NEPAL ELECTRICITY AUTHORITY

Mr. **Chandan Kumar Ghosh**

Director/Spokesperson

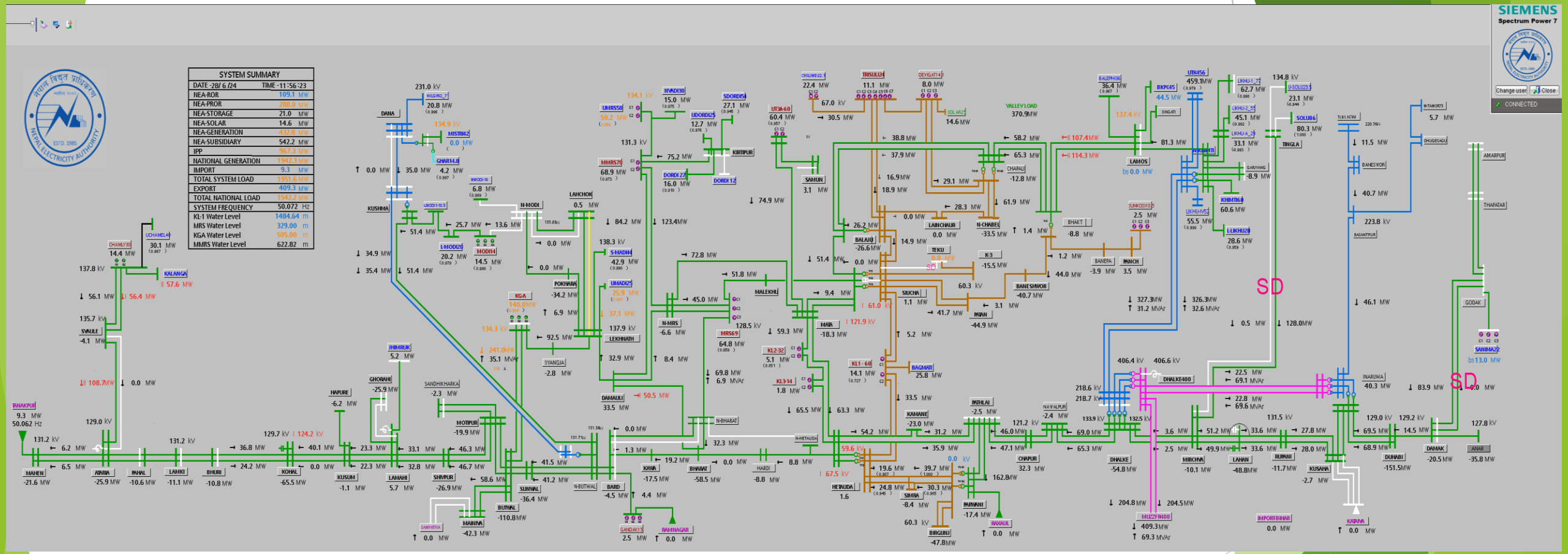
Load Dispatch Center

Nepal Electricity Authority

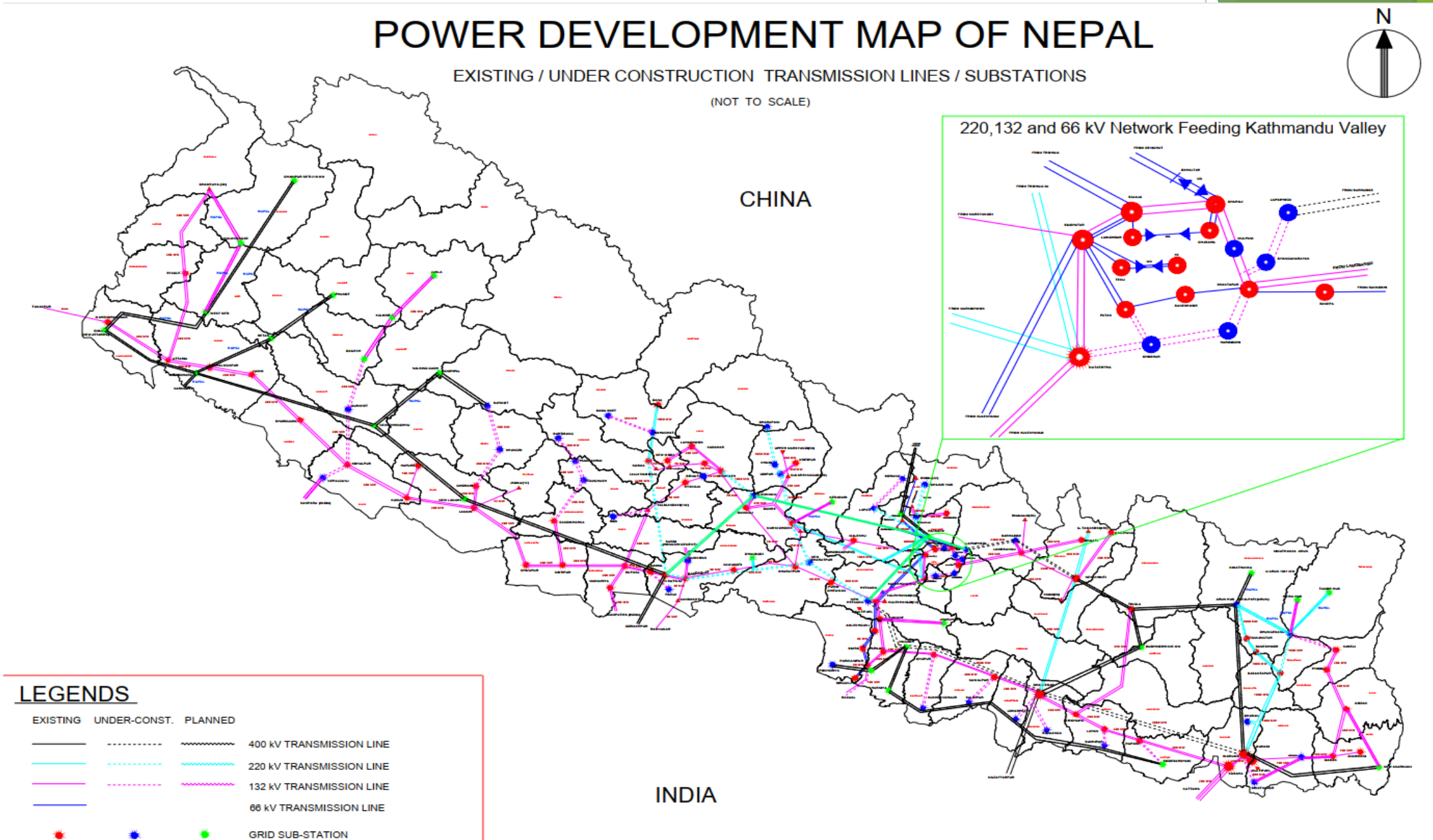
June 2024

“ NOT JUST THE GRID BUT ALL OF OUR MINDS SHOULD ALSO BE SYCHORINISED”

- KULMAN GHISING
- MD NEA


SYSTEM SUMMARY
DATE -28/ 6 /24
TIME -11:56:23
NEA-ROR 109.1 MW
NEA-PROR 288.0 MW
NEA-STORAGE 21.0 MW
NEA-SOLAR 14.6 MW
NEA-GENERATION 432.8 MW
NEA-SUBSIDIARY 542.2 MW
IPP 967.9 MW
NATIONAL GENERATION 1947.3 MW
IMPORT 9.3 MW
TOTAL SYSTEM LOAD 1951.6 MW
EXPORT 409.3 MW
TOTAL NATIONAL LOAD 1542.2 MW
SYSTEM FREQUENCY 50.072 Hz
KL-1 Water Level 1484.64 m
MRS Water Level 329.00 m
KGA Water Level 505.00 m
MMRS Water Level 622.82 m
SIEMENS
Spectrum Power 7
Change user
Close
CONNECTED
SD
SD
SD

