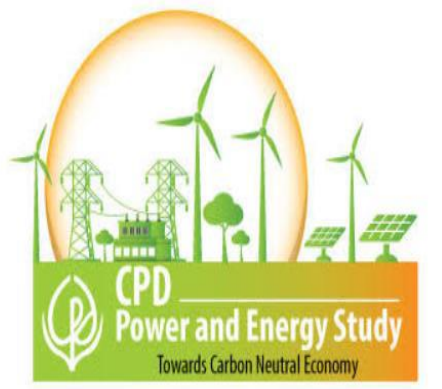


Integrated Energy and Power Master Plan (IEPMP)
(Interim Report)
Can it address the clean energy targets?

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1. Background

1. Background

1.1 Introduction

- The Ministry of Power, Energy and Mineral Resources (MoPEMR) **has prepared a draft** master plan for the energy and power sector titled *Integrated Energy and Power Master Plan (IEPMP)*
 - This is the **first time** the government of Bangladesh is preparing an integrated master plan for the energy sector
 - The new integrated plan has **accommodated** the following individual energy related plans such as: a) Energy efficiency and conservation Masterplan 2016; b) Gas Sector Masterplan 2017; c) Renewable Energy Policy 2008 ; d) Coal Draft Policy 2008
- The final plan is likely to be **published** in March 2023
 - The Interim Plan has been already prepared and has been **discussed in meetings** with CSOs, academia's, think tanks
- The plan is coming out at **such a time**, when the sector is going through a short to medium term crisis
 - However, even of the challenges are short to medium term in nature, the plan **should go beyond** to address these situation in medium and long term
- Therefore, it is crucial **to review the IEPMP** to understand how it will achieve the **clean energy targets** amid contemporary challenges
 - Strategies to be adopted for the power and energy sector keeping in mind the issue of **energy security** in the coming years

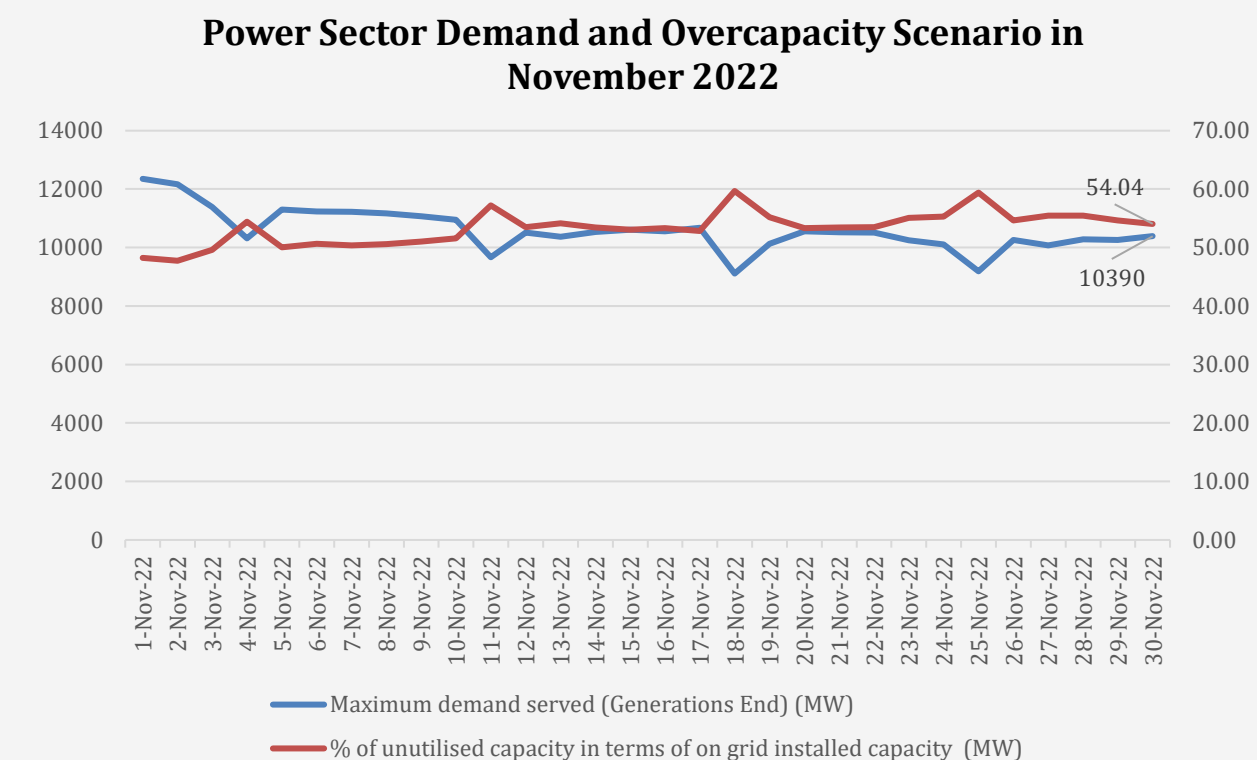
1.2 IEPMP 2021

- The Ministry of Power Energy and Mineral Resources (MoPEMR) is **leading** the formulation of the IEPMP
- Technical support is prepared by the Japan International Cooperation Agency (**JICA**)
 - Previous **3 PSMPs** (2005, 2010 and 2016) were also supported by JICA
- Institute of Energy Economics, Japan (IEEJ) **an academic institute**, has undertaken the assignment
 - The **technical aspects** such as energy and power development plan, long term policy outlooks, demand methodologies, SEA and other critical issues have been developed, reviewed and assessed by them
- The **new integrated plan aims** to set forth a long-term energy plan **covering every sector** and **energy source** in consideration of the present conditions in Bangladesh and the **global momenta toward low-carbonization and/or decarbonization**

1. Background

1.3 Current State of the Power and Energy Sector (November 2022)

- There has been a **substantial mismatch** between the demand and supply in the power and energy sector
- **Power**
 - Demand: Maximum power demand from the generation's end was 12350 MW
 - Supply: Maximum supply 10250 MW (on 30 November, 2022)
 - Excess reserve capacity in November, 2022 was as high as 13493 MW (60%) against the total installed capacity of 22608 MW
- **Oil**
 - Demand: 4,60,000 lac metric ton
 - Supply: 4,60,000 lac metric ton



Source: Prepared by authors

Electricity Generation (Fuel type), 18 December, 2022

Fuel Type	Total Installed Capacity	No. of Plants in Operation	No. of Plants Shut Down	Reasons
Gas	70	44	26	Shortage of Gas
HFO	65	51	14	Line Overload
HSD	10	0	10	
Coal	7	3	4	Coal Shortage
Hydro	1	1	0	
On-Grid Solar	10	10	0	

Source: Prepared by authors

1. Background

1.3 Current State of the Power and Energy Sector

- During January-December 2022, a **gap** existed between the overall **gas demanded and supplied**.
 - Monthly average gas demand during 2022: **3500 mmcf per month**
 - Monthly average gas supply was **2828 mmcf per month**
- Most of the gas supplied was from domestic production, while a part of it came from LNG imports
- As GoB has undertaken initiatives to explore new and old gas well maximum of 335 mcf daily is expected to be produced
- **LNG**
 - Demand: 1367 MMCFD
 - Supply: 368 MMCFD

Gap Between Demand and Supply of Natural Gas, 2022

Month	Demand	Domestic Production	LNG Import	Total (Domestic + LNG)
	mmcf	mmcf	mmcf	mmcf
January	3500	2306	442	2748
February		2314	544	2858
March		2326	674	3000
April		2277	729	3004
May		2169	750	2919
June		2341	744	3085
July		2247	500	2747
August		2327	564	2891
September		2305	481	2786
October		2260	381	2641
November		2133	368	2501
December*		2300	455	2755

Source: Prepared by authors based on official data

1. Background

1.3 Current State of the Power and Energy Sector (November 2022)

- The GoB has decided to **stop importing fuels** specially LNG, after the prices in global market has skyrocket
- Decisions have been taken to **shut all diesel-run power plants** by next June,2023 and the power plants run on other types of oil will also be phased out within the next two to three years
 - As a result, all the **oil-based power plants** will be phased out by **2025**
- The GoB is now preparing a **guideline allowing the private sector** to import oil and gas and retail the products to consumers
- The **trial run of the transmission system** of Payra 1,320MW Thermal Power Plant has been started
 - Electricity is set to be transmitted to Dhaka as both sides of the Padma River have been connected with power transmission lines
 - The same transmission line will be **used to add electricity from Rampal 1,320MW** coal plant to the national grid
- Using the electricity generated from imported coal in Payra and Matarbari power plants at this time when power sector is suffering from over capacity **can create additional pressure** in the reserve
 - As the global coal price also demonstrates an increasing price trend, the **importing coal** may not be a good idea
- Additionally, plans for **installing rooftop solar PVs** in primary schools and transforming **diesel irrigation** system to solar irrigation system have been proposed

1. Background

1.3 Current State of the Power and Energy Sector (November 2022)

- The government has increased the price of Liquefied Petroleum Gas (LPG) again at a retail level on 4th December, 2022
 - The price of each 12-kilogram cylinder of LPG has been increased by Tk 46 to Tk 1,297
 - Current crisis forced the government to take some decisions which would have negative implications
- On December 1, the government issued **an amendment to the Bangladesh Energy Regulatory Commission (BERC) Act, 2003**, empowering the power and energy ministry to set fuel and electricity prices under special circumstances
 - Previously, according to the law, the prices of energy commodities could only be fixed by BERC

2. Analytical Frame of IEPMP 2021

2.1 Contextual Issues

IEPMP

- **Key policies** have been discussed
- Some of the policy related **targets are mentioned**
- **Renewable** energy related targets are **less focused**
- **Advanced technologies** have been referred as '**questionable**'

CPD

- CPD pressed to refer all relevant policies
- Discussion avoids clean energy perspectives in detail
- Not having a conclusive scenario on power and energy demand based on major policies

PSMP16

- From, the contextual aspect between PSMP 16 and IEPMP, **PSMP** focused more on attaining the **efficient energy** goal while IEPMP additionally incorporated some pathways towards achieving **sustainable clean energy**

2.2 Scenario Setting

IEPMP

- Reference Scenario (REF)-
 - Gas remains as a major fuel in the mix along with oil and coal
 - Nuclear power will also be a part of the mix.
 - Imported fuels is predicted to increase by 2050
- Advanced Technology Scenario (ATS)-
 - The fuel mix is similar to that of REF scenario.
 - Notably after 2030 it is predicted that solar, hydro and clean energy will be a part of energy mix.
 - Ammonia will be adopted also in ATS, but it will be much more moderate than in NZS
- Net Zero Scenario (NZS)-
 - Coal-fired power will shift to ammonia after its introduction as co-firing fuel.
 - Gas-fired power, will be replaced by hydrogen fired power very rapidly after its introduction

CPD

- There should be a **new scenario** based on the RE; RE Scenario (40% of RE by 2041)
- Govt. should focus on **domestic gas** in spite of relying on imported fuels
- Govt. should gradually **step aside** from socially and economically expensive fuel
- There should be a **roadmap** regarding how the fuel mix can be gradually transferred from coal to renewables

PSMP16

- No scenario

2.3 Methodological Approaches

IEPMP

- Technological assessment model
 - Bottom-up approach
- Econometric modeling
 - Regression analysis
- Micro level demand forecasting was adopted

CPD

- Recommended to follow a bottom-up approach for demand forecast
- A simple forecast was not enough and suggested for an inclusive regression model rather than using Correlation analysis, Electricity Intensity Method, GDP Elasticity Method

PSMP 16






- Correlation analysis, Electricity Intensity Method, GDP Elasticity Method were mostly used in PSMP 16 which was **further improved in IEPMP** by applying **bottom-up approach** with regression analysis

2.4 Key Variables

- IEPMP
- The power demand forecast in IEPMP is not entirely based in the GDP growth rate **rather includes several variables** such as GDP, Population, Energy Prices, Previous Demand, Exchange Rates and International Trade
- CPD
- It was strongly recommended that projection based on only GDP is a faulty way rather variables such as the income of a household, population, historical load data weather or temperature can be incorporated in the projection
- PSMP 16
- PSMP 16 incorporates mostly projections based on GDP while IEPMP improves it by adding six more variables.






