POWER SCENARIO IN THE YEAR 2029-30

ERPC Meeting

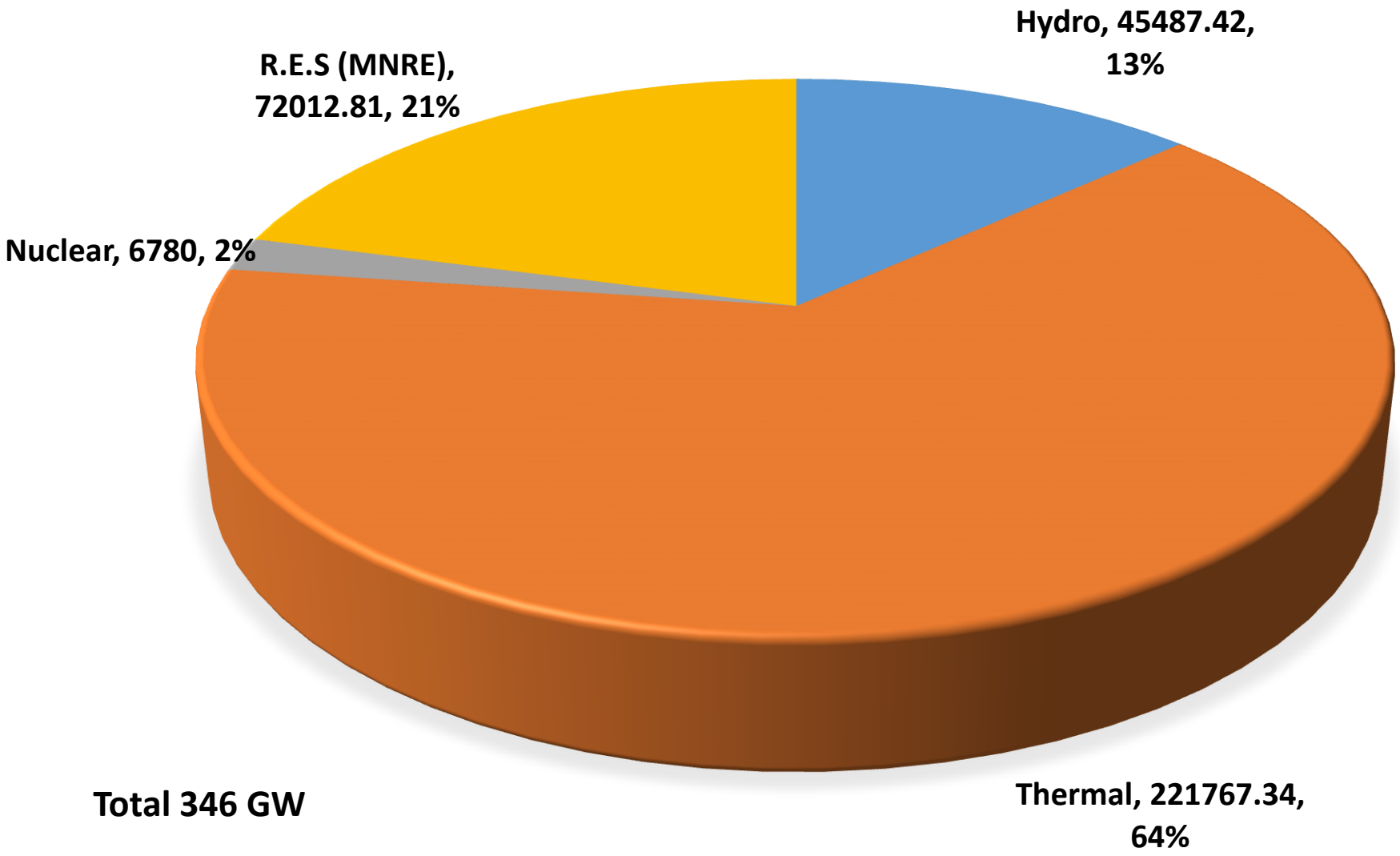
17.11.2018

Jaipur

All India Demand (Projected by 19th EPS)