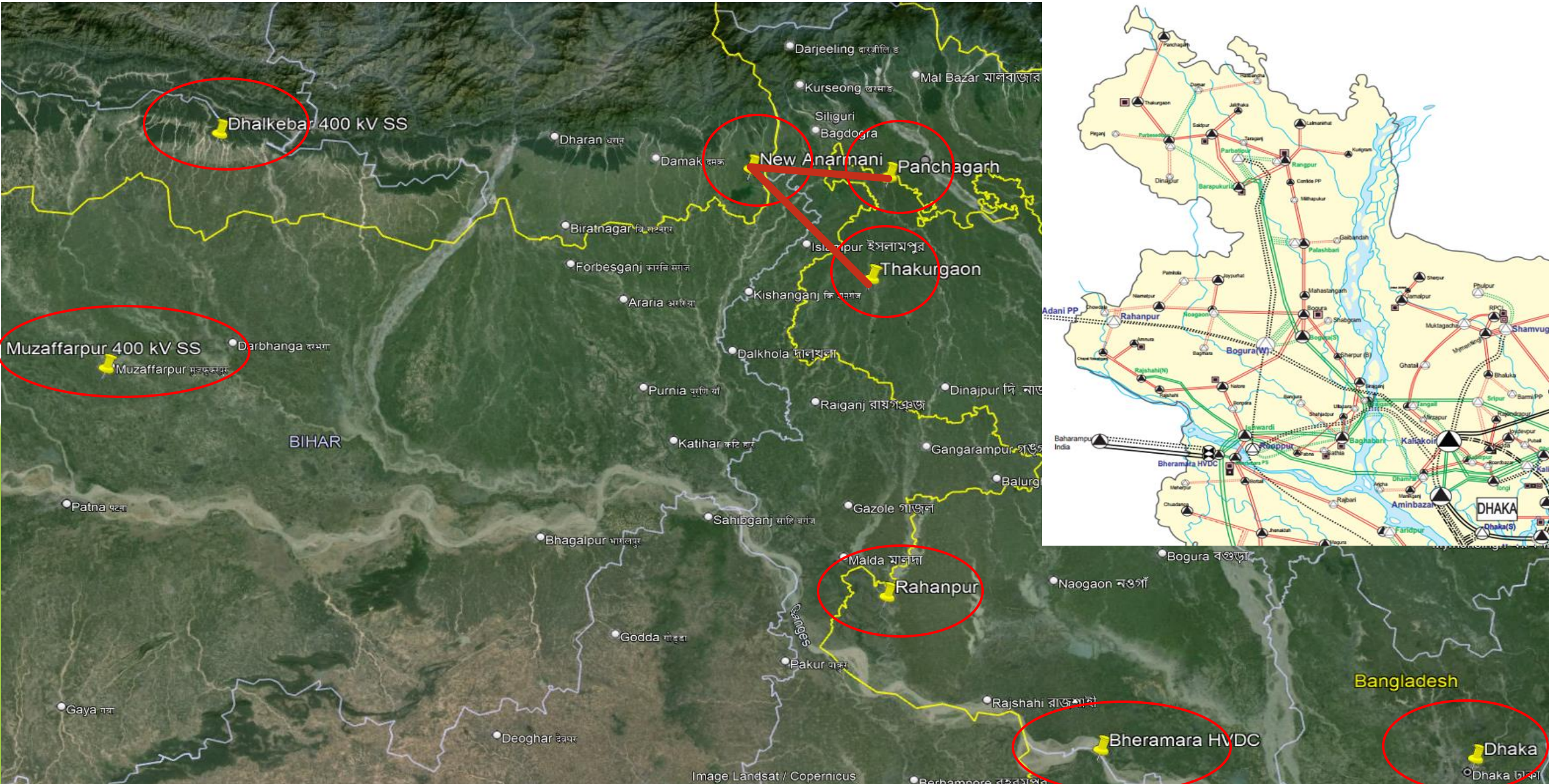
Power Development Map



Details of under construction/planned & proposed Transmission Line

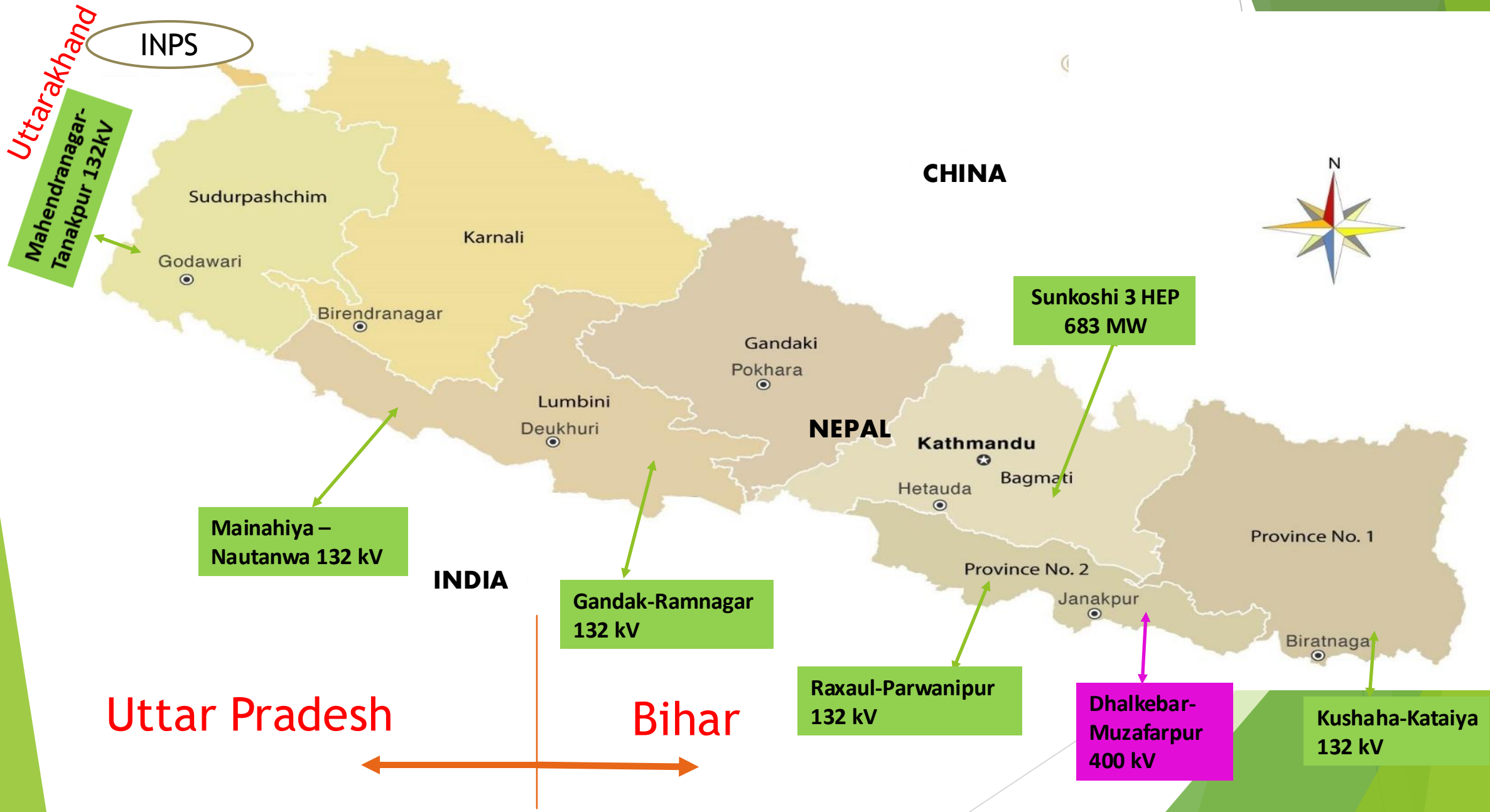
S.No.	Voltage Level	Existing	Under construction	Planned and Proposed
1	400 kV	384	450	3858
2	220 kV	1110	583	1718
3	132 kV	3960	1206	958
4	66 kV	514		
Total		**5968**	**2239**	**6534**

Topography


Dhalkebar 400 kV SS
Darjeeling
Kurseong
Mal Bazar
Siliguri
Bagdogra
Dharan
Damak
New Anarmani
Panchagarh
Biratnagar
Forbesganj
Araria
Kishanganj
Thakurgaon
Muzaffarpur 400 kV SS
Muzaffarpur
Darbhanga
Dalkhola
Purnia
Raiganj
Dinajpur
BIHAR
Katihar
Gangarampur
Patna
Sahibganj
Gazole
Bhagalpur
Malda
Rahanpur
Naogaon
Bogura
Godda
Pakur
Rajshahi
Gaya
Deoghar
Bheramara HVDC
Bangladesh
Dhaka
Image Landsat / Copernicus

Adani PP
Rahanpur
Bogura(W)
Baharampur
India
Bheramara HVDC
Baghabari
Kaliakoir
Aminbazar
DHAKA
Faridpur

Power Export-Import with India



NEPAL-INDIA CROSS-BORDER TRANSMISSION INTERCONNECTION

Existing Nepal-India Inter-connections Links	Voltage (kV)	Power (MW)
Kusaha - Kataiya I, II & III	132	280
Rajbiraj - Kataiya	33	8
Jaleshwor - Sursand	33	12
Birgunj - Raxaul	33	12
Gandak - Ramnagar	132	60
Siraha - Jaynagar	33	7
Nepalgunj - Nanpara	33	12
Mahendranagar - Tanakpur	132	70
Parwanipur - Raxaul I & II	132	160
Sampatiya-Nautanwa I & II	132	80
Total		701 MW

Time-frame	India – Nepal Cross-Border High Voltage Interconnection (Existing/Under Construction/Planned)	Capacity (MW)
Existing	Dhalkebar – Muzaffarpur 400kV D/c Twin Moose TL	1200
Apr'24	Dhalkebar – Sitamarhi 400kV D/c TL	2500
2025-26	New Butwal – Gorakhpur 400kV D/c (Quad) line	2500
2027-28	Inaruwa – Purnea (New) 400kV D/c (Quad) line	2500
2028-29	Lamki (Dododhara) – Bareilly 400kV D/c (Quad) line	2500
		10200 MW

Opportunities and Challenges for Nepal

Opportunities

- Seasonal/ diurnal energy demand/availability complementarities between BBIN countries
- Economic benefits through selling of excess energy in the market
- Avoiding cost of generation by import (solar replacing coal, gas)
- Managing supply deficit by import during dry season
- Economic benefits through comparative price discovery

Challenges

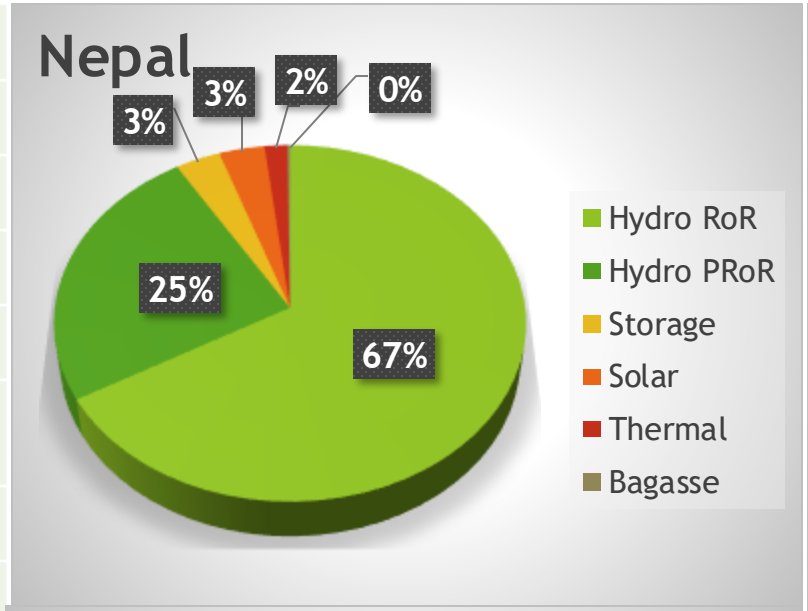
- Transmission Network (Higher Capacity Lines) Issues
- Geographical terrain of Nepal is challenging
- Grid Codes harmonization – required to figure out for smooth multilateral transaction
- Cross – border guidelines
- Geo-political Issues requiring diplomatic channel