2.5 Cross-Country Evaluation

2. Analytical Frame of IEPMP 2021

					
Timeframe	Power Development Plan (PDP) 2018-2037 aims to improve energy efficiency and enhance energy security in Thailand.	Vietnam's ministry of industry and trade (MoIT) has been asked to finalise the National Power Development Plan (PDP) VIII from 2021 till 2030 with a vision till 2045 , focusing on reducing coal-based power.	In the 6th Strategic Energy Plan (SEP), the key theme is to realize carbon neutrality by 2050 and reduce greenhouse gas emissions by 46% in FY 2030 from its FY 2013 levels.	Sri Lanka's Energy Sector Development Plan for Knowledge-based Economy, 2015-2025 places a strong emphasis on energy security from both national and individual perspectives.	The draft IEPMP has been prepared based on the plan to turn Bangladesh into a developed country by 2041 . A carbon-neutral economy by 2050 .
Energy Mix (RE)	The 10-Year Alternative Energy Development Plan 2012 – 2021 is targeting on increasing the share of RE and alternative energy uses by 25% instead of fossil fuels within the next 10 years .	Currently, power production is dominated by RE, with a share of 40% in electricity generation,	The 6 th SEP increased the country's RE generation target from the previous 22%-24% to 36%-38% by 2030 .	Renewable energy to make up 20% of energy generation in 2023 .	Renewable energy makes up 3.68% of energy generation. RE by 40% by 2041 .

2.5 Cross-Country Evaluation

2. Analytical Frame of IEPMP 2021

					
Energy Efficiency & Conservation (EEC)	The 20-Year Energy Efficiency Development Plan 2011 – 2030 is targeting on 25 per cent reduction of energy intensity (ratio of energy consumption to GDP) of the country within 20 years (2011 – 2030).	Vietnam Energy Efficiency Program (VNEEP 3) expects to save 8-10% of national energy consumption and a 6.0% power loss reduction through 2030 .	The goal is to improve energy efficiency by about 40% between 2012-2030 .	A 10% reduction in total energy demand will be realized by 2020 through EEC.	Under the Energy Efficiency and Conservation Master Plan, the government aims to lower energy intensity in 2030 by 20% compared to the 2013 level .
Technological Advancement – Carbon capture technology (CCT)	Thailand's first CCT project will be put into operation by 2026 .	Vietnam is yet to adopt CCT .	Japan's industry ministry plans to create a legal framework for CCT to enable companies to start storing CO2 underground or under the seabed by 2030.	Techno-economic feasibility studies of implementing CCT are being carried out.	Neither Bangladesh have CCT installed in any power plants, nor have any feasibility studies been carried out on the topic of CCT.

Source: Prepared by authors

2.5 Cross-Country Evaluation

From the perspective of clean energy

- **Timeframe**
 - Bangladesh's timeframe of IEPMP is **adequate** in comparison with other countries.
- **Energy Mix**
 - While other countries are trying to become less dependent on fossil fuels and move towards renewable energy, Bangladesh **lags behind** in this scenario as the country's energy mix is heavily focused on fossil fuels
- **Energy Efficiency and Conservation**
 - The energy efficiency and conservation targets set for Bangladesh are similar to other countries; however, Bangladesh **lags in achieving the target** due to inadequate guidelines.
- **Technological Advancement – Carbon capture technology (CCT)**
 - Countries such as Thailand, Vietnam, and Japan are way ahead in adopting CCT in their power and energy sector – carrying out feasibility tests, impact evaluation, and creating a legal framework for CCT.
 - Bangladesh, in this context, has done nothing; the **concept of CCT** is not very known or popular in this county.

3. Energy Security

3.1 Power Development Plan

GDP Case Setting

IEPMP

- 3 GDP cases (1 main and 2 exercise): REF, PP2041, in between
- Real GDP: Perspective Plan 2041
- GDP In- between case
- IMF Ext Case

CPD

- GDP growth rate used in previous PSMPs seemed overestimated and unrealistic.
- It was suggested that the projection of power demand should be based on a more practical growth rate

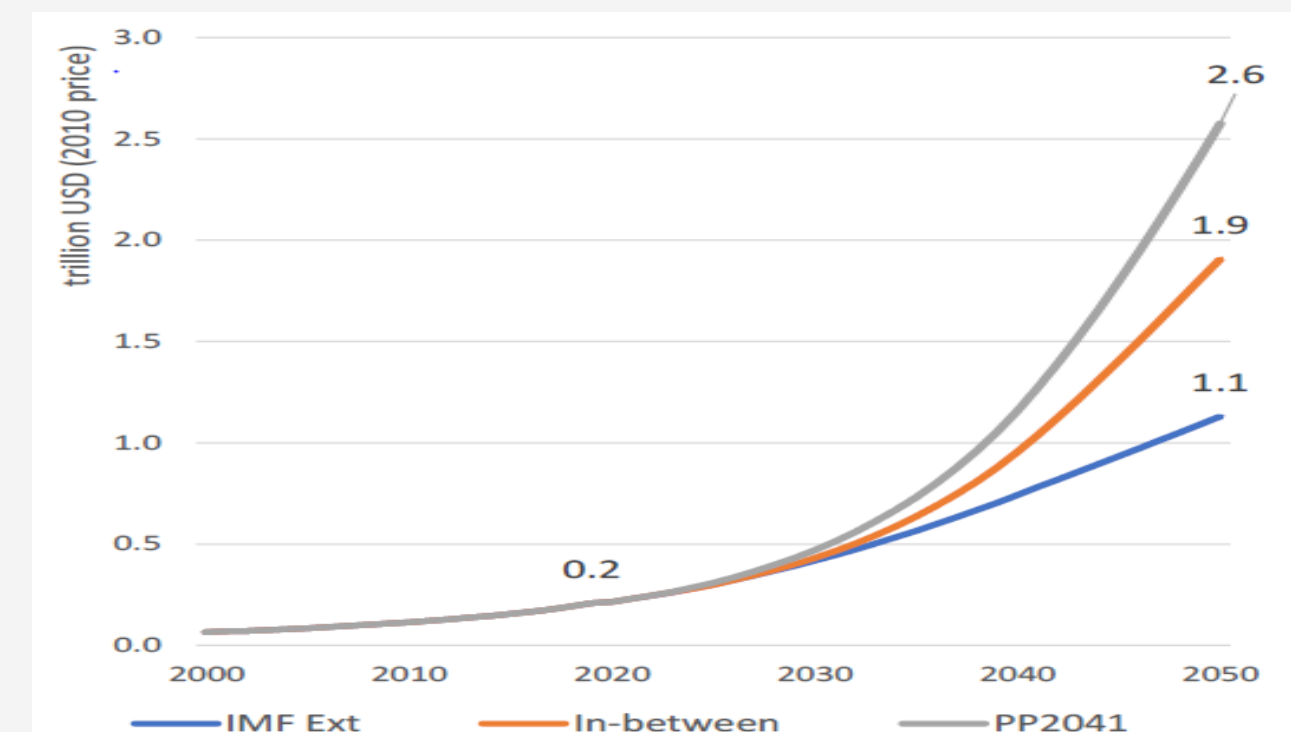
3. Energy Security

3.1 Power Development Plan

- The In-between case has been set according to the deviation rates between planned and actual growth rates during the 6th and the 7th five-year plan periods
 - The annual deviation rate is estimated at -1.1% in the In-between Case on average
 - This estimation method was developed by the discussion between Planning Commission and JICA Study Team
- The **PP2041** Case will be the main case of the study which is **not a viable option** due to its overestimation of achieving more than 12500 USD income per capita by 2050.
- Rather the exercise case of **IMF projections** can be a plausible alternative to have a proper estimate

GDP Case Setting

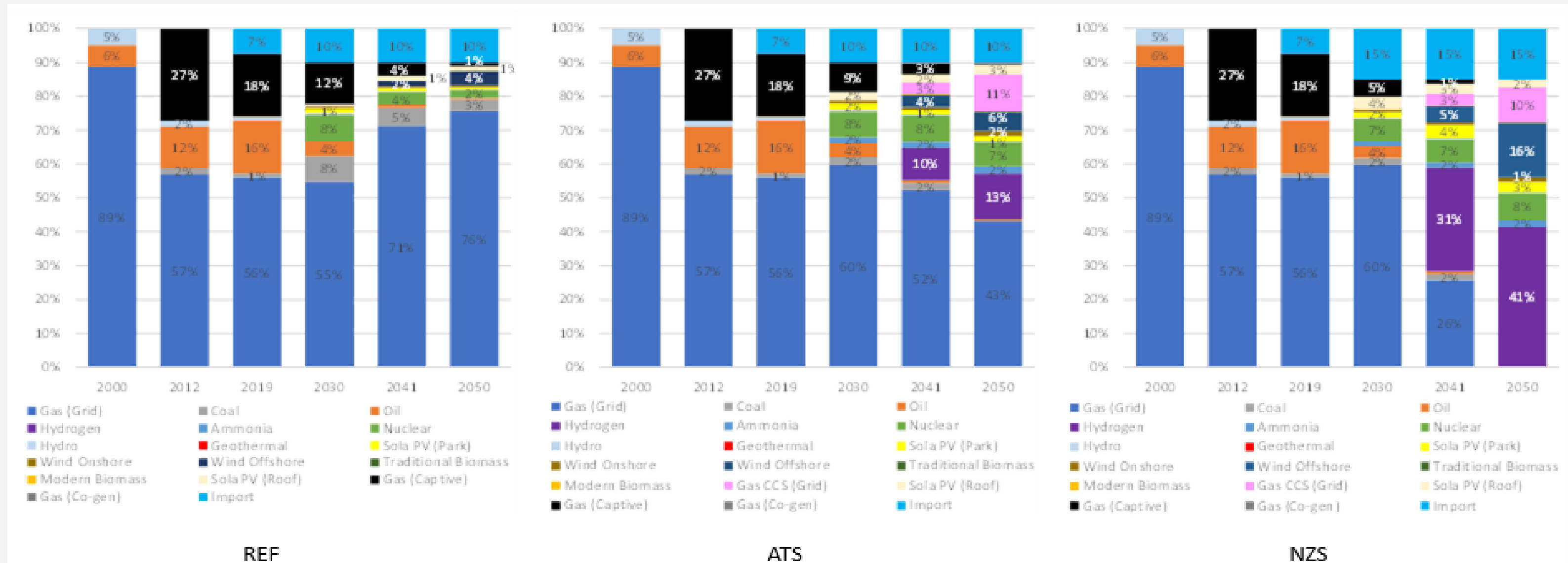
Year	PP2041	In- between	IMF Ext.
2000		5.30%	
2012		6.50%	
2019		8.20%	
2020		3.50%	
2021		6.90%	
2025	8%	6.90%	7.20%
2030	8.90%	7.70%	6.60%
2035	9.40%	8.20%	6.00%
2041	9.90%	8.70%	5.30%
2045	8.50%	7.30%	4.30%
2050	6.80%	5.60%	3.60%