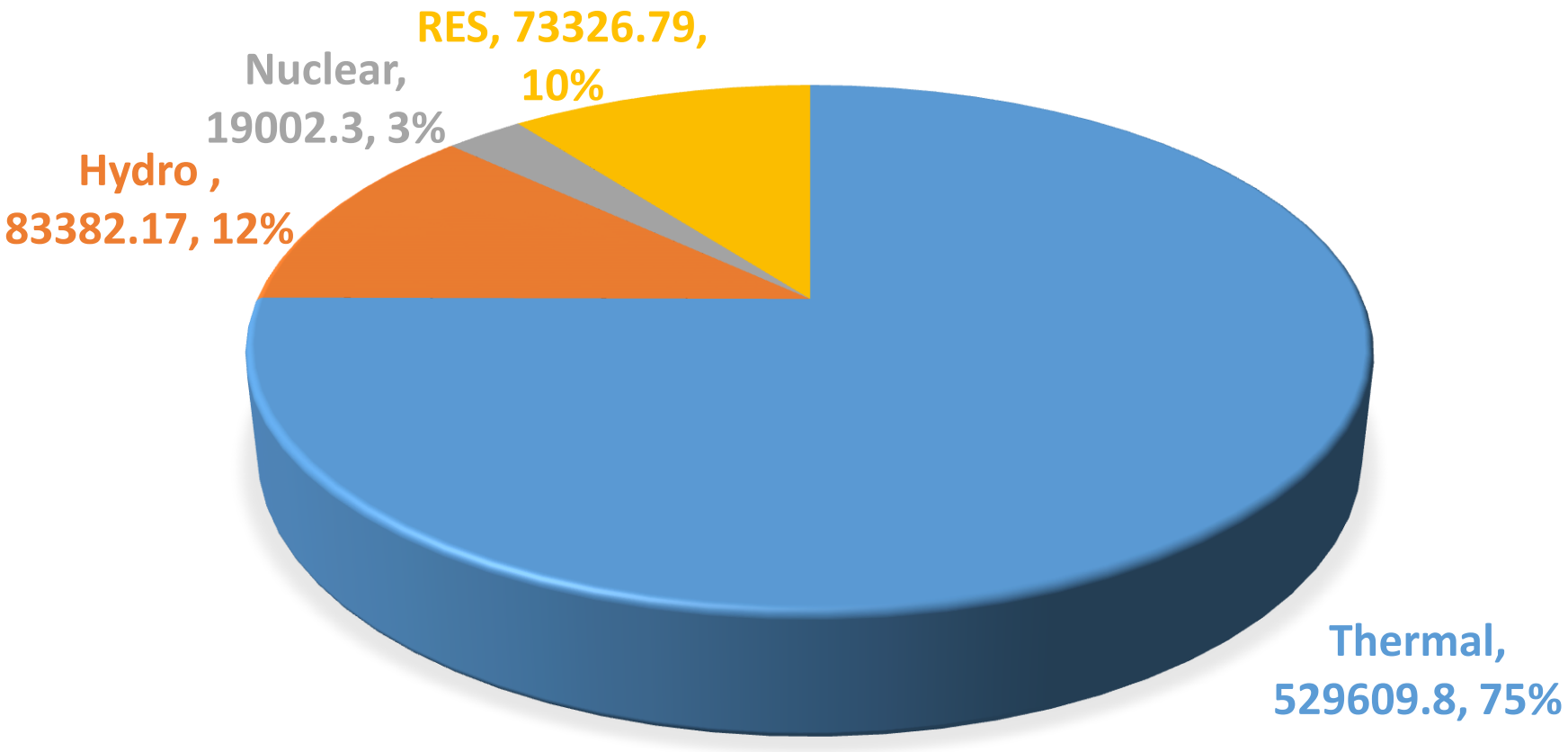
Year	Electrical Energy Requirement (BU) Ex Bus	Peak Electricity Demand (GW)
2021-22	1566	225.751
2026-27	2047	298.774
2029-30	2322	339.973

All-India Installed Capacity (in MW) as on 31.10.2018



Total 346 GW

All-India Generation During the Year 2018-19 (in MU)
(as on 30.09.2018)