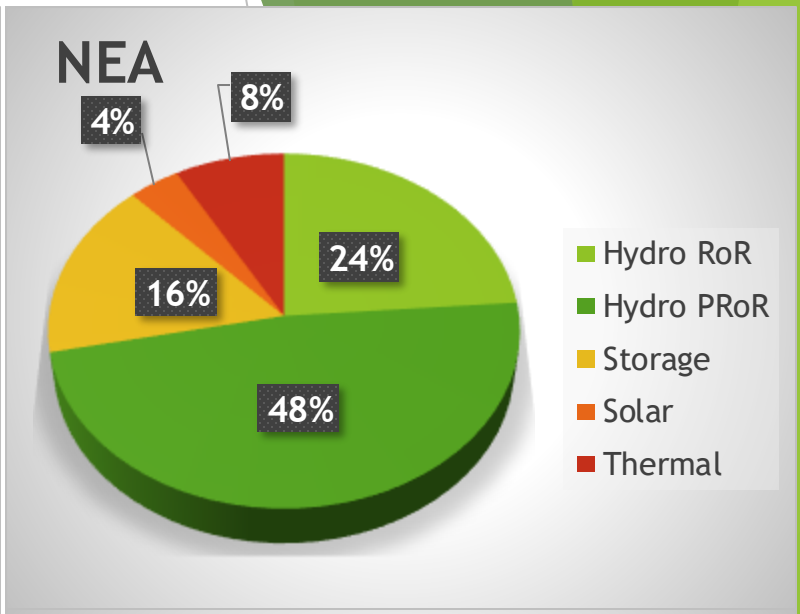
Nepal Electricity Authority

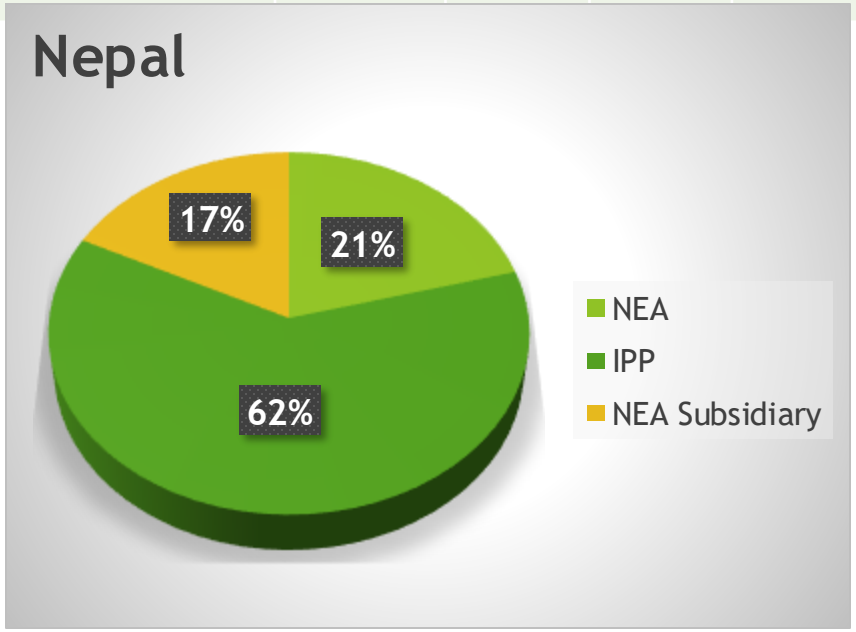
- Established on August 16, 1985
- State owned vertically integrated organization
- Owns generation, transmission and distribution
- **Nodal agency on behalf of Nepal Government to takeover all electrical energy related transactions with neighboring countries.**

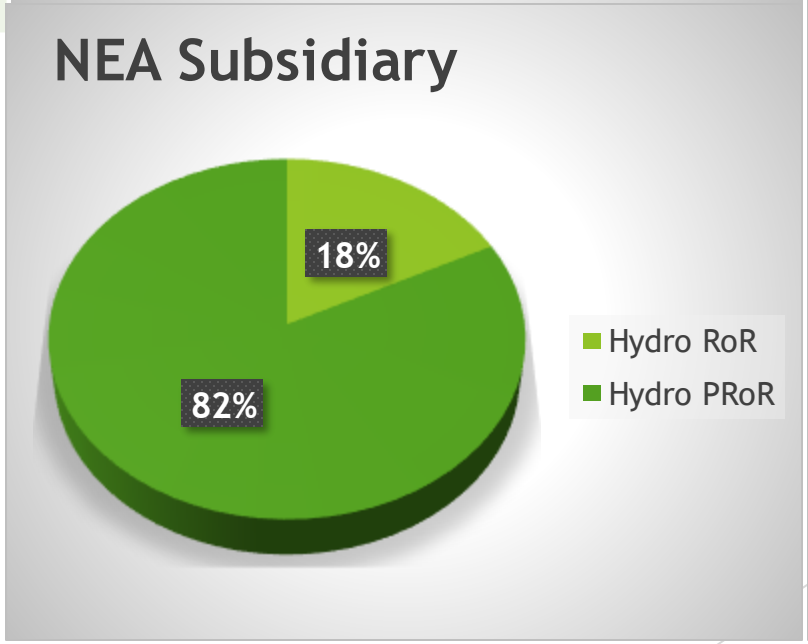
GENERATION CAPACITY

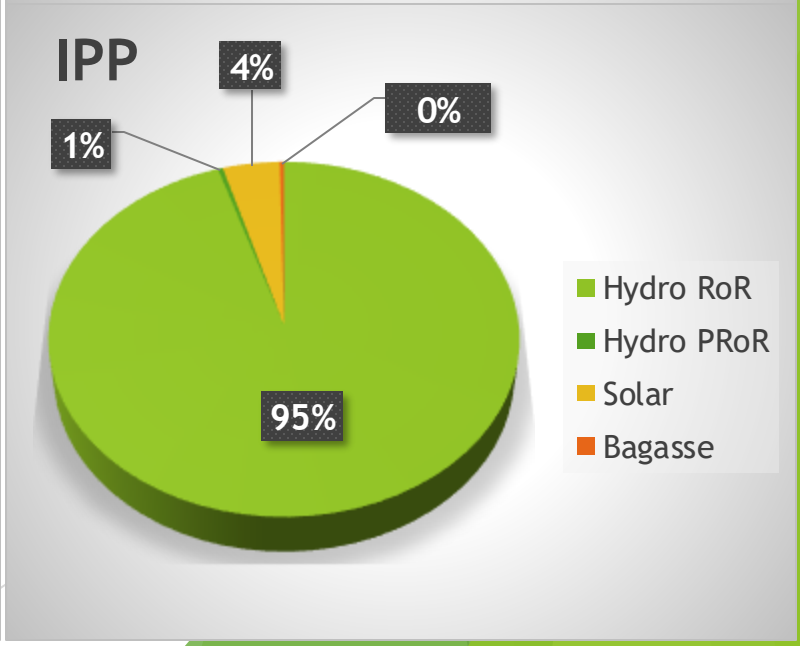
Description	NEA	IPP	NEA Subsidiary	Nepal
Hydro RoR	163	1841	97	2101
Hydro PRoR	313	6.6	456	775.6
Hydro Storage	106	0	0	106
Solar	25	82	0	107
Thermal	53.4	0	0	53.4
Bagasse	0	6	0	6
Total	660	1935.6	553	3149











Power Status of Nepal (FY 2022/23)

System Peak Demand: 2171 MW (July 11, 2023)

National Peak Demand: 1986 MW (June 1, 2023)

National Peak Growth Rate: 13.66 %

Total System Energy Demand : 12881 MU

National Energy Demand : 11548 MU

National Energy Growth Rate : 8.06 %

Per Capita Electricity Consumption : 380 kWh

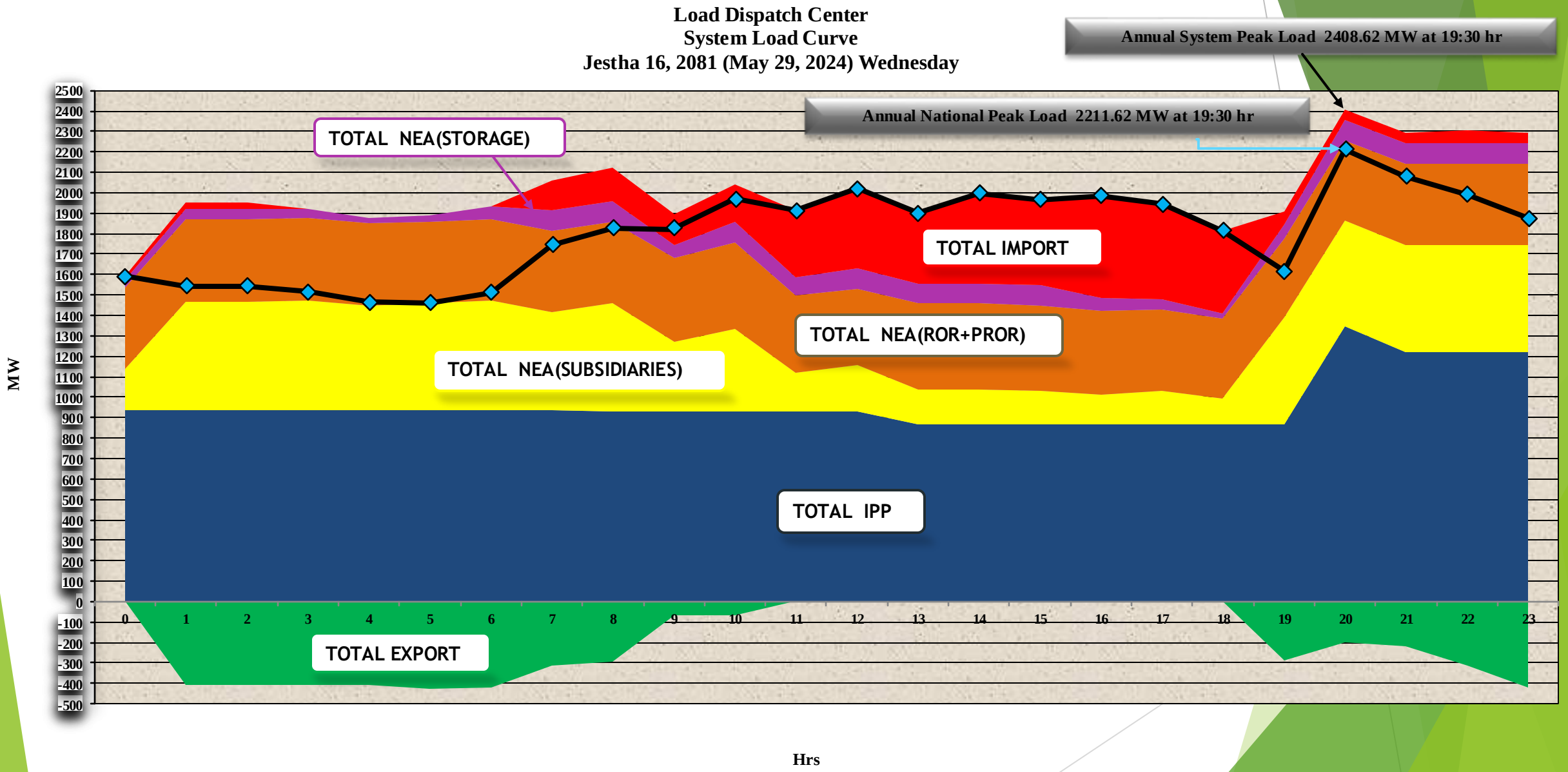
System Peak Demand: 2409 MW (May 29, 2024) **for FY 2023/24***

National Peak Demand: 2212 MW (May 29, 2024) **for FY 2023/24***

PPA under Process

S.No.	No. of Projects	Capacity	Stage
1	129	3680 MW	Under Construction
2	141	3760 MW	Under Development
3	187	11229 MW	PPA Process
Total	**457**	**18669 MW**	

SYSTEM PEAK LOAD CURVE OF F/Y 2023-024*



Power Export-Import with India

- Power Import-Export relationship between Nepal and India exists since 1971
- Nepal have been importing power from India through **Bilateral contracts**, **PEC mechanism, Day-Ahead Market (DAM) and Real-Time Market (RTM)** of Power Exchange Market (IEX) of India
- Nepal initially started to import power via 11 kV and 33 kV lines
- From 1995, Nepal started importing via 132 kV lines (Kataiya-Kusaha and Ramnagar-Gandak TLs)
- From 1999, Tanakpur-Mahendranagar 132kV line was operational under Mahakali treaty
- Bulk power trading started after the commissioning of Dhalkebar-Muzaffarpur 400 kV TL (initially charged and operated at 132 kV (2016) and 220 kV (2018) consecutively)
- Nepal has started to export surplus power to India via DAM (IEX) since **November 3, 2021**