Source: IEPMP Interim Report

3. Energy Security

3.1 Power Development Plan: Generation Mix



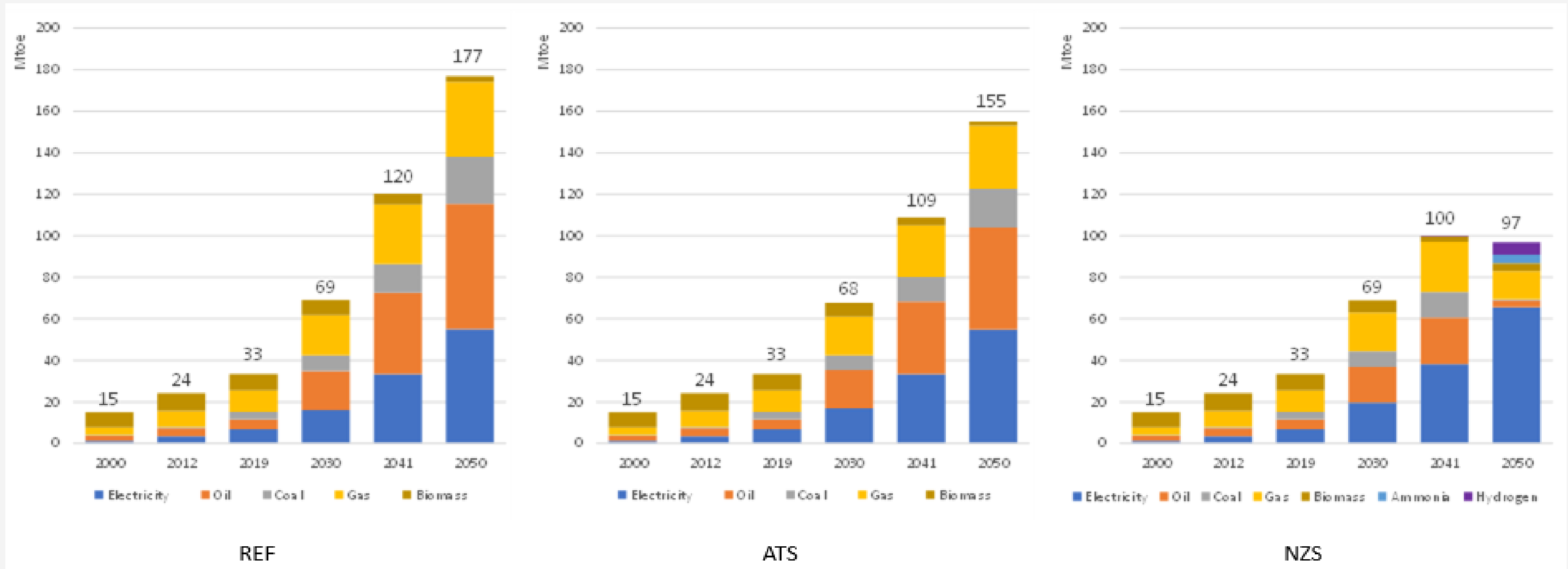
Source: IEPMP Interim Report

- The REF scenario is mostly dominated by Gas (Grid) by 2050 while the NZS includes a balanced mix of nuclear, solar, hydrogen, Gas(CCS), Ammonia etc.
- Both ATS and NZS scenario are not pragmatic for Bangladesh
- A new scenario called “40 percent power generation from renewable energy by 2041” is proposed by CPD

3.2 Scenario Analysis of Energy Mix

3. Energy Security

Fuel Mix Scenario based on IEPMP



Source: IEPMP Interim Report

- The REF scenario depicts the projected 2050 based on Coal, Oil and Gas while ATS slightly changed the mix for coal
- The NZS includes Ammonia, Hydrogen as alternatives for coal.
- JICA opined that NZS scenario is mostly impossible for Bangladesh and suggested to not opt for it

3.2 Scenario Analysis of Energy Mix

Coal Reserve (as discussed in the IEPMP)

Coal Field	Area (sq. km)	Depth (m)	Reserve (mil. Ton)	Status
Barapukuria U/G	6.68	118-509	390	In operation
Barapukuria O/C				F/S Ongoing
Digipara U/G	24	328-455	706	F/S Completed
Jamalganj U/G	11.5	640-1158	5,450	F/S Completed
Phulbari O/C	16	150-240	572	F/S Completed
Kalaspur U/G	7.5	222-516	685	F/S Not Yet
Total			7,803	

Source: IEPMP Interim Report

3.2 Scenario Analysis of Energy Mix

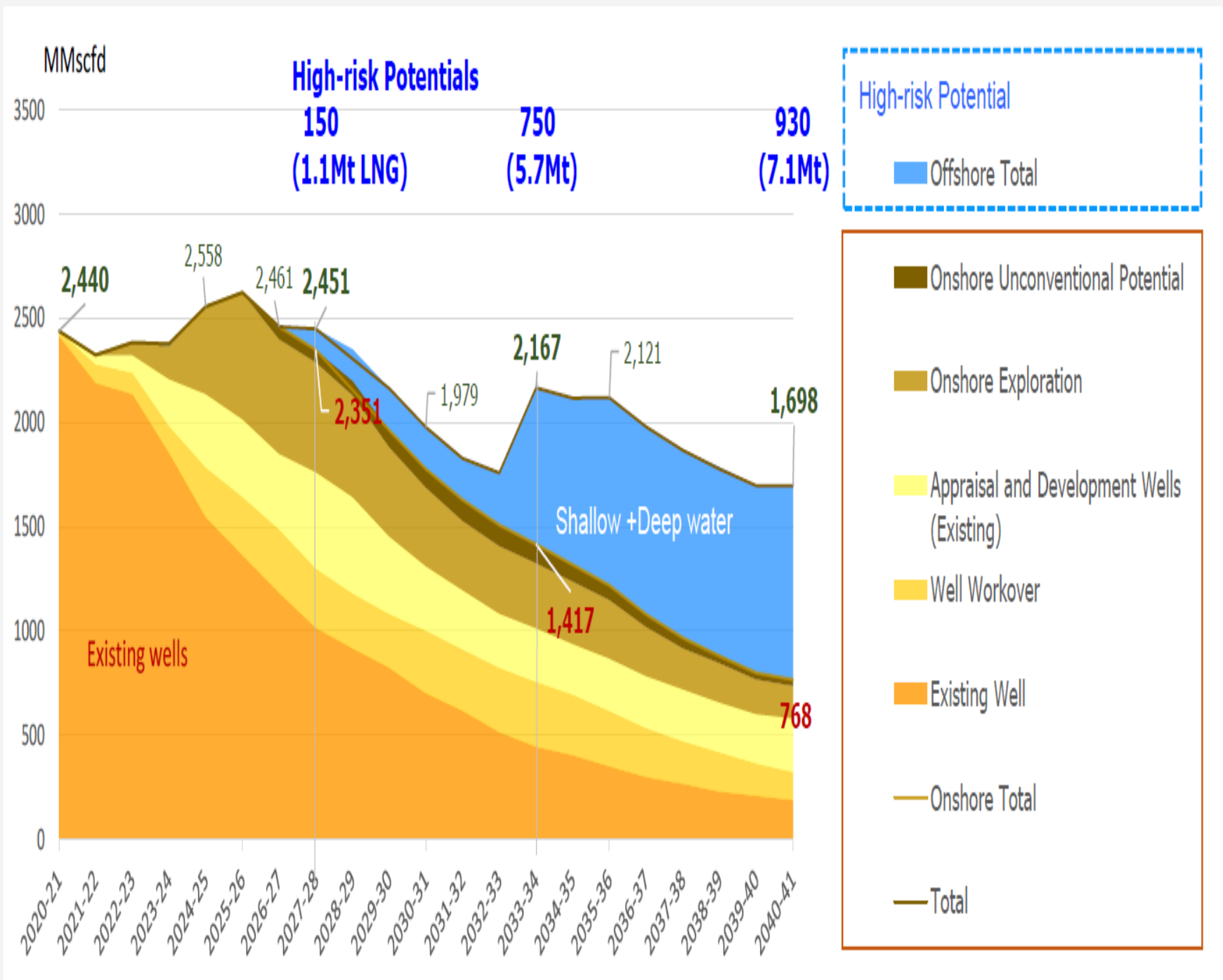
3.2.1 Coal

- Updated version of the IEPMP **tries to promote coal-based energy**
 - Bangladesh's total coal reserves are 7.8 billion tons, which equates to 200 Tcf of natural gas (even with a 10% recovery rate, this still amounts to 20 Tcf, or 2,730 million cf/d for 20 years).
- Feasibility study has been completed- Expansion plan of Barapukuria Coal Mine (BCMCL), Development plan for Dighipara coalfield, CBM at Jamalgonj.
- The government **strongly believes that new development of domestic coal should be avoided** due to the problems faced by local residents and environmental issues
 - The dependency on imported coal needs to be reduced and substituted by alternative renewable energy sources to achieve the goal of clean energy.
- The policy must **adhere to the global “Just Transition “** coal phasing out momentum to have a sustainable and clean energy supply.
- The early **retirement plans for Operational Coal Based Power plants** can be expedited through an abandonment policy including a compensation package for both public and privately owned power plants²⁵

3. Energy Security

3.2 Scenario Analysis of Energy Mix

Domestic Natural Gas Production as Projected in the IEPMP



Source: JICA-IEPMP Focused Group Meeting

Domestic Natural Gas Supply Balance as Projected in the IEPMP

	2019	2022	2030	2035	2040	2045	2050
Gas Demand	mmcfd	mmcfd	mmcfd	mmcfd	mmcfd	mmcfd	mmcfd
PP2041	2870	2987	3384	4008	4985	5823	8142
In-Between	2870	2989	2879	3213	3717	3982	4545
Production							
Low Risk Potential	2494	2386	1779	1221	768	580	470
High Risk Potential			200	900	930	1080	1230
Total	2494	2386	1979	2121	1698	1660	1700
LNG Demand (mmscfd)							
PP2041: Base	376	601	1405	1887	3287	4163	6442
Without High Risk Potential	376	601	1605	2787	4217	5243	7672
In-Between: Base	376	603	900	1092	2019	2322	2845
Without High Risk Potential	376	603	1100	1992	2949	3402	4075
LNG Demand (million tonnes)	Mt	Mt	Mt	Mt	Mt	Mt	Mt
PP2041: Base	2.9	4.6	10.8	14.5	25.2	31.9	49.4
Without High Risk Potential	2.9	4.6	12.3	21.4	32.3	40.2	58.8
In-Between: Base	2.9	4.6	6.9	8.4	15.5	17.8	21.8
Without High Risk Potential	2.9	4.6	8.4	15.3	22.6	26.1	31.2

Source: IEPMP Interim Report

3.2 Scenario Analysis of Energy Mix

3.2.2 Natural Gas

- IEPMP focuses on the demand for natural gas
 - The Gas Demand for 2050 has been projected **at 8142 mmcfd** according to PP2041 and **4545 mmcfd** according to the In-between scenario.
 - Based on the demand, the projected low-risk potential (On-shore) production will be 470 mmcfd in 2050.
 - The projected production from high-risk potential (Off-shore) is 1230 mmcfd which totals **1700 mmcfd**.
- Onshore and offshore production from new sources is anticipated to increase existing production.
 - The production attained by the current drilling program is one of these new sources.
- Exploration efforts have **not yet established** offshore potential.
- There is tendency to **depend on imported gas (LNG)**.

