EEC Conference

31th August, 2015, New Delhi

Large Scale Integration of Renewables

Power System Operation Corporation
New Delhi, India

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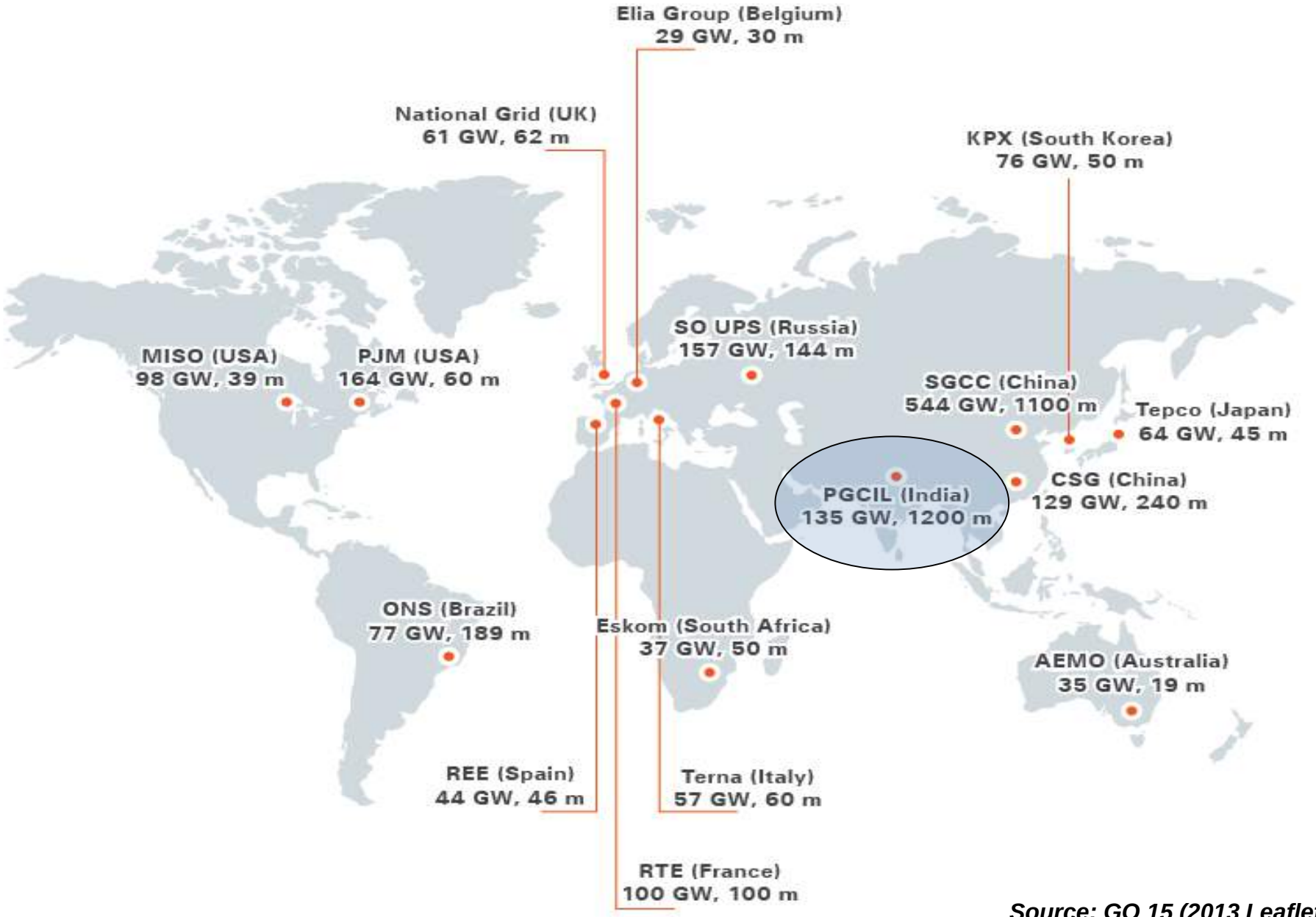
Some of the Large Power Grids in the World



Source: GO 15 (2013 Leaflet)

Typical Statistics

Power System Related

Installed Capacity:

275 GW

Renewables Capacity:

36 GW – Wind (23 GW), Solar (4 GW)

No. of 400kV & above Trans. Line: **1300 Nos., 765 kV (65 Nos.)**

Number of Generating Units: **1750 Nos., 500 MW & above (140 Nos.)**

Grid Operation Related

Peak Demand Met:

141 GW

Energy Met (Avg.):

3100 MU/day

Max. Wind Generation:

240 MU/day

Short Term Open Access:

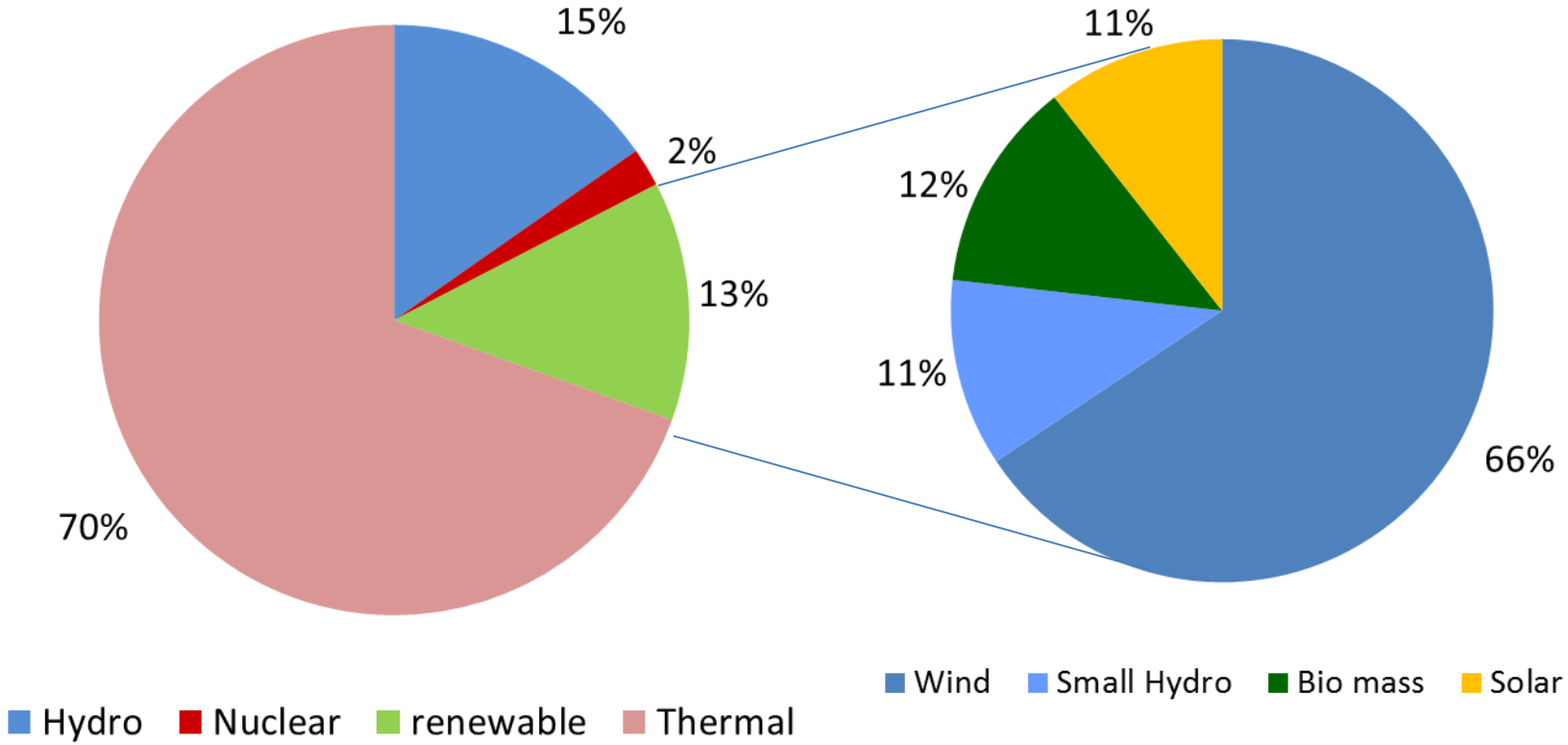
240 MU/day

Inter-regional Exchange:

225 MU/day

Indian Power Sector

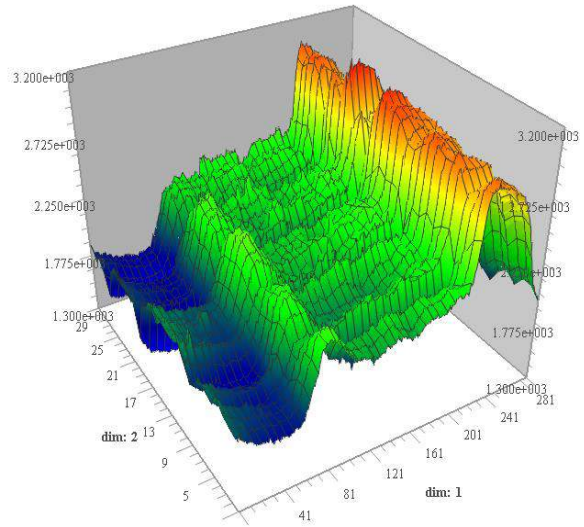
Power Installed Capacity = 275 GW



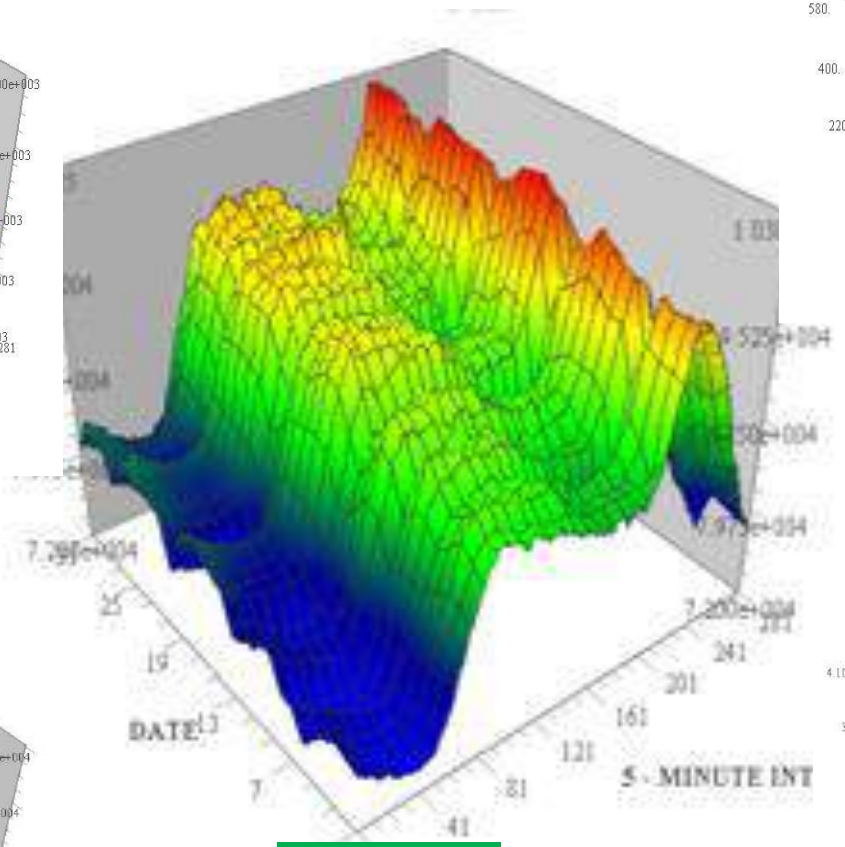
Thermal	Hydro	Nuclear	Renewable	Total
191 GW	42 GW	6 GW	36 GW	275