EXISTING CROSS BORDER POWER TRADING BETWEEN NEPAL AND INDIA

1. **G-G (Treaties)**
   a. Koshi Treaty
   b. Tanakpur 70 Million Units
2. **Power Exchange Committee (PEC) (NEA and BSPTCL/UPPCL/UPCL)**
   a. Bihar State Power Transmission Company Ltd (BSPTCL)
      132 kV and 33 kV
   b. Uttar Pradesh Power Corporation Limited (UPPCL)
      132 kV and 33 kV
   c. Uttarakhand Power Corporation Limited (UPCL)
      11 kV (Now not in use)
3. **Short & Medium term Bilateral Contracts (NEA and NVVN/PTC)**
   a. NVVN for DM Line (400 kV)
   b. NVVN for TM Line (132 kV) (previously PTC)
   c. PTC for all 132 kV lines and below (not effective)
   d. NVVN for Haryana State (5 yrs)

4) Day-Ahead Market & Real Time Market (Import and Export through NVVN)

S.No.	Portfolio No.	Projects	Quanta MW
1	E1NP0NVN0169	Trishuli	-23.2
2	E1NP0NVN0170	Devighat	-14.5
3	E1NP0NVN0176	Kali gandaki	-140
4	E1NP0NVN0179	Marshyangdi	-67
5	E1NP0NVN0180	Middle Marshyandi	-68
6	E1NP0NVN0182	Likhu iV	-51
7	E1NP0NVN0187	Chilime	-21.4
8	E1NP0NVN0188	Upper Solu	-22.8
9	E1NP0NVN0204	Kabeli B-1	-24.2
10	E1NP0NVN0205	Lower Modi	-19.4
11	E1NP0NVN0218	Upper Dordi	-24.2
12	E1NP0NVN0222	Solu Khola	-83.4
13	E1NP0NVN0228	Dordi Khola	-26.1
14	N2NP1NVN0211	Upper Kalangagad	-32.7
15	N2NP1NVN0212	Upper Chameliya	-37.3
		Total Export	**-655.2 MW**

EXPIRED ON 30 JUNE 24

Import Portfolio	Name	Quanta
E1NP0NVN0166	NEA-II	500
N2NP1NVN0173	NEA-NR	54
Total **Import**		454 MW

Export Points	Quanta
Dhalkebar - Muzaffarpur	585.2
Mahendranagar - Tanakpur	70
Total **Export**	655.2 MW

NEPAL'S PARTICIPATION IN DAY-AHEAD MARKET

In India, post electricity market reform, Indian Exchange Market (IEX) started operation from 2008

- Nepal - first South Asian country to join IEX's power exchange platform from April 17, 2021
- Import of power up to 350 MW from **May 1, 2021**
- Export of 39 MW from November 3, 2021
- Import of 70 MW via Tanakpur-Mahendranager line started on Jan 15, 2022
- Export of 70 MW via Tanakpur-Mahendranager line started on Sep 5, 2023
- Nepal has got approval to export 655.2 MW of power via DAM (IEX)

NEPAL'S PARTICIPATION IN Real Time MARKET (RTM)

First participation on 2nd October 2023 through D-M Line (DA approval for 2 projects, 43.65 MW)

Export

Import of power up to 400 MW from Nov 1, 2023

Muzaffarpur

Import of power up to 54 MW from Nov 7, 2023

Tanakpur

OPERATIONAL PROCEDURE OF POWER TRADING IN IEX

01 Load & Generation Forecasting considering outages

02 DAM Price Forecasting & Generation Schedule Optimization based on it specially in Dry Season

03 DAM BID Preparation for Export/Import analyzing optimized Generation Schedule, Load Forecast and Bilateral Trading

04 Placing DAM Bid on NVVN Portal

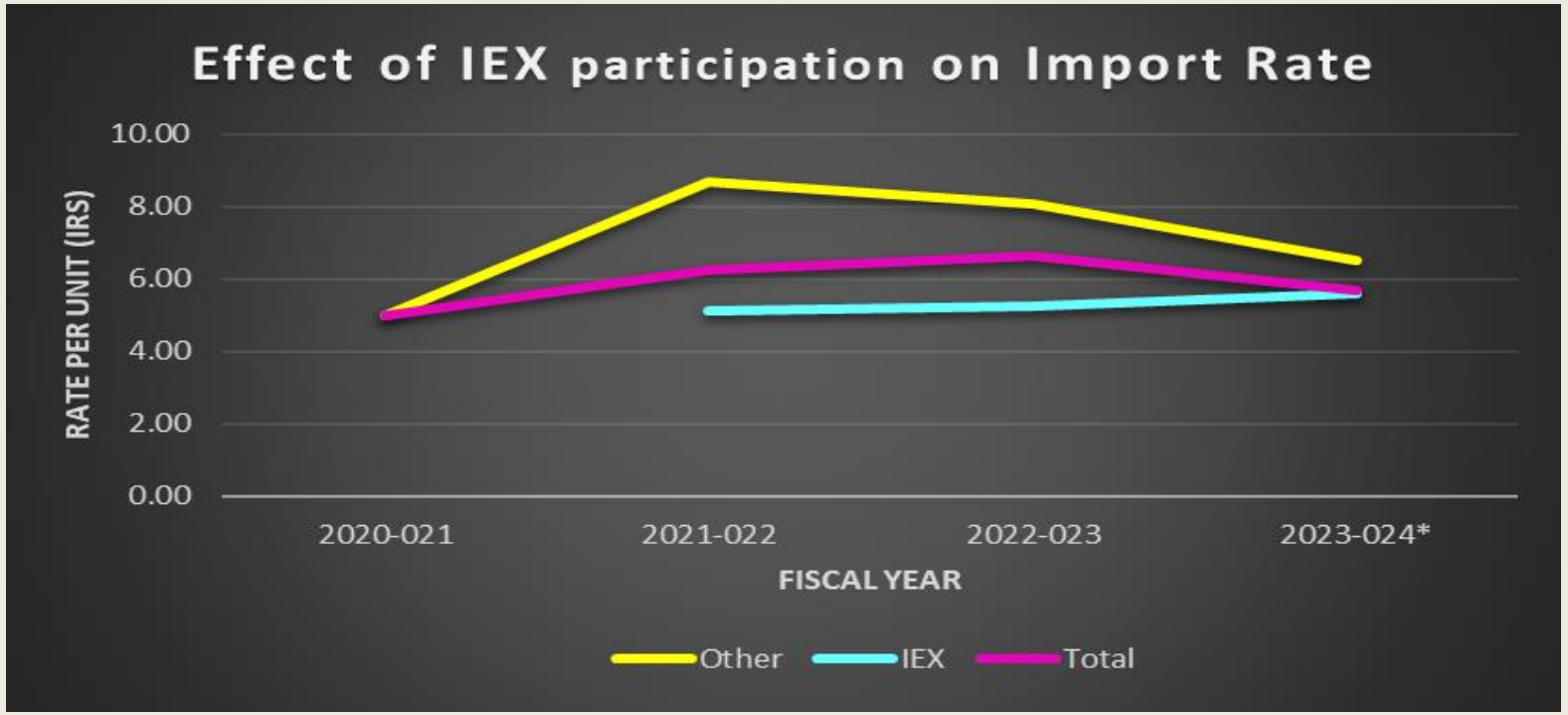
05 Bidding in RTM considering current surplus/deficit.

EXPERIENCES

EXPERIENCES

EFFECT OF IEX PARTICIPATION ON IMPORT RATE

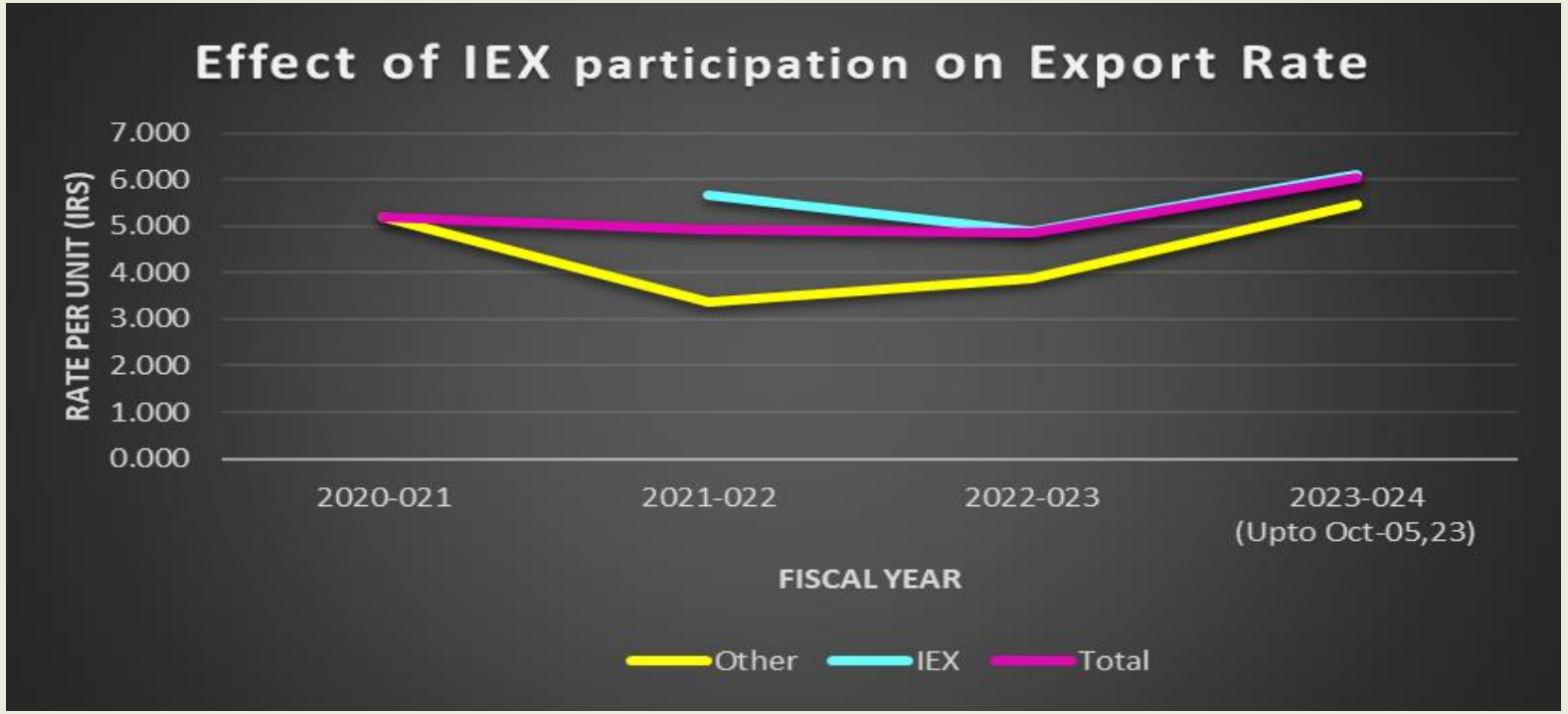
F/Y	2020-021	2021-022	2022-023	2023-024*
Other	4.97	8.70	8.09	6.50
IEX		5.12	5.27	5.60
Total	4.97	6.26	6.63	5.70