3.2 Scenario Analysis of Energy Mix

3.2.2 LNG

- IEPMP promotes LNG
 - The demand for LNG is projected from the **PP 2041** for the year 2050 is **7672 mmcdf** (Without high-risk potential)
 - The demand for LNG is projected from the **in-between case** for the year 2050 is **4075 mmcdf** (Without high-risk potential)
- The **shallow topography** of Bangladesh restricts the options for locations for **LNG receiving terminals**.
 - Following the completion of the **Matarbari onshore LNG terminal**, more pipeline connections to Dhaka will be required as **LNG imports rise**.
 - Due to this, a total of 1,000 mmcfd of LNG vaporized gas has been delivered to the pipeline by two offshore LNG receiving terminals using FSRUs
- LNG-based energy development **needs to be substituted** by domestic gas
 - A **huge investment is required** to establish the LNG based infrastructure

3. Energy Security

3.2 Scenario Analysis of Energy Mix

3.2.4 Oil

- Major planned projects include- **Distillation unit 2 at the ERL U2, New SPM, One LPG import terminal**
 - Petroleum products import pipeline from India
 - IEPMP assumes the following additional supply capacity projects until 2050: **Additional crude distillation unit, New SPM, Additional LPG terminals**
- The total liquid fuel demand is projected to be **43.1 million tons per year in FY2050.**
 - Oil is heavily used based on imports which need to be replaced by clean energy sources
 - The supply capacity projects need to have a proper monitoring and evaluation module
 - Feasibility studies of renewable energy replacing oil should be constructed in terms of efficiency, affordability, and sustainability
 - A huge investment is required** for setting up relevant infrastructure

Petroleum Supply Plan according to the IEPMP

Unit: million tons per year	2021FY	2030FY	2041FY	2050FY
Total Liquid Fuel Demand	12.3	17.5	30.4	43.1
Refinery Production	2.0	5.0	10.0	8.5
ERL-1	1.5	1.5	1.5	
ERL-2		3.0	3.0	3.0
ERL-3 (replace ERL-1)			5.0	5.0
Other Small Refineries	0.5	0.5	0.5	0.5
Product Import (excl LPG)	8.9	10.0	15.4	24.6
BPC@Chittagong	4.5	5.0	5.0	5.0
IBFPL		1.0	1.3	1.3
SPM-1@Chittagong		3.0	9.0	9.0
New SPM@TBD (excl crude oil)			0.1	9.3
HSD/FO for IPP	4.4	1.0	0.0	0.0
LPG	1.4	2.5	5.0	10.0
Existing LPG Terminal	1.4	1.5	2.0	2.0
ERL	0.0	0.1	0.3	0.2
New LPG Terminals@TBD		0.9	2.7	7.8

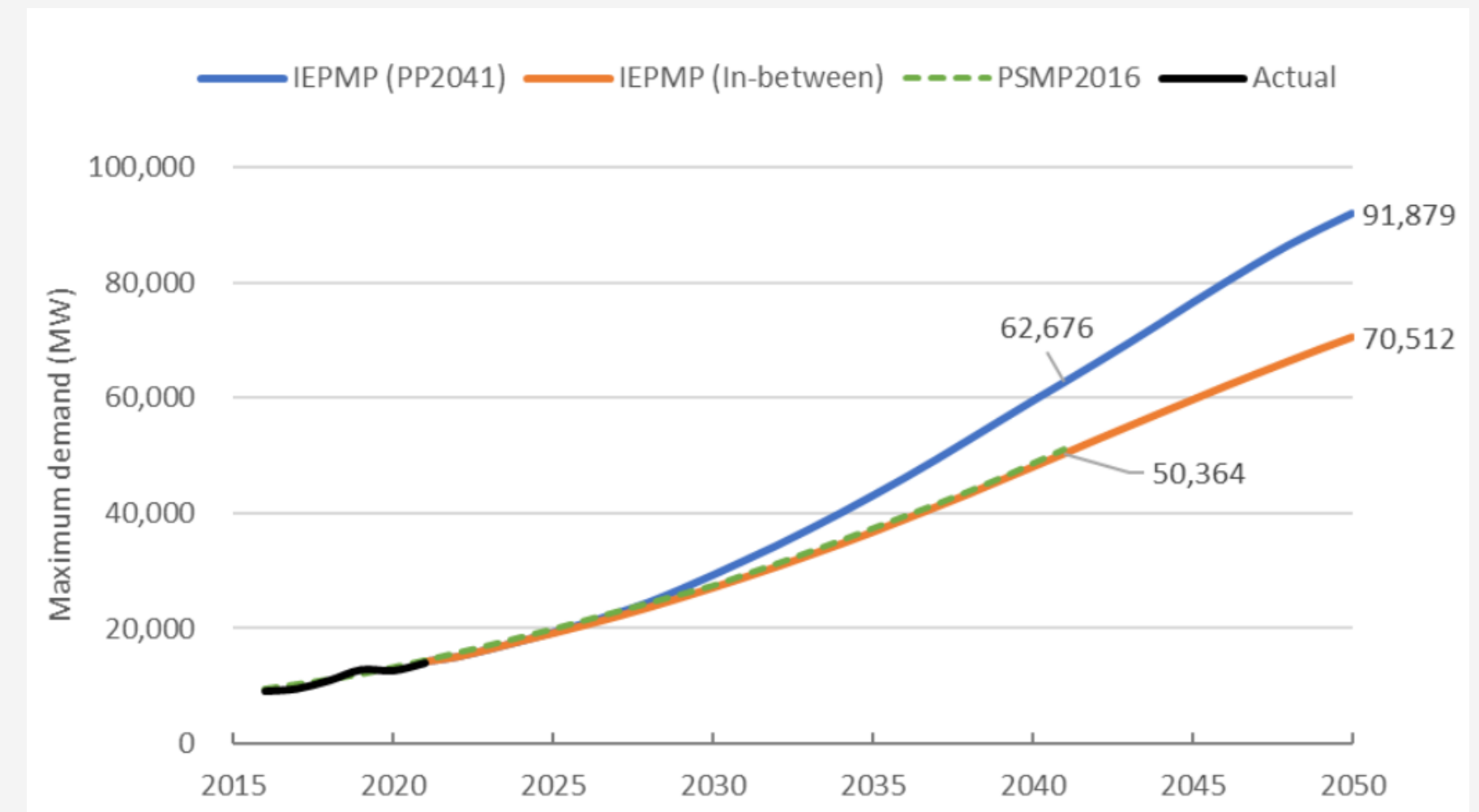
Source: IEPMP Interim Report

3. Energy Security

3.2 Scenario Analysis of Energy Mix (Power Demand Forecast)

Electricity Demand Forecast

- As the PP2041 case as been considered the main case at 7.2% GDP growth rate the maximum demand for electricity will be 29257 MW by 2030
 - This seems overly ambitious as the highest demand in 2022 was 14,792 MW (as of 16 April 2022)
 - The demand needs to rise **about 200 percent in 8 years**
- It is forecasted that in **2050 maximum** power demand will be **90000 MW**



	2019		2030		2041		2050	
	Growth Rate	Maximum demand (MW)	Growth Rate	Maximum demand (MW)	Growth Rate	Maximum demand (MW)	Growth Rate	Maximum demand (MW)
PP2041	7.70%	12,893	7.20%	29,257	4.30%	62,676	6.50%	91,879
In- between	7%	12,893	5.80%	27,087	3.80%	50,364	5.60%	70,512

3.3 Final demand (Technology Settings)

3. Energy Security

Under NZS

- Three technological settings are considered.
 - NZS
 - ATS
 - BAU
- Based on the discussions in the consultation meetings in May and June 2022, some changes in technological settings have been proposed.

Issues	June Draft	December Updates
Energy Conservation in Industry Sector	-43.2% (-2.0%/year) in 2050 from the REF level w/o price effect.	-43.2% (-2.0%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Industry Sector	+20.0% points in 2050 from the REF level w/o price effect.	+15% points in 2050 from the REF level, holding other conditions constant.
Hydrogen in Industry Sector	Non-electricity energy will shift to hydrogen through 2050.	Non-electricity energy will shift to hydrogen through 2050.
Fuel Economy in Road Sector	IMF Ext: +149% in 2050 from the 2019 level In-between: +174% in 2050 from the 2019 level PP2041: +201% in 2050 from the 2019 level	IMF Ext: +130% in 2050 from the 2019 level, In-between: +170%, PP2041: +200%
Evs in Road Sector	100% of passenger light-duty vehicles (PLDVs) and 90% of trucks and buses (TRBSs) will shift to electric vehicles (EVs) in 2050.	100% of passenger light-duty vehicles (PLDVs) and 90% of trucks and buses (TRBSs) will shift to electric vehicles (EVs) in 2050.
Hydrogen in Road Sector	10% of TRBSs will become fuel-cell vehicles (FCVs) in 2050.	10% of TRBSs will become fuel-cell vehicles (FCVs) in 2050.
Energy Conservation in Residential Sector	-34.5% (-1.5%/year) in 2050 from the REF level w/o price effect.	-34.5% (-1.5%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Residential Sector	100% electrification.	100% electrification.
Energy Conservation in Commercial Sector	-43.2% (-2.0%/year) in 2050 from the REF level w/o price effect.	-43.2% (-2.0%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Commercial Sector	100% electrification.	100% electrification.

Source: Prepared by authors

3.3 Final demand (Technology Settings)

3. Energy Security

Advanced Technology Scenario

Issues	June Draft	December Updates
Energy Conservation in Industry Sector	-24.5% (-1.0%/year) in 2050 from the REF level w/o price effect.	-24.5% (-1.0%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Industry Sector	+10.0% points in 2050 from the REF level w/o price effect.	+10% (+5%*) points in 2050 from the REF level, holding other conditions constant.
Hydrogen in Industry Sector	-	-
Fuel Economy in Road Sector	IMF Ext: +6% in 2050 from the 2019 level In-between: +34% in 2050 from the 2019 level PP2041: +65% in 2050 from the 2019 level.	IMF Ext: +5% in 2050 from the 2019 level, In-between: +35%, PP2041: +65%.
Evs in Road Sector	About 40% of PLDVs and 10% of TRBSs will shift to EVs in 2050.	About 40% of PLDVs and 10% of TRBSs will shift to EVs in 2050.
Hydrogen in Road Sector	-	-
Energy Conservation in Residential Sector	-13.1% (-0.5%/year) in 2050 from the REF level w/o price effect.	-13.1% (-0.5%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Residential Sector	+15.0% points in 2050 from the REF level w/o price effect.	+15% (+7.5%*) points in 2050 from the REF level, holding other conditions constant.
Energy Conservation in Commercial Sector	-13.1% (-0.5%/year) in 2050 from the REF level w/o price effect.	-13.1% (-0.5%/year) in 2050 from the REF level, holding other conditions constant.
Electrification in Commercial Sector	+1.3% points in 2050 from the REF level w/o price effect.	+1% points in 2050 from the REF level, holding other conditions constant.