Wind	Small Hydro	Solar	Biomass	Total
23.5 GW	4 GW	3.8 GW	4.5 GW	35.8 GW

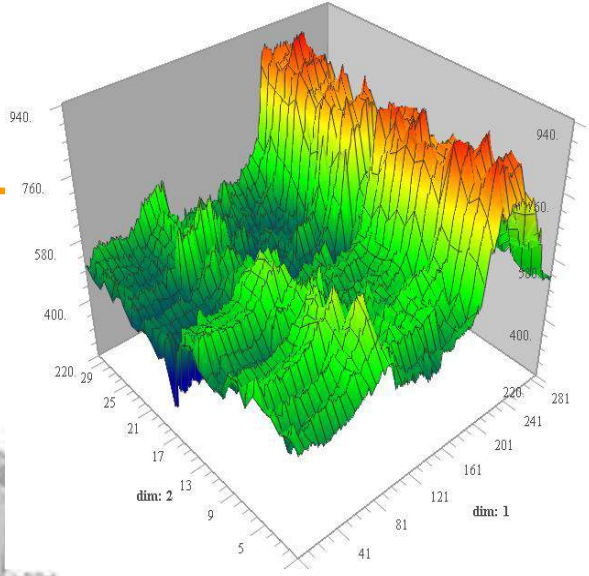
Diversity in Demand



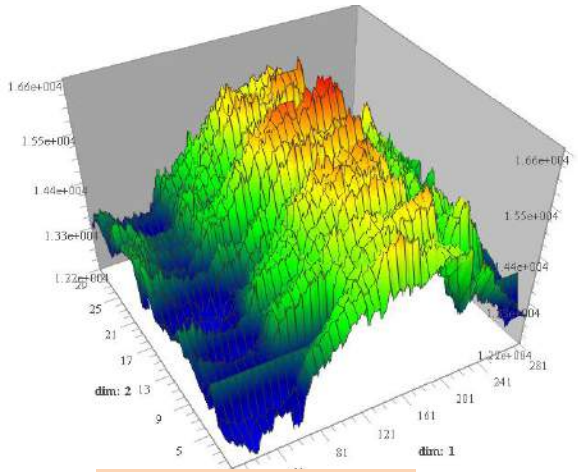