EXPERIENCES

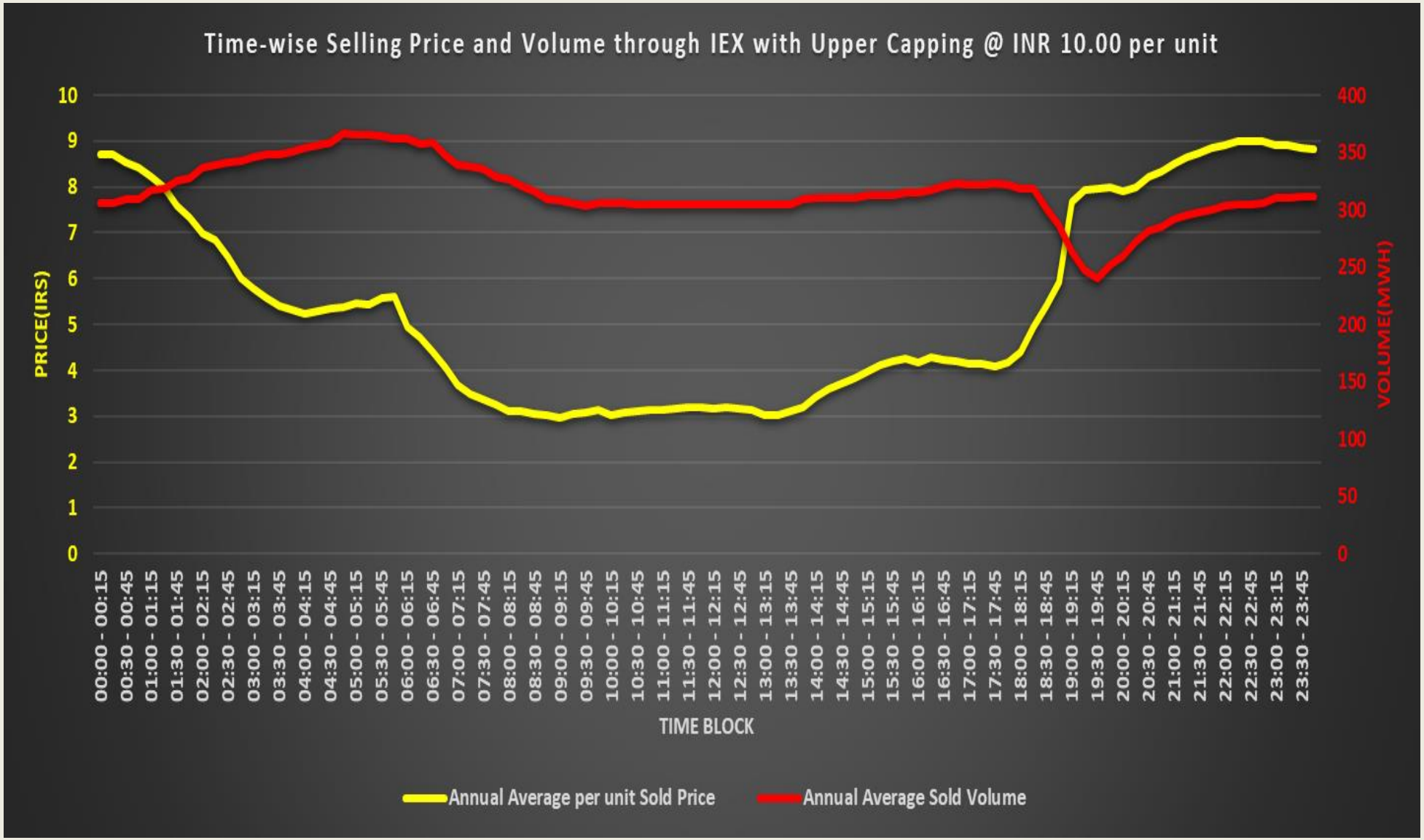
EFFECT OF IEX PARTICIPATION ON EXPORT RATE

F/Y	2020-021	2021-022	2022-023	2023-024*
Other	5.200	3.380	3.880	5.450
IEX		5.670	4.880	6.090
Total	5.200	4.920	4.860	6.030



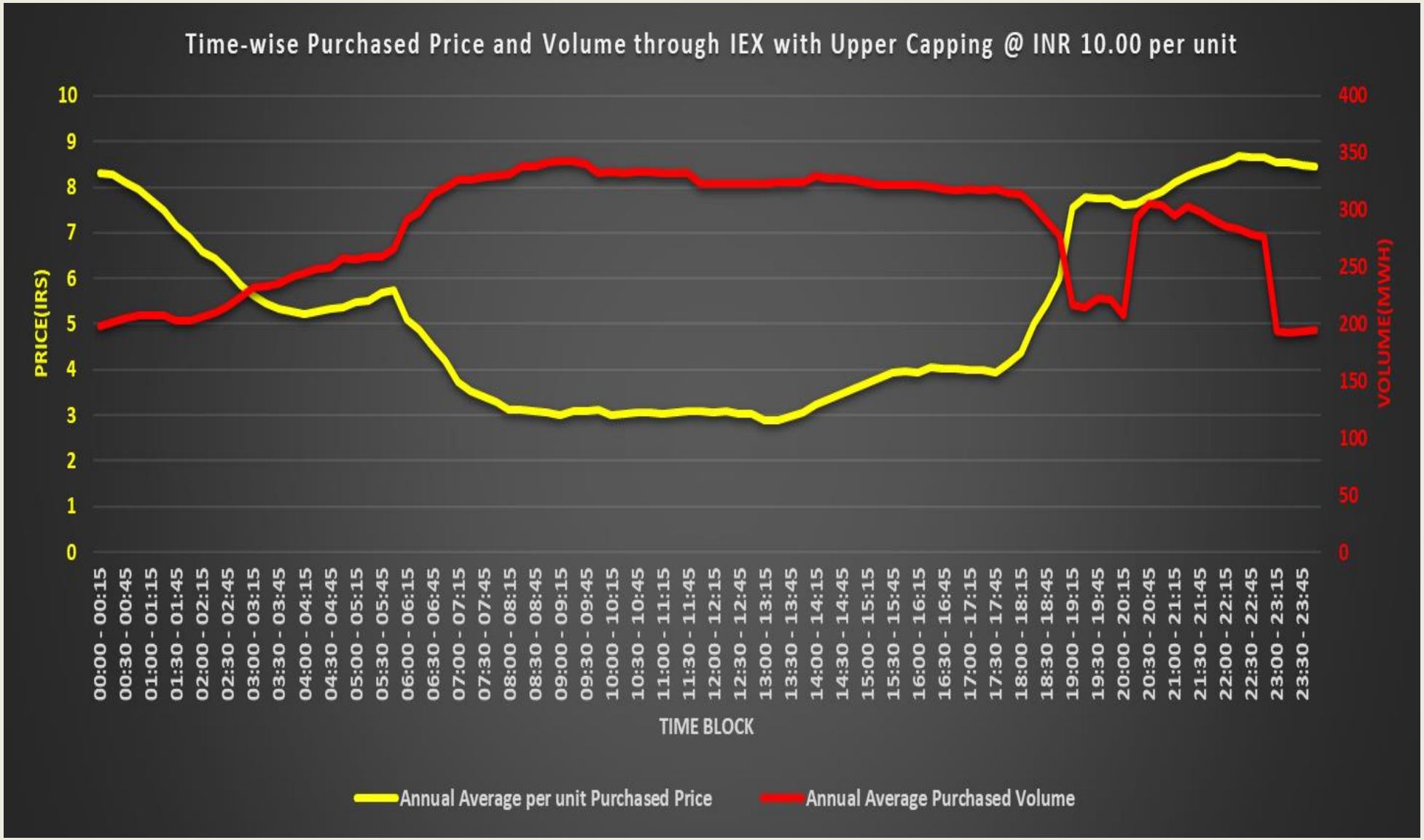
EXPERIENCES

EXPORT PRICE (Cap@10) Vs VOLUME F/Y 2022-023



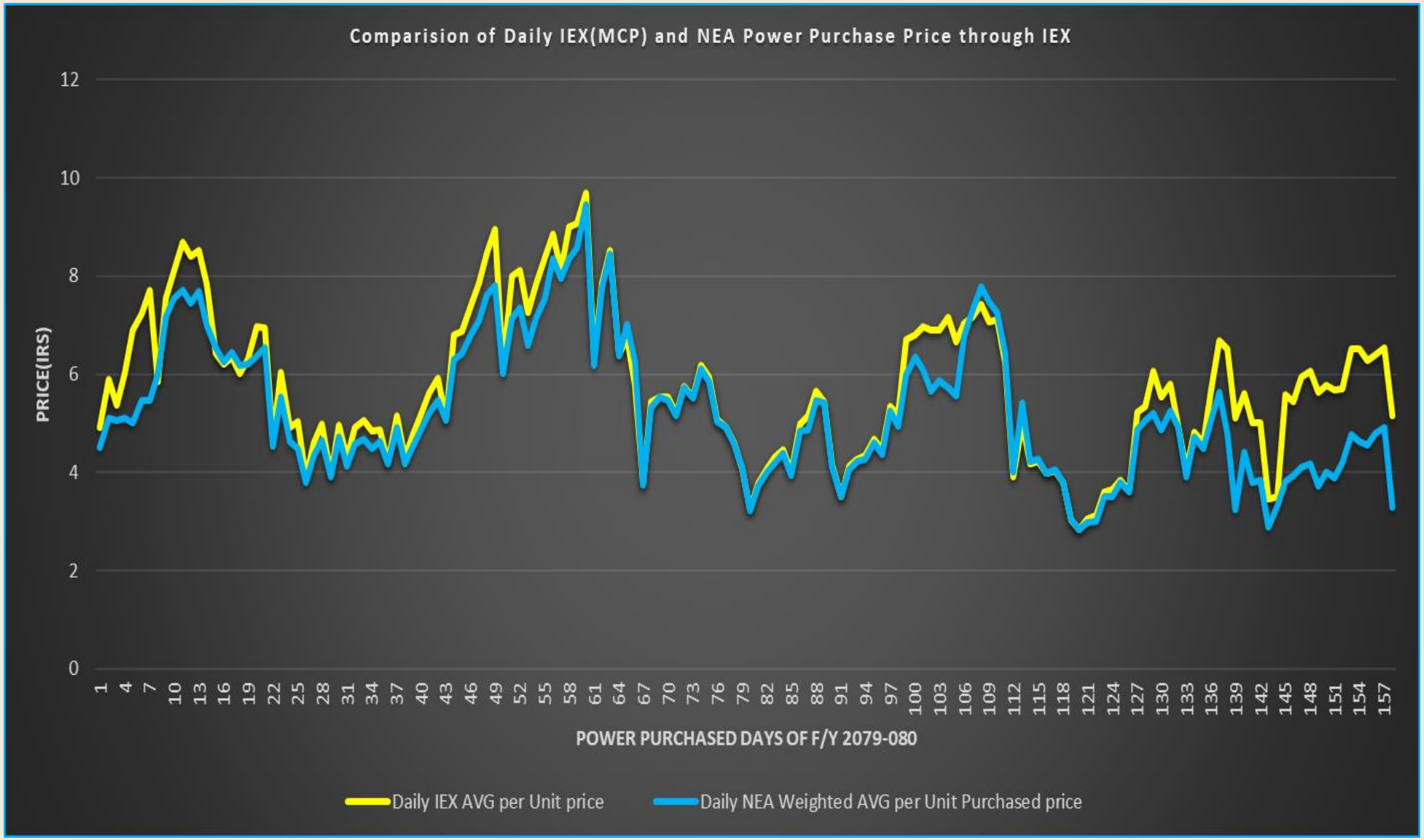
IMPORT PRICE (Cap@10) Vs VOLUME F/Y 2022-023