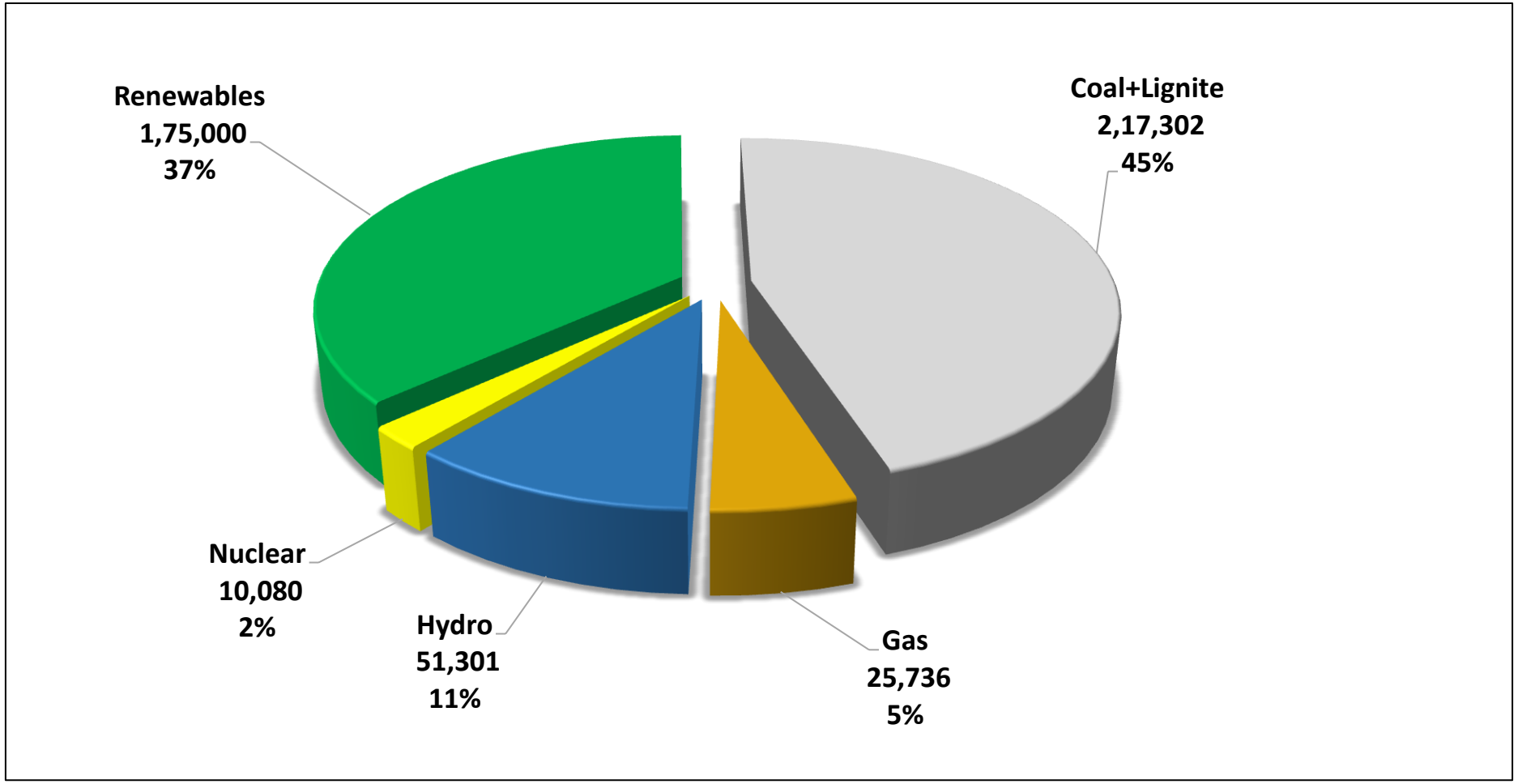


Target for 2018-19 – 1385BU
including 120BU from RE

All-India Demand (in MW) and Energy (in MU) During the year 2018-19 (As on 30.09.2018)

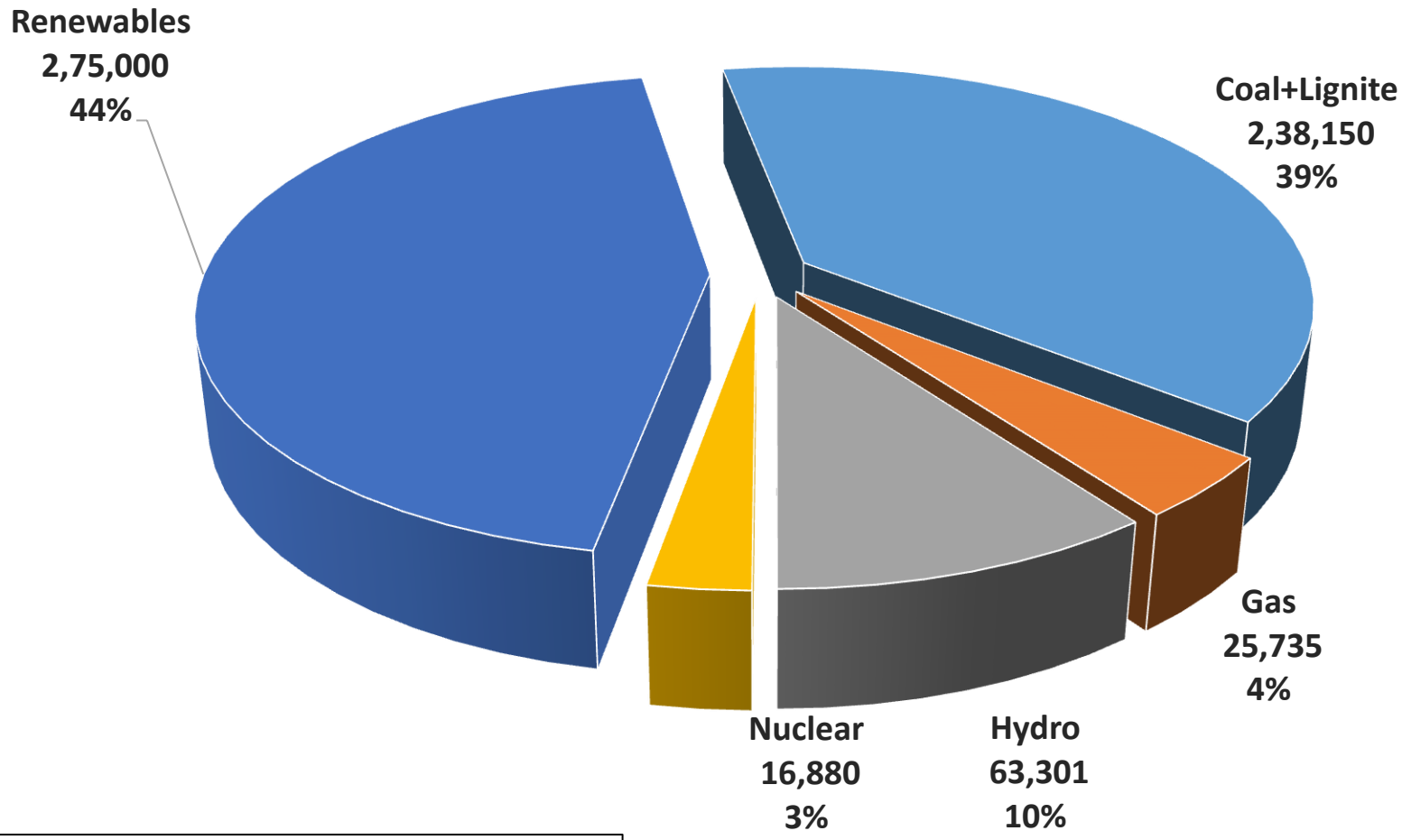
Demand	Peak Demand (in MW)	177022
	Peak Met (In MW)	175528
	Demand Not Met (In MW)	1494
	Demand Not Met (in %)	0.8
Energy	Energy Requirement (In MU)	657944
	Energy Supplied (In MU)	653873
	Energy Not Supplied (In MU)	4071
	Energy Not Supplied (In %)	0.6

Projected All India Installed Capacity (As per NEP) (As on 31.03.2022)



TOTAL 4,79,419 MW

Projected All India Installed Capacity (As per NEP) (March 2027)