* ATS In-between & ATS IMF Ext cases

Source: Prepared by authors

3.3 Final demand: Summary (Technology Settings)

Under NZS

- There has been **no change to the position** on Energy Conservation in Industry Sector, Hydrogen in Industry Sector, Evs in Road Sector, Hydrogen in Road Sector, Energy Conservation in Residential Sector, Electrification in Residential Sector, Energy Conservation in Commercial Sector, and Electrification in Commercial Sector
- Positions on electrification in Industry Sector and Electrification in Commercial Sector **have deteriorated**

Advanced Technology Scenario

- Positions on electrification in Industry Sector, Evs in Road Sector, Hydrogen in Road Sector, Energy Conservation in Residential Sector, Electrification in Residential Sector, and Energy Conservation in Commercial Sector have no change
- Positions on hydrogen in Industry Sector, Fuel Economy in Road Sector, and Electrification in Commercial Sector **have deteriorated**

3.4 Supply side of Power Generation (Technology Settings)

3. Energy Security

Under NZS

Issues		Interim Report	SHM3
Renewables	Solar PV (Solar Park, Irrigation)		16 GW in 2050 with land use restriction
	Solar PV (Rooftop)	45 TWh (25.7 GW considering 20% LoE) in 2050 with land use restriction	12 GW in 2050 on rooftops of the buildings
	Onshore wind	10 TWh (0.6 GW considering 20% LoE) in 2050 on rooftops of the buildings	5 GW in 2050, mainly coasts
	OFFshore wind	130 (74.2 GW considering 20% LoE) TWh in 2050, mainly coasts	50 GW (near seas + EEZ) in 2050 excl. heritage
Nuclear	Eight (8) units by 2050		Eight (8) units by 2050
Coal-fired	50% ammonia co-firing around 2030 and 100% ammonia single-firing around 2042		50% ammonia co-firing around 2030 and 100% ammonia single-firing around 2042
Gas-fired	100% hydrogen single-firing will start around 2035 and replace 70% of gas-fired power through 2050. Gas-fired with CCS will start around 2036 and achieve 30% of the gas-fired power in 2050		100% hydrogen single-firing will start around 2035 and replace 70% of gas-fired power through 2050. Gas-fired with CCS will start around 2036 and achieve 30% of the gas-fired power in 2050
Oil-fired	For about 1% of grid net power generation in 2041, oil-fired power will remain through 2050.		For about 1% of grid net power generation in 2041, oil-fired power will remain through 2050.
Captive	Conventional captive power will be zero in 2050.		Conventional captive power will be zero in 2050.
Import			15% of total electricity demand through 2050

3.4 Supply side of Power Generation (Technology Settings)

Under ATS

3. Energy Security

Issues		Interim Report	SHM3
Renewables	Solar PV (Solar Park, Irrigation)		6 GW in 2050 with land use restriction
	Solar PV (Rooftop)	30 TWh in 2050(18 GW considering 20% LoE)	12 GW in 2050 on rooftops of the buildings
	Onshore wind	10 TWh in 2050 (0.6 GW considering 20% LoE)	5 GW in 2050, mainly coasts
	Off shore wind	40 TWh in 2050 (24 GW considering 20% LoE)	15 GW (near seas + EEZ) in 2050 excl. heritage
Nuclear	Six (6) units (four (4) units*) by 2050	50%	Six (6) units (four (4) units*) by 2050
Coal-fired	50% ammonia co-firing around 2030 and 100% ammonia single-firing around 2049		20% ammonia co-firing around 2030 (2035*) and 50% ammonia co-firing around 2035 (2040*)
Gas-fired	100% hydrogen co-firing will start around 2035 (2037*), 50% hydrogen co-firing will start around 2040 (2045*).Gas-fired with CCS will start around 2036 (2040*) and achieve 77 TWh (38 TWh**) in 2050.		20% hydrogen co-firing will start around 2035 (2037*), 50% hydrogen co-firing will start around 2040 (2045*).Gas-fired with CCS will start around 2036 (2040*) and achieve 77 TWh (38 TWh**) in 2050.
Oil-fired	For about 1% of grid net power generation in 2041, oil-fired power will remain through 2050.		For about 1% of grid net power generation in 2041, oil-fired power will remain through 2050.
Captive	Conventional captive power will remain a little in 2050, while high-efficiency co-gen system will be introduced from 2031 and reach 300 MW (app. 30 MW*10 towns) in 2050 nationally.		Conventional captive power will remain a little in 2050, while high-efficiency co-gen system will be introduced from 2031 and reach 300 MW (app. 30 MW*10 towns) in 2050 nationally.
Import			Less than 12% of total electricity demand through 2050

3.4 Supply side of Power Generation: Summary (Technology Settings)

Under NZS

- **Positions on Renewables:** Solar PVs (solar park and irrigation) have been added, solar PV (rooftop) deteriorated, onshore wind deteriorated, and offshore wind **improved**
- **No change in the position** for Nuclear, Coal-fired, Gas-fired, Oil-fired, Captive

Advanced Technology Scenario

- **Position on Renewables:** Solar PVs (solar park and irrigation) have been added, solar PV (rooftop) deteriorated, onshore wind, and offshore wind **deteriorated**
- No change in the position for Nuclear, Oil-fired, and Captive

3. Energy Security

3.5 Supply Reliability and Reserve Margin

- The plan still **promotes a high reserve margin**
 - 30% for 2030
 - 25% for 2040
- The upward revision of the reserve capacity is not encouraged while we are bearing the burden of excess installed capacity
 - The **excess reserve capacity** ratio will further add to the financial burden of power sector
- The targeted unplanned outage has been targeted to reduce slowly
 - The target should be lowered, and technical measures should be taken accordingly to limit the power outage

Supply Reliability and Reserve Margin

	SHM3 (November 2022)		
	2030	2040	2050
Reserve capacity rate	30%	25%	20%
LOLE target (hours/year)	24	24	24
Unplanned outage rate	12% or less	11% or less	10% or less

Source: Prepared by authors

3.6 Transmission and Distribution System

Increase of South to North Power Flow

Reliability improvement of supply network to Capital Dhaka

a. Increase of South to North Power Flow

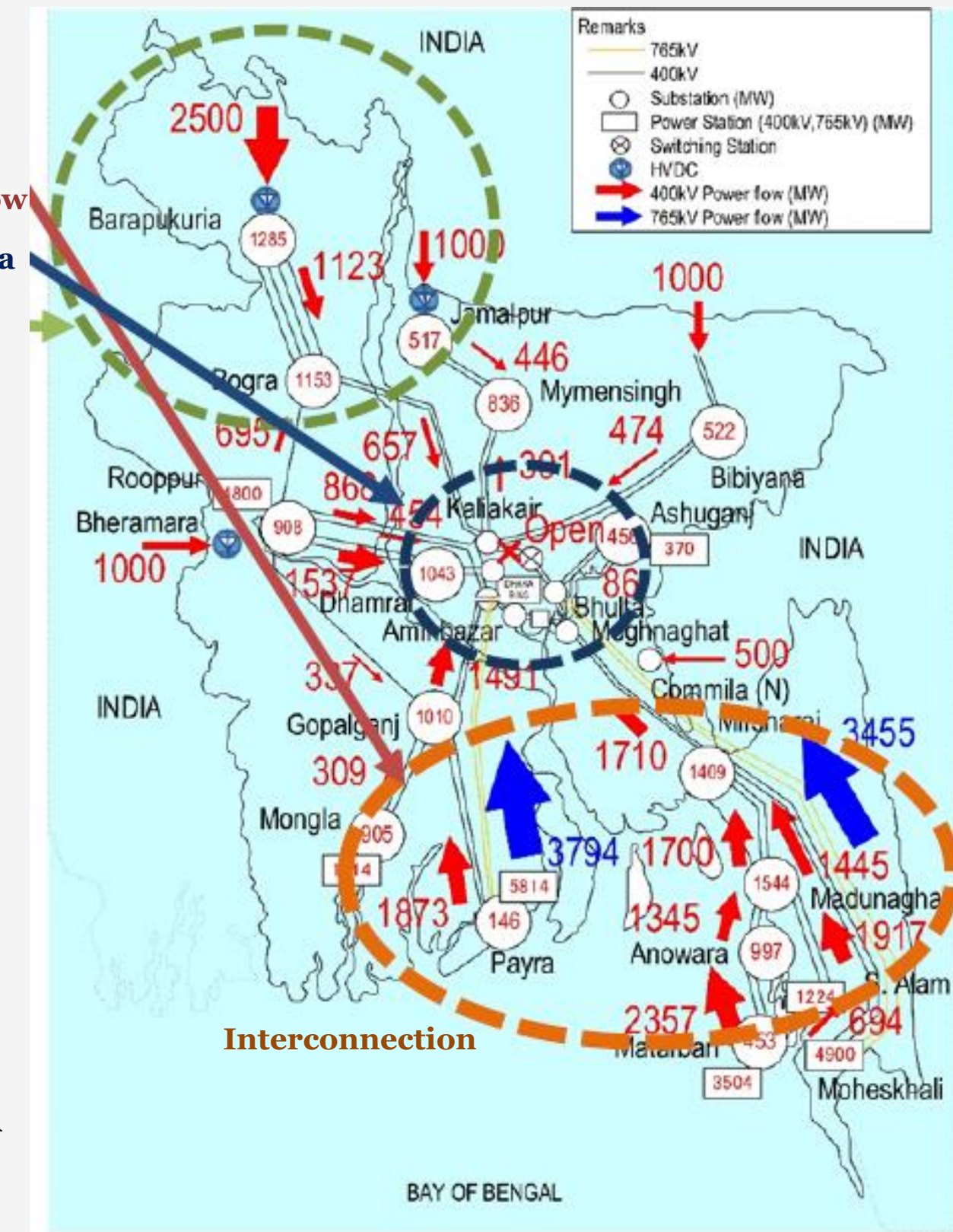
- The future electricity demand growth shall basically be for the industrial demand of economic zones mostly outside of Dhaka
- Crossing the Padma Bridge and narrow Feni region are constraints in constructing the transmission lines
 - Since this is the issue of long-distance transmission from large-capacity power sources, IEPMP plans to construct precisely simulating on the dynamic characteristics of the generators mainly on the large-capacity power sources

b. Reliability improvement of supply network to Capital Dhaka

- Securing the underground transmission line route from 400kV transmission ring to the center of Dhaka has been prioritized in IEPMP
- It is important to simplify the relationship between demand points and underground transmission line routes through a radial system, and to maintain close cooperation between power generation, transmission and distribution utilities and share a common concept

c. Interconnection

- The interconnectivity lines to be introduced will be decided as a result of coordination with neighboring countries from the aspect of energy security and the aspect of securing the amount of renewable energy to be introduced