EXPERIENCES



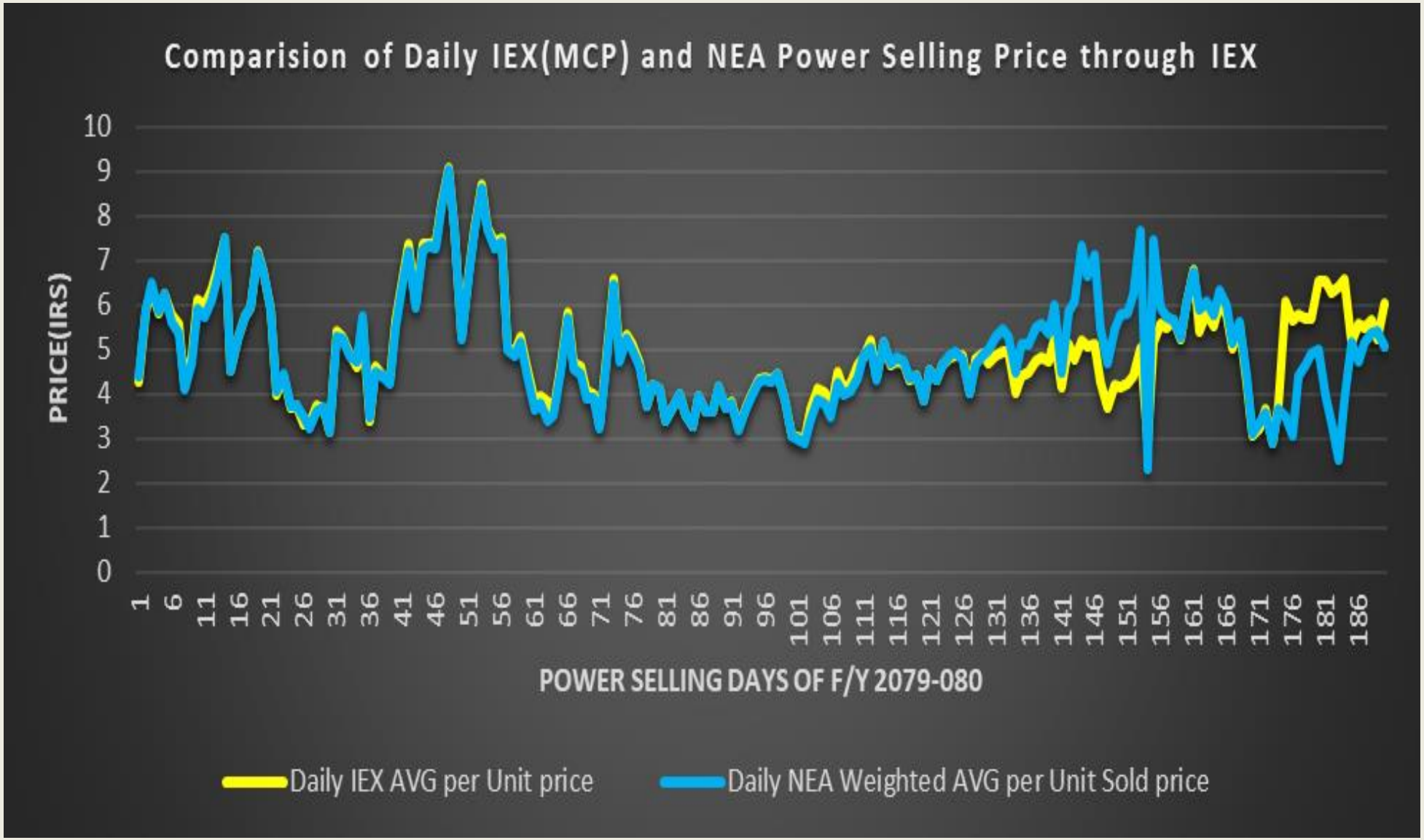
EXPERIENCES

IMPORT PRICE Vs IEX PRICE F/Y 2022-023



EXPERIENCES

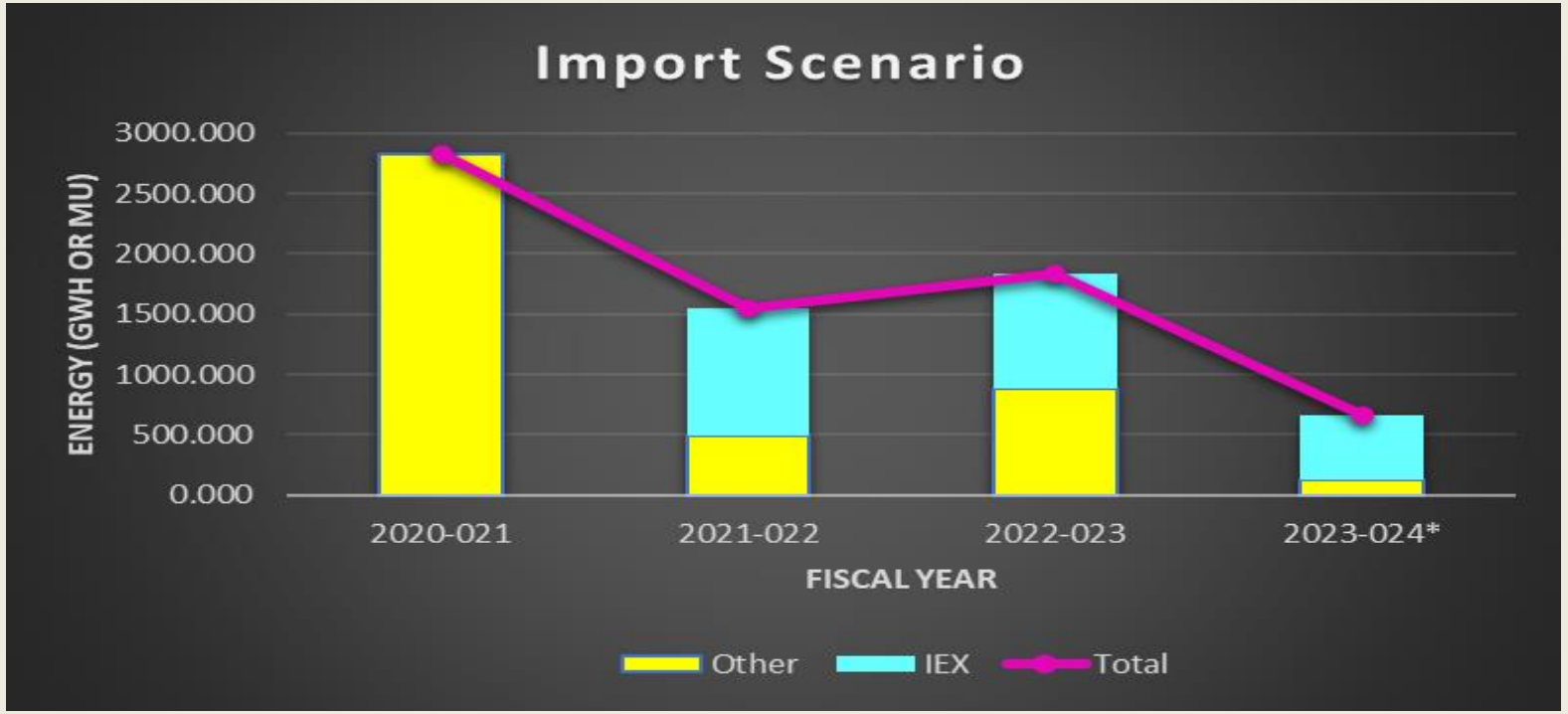
EXPORT PRICE Vs IEX PRICE F/Y 2022-023



EXPERIENCES

IMPORT SCENARIO

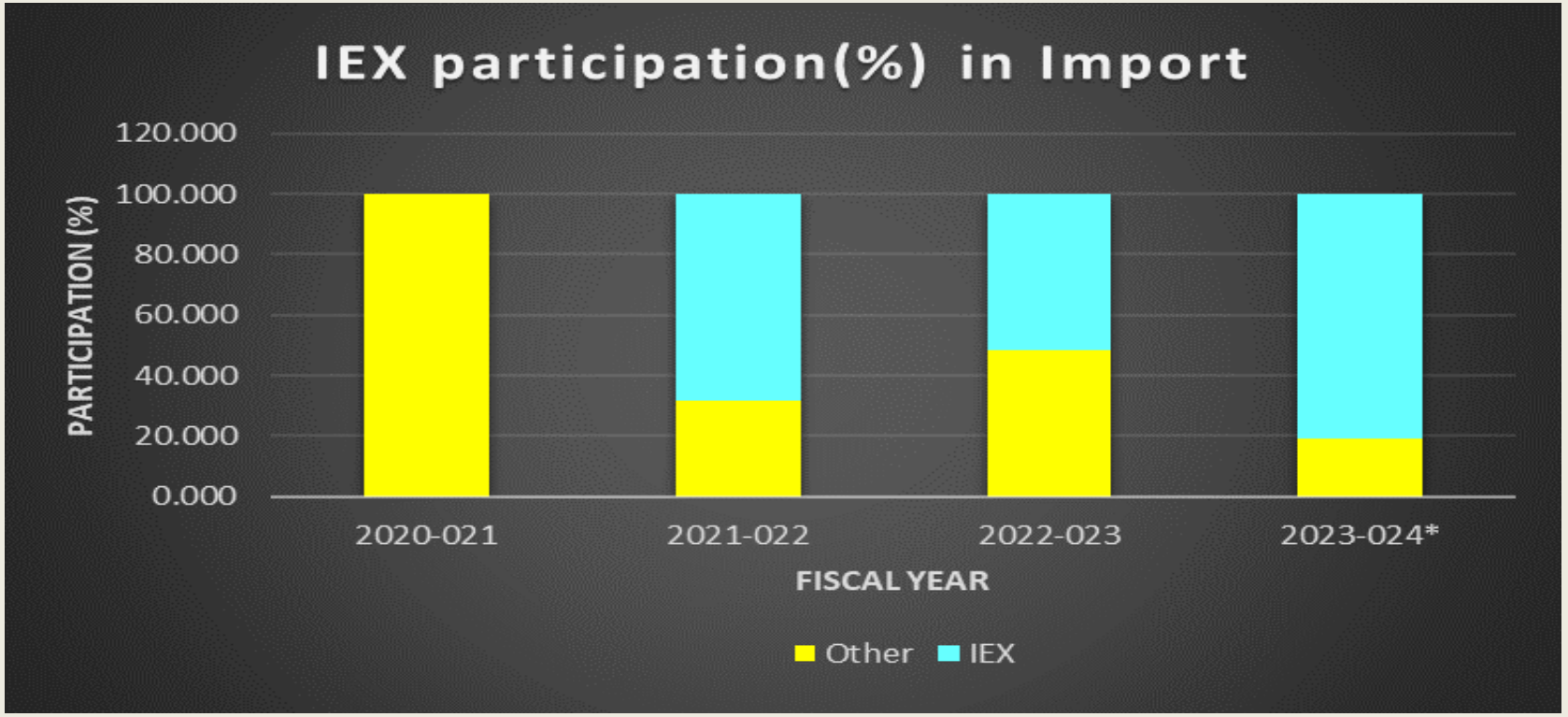
F/Y	2020-021	2021-022	2022-023	2023-024*
Other	2826.210	491.780	883.742	126.3932
IEX	0.000	1051.220	949.258	536.170
Total	2826.210	1543.000	1833.000	662.563