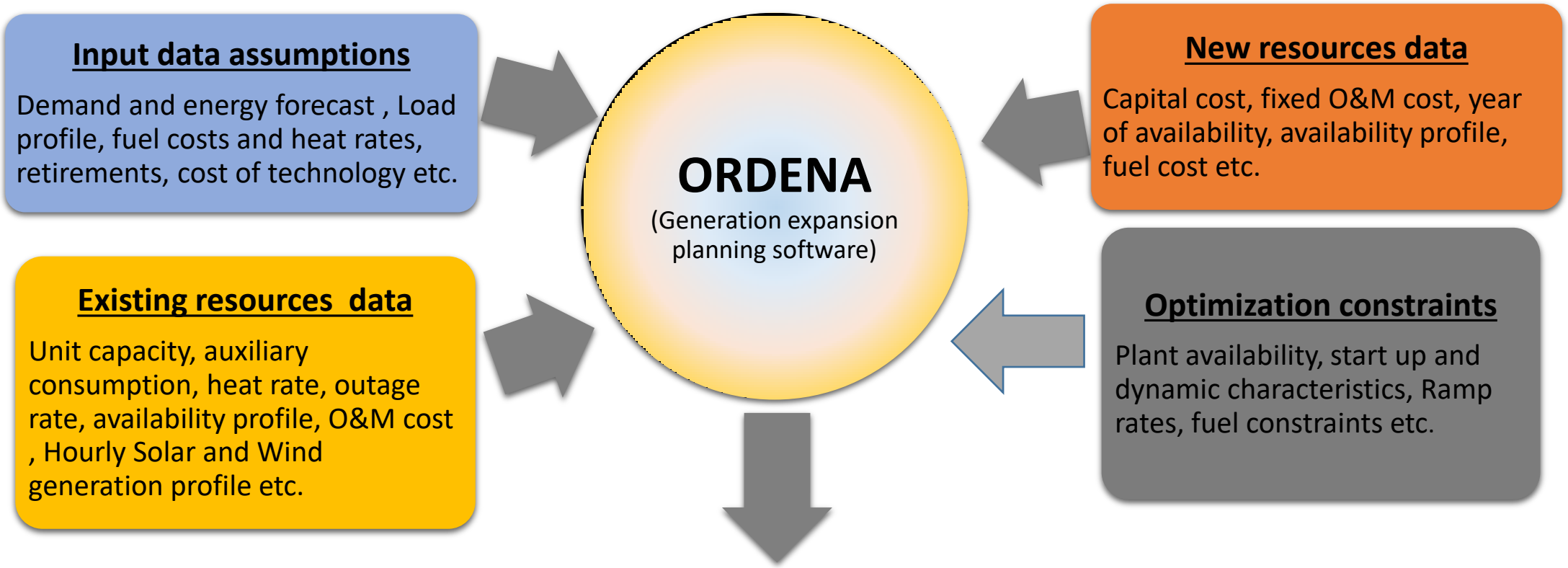


TOTAL 6,19,066 MW

Likely Technologies in Future

Conventional Technologies	Renewable Technologies
Coal (Pithead)	Solar
Coal (Load-centered)	Wind
Gas	Biomass
Nuclear (LWR)	Hydro + PSP+ Small Hydro
Nuclear (PHWR)	Battery Storage

Generation Expansion Planning Model



Optimized resource plan

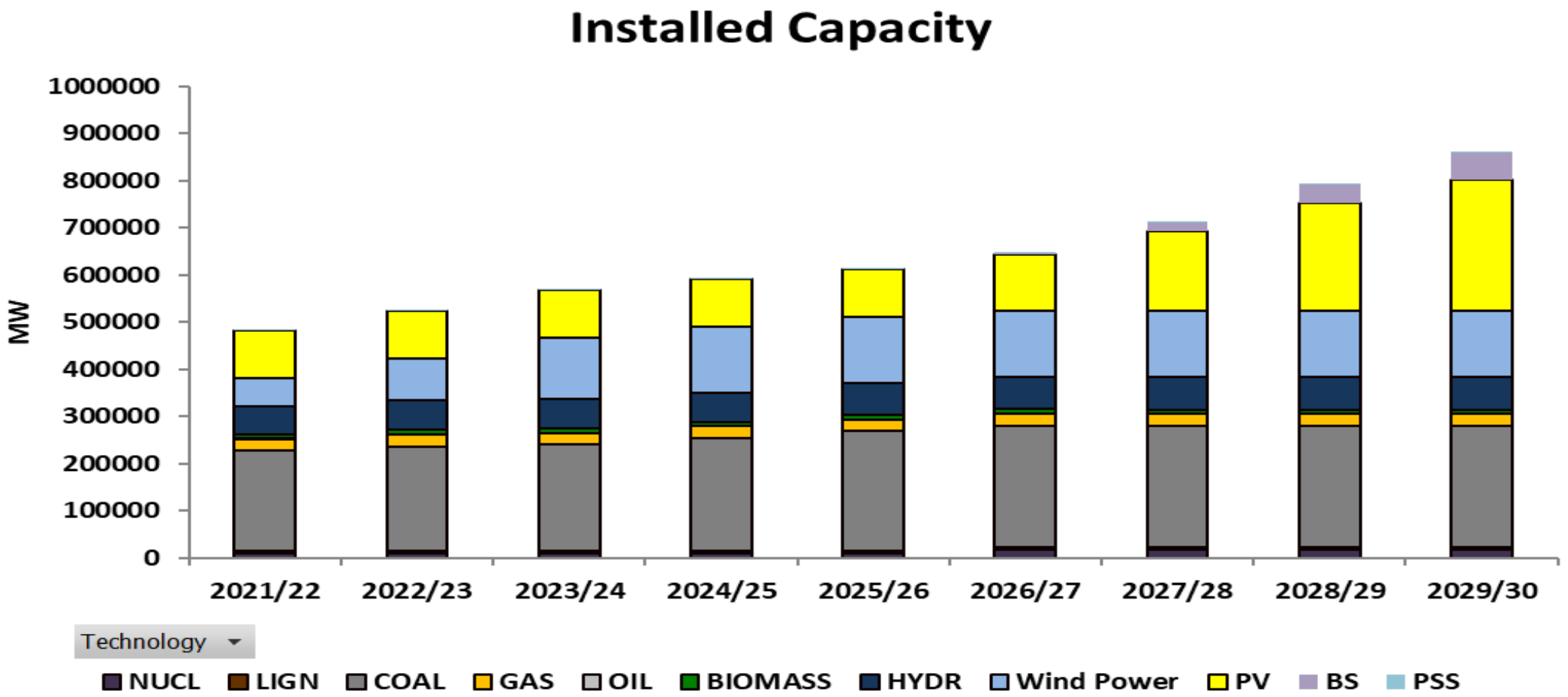
Long Term Planning:-Total system cost, annual system capacity requirement fuel wise,CO2 Emissions