Source: JICA- IEPMP Third Stakeholders Meeting

3.6 Transmission and Distribution System

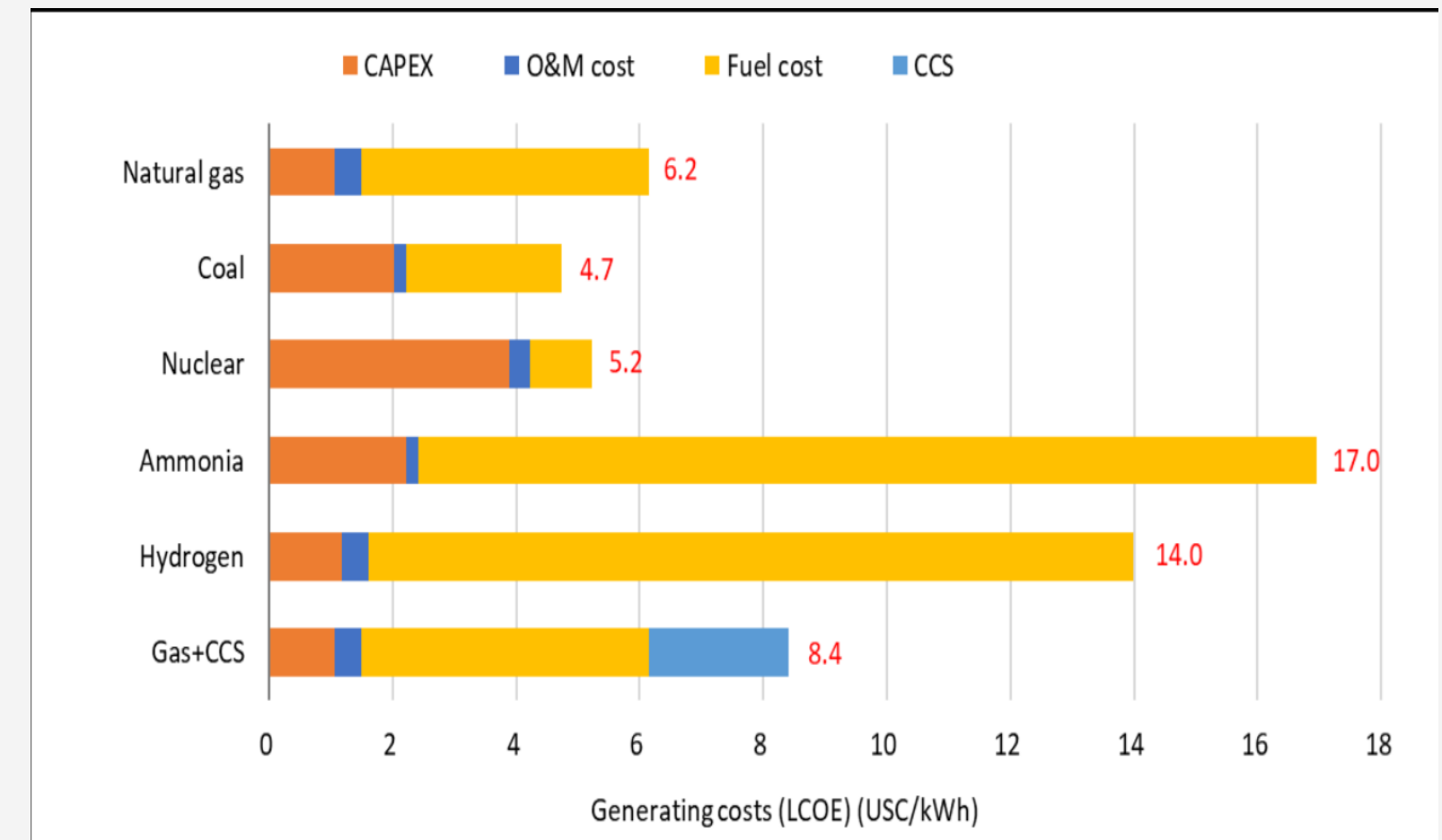
- All the three aspects are matters of importance and to be emphasized upon but there is still lack of a **strong, digital and smart national grid system**
 - IEPMP team recommended to establish a smart grid **with GIS and SCADA** as components in order to reduce distribution system losses, theft and leakage.
- As for DMS or Smart Grid, each company will be on the stage to consider full-scale introduction in the future.
 - DPDC and DESCO are currently preparing to **introduce DMS** (Distribution Management System) together with the smart grid project. is also planning to introduce it
 - BREB has completed feasible study regarding the issue.
- More **aggressive, active and planned approach** is required to introduce the **Smart grid and smart metering system**

3. Energy Security

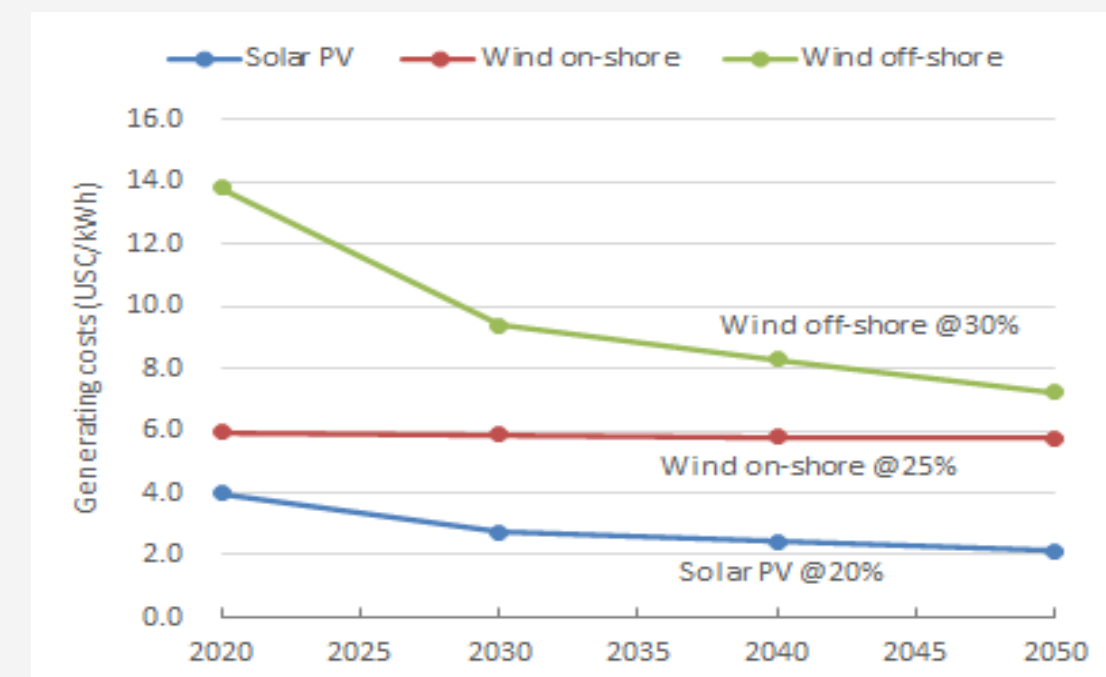
3.7 Electricity Tariffs

- Under ATS, the IEPMP interim report decided to operate 50% ammonia co-firing around 2030 and 100% ammonia single-firing around 2049.
 - Later on, the plan was further developed and it has been decided that 20% ammonia co-firing around 2030 (2035*) and 50% ammonia co-firing around 2035 (2040*)
- Under NZS, 50% ammonia co-firing around 2030 and 100% ammonia single-firing around 2042 has been decided
- The findings from JICA study team demonstrates that the **generating cost of ammonia and hydrogen based power plants are more than double** than the generating cost of **natural gas based power plants**
- On the other hand, the **generating cost of electricity from RE based sources are lower** compared to that of thermal energy and even shoes a **further decreasing trend in future**
- So there doesn't seem any **logical reason** to obtain the costly thermal energy based power generation over the cheaper RE ones

Generating costs of thermal power plants



Generating costs of RE power plants



Source: JICA- IEPMP Third Stakeholders Meeting

4. Renewable Energy

4. Renewable Energy

4.1 RE in IEPMP

- IEPMP so far **acknowledges the GoB's global goals** towards clean energy for achieving net zero commitments by 2050
 - But not **enough spotlight** has been provided to RE yet
- Initially the target was to generate **40 per cent of power from RE** by 2041
 - Later on, the target was revised to **“Upto 40 per cent of power from cleaner energy” by 2041**
 - Such change in narratives **weakens the commitments and create confusion** among the mass people regarding RE
- The updated version of IEPMP interim report shared on the SHM3, sets a **much positive tone** for renewables and clean energy
 - Significantly **moderate targets** have been determined for solar, wind and biogas
- Even though it is comprehensive than the previous interim report, it **doesn't detail out the plan** for the implementation and transition
 - **Investment plans, details regarding feasibility tests, technological advancements** and other macro- micro issues are yet to be included in the final plan

4.1 RE in IEPMP

4. Renewable Energy

Issue	Interim Report (June 2022)	SHM3 (November 2022)	Remarks
Perspective on RE	Initially the draft IEPMP report didn't seem to give enough importance towards RE, the discussion has been more focused on the challenges and limitations rather focusing on the expansion	The possible scopes to explore existing solar, wind, waste energy based on Solar Energy Roadmap, Wind Energy Plan and other RE based researches. It particularly defines that the targeted power generation from RE sources is possible	The total discussions seem to be limitation and challenge based rather than looking for the opportunity and chances for expanding and promoting RE in Bangladesh. The presented paper in the SHM3 includes the recommended possible scopes to explore existing solar, wind, waste energy but it doesn't necessarily mention the way to attain the 40 per cent clean energy by 2041 goal
Target	No target was set	40 per cent clean energy target has been set	The ambitious goal of achieving 40 percent from clean energy is praise worthy, at the same time it should be more clearly pointed out that whether these 40 per cent should come from renewable or from some other cleaner sources
Solar	IEPMP rightfully mentioned the importance of solar PV in Bangladesh, it is necessary to promote the introduction of solar parks as aggressively as possible. IEPMP discusses the limitations of expanding the use of solar PV in Bangladesh, which is the constraint of lands	Justifies the possible options discussed in several	As the characteristics of the solar power plant sites have been identified, the feasibility test should be executed for understanding the actual situation

4.1 RE in IEPMP

4. Renewable Energy

Issue	Interim Report (June 2022)	SHM3 (November 2022)	Remarks
Rooftop PVs	IEPMP recommended the following measures to promote the introduction of Rooftop PV be considered Public Sector Mandatory introduction of Rooftop PV	Currently the installed Rooftop solar PV is 400 MW which is targeted to increase at 2000 MW by 2030 and 12000 MW by 2050	Less ambitious target has been set. By 2030 and 2050 much more electricity can be generated from Rooftop solar PVs
Wind	Data collection of wind power has been emphasized in IEPMP, as there is a lack of progress in the wind in Bangladesh	The IEPMP acknowledges that forecasted value of 5,000 MW of on-shore wind power by 2050 is not excessive	The target seems fine but the technical aspects needs to be looked into such as the height of the wind turbine should be based on the international standard
Hydro	IEPMP projected that around 2041, approximately 5,000 MW of hydropower could be imported, mainly from Bhutan, Nepal and north-eastern India.	in 2030 the target is 230 MW and by 2050 it is 330 MW	
Waste to energy	IEPMP defines that usefulness of Waste to Power from the perspective of 3R (Reduce, Reuse, Recycle) and expected to expand the introduction of several MW class in rural areas, in addition to the introduction of power plants of the same scale in metropolitan areas such as Chattogram	in 2030 the target is 93.5 MW, by 2041 150, and by 2050 it is 230 from three committed power plants at Nrayonganj, Aminbazar and Dhaka	

4. Renewable Energy

4.1 RE in IEPMP

- Draft IEPMP rightfully mentions the scopes and possibilities for renewable energy in Bangladesh but lacks a specific workplan with timeline for the transition to RE
 - Even with the objective of moving towards low-carbonization, IEPMP lacks substantial and adequate policy pathways to address the possible energy mix focused on RE.
 - Carbon capture storage (CCS) has been referred as a 'clean energy' which is unacceptable
- There is no detailed plan of the necessary financial estimates for investment and maintenance of RE technologies that could be used to attain the goal of low-carbonization.
- **No accurate policy framework for RE subsidies**
 - The decision of phasing out **diesel-based power plants doesn't seem to be reflected** in the IEPMP yet
 - Similarly, the GoB's plans to **phase out of diesel-based and furnace oil-based powerplants** have not been considered, and the resources that could be saved from implementing this decision and used to subsidize the RE sector were not raised in IEPMP
 - **Medium-term plans for installing solar PVs in sectors like agriculture**, irrigation, and primary schools are not mentioned
- No feasibility study was discussed on RE-related implementation in various spheres of the economy.