EXPERIENCES

IEX PARTICIPATION(%) IN IMPORT

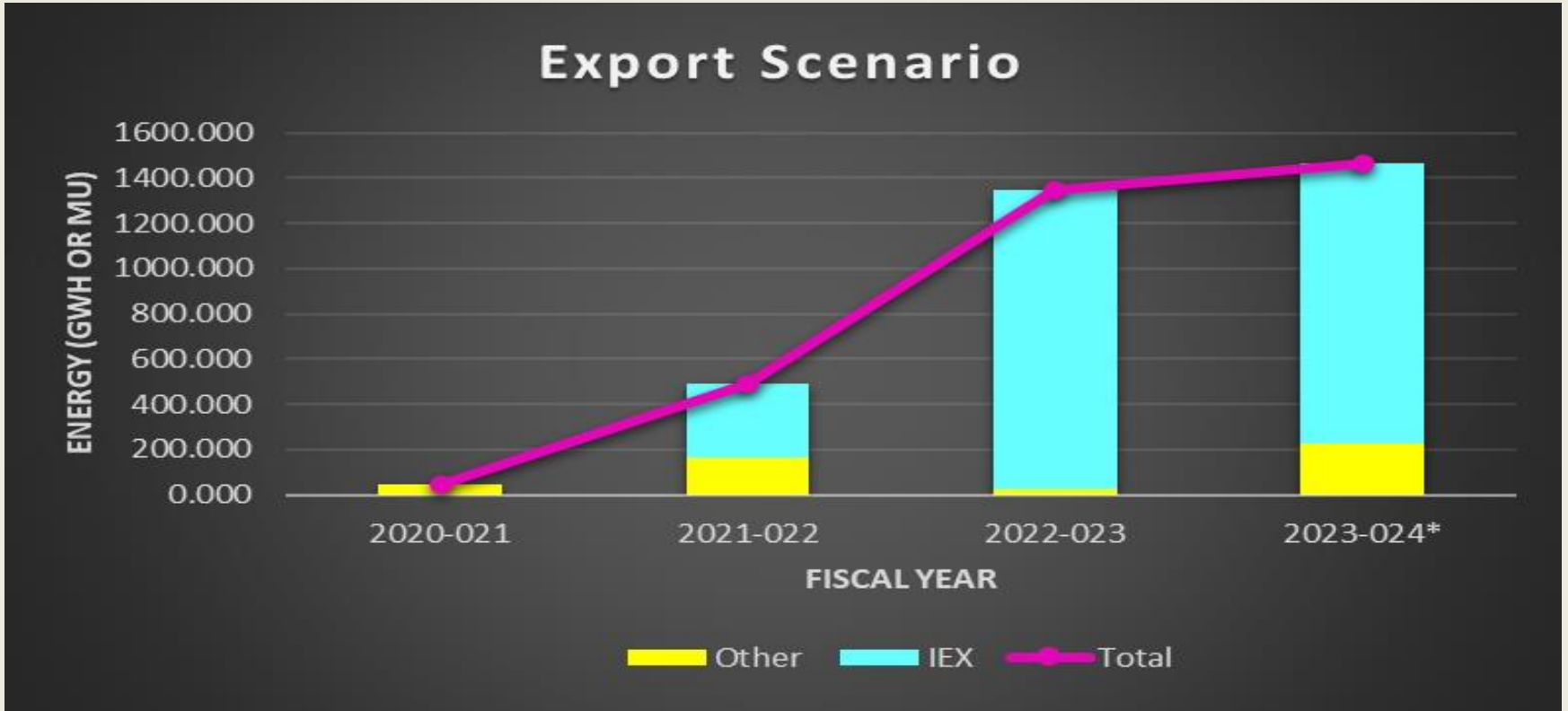
F/Y	2020-021	2021-022	2022-023	2023-024*
Other	100.000	31.872	48.213	19.0763
IEX	0.000	68.128	51.787	80.924
Total	100.000	100.000	100.000	100.000



EXPERIENCES

EXPORT SCENARIO

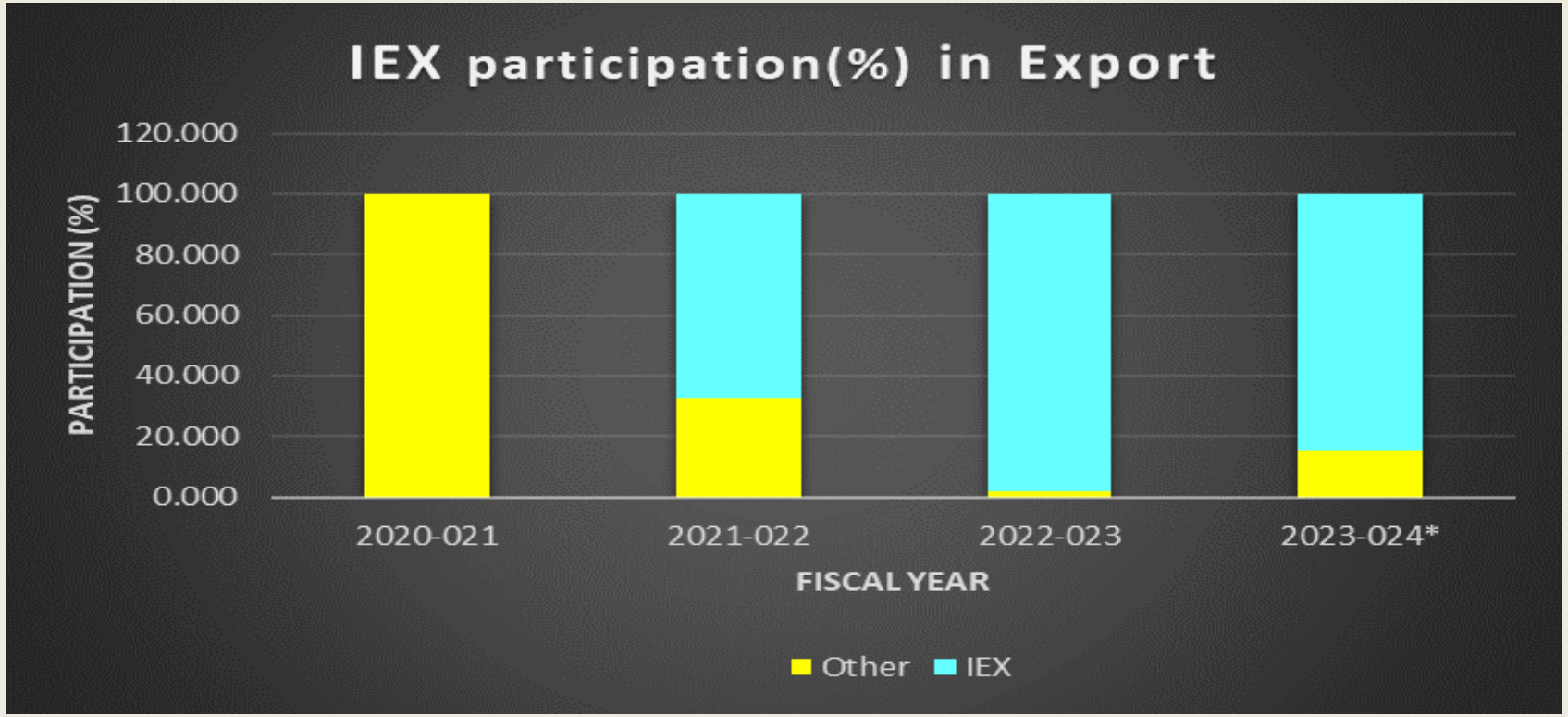
F/Y	2020-021	2021-022	2022-023	2023-024*
Other	44.000	161.838	27.038	226.4291
IEX	0.000	331.162	1318.962	1236.538
Total	44.000	493.000	1346.000	1462.967