Short term planning:-Economic Hourly energy generation fuel wise to meet the hourly demand

Typical Long Term Results- Likely Installed capacity

Node | Zone | Area | Plant

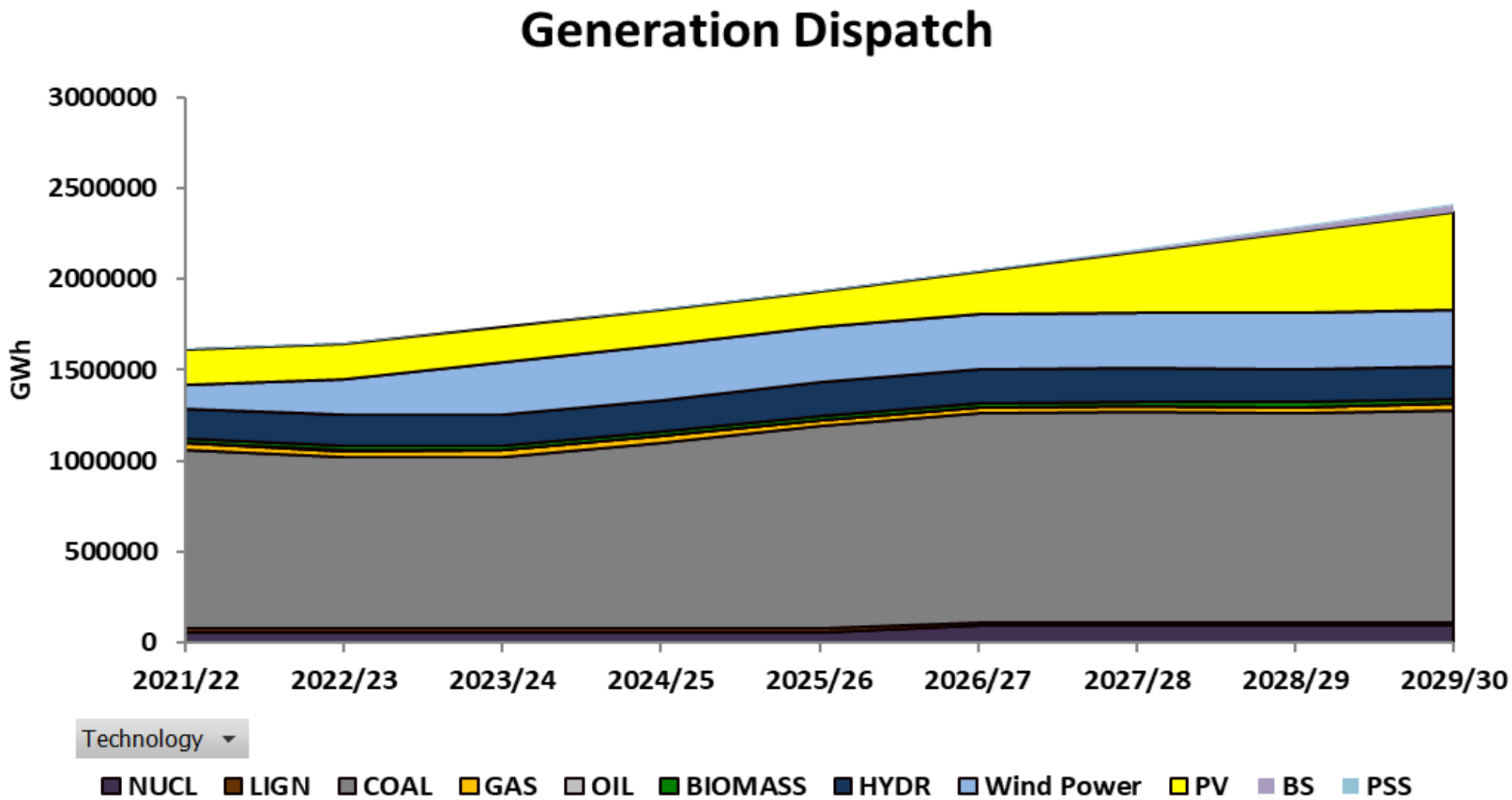
Sum of Capacity (MW)p



Period

Scenario | Node | Zone | Area | Plant

Sum of Total Generation (GWh)

