further worsening the financial situation that Bangladesh's power system finds itself in. A switch from coal to LNG will *not* avoid this problem.

As a result, the 8FYP identifies the financial problems within the power system as key issues that need to be addressed:

> *"Two major performance gaps in the power sector are: (a) increasing cost of electricity production and (b) continued operational deficits in the power sector. The Eighth Plan strategy needs to recognize these areas of concern and take adequate measures to correct them."*

The 8FYP has also identified that continued subsidisation of fossil fuels has contributed to Bangladesh being unable to meet its previous renewable energy targets, meaning the country has been unable to capitalise on the reducing cost of solar and wind that has been developed globally and which can help Bangladesh reduce the average cost of power generation:

Bangladesh has been unable to capitalise on the reducing cost of solar and wind.

> *"…in all likelihood, the 7FYP target for renewable energy will not be met. Several factors have contributed to this including continued subsidization of fossil fuel use and inadequate incentives to renewable energy, both of which have adversely affected demand and supply of renewable energy. There will be renewed effort to improve the focus and implementation of the RE policy during the 8th plan period."*

Identified Solutions

As well as correctly identifying many of the issues faced by Bangladesh's power system, the 8FYP also suggests a number of solutions.

Given the declining cost of wind and solar globally, it is no surprise that the Plan targets greater emphasis on renewable energy in order to make Bangladesh's power system financially sustainable:

> *"During the eighth plan period the effort will be to build a fiscally sound efficient least cost power generation system, with increasing renewable energy as a source for power production."*

> *"Renewable energy is increasingly becoming cheaper to produce and so should form important part of future fuel mix strategy."*

One of the many advantages of renewable energy is that wind and solar power

installations do *not* receive capacity payments and so would help tackle a growing issue within the power system which threatens its financial sustainability. The 8FYP also acknowledges the need to review the power purchase agreements (PPAs) of existing fossil-fuelled power plants due to the high burden of these capacity payments and the growing gap between available capacity and actual utilisation.

Wind and solar power installations do *not* receive capacity payments.

The 8FYP also focuses on Bangladesh's electricity grid, stating that:

> *"It is of utmost necessity to enhance grid connectivity among the zones/regions to get rid of such situation."*

Enhanced grid connectivity would alleviate overcapacity by making better use of existing power stations. It would also prepare the grid for greater use of renewable energy and reduce transmission and distribution losses which are a financial burden on the system.

The removal of fossil fuel subsidies is also called for in the 8FYP:

> *"Proper pricing of fossil fuel energy products is also essential to promote production and use of clean fuel options and to meet the environmental goals of Bangladesh including its commitments to the Paris Accord on Carbon Emission Reduction."*

The goal of reaching fully cost-reflective power tariffs is also deemed necessary by the 8FYP. This would need to be implemented gradually to avoid undue cost burden on power consumers. However, increased reliance on ever-cheaper renewable energy would help lower the cost of power generation and limit the need for tariff increases:

> *"…in view of uncertainties of international oil prices, electricity pricing and subsidy could still continue to pose policy challenges during the Eighth Plan. Full cost recovery for all power and energy products is an important goal for the 8FYP. This will not only help lower the financial burden on the Treasury, it will help conserve energy and support the development of renewable energy."*

What Should Be Expected From the Integrated Energy and Power Master Plan

The 8FYP has insightfully identified the major issues faced by Bangladesh's power system.

With JICA committed to planning for a "low or zero carbon energy system", the new

IEPMP ought to be aligned to the 8FYP and that means high level expectations for the new Plan being prepared by JICA can be listed:

- Given that the 8FYP has clearly identified power overcapacity as a problem, the new IEPMP must address this by **prioritizing grid investments so that better use can be made of existing capacity**. At the same time, enhanced transmission and distribution investment can prepare the grid for greater levels of renewable energy and help reduce transmission and distribution losses further, helping to lower the cost of power.

- To further address overcapacity, the new IEPMP must **employ more realistic power demand growth forecasts to prevent the continued over-build of new power capacity**. The current rate of planned power additions requires power demand growth in excess of 10% per annum to prevent under-utilisation of power plants getting worse. The 8FYP maintains that power demand growth will be 8% per annum over the period to 2025.