Kerala



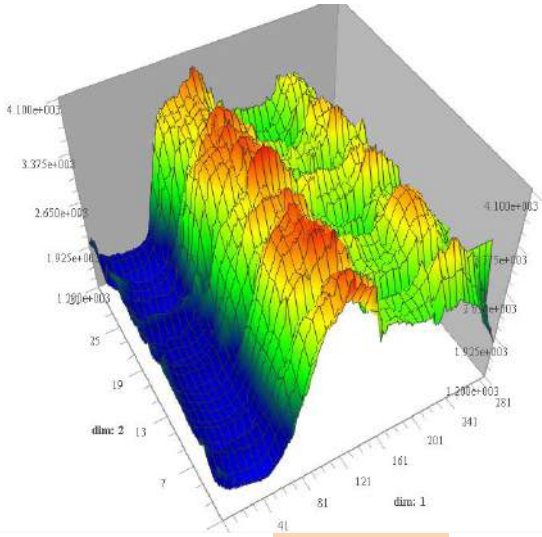
All India



Assam

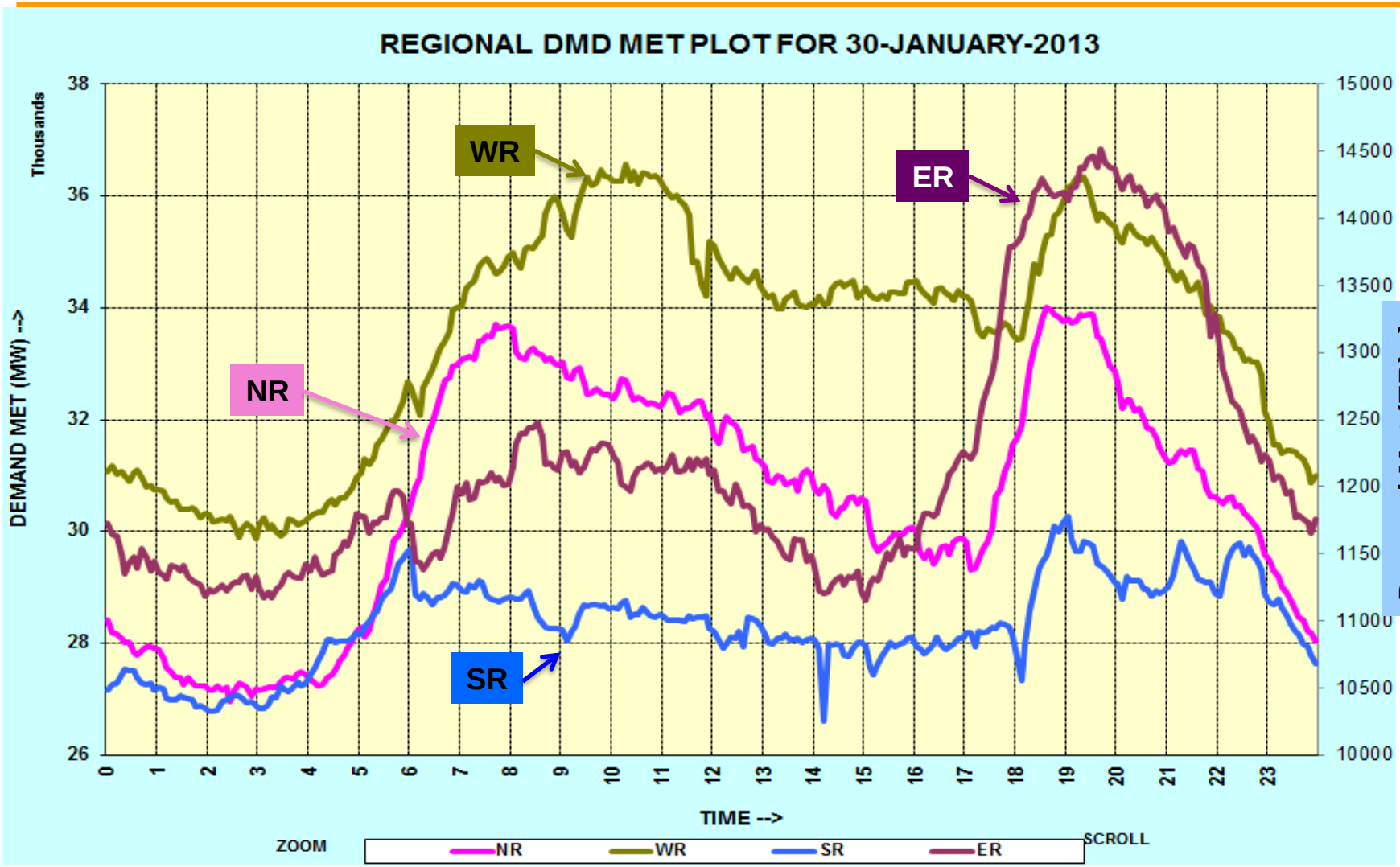


Maharashtra



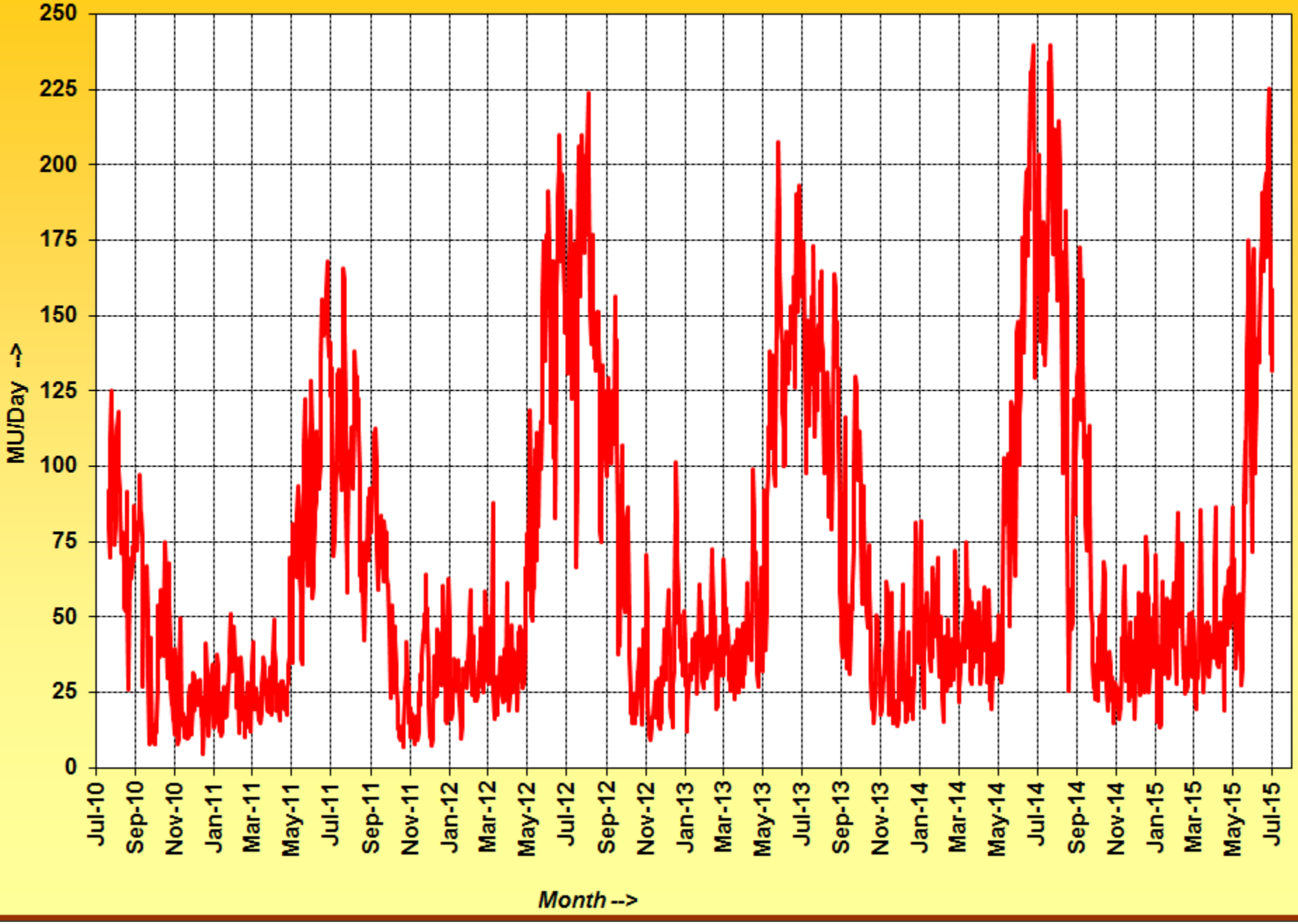