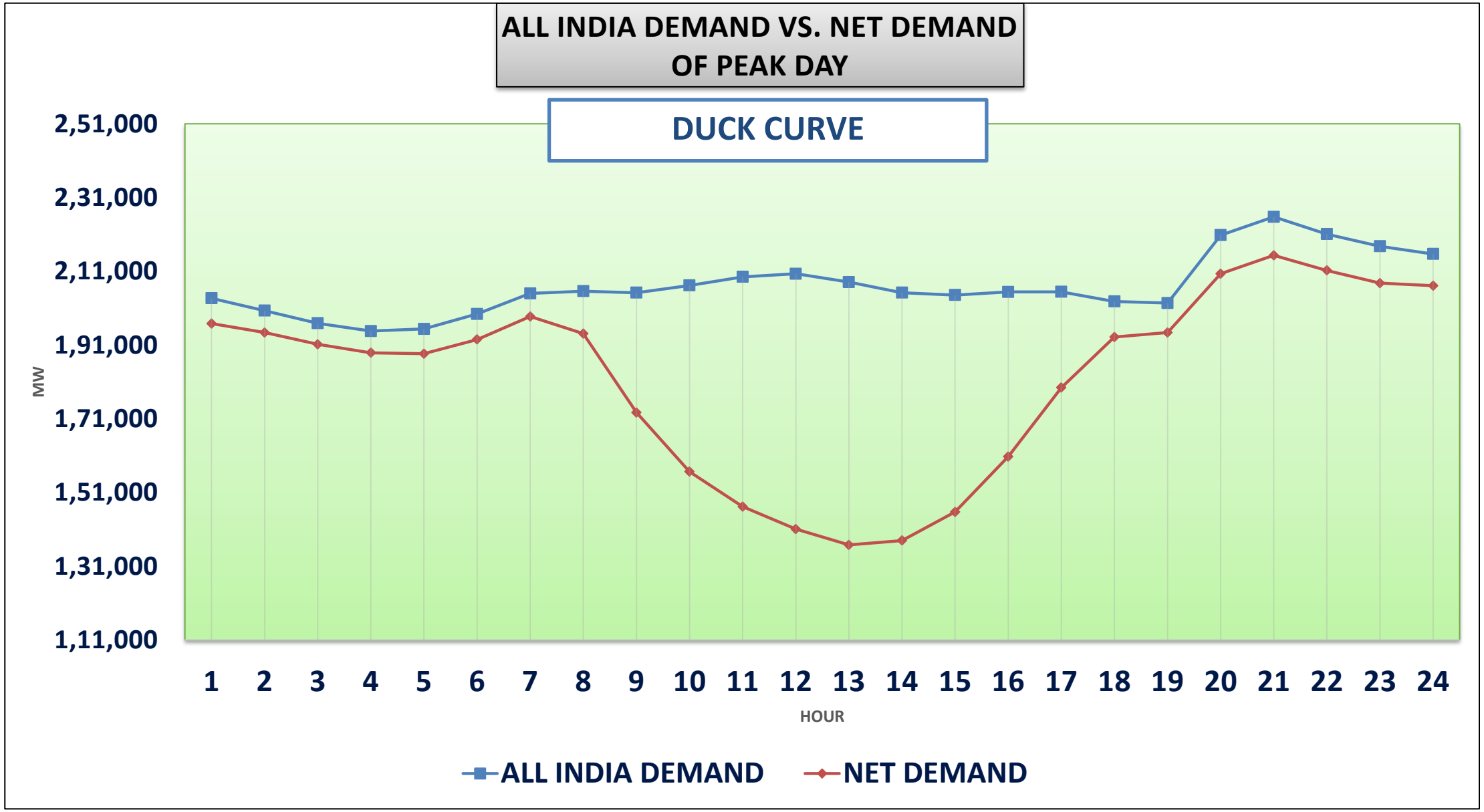


Period

Cost Trends of Emerging Technologies

- **Capex of solar plants likely to reduce from presently Rs 4.5 Cr to Rs. 4.0 Cr during the year 2029-30.**
- **Cost of energy storage(Battery) ranging from $160/kWh-$200/kWh including cost of inverter in the year 2022 is likely to reduce to $100/kWh-$125/kWh in 2029-30 due to technological interventions and economies of scale.**

TYPICAL ALL INDIA DEMAND & NET LOAD CURVE



Likely Scenario in 2030

- 140 GW Wind by 2030 based on MNRE Projections.
- High Solar penetration is also envisaged by 2030 in view of the focus on RE Generation.
- Energy Storage Technologies (MW scale Batteries may become essential for large RE Integration)
- No additional gas-based capacity by 2030 due to prevailing Domestic gas shortages.
- Coal based units of 660 MW/ 800 MW(Super-critical) – Mainly Pithead.
- Flexible operation of Coal based Plants to accommodate the intermittency of RE Generation.
- Nuclear as Government of India plans.