5. Energy Transformation

5. Energy Transformation

5.1 Energy Efficiency (EE)

- Under the *Energy Efficiency and Conservation Master Plan*, the government aims to lower energy intensity (national primary energy consumption per unit of GDP) in 2030 by 20% compared to the 2013 level
 - A total of 95 million toe (113 billion m³ of gas equivalent) is expected to be saved during the period

Issues Discussed in IEPMP	Comments
<ul style="list-style-type: none">• A chapter dedicated to “<i>Improving Energy Efficiency</i>”, where energy efficiency policies were discussed in the industrial, residential, and commercial sectors.• No sector-wise energy efficiency targets were shared.• Challenges of energy efficiency and conservation (EEC) policy in the industrial sector were shared.• The targets set in EECMP2016 for total energy consumption in the residential and building sectors were highlighted.	<ul style="list-style-type: none">• The chapter does not sufficiently address sector-specific targets or plan to achieve low energy intensity by 2030.• No proposition was given on overcoming the challenges of adopting EEC policies in the industrial sector.• The reflection of EECMP2016 in IEPMP is appreciative; however, proper framework or guidelines on attaining those targets could have been worked out.

5.2 Low Carbonization & Decarbonization

Issues Discussed in IEPMP	Comments
<ul style="list-style-type: none">In the power sector, clean energy such as renewables, nuclear and decarbonization technologies including ammonia co-firing, hydrogen single-firing and gas-fired power with CCS are expected to start to diffuse in both net-zero scenario (NZS) and advanced technology scenario (ATS).	<ul style="list-style-type: none">The objective of IEMPMP mentions about low-carbonization and/or decarbonization.The target of achieving 40 percent of the country's energy from clean sources by 2041A timeline was shared for the introduction of decarbonization technologies.IPEMP includes coal and other fossil fuel based energy with advanced technologies as 'clean'IEPMP should exclude technology based hydro-carbon as clean energyIt should replace RE as the prime source of clean energy: only 12GW out of 26GW is planned to be generated from RE

5.2 Low Carbonization & Decarbonization

CO2 Emission Targets

- **June Draft**

- The emissions will be the largest in REF, followed by ATS and NZS. The emissions of REF will significantly grow to around 515 million tons-CO₂ in 2050
- The emissions of ATS will be much more moderate at 355 million tons- CO2 in 2050, which is almost a two third of the REF level. It **projects a net zero** by 2070
- The emissions of **NZS will be**, by definition, almost zero in 2050

- **December Update**

- The emissions of ATS PP2041 will be much more moderate at 305 million tons-CO2 in 2050 compared with 486 million tons-CO2 in REF PP2041
- As well, that of ATS In-between will be even lower at 266 million tons-CO2 in 2050

- **NDC**

- Table in the following slide presents NDC targets on GHG emissions for 2030
- Bangladesh has committed to reduce **89.47 million tons-CO2** combinedly by 2030

5.2 Low Carbonization & Decarbonization

5. Energy Transformation

GHG emission reduction scenario

UNFCCC Sector	Sub-Sector	GHG Emission		GHG Reduction by Mitigation (2030)	
		BAU 2030		Combined	
		MtCO ₂ e	In %	Reduction MtCO ₂ e	In %
Energy	Power	95.14	23.24	43.74	48.9
	Transport	36.28	8.86	9.72	10.86
	Industry (energy)	101.99	24.91	7.68	8.58
	Other energy sub-sectors:				
	Households	30.41	7.43	5.64	6.3
	Commercial	3.35	0.82	0.84	0.94
	Agriculture	10.16	2.48	0.82	0.92
	Brick Kilns	23.98	5.86	11.16	12.47
	Fugitive	8.31	2.03	4.28	4.78
	F Gases	2.92	0.71	2.89	3.23
Total Energy		312.54	76.34	85.98	96.1
IPPU	Cement and Fertilizer	10.97	2.68		
AFOLU	Agriculture and Livestock	54.64	13.35	1.04	1.16
	Forestry	0.37	0.09		
Total AFOLU		55.01	13.44	1.68	1.16
Waste	MSW and wastewater	30.89	7.55	2.45	2.74
Total Emission		409.41			
Total Reduction				89.47	21.85

Source: NDC (2021)

5.3 Technological Advancement, Research and Development

- There was no mention of **data management** in previous power sector master plans; however, in the IEPMP, a **new chapter has been added** on this topic
 - Energy statistics and the government bodies that handle them were highlighted
 - This is in line with the **agreement with JICA**, which states better capacity building

IEPMP	Comments
• A chapter was dedicated for Energy Data Management	• No particular guideline was provided on how to manage data.
• Hydrocarbon Unit takes several days to re-enter data from different energy supply companies.	• It is necessary to improve work efficiency by eliminating re-entry.
• Bangladesh Bureau of Statistics does not have any energy experts, but two staff in charge of mining and quarrying and power are compiling energy data.	• Qualified staffs need to be recruited for specific data management jobs and they should be trained regularly.
	• Neither Bangladesh have carbon capture technology (CCT) installed in any power plants, nor have any feasibility studies been carried out on the topic of CCT.

5. Energy Transformation

5.4 Strategic Environment Assessment (SEA)

Sectors	Proposed Plans in IEPMP	Comments
Natural gas	Although natural gas-fired power plants emit less greenhouse gases than coal-fired power plants and other types of power plants, it is necessary to pay attention to environmental aspects such as air quality, water quality, and ecosystems , as well as to resettlement and accidents that may occur when securing land for the plants.	<ul style="list-style-type: none"> • No Technological aspect with proper planning has been mentioned. • Less information about expertise team conducting SEA. • Costing burden are also not distributed.
Coal	In the SEA, the evaluation will take into account the following points: (1) development of port facilities, (2) construction of coal-fired power plants, and (3) construction of power transmission and distribution networks. Particular attention will be paid to the climate change impacts and air pollution associated with coal-fired power generation.	<ul style="list-style-type: none"> • No inclusion of Carbon Capture Technology in the methodology. • Less of particular feasibility study Budget. • Post-combustion carbon capture (the primary method used in existing power plants), pre-combustion carbon capture (largely used in industrial processes), and oxy-fuel combustion systems are not mentioned.
Oil	SEA will pay attention to climate change, air and water pollution, ecosystems, land acquisition and resettlement, accidents, etc	<ul style="list-style-type: none"> • The government should invest more funds in capacity building, by providing the necessary training of staff government environmental parastatals and also making available necessary facilities and legally empowered to do their duties effectively • Comparative studies between technologies need to be covered.
Wind	<p>1. Bangladesh is located on two migratory bird routes: the East Asian-Australasian Flyway (EAAF) and the Central Asian Flyway (CAF), and the impacts on migratory birds associated with wind farms will be considered.</p> <p>2. From a livelihood perspective, the impact on inland and marine fisheries, as well as aquaculture and other industries in coastal areas, should be taken into account</p>	<ul style="list-style-type: none"> • Multidisciplinary approach including experts from ecology is not counted. • Gap in baseline study for collecting necessary data.

5. Energy Transformation

5.4 Strategic Environment Assessment (SEA)

Sectors	Proposed Plans in IEPMP	Comments
Nuclear	In SEA, nuclear power generation emits less greenhouse gases than coal-fired power generation, etc.; however, the evaluation will take into account safety aspects, especially accidents during nuclear power plant operation, and management of radioactive materials (waste, exhaust gas, wastewater, etc.).	<ul style="list-style-type: none"> • Extreme Safety measure plan is not mentioned. • No technology has been mentioned for a toxic burst out or accident. • No proper stages are mentioned for SEA.
Ammonia	it is necessary to consider the impact of production process, such as the procurement of hydrogen as a raw material	<ul style="list-style-type: none"> • No outline of feasibility plan and technological costings.
Hydrogen	<ul style="list-style-type: none"> • SEA will consider environmental and social impacts of hydrogen production, hydrogen power generation, and transmission and distribution. Hydrogen emits no greenhouse gases during power generation. • In addition, for green hydrogen made from renewable energy sources, etc., environmental and social impacts at the electricity procurement stage, such as wind and solar power generation, will also be examined. • In addition, from a social perspective, hydrogen is an extremely flammable and combustible gas, so as an environmental and social risk related to hydrogen, the attention must be paid to safety management during storage and transportation. 	<ul style="list-style-type: none"> • Further study for the scope of hydrogen as a renewable by product has not been empirically addressed. • Risk mitigation measurement in the factories is missing.

5. Energy Transformation

5.4 Strategic Environment Assessment (SEA)

June Draft IEPMP vs December Updates

Issues	December Updates
SEA	<ul style="list-style-type: none">• A work plan and schedule has been added, which was not present in the June draft.• Four level (policy, plan, program, and project) segregation was added.• Balanced approach involving characteristics, policy, and technology in the three scenarios – REF, ATS, and NZS were included.• Alternatives regarding economic affordability, environmental sustainability, and energy supply security were added.• Strategic environmental objectives including the parameters biodiversity, fauna, and flora, air and climate factors, labor and land acquisition were added.

5. Energy Transformation

5.4 Strategic Environment Assessment (SEA)

- **Provide training and capacity building on SEA Statements** and monitoring for SEA practitioners/consultants and plan-makers, along with this SEA monitoring and SEA Statement Guidance
 - This would enhance current practice and promote proactive and practical monitoring commitments
- **Revise the existing SEA Process Checklist.**
 - This checklist could be used as a quality check framework once it is revised to address not only the process but also reporting requirements
- Encourage **monitoring findings to be published** on the plan makers' websites alongside the plan/program and SEA-related documentation, at least as part of the plan/program reviews, and made publicly available.
 - This will help ensure that monitoring is properly undertaken and monitoring reports are prepared.
 - Create a **national monitoring body**. A national monitoring body or forum could be created to provide a focal point to ensure that the benefits of monitoring are achieved. This would work with local authorities and other plan-making authorities to ensure monitoring.
 - **Incentivize monitoring initiatives** that go beyond the minimum legal requirements, for instance, through awards by the ministry of environment organized conferences or relevant national planning conferences

6. Other Issues

6. Other Issues

6.1 Financial Issues

6.1.1 Power Tariff

- A discussion is currently ongoing to raise the power tariff by 19.92 per cent to Tk 6.20 per unit (1 kilowatt-hour) from previous Tk 5.17 per unit with effect from December 2022
 - The distribution companies demanded to hike retail level electricity tariff by around 25 per cent on an average
 - BERC has arranged a two-day public hearing starting from 8 January 2023, to justify power tariff hike proposals in retail level by different state-run power distribution companies
- The upward revision of power tariff at this moment of inflationary pressure faced by the consumers may add more burden
 - The hike could have been avoided by exploring other option
 - If expensive oil based power plants are phased out as per the plan, there will be no need of subsidizing electricity for easing the consumer's burden
 - In that case, substantial tariff rationalization at this situation is not required

6.1.2 Subsidy

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- The full additional subsidy demanded for power, petroleum and LNG will not be required
- In one hand BPC is currently going through a profitable phase, in other hand it is demanding a subsidy of BDT 19358 crore
 - BPC should rather cross subsidise Petrobangla for an efficient allocation of resource
- The upcoming 978 MW power generation from RE can substitute for imported LNG based power generation
 - This will also help with reducing the subsidy in current fiscal year

6.2 Policy Issues

6.2.1 Retirement of the QRRs

- Fossil fuel based power plants which are in the process of retirement should not be extended further under the Quick Enhancement of Electricity and Energy Supply (Special Provision) Act 2010
 - A total of 8 IPPs are going to be retired in this FY 2022-23 as per plan
 - Another 5 IPPs are going to retire in FY 2023-24
 - Neither the contract of these 13 fossil fuel based IPPs should no way be extended again, nor new IPPs should be signed

6.2.2 No further extension of the Quick Enhancement of Electricity and Energy Supply (Special Provision) Act 2010

- Last year in September, the special act was extended for the third time till 2026
- This special provision doesn't ensure a competitive market for the procurement rather cause market failures through externalities
 - The act should not be extended again infact should be abolished earliest possible⁵⁸