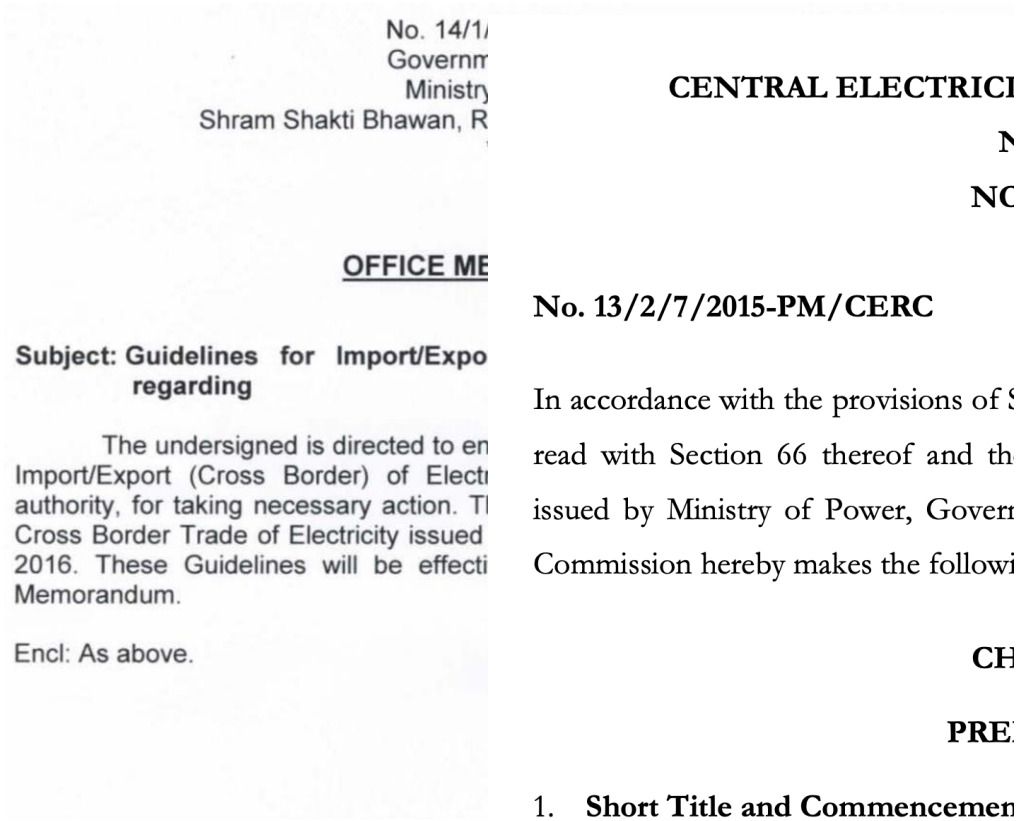
EXPERIENCES

IEX PARTICIPATION(%) IN EXPORT

F/Y	2020-021	2021-022	2022-023	2023-024*
Other	100.000	32.827	2.009	15.477
IEX	0.000	67.173	97.991	84.523
Total	100.000	100.000	100.000	100.000



APPREHENSIONS AND UNCERTAINTIES



No. 14/1/
Governm
Ministry
Shram Shakti Bhawan, R

OFFICE ME

Subject: Guidelines for Import/Expo regarding

The undersigned is directed to en Import/Export (Cross Border) of Electr authority, for taking necessary action. Th Cross Border Trade of Electricity issued 2016. These Guidelines will be effecti Memorandum.

Encl: As above.

CENTRAL ELECTRICI

N

NC

No. 13/2/7/2015-PM/CERC

In accordance with the provisions of S read with Section 66 thereof and th issued by Ministry of Power, Goverr Commission hereby makes the followi

CH

PRE

1. **Short Title and Commencemen**

(1) These regulations may be cal (Cross Border Trade of Electr

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग-II
Power System Planning & Appraisal Division-II

To,

All Stakeholders in power sector (through website of CEA)

Subject: Procedure for approval and facilitating Import/Export (Cross Border) of Electricity) by the Designated Authority.

Sir,

Ministry of Power, Govt. of India have issued the "Guidelines for Import/Export (Cross Border) of Electricity-2018" vide office Memorandum No. 14/1/2017-Trans dated 18th December, 2018.

Further, Ministry of Power, Govt. of India vide its OM dated 24th December, 2018, had appointed Member (Power System), Central Electricity Authority as Designated Authority for carrying out the functions prescribed under the Guidelines. The Designated Authority was also mandated to lay down procedure for facilitating approval and other matters related to Import/Export (Cross Border) of Electricity between India and neighbouring countries.

Accordingly, the **Procedure for Approval and Facilitating Import/Export (Cross Border) of Electricity by the Designated Authority**, as approved by the competent authority in Ministry of Power, is enclosed herewith.

Yours faithfully,

26/02/2021

(Pardeep Jindal)
Nodal Officer to the Designated Authority
& Chief Engineer (PSPA-II)

RELAXATION REQUIRED

Indian entities may import electricity from the generation projects located in neighbouring country(ies) directly or through Government or a Government Company or a licensed trader of that country after taking approval of the Designated Authority, provided that the generating company is not owned, directly or indirectly by any natural/ legal personality(ies) whose effective control or source of funds or residence of beneficial owner, is situated in/ citizen of a third country with whom India shares land border and that third country does not have a bilateral agreement on power sector cooperation with India. For any relaxation in this provision, the Designated Authority will consult Ministry of Power and Ministry of External Affairs.

CHALLEGES IN THE INDIAN MARKET

- (iii) In case of trading in Indian power exchanges, maximum time period of one year will be allowed at a time from the date of approval.
  - Periodic Approval necessary for Same Plants
  - Approval one one year is also not guaranteed it may be of some days to some months
  - Approval may remain restricted to some hours of day like SOLAR Hrs.
  - Apporval may not be granted at all on some pretext

INTERNATIONAL CROSS BORDER TLS

- SUSTAINABLE IN EACH SIDE
- MODALITY AND CHALLENGES
  - DHALKEBAR MUZAFFARPUR (CPTC INDIA (NEA-10%) and PTCN Nepal (NEA-50%)
    - 1243 MVA (N-1) and is not yet utilised so far
  - NEW BUTWAL GORAKHPUR
    - A j/v in INDIA between Power Grid and NEA and in NEPAL side NEA alone

DHALKEBAR MUZAFFARPUR 400 KV

- TWIN MOOSE DOUBLE CIRCUIT SYNCHRONOUSE CONNECTION
- HUGE SOCIO ECONOMIC IMPACT ON BOTH THE BENEFICIARIES
- SURPLUS AND DEFICIT MANAGEMENT IN BOTH THE COUNRTIES
- (PPP) PRIVATE SECTOR IS ALSO INVOLVED

NEW BUTWAL GORAKHPUR 400 KV

- QUAD MOOSE DOUBLE CIRCUIT SYNCHRONOUSE CONNECTION
- NO SUBSTATION AT GORAKHPUR REQUIRED
- **CHALLENGES : ENTIRE TSC TO BE BORNE BY NEA ALONE**
- G2G
  - (NEA/POWER GRID FOR THE INDIAN PORTION AND NEA FOR NEPAL PORTION)
- IF THE TL IS UNDERUTILISED, IT WILL BE A BIG LOSS FOR NEA
- CAN ONE PARTY TAKE THE RISK ALONE?

PRINCIPLES THAT MAY BE ADHERED

- MUTUAL BENEFITS
  - ALL BENEFICIARIES SHOULD SHARE THE RIS
- IDENTIFY ANCHOR CUSTOMERS
  - COUNTRIES WITH SUCH CUSTORMERS MAY TAKE THE LEAD
- PRIVATE SECTOR PARTICIPATION
  - SHOULD REVIEW INTERNATIONAL PRACTICES
- MATCHING TIME FRAME FOR CONSTRUCTION
  - RISK OF DIFFERENT CONSTRUCTION TIME IN THEIR RESPECTIVE COUNTRIES
  - SINGLE ENTITY TO CONSTRUCT (?)
  - DHALKEBAR SITAMADI (SJVN) : INDIAN PORTION IS COMPLETE AND CHARGED FOR ANTITHEFT MEASURES
- ITSA : ALL PENANTIES TO BE BORNE BY NEPAL FOR NEW BUTWAL GORAKHPUR

FUNDING

- PREFERABLY CONCESSIONAL LOAN – INTERNATIONAL LOAN
- CONSTRUCTION OF LINES COULD BE TIED WITH GENERATION PROJECTS
- GREEN FUNDS (NEPAL AND BHUTAN ARE HELPING DECARBONISATION OF THE NEIGHBOURING GIANTS)
  - Bangladesh's renewable commitment : COP26 in Glasgow, UK, in November 2021 that they hoped to have 40% of their energy from renewable sources by 2041.
  - CARBON ZERO OR NEGATIVE COUNTRIES SHOULD BE GIVEN PRIORITY

Darjeeling
Kurseong
Mal Bazar
Siliguri
Bagdogra
Dharan
Damak
New Anarmani
Panchaga
Biratnagar
Islampur
Thakurgaon
Forbesganj
Kishanganj
Araria
Dalkhola
Purnia
Raiganj
Katihar
Gazole
Sahibganj
Malda মালদা
Rahanpur
Naogaon নওগাঁ
Bogura বগুড়া
Godda
Pakur
Bangladesh
Rajshahi রাজশাহী
Bheramara HVDC
Dhaka
Berhampore বহরমপুর
Image Landsat / Copernicus
Adani PP
Rahanpur
Bogura(W)
Baharampur India
Bheramara HVDC
Ishwardi
Rooppur
Baghabari
Kaliakoir
Aminbazar
DHAKA
Dhaka(S)
Rangpur
Barapukuria
Parbatipur
Palashbari
Noagaon
Rajshahi(N)
Faridpur

40 MW OF POWER FOR BANGLADES

- GATE OPENER : TRIPARTITE AGREEMENT ON THE FLOOR

TL	CAPACITY	HVDC	RECOMMENDATION
BEHERAMPUR BERAMERA	2400 MW ASYNCHRONOUS	500 MW X 2 BLOCK = 1000 MW	500 MW X 4 BLOCKS = 2000 MW
ADANI	DEDICATED		

UTILISATION OF ECONOMICAL RE IN THE SUBREGION

AFTER Tripartite Agreement signing

- Submission of complete documents along with TPSA and necessary
- details of specific hydropower projects to NVVN
- Submission of complete application set to Designated Authority of India
- (Member, Power System, Central Electricity Authority, India)
- Approval from the Designated Authority of India
- Submission of the required forms and documents to Central
- Transmission Utility of India for grant of General Network Access
- Approval of Open Access for using the Indian grid
- Scheduling, dispatch and booking of transmission corridor, and finally
- Commencement of power supply.

OTHER ISSUES

- HARMONISATION OF GRID CODE
- “S plus 3E” representing Safety, Energy Security, Economic Efficiency and Environment as the central pillars of planning
- Bornagar Substation in Assam (North-Easter Region, India) and Katihar Substation in Bihar (Eastern Region, India) may be connected to Parbotipur/Barapukaria (Parbatipur-about 6 km north of Barapukaria) through Bornagar-Parbotipur-Katihar 765 kV transmission line to be initially charged at 400 kV which is being discussed at Bangladesh-India JWG/JSC meeting as a main agenda item

(N-1) CONTINGENCY

- The definition should be reconsidered
- During natural calamities both the circuits shall be destroyed
- CAPACITY UTILISAITON IS RESTRICTED AND RETARDS PAYBACK
- OTHER TRANSMISSION LINES SUCH AS ANARMANI PANCHAGARH MAY BE CONSIDERED

Thank You

Substation Capacity

S.No	Voltage Rating (kV)	Transformer No.	Total Capacity FY 079-80 (MVA)	Total Capacity FY 080-81 (MVA)	Total Increment (MVA)
1	400/220	9	945	2390.01	1445.01
2	220/132	37	2190	3549.95	1359.95
3	220/33	4	186	186	0
4	132/66	13	610.40	635.40	25
5	132/33	84	2994.00	3452.00	458
6	132/11	27	547.50	722.50	175
7	66/33	3	52.50	70.00	17.5
8	66/11	33	661.00	719.50	58.5
9	33/11	50	680.6	720.6	40
	Total	**260**	**8867.00**	**12445.96**	**3578.96**