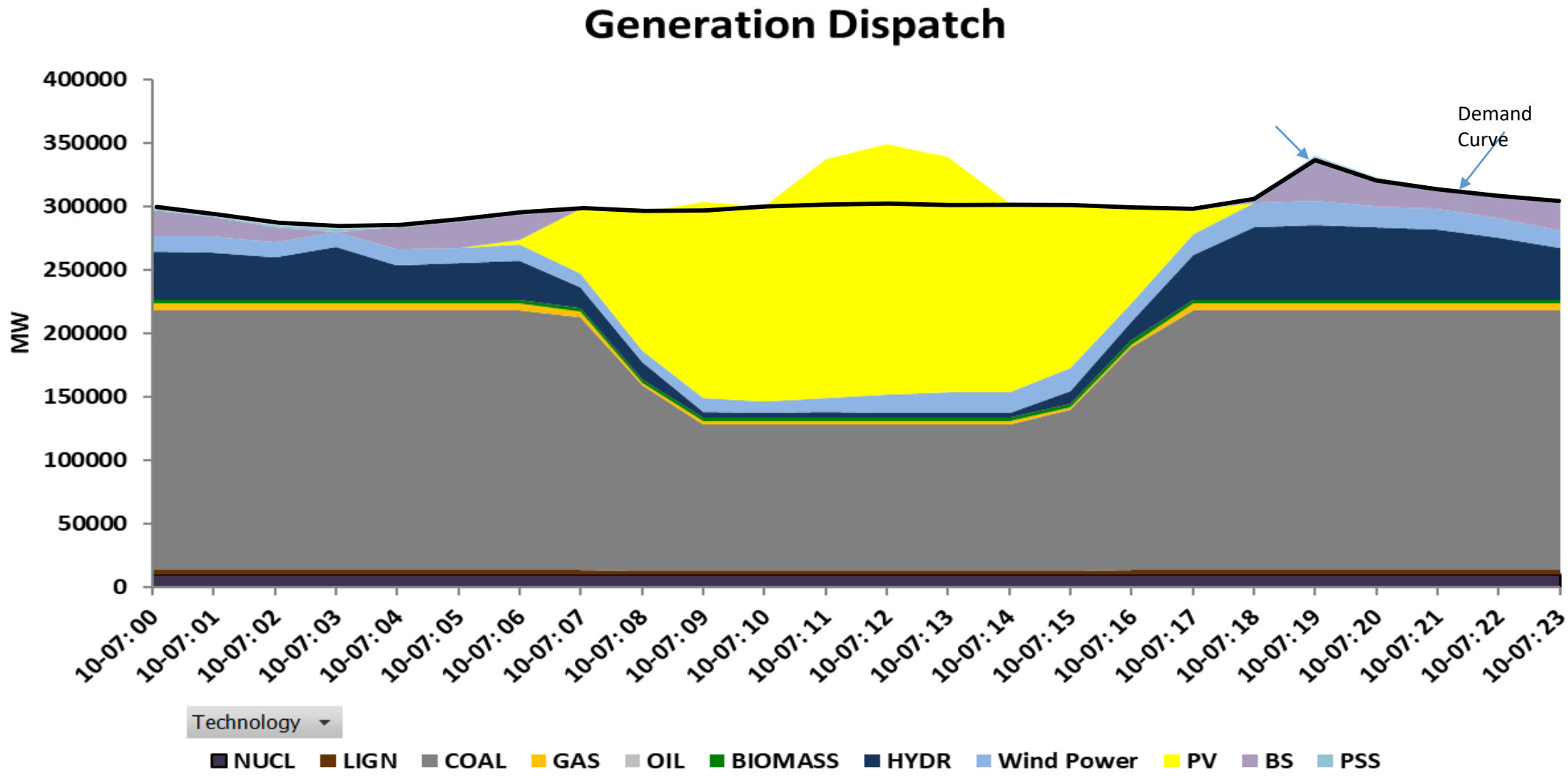
Short Term scenarios considered for typical days

Scenario *
Peak Day / Max Energy demand day
Maximum Variable RE (Wind+Solar) day
Maximum Solar day
Minimum Solar day
Minimum total Demand day
Minimum Variable RE (Wind+Solar) day

Generation Dispatch on a Typical Day

Scenario | Area | Zone

Sum of Total Generation (MW)