6.2.3 Amendment to the BERC Ordinance 2022

- Bangladesh Energy Regulatory Commission (BERC) will now consult with the government before any move towards holding a public hearing on retail power tariff hike proposals
 - The GoB has amended the BERC Act 2003 to create scope for the government to take arbitrary decisions on raising retail and bulk power and energy prices
- This decision will weaken the institutional capability of BERC even more

6.3 Investment Issues

6.3.1 Resource allocation for investment

- IEPMP broadly emphasizes in the ATS scenario which will introduce technologies with high cost
 - But the allocation for investing in this high technology seems to be overlooked
 - The RnD allocation for technologies such as green ammonia and hydrogen has not been cleared as well
 - A huge fiscal burden or investment would be created in adopting advanced technology which is not discussed
- To incorporate RE in fuel mix and generate power from RE sources short term⁵⁹ plant investment will be required as well
 - Without a proper investment plan and work plan the aim of achieving 40 per cent from clean energy is impractical

6.4 Few proposals from a clean energy perspective

- Amid the prevailing medium to long-term crisis, from a clean energy perspective, CPD has come up with a short to medium-term energy mix scenario from 2023-2025
 - The GoB has recently announced to completely phase out diesel-based power plants and gradually phase out furnace oil-based power plants
 - Additionally, plans have been proposed for installing rooftop solar PVs in primary schools and transforming diesel irrigation systems into solar irrigation systems.
 - Taking all these decisions and the upcoming plans in consideration, CPD has set forth an estimation of the fuel mix scenario for the next 3 phases (Years 1, 2 & 3)

Year 1 (Jan-Jun'23)

- Considerations for power and energy supply:
 - The fuel mix will remain same except for some additional 978 MW of renewable energy
 - Installation of solar rooftop PVs in the primary schools will take 5 years (in line with govt. commitment)
 - Transformation of diesel irrigation systems to solar irrigation systems will require 5 years (in line with govt. commitment)

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Year 2 (Jul'23- Jun'24)

- Considerations for power and energy supply:
 - Substantial amount of RE based power generation will be included in the fuel mix
 - 1/5th of the installation of solar rooftop PVs in the primary schools will be completed
 - 1/5th of the transformation of diesel irrigation systems to solar irrigation systems will be completed
 - All HSD based power plants will be phased out (in line with govt. commitment)
 - HFO based power plants will start to phase out gradually (in line with govt. commitment)

6. Other Issues

6.4 Few proposals from a clean energy perspective

Year 3 (Jul'24- Jun'25)

- Considerations for power and energy supply
 - A major share of energy mix will be the share of RE based power generation
 - Another 1/5th (total 2/5) of the installation of solar rooftop PVs in the primary schools will be completed
 - Additional 1/5th (total 2/5) of the transformation of diesel irrigation systems to solar irrigation systems will be completed
 - A substantial amount of HFO based power plants will be phased out gradually (in line with govt. commitment)

**Power demand projection and estimated fuel mix
under three different scenarios (MW)**

	Year 1 (June, 23)	% of fuel mix	Year 2 (June, 24)	% of fuel mix	Year 3 (June, 25)	% of fuel mix
Total	14417 MW	100 %	14983 MW	100%	16482 MW	100%
Coal	2192	15.20	2804	18.71	2804	17.01
HFO	4500	31.21	3023	20.18	1413	9.00
Imported electricity	1050	7.28	1050	7.01	1050	6.37
Gas	5273	36.57	5740	38.31	5597	34.00
Hydro-power	50	0.35	50	0.33	50	0.30
Diesel	650	4.51	0	0.00	0	0.00
Nuclear	0	0.00	600	4.00	1200	7.28
Renewable	717	4.97	1717	11.46	4194	26.00

Source: Prepared by authors

6. Other Issues

6.5 Estimation of Resources

- The estimation made by CPD finds that the resources that can be saved by phasing out fossil fuel can even generate surplus after investing in RE in the medium and long term
 - Even though in short term it can be seem that investing in RE is not economically viable
- For Year 1(The short-term scenario), The resource savings from different fossil fuels is much lesser than the investment required for implementing renewable alternatives like solar
- For Year 2, The resource savings from different fossil fuels is higher than the investment required for implementing renewable alternatives
 - Even after investing in REs, a significant amount (\$ 1,048.99 mln.) can be saved, according to our estimate
- For Year 3, The scenario is almost the same as Year 2

Year 1	Resources Saved (mln. \$)	Subsidy Saved (mln. \$)	Year 1	Required Investment (mln. \$)
Diesel	613.97	-	Renewable Energy	2121.93
Oil	1540.00	-	Solar Based Rooftop	147.00
Power	-	413.15	Solar Based Irrigation	2234.37
Sub-total in Y 1	2153.97	413.15	Total in Y1	4503.30
Total in Y1	2567.12			
Year 2	Resources Saved (mln. \$)	Subsidy Saved(mln. \$)	Year 2	Required Investment (mln. \$)
Diesel	1093.13	-	Renewable Energy	3894.00
Oil	1540.00	-	Solar Based Rooftop	147.00
Power	-	4691.23	Solar Based Irrigation	2234.37
Sub-total in Y2	2633.13	4691.23	Total Y2	6275.37
Total in Y2	7324.36			
Year 3	Resources Saved (mln. \$)	Subsidy Saved(mil. \$)	Year 3	Required Investment (mln. \$)
Diesel	1093.13	-	Renewable Energy	3072.75
Oil	1540.00	-	Solar Based Rooftop	147.00
Power	-	3651.50	Solar Based Irrigation	2234.37
Sub-total in Y3	2633.13	3651.50	Total Y3	5454.10
Total in Y3	6284.6			

Source: Prepared by authors

6. Other Issues

6.5 Estimation of Resources

- Less subsidy required in power generation
 - The additional subsidy demanded in the power and energy sector seems to be **unrealistically high**
 - As per our estimation, 42% of the demanded additional subsidy will be required
 - Year 1: Additional RE can be used to substitute imported LNG that may reduce the subsidy burden
 - From July'23 subsidy for the HSD based power plants would be withdrawn
 - Year 2: Subsidy would be substantially dropped as the HSD based power plants will be phased out and HFO based power plants will be started to phased out
 - Year 3: By the end of 2025, no subsidy amount will be required for oil-based power generation
- Less subsidy required for diesel and furnace oil
 - Year 1: As of November, BPC has a gross profit of BDT 1041.6 crore /\$ 100.8 mln. The required subsidy is zero (0)
 - Year 2: There will be a substantial reduction in subsidy for diesel as the diesel plants will be totally phased out and furnace oil will be partially phased out
 - Year 3: There will be a substantial reduction in subsidy for diesel as the diesel plants will be totally phased out and furnace oil will be fully phased out

Additional resource estimates

	Additional Demanded (Crore Tk)	Estimated Resource Required (Crore Tk)	Estimated Resource Saved (Crore Tk)
Power	32500.00	28,248.34	4,251.66
Oil	19358.00	0	19358
LNG	5000.00	5000.00	0
Total	56858.00	33248.34	23609.66 (42% of the additional demand)

Source: Prepared by authors

7. Adequacy of the Objectives in the Overall IEPMP

7. Adequacy of the Objectives in the Overall IEPMP

7. Adequacy of the Objective in the overall IEPMP (5 BEST, 1 WORST)

	Scope of the policy	Feasibility Study	Way Forward Guidelines	Time Frame
Objective 1	<p>Moderate</p> <ul style="list-style-type: none"> The targeted goals of each section has been well defined Some specialized sectors regarding transition to Renewable energy were not adequately addressed. 	<p>Moderate</p> <ul style="list-style-type: none"> Feasibility studies along with the proposed plans are mostly in process or completed. Evaluation of feasibility policy needs to be revised. 	<p>Below average</p> <ul style="list-style-type: none"> Each chapter needs to have separate “way forward” guidelines. 	<p>Moderate</p> <ul style="list-style-type: none"> A well defined long term goal but needs to address the short and medium term benchmarks.
Objective 2	<p>Below average</p> <p>Less goals regarding the pathway of decarbonization have been addressed.</p>	<p>Poor</p> <p>Very less feasibility studies targeting technological advancement.</p>	<p>Poor</p> <p>Need to have multiple portions significantly focusing on the way forward of RE.</p>	<p>Below average</p> <p>No significant short or medium term benchmark has been addressed.</p>

8. Concluding Remarks & Recommendations

8. Concluding Remarks & Recommendation

- The IEPMP 2021 formulation process is found to be **distinctive** in number of accounts
 - A comprehensive plan which accommodate energy and power related issues
 - A specialized research organization has been involved in providing technical support
 - A consultative process has been followed though it is not reached to the level of partnership
- The Plan considers **carbon neutral economic** perspective though it is **not fully reflected** in operational issues
- The Plan has been revised since the first draft was available in May/June 2022
 - A revised version is available in November 2022
 - Findings have been presented to different stakeholder groups
 - Taking into consideration of number of issues
 - Some are positive and some are negative
- The plan though found to be **relatively rigorous** but cannot come out **from a number of biasness**
 - Over reliance on **GDP estimates**
 - Reliance on **coal and LNG** as important fuel mix
- GDP estimate based on **PP2041 made the whole exercise unreliable**
 - To reduce the biasness an alternate scenario 'in-between' is proposed which also seems high
 - A more realistic assumption on GDP estimates is highly important

8. Concluding Remarks & Recommendation

- This GDP estimate has made a highly ambitious energy demand for 2040 and 2050
 - This has made some demand projections in energy mix, power demand and supply
- The commitment of **40% of RE has been** shifted to 40% of clean energy
 - This apparently seems “logical”
 - This however includes **coal and other hydrocarbon based energy mix** with advanced technologies as ‘clean’ which is **not acceptable**
- It is expected that an alternate scenario called ‘**40% RE by 2040**’ **needs to be set**
 - Necessary modeling and exercise needs to be undertaken
- The Plan directly and **indirectly promote coal and coal based energy**
 - This should **is not accepted**
- The Plan does not take into **account the fiscal burden due to use of fossil fuel** and excess reserve margin
 - The Plan is not properly discussed the impact and **implications on energy tariff** – proposed technological choice would raise energy price significantly
- We feel that amid this crisis a **clean energy scenario in the power and energy** sector can be resource efficient, can generate more power and save subsidy allocation
 - LNG based power generation should not be encouraged further
 - IEPMP should emphasize more **on gas exploration** in domestic gas fields

8. Concluding Remarks & Recommendation

- Dependency on long term **LNG contracts should also be reduced**
 - We should not opt for LNG purchase from spot market as this is a high price situation.
- BPDB/SREDA/IDCOL should **aggressively look for foreign financiers** and investors in the RE sector
 - Implementation plan for rooftop solar in primary school and solar irrigation system is required
- Fossil fuel based power plants which are in the **process of retirement** should not be extended further under the Quick Enhancement of Electricity and Energy Supply (Special Provision) Act 2010
 - This will save resources in terms of capacity payment and subsidy
 - Additionally, it will save the USD required for importing fuels
- BPDB must **revisit the existing IPP contracts** that are yet to retire after July 2023
 - Specially, the capacity payment paid and the tariff at which PDB is buying power from IPPs should be reviewed
- Reducing the **LNG tariff will only encourage** additional LNG import
 - Such tariff can generate revenues for investing in renewables
- A more **sectoral approach** can be taken for accelerating the RE based power generation in Bangladesh such as promoting the RE portfolio in RMG sector in Bangladesh
- Establish **proper implementation of the existing SEA guidelines**
 - Ensure enough budgeting and costing for numerous technologies to conduct to conduct a complete feasibility analysis, impact evaluation, and reporting

Thank You!