- The 8FYP has clearly targeted a least-cost power generation system. Meanwhile the Matarbari 1 coal power project is reportedly running significantly over-budget and over-schedule.[20] The new IEPMP must **abandon the expensive pipeline of coal-fired power plants that are yet to begin construction**. This would also help address the overcapacity problem by limiting further additions of large power plants. Media reports have strongly suggested that such a move is being targeted by the Bangladesh government.[21] **It should therefore be expected that JICA will not provide funding for the Matarbari 2 coal power proposal**, and that this project will be amongst those cancelled.

- Furthermore, **a least-cost power system cannot be achieved by replacing coal power proposals with LNG-fired power**. To be aligned with the 8FYP, the new power plan must *not* include increased emphasis on LNG-fired power. Along with the expensive, additional infrastructure required by a shift towards LNG, such a move would expose Bangladesh to a fossil fuel with even greater price volatility than imported coal and place further economic burden on the nation. It would also do nothing to address overcapacity and likely expose Bangladesh to further, burdensome capacity payments. Given the full life cycle emissions of LNG are comparable to that of coal, it would also do little to alleviate the growing international pressure on nations to increase climate commitments. JICA cannot contribute to "a transformation to low or zero carbon energy system through formulating a comprehensive, long-term energy plan"[22] if that plan calls for increased import and combustion of LNG.

[20] Financial Express. Matarbari fast-track power project in need of more fund and time. 22 April 2021.
[21] Daily Sun. Govt to drop nine coal-fired power plants. 24 February 2021.
[22] JICA. Signing of Record of Discussions on Technical Cooperation for Development Planning with Bangladesh. 15 March 2021.

- **A renewed focus on energy efficiency should be a key part of IEPMP.** Overcapacity has meant that energy efficiency has not been prioritised but will become more important if Bangladesh stops or slows the additions of expensive coal- and LNG-fired power and starts increasing the utilisation of existing thermal power plants. Energy efficiency can then help limit the amount of new power capacity needed to meet demand growth, meaning low-cost renewable energy can fulfil a greater proportion of that growth. The 8FYP has clearly identified energy efficiency gains as a key goal. Fortunately, **Japan is an energy efficiency world leader and well placed to help Bangladesh planned for increased efficiency** as well as being able to provide many of the efficient products that can achieve it.

- A least-cost power system needs to embrace the plunging cost of renewable energy. **A significant scaling up of renewable energy ambition** would see Bangladesh enjoy the rapid decline of solar power tariffs seen in neighbouring India. Bangladesh's Sustainable and Renewable Energy Development Authority (SREDA) published its draft National Solar Energy Roadmap 2021-2041 in December 2020.[23] Under its high solar deployment scenario – which is the one it recommends be implemented – 30,000MW of solar would be targeted for installation by 2041. SREDA envisages how such ambition can get around land constraints by installing panels on rooftops and in designated solar parks. The IEPMP should be informed by this National Solar Energy Roadmap and show the same level of solar ambition.

- In addition to solar, **wind power potential should not be neglected** by the IEPMP, particularly given that the most recent technology can utilise wind resources considered unexploitable several years ago. The potential for offshore wind also needs to be considered by JICA. Japan is itself planning significant offshore wind investment and, with the technology costs declining fast[24], there is no longer any reason why it now cannot be part of a long term power plan for Bangladesh.

- Although Bangladesh currently has little grid-scale renewable energy installed, the long term outlook of the IEPMP means that **plans should be put in place for the roll out of power storage technologies like batteries** that can store renewable energy in the future. Although still relatively expensive, the cost of such storage technology is declining fast and will become a cost-effective way of meeting peak demand relative to more gas-fired power plants that would stand idle much of the time.

[23] SREDA. Draft National Solar Energy Roadmap 2021-2041. December 2020.
[24] Renew Economy. Giant offshore turbines set to drive plummeting cost of wind power. 16 April 2021.

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