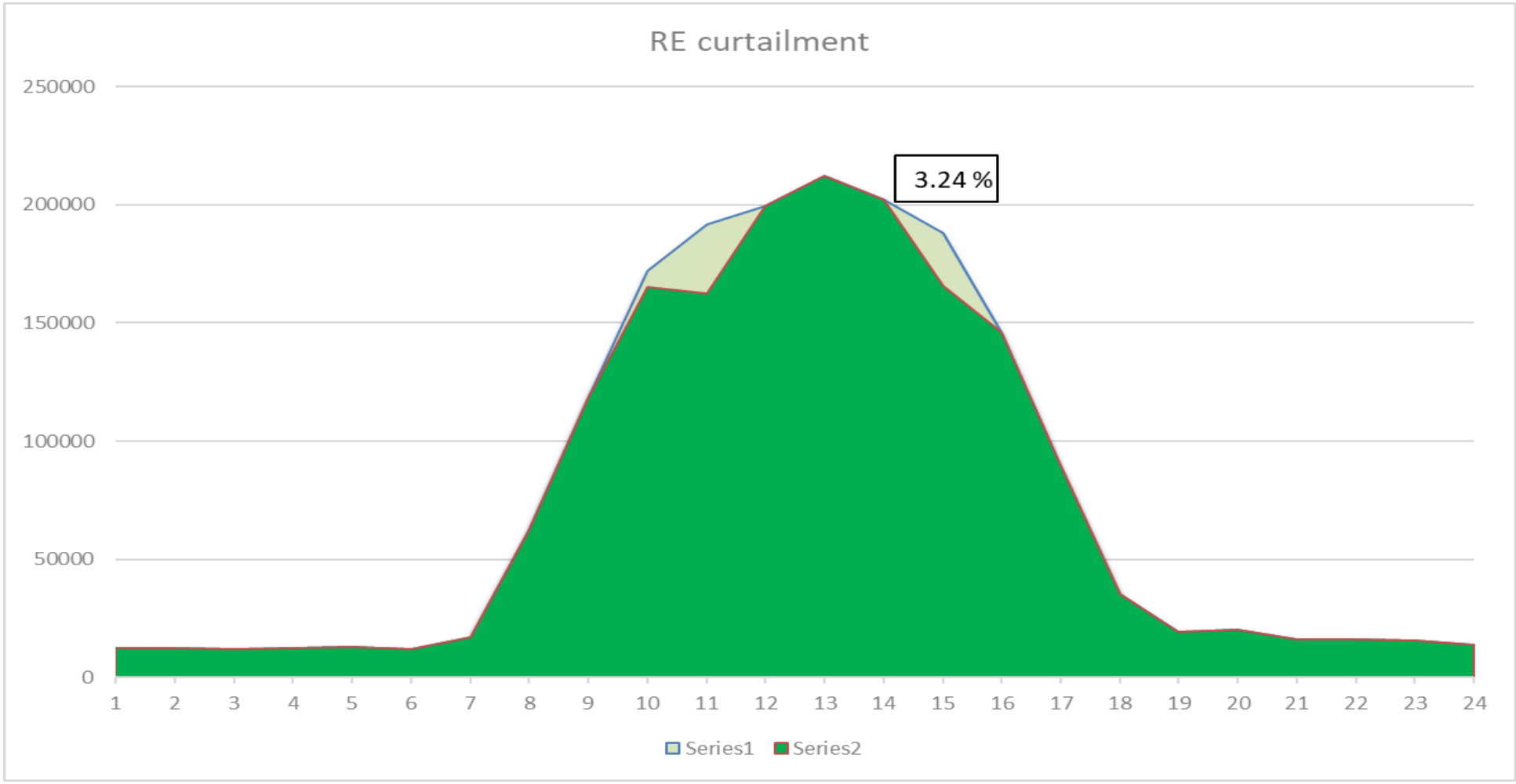


Block

Economic dispatch of the day

	NUCL	LIGN	COAL	GAS	BIOMASS	HYDR	Wind Power	PV	BS	PSS	Demand
10-07: 00	10326	3639	204265	5135	2760	38107	12272	0	20754	1861	299119
10-07: 01	10326	3639	204265	5135	2760	37677	12175	0	15325	1270	292573
10-07: 02	10326	3639	204265	5135	2760	33993	11883	0	11649	1788	285439
10-07: 03	10326	3639	204509	5135	2760	41318	12483	0	0	2412	282583
10-07: 04	10326	3639	204265	5135	2760	27574	12743	0	16920	189	283550
10-07: 05	10326	3639	204265	5135	2760	29160	11832	200	20327	1125	288769
10-07: 06	10326	3639	204305	5135	2760	30923	13010	3747	19621	1182	294649
10-07: 07	10326	3639	198738	4684	2760	15648	11017	50884	0	551	298248
10-07: 08	10326	2596	145954	2054	2760	13029	9279	109108	0	551	295657
10-07: 09	10326	2064	115959	2054	2760	5086	10289	154979	0	0	296105
10-07: 10	10326	2064	115959	2054	2760	4196	9140	153220	0	0	299603
10-07: 11	10326	2064	115959	2054	2760	4791	11345	188049	0	0	301322
10-07: 12	10326	2064	115959	2054	2760	3937	14604	197449	0	0	302040
10-07: 13	10326	2064	115959	2054	2760	3961	16504	185522	0	0	300817
10-07: 14	10326	2064	115959	2054	2760	3879	16933	148991	0	0	301038
10-07: 15	10326	2596	127038	2054	2760	9508	18499	127495	0	551	300828
10-07: 16	10326	3238	175617	2054	2760	14722	15134	74357	0	551	298759
10-07: 17	10326	3639	204509	5135	2760	35413	15797	19419	0	551	297549
10-07: 18	10326	3639	204509	5135	2760	57210	19142	0	1968	1574	306262
10-07: 19	10326	3639	204509	5135	2760	58504	19931	0	33662	1505	339972
10-07: 20	10326	3639	204509	5135	2760	57477	16026	0	20454	1906	322233
10-07: 21	10326	3639	204509	5135	2760	55375	16032	0	14978	1933	314687
10-07: 22	10326	3639	204509	5135	2760	48644	15754	0	16444	1636	308846
10-07: 23	10326	3639	204509	5135	2760	40531	13611	0	22494	1365	304371

Possible RE Curtailment on Typical day



Only for Representational purpose

Sensitivity Analysis -Short Term scenarios

- 10% reduction in Wind generation during peak day
- 10% reduction in variable RE (Solar+ Wind) generation during peak day
- 6% reduction in hydro generation during peak day.
- 10% reduction in Minimum variable RE day(Solar+ Wind) generation
- 5% increase in demand on peak day (use of reserve margins)


thank you
danke
рахмат
謝謝
ngiyabonga
teşekkür ederim
Баярлалаа
спасибо
mersi
kia ora
barka
welalin
tack
spas
faafetai lava
vinaka
спасибі
blagodaram
dank je
misaotra
matondo
paldies
grazzi
mahalo
tapadh leat
gracias
kiitos
dankie
nanni
nandri
dhanyavad
хвала
asante
manana
obrigada
tenki
murakoze
bedankt
bayarlalaa
gràcie
hvala
mauruuru
köszönöm
akun
dankon
aċiū
djiere dieuf
tau
mochchakkeram
дякую
mamnun
chokrane
enkosi
dziękuję
chnorakaloutioun
gratias ago
gràcies
sulpáy
taiku
go raibh maith agat
sobodi
dėkuji
sagolun
sukriya
kop khun krap
arigatô
takk
dakujem
trugarez
obrigado
mèsi
didi madloba
najis tuke
ありがとう
tanemirt
grazie
kam sah hamnida
rahmat
terima kasih
rahmet
ευχαριστώ
diolch
dhanyavadagalu
shukriya
mercé
мерси
তোমাকে ধন্যবাদ
감사합니다
xièxie
merci

ESTIMATED POTENTIAL OF RENEWABLE ENERGY

India has an estimated renewable energy potential of about 1096 GW from commercially exploitable sources

- Wind – 302 GW (at 100-meter mast height)
- Small Hydro – 21 GW
- Bio-energy – 25 GW

Solar power- 750 GW (assuming 3% wasteland)