



Variable Renewable Energy Integration

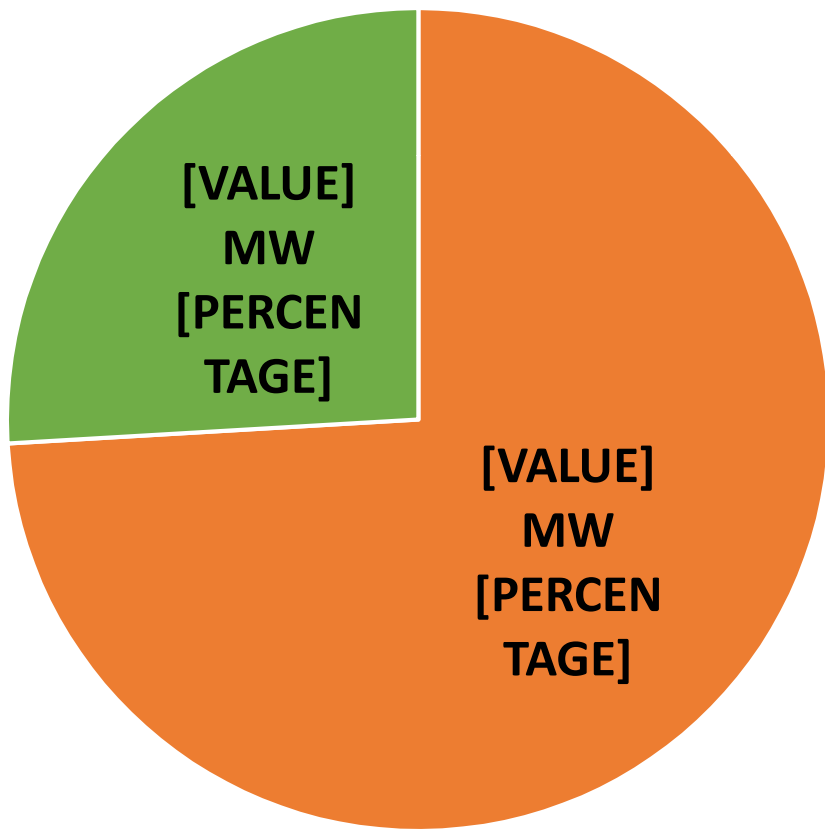
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Fuel wise capacity as on 31.12.17 V/s Expected by 2022 (in MW)

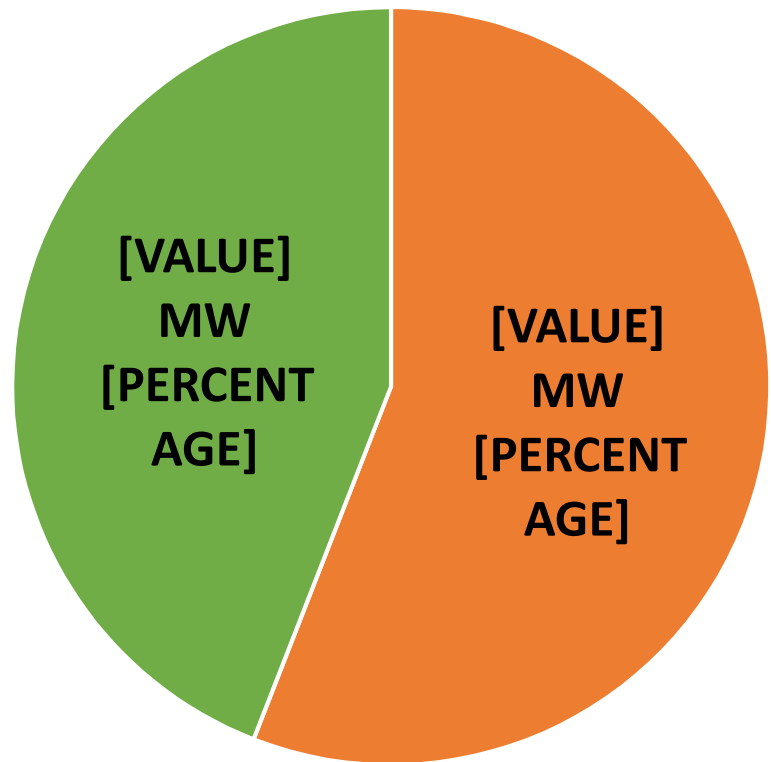
Installed Capacity	Thermal	Gas	Hydro	Nuclear	Sub-Total (NRE)	Solar	Wind	Mini Hydro	Biomass	Total (Renewable)	Total
31.12.17	13855	4934	779	559	20127	1492	5502	9	41	7044	27171
Percentage (%)	50.99	18.16	2.87	2.06	74	5.49	20.25	0.03	0.15	26	100
Exp by 2022	15302	4279	779	1035	21395	8020	8800	9	41	16870	38265
Percentage (%)	39.99	11.18	2.04	2.70	56	20.96	23.00	0.02	0.11	44	100

As on 31.12.17



■ Sub-Total (NRE) ■ Total (Renewable)