Delhi

Regional Geographical Diversity

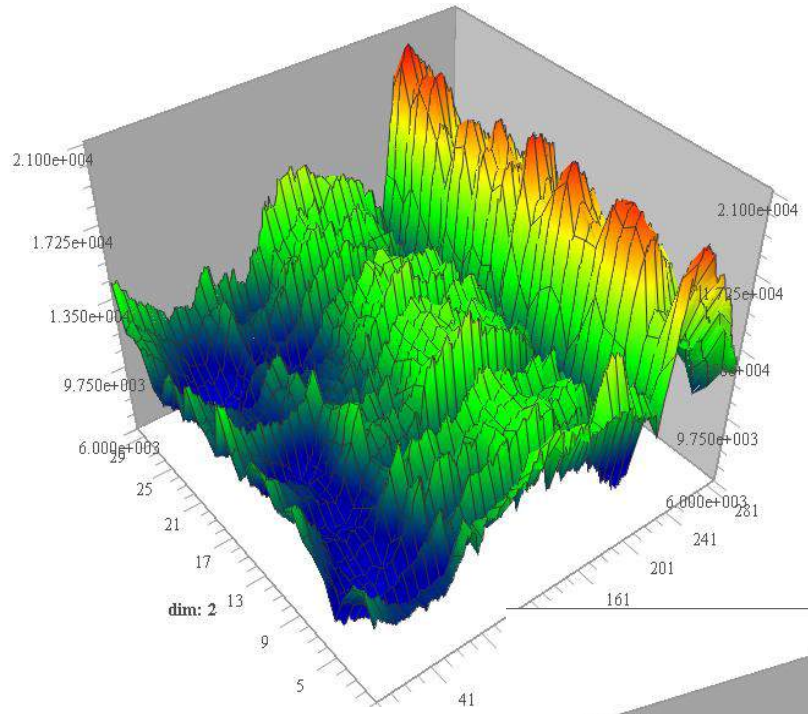


Diversity on account of geographical location, seasons, time of day, load, etc.