Expected by 2022

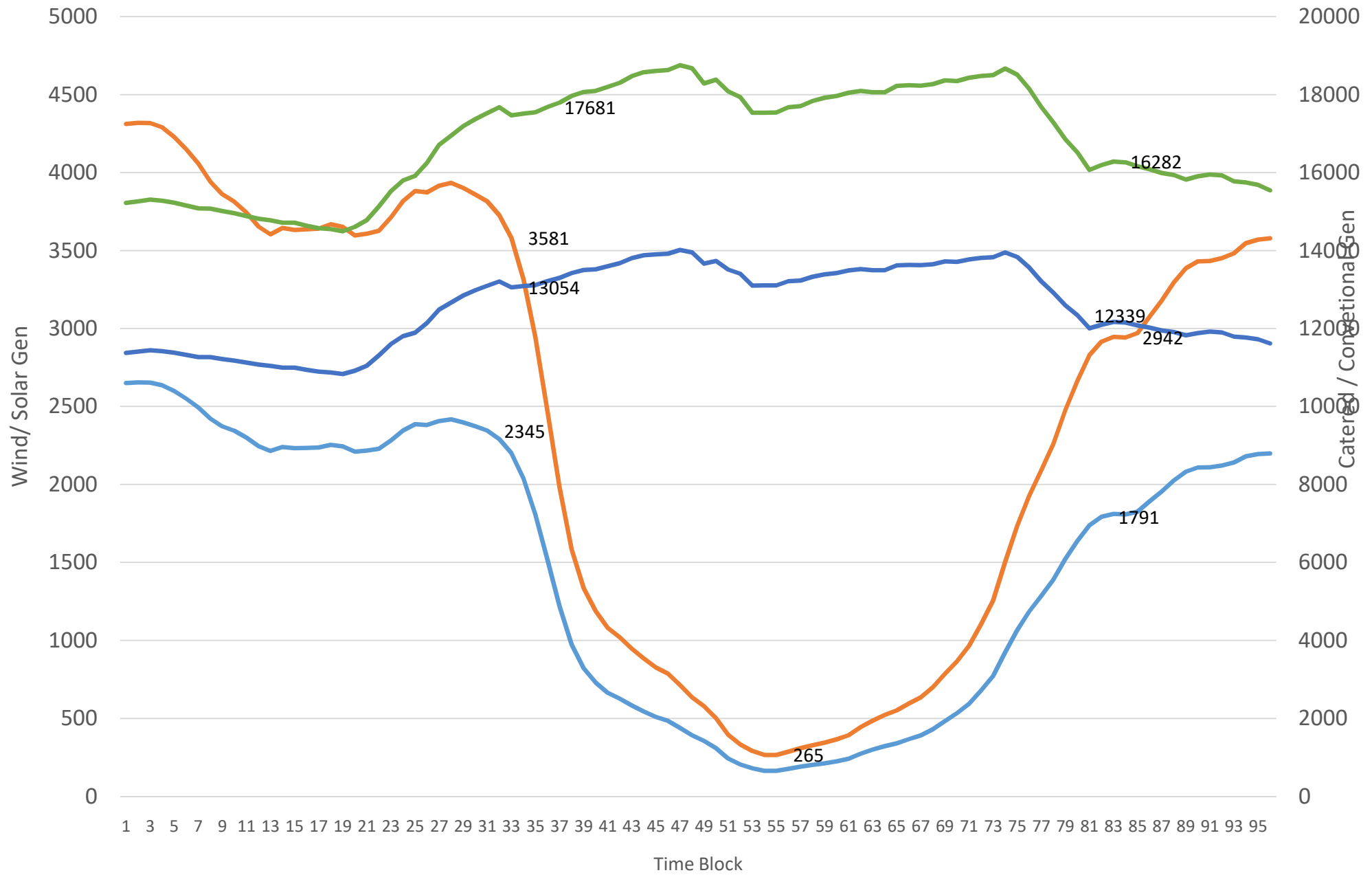


■ Sub-Total (NRE) ■ Total (Renewable)



RE : Sudden – Down & Up Trend of Wind Gen. 22.11.17 & Exp by 2022

Wind Generation Down: 1615 MW , Expepected in 2022: 3316MW (Duration 9 Blocks)



— Wind — Wind by 2022 — Catered — Peak Demand by 2022

Gujarat – Technical Minimum



As on 31.12.17	Installed Capacity	Coal Min/Tech Min	Margin	Tech Min by 60%	Margin	Tech Min by 55%	Margin
Thermal	13855	8821	5034	8313	5542	7620	6235
Gas	4934	2961	1973	2960	1974	2714	2220
By 2022							
Thermal	15302	10121	5181	9181	6121	8416	6886
Gas	4279	2535	1744	2567	1712	2353	1926

(Coal base): Ramp for old M/ch 1 to 2.5MW/Min & New M/ch 5 to 9 MW/Min

(Gas Base): Ramp 2 to 11MW/Min



Way forward

- ✓ Relooking into present technology, operation and Regulations.
- ✓ Regional pooling of resources- interstate and intra state banking
- ✓ Ancillary Services at larger area (Explore the Participation from State and Private Generators having good ramp rate and technical minimum capability)
- ✓ Ancillary Service at Market Price (Allowing CGS & SGS some percentage Capacity Reserve for Ancillary Services)
- ✓ Forecasting & Scheduling of RE – State of Art analytical tools
- ✓ Stressed Capacity of Gas Based Power Plant Should be utilised by policy intervention and Government support
- ✓ Retrofitting in old machine for better ramp rate and technical minimum operation
- ✓ Align State Regulations to Compensate the Thermal Plant due to Frequent variation of Generation & Start/ Stop Operation.
- ✓ Explore the Possibility of Pump Storage Mode operation of Hydro Plants.
- ✓ Demand Side Management After roll out of Smart Meter (offer discount on energy charges as per Real Time Market price)
- ✓ MW Scale Battery Storage/ EV Charging Station



Thank you