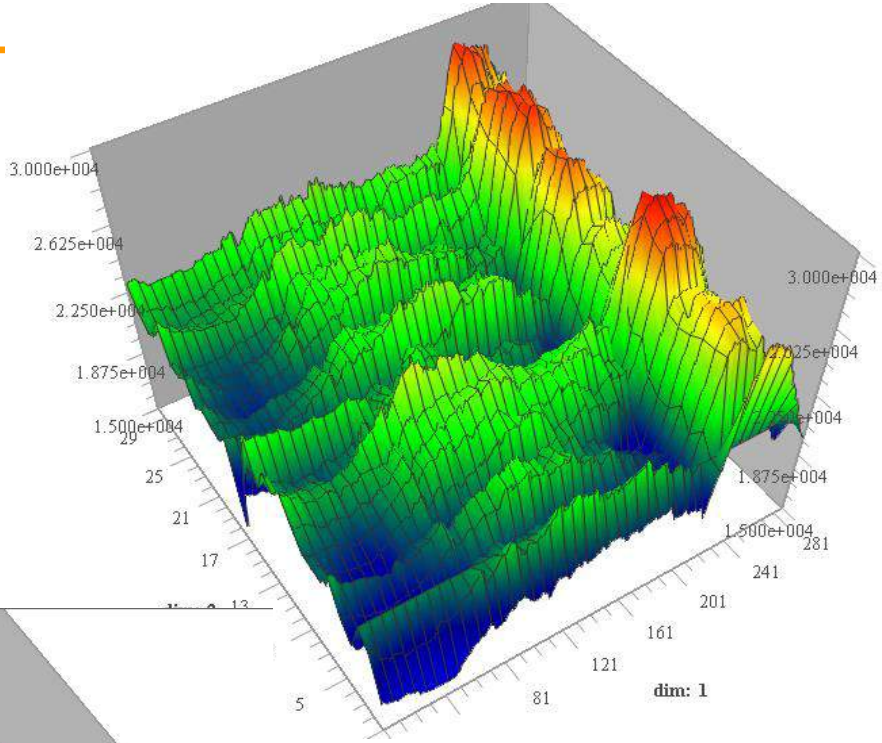
All India Wind Energy Generation



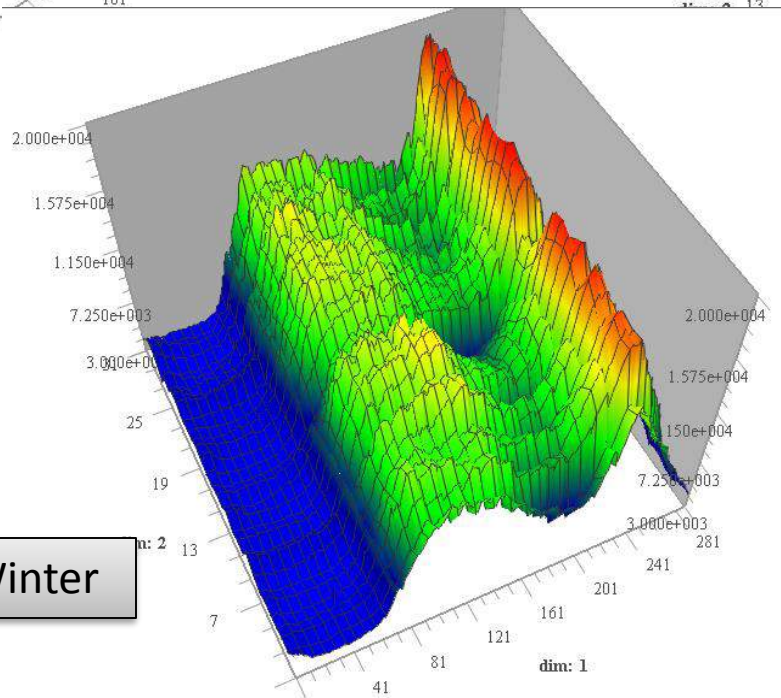
Variation in Hydro Generation



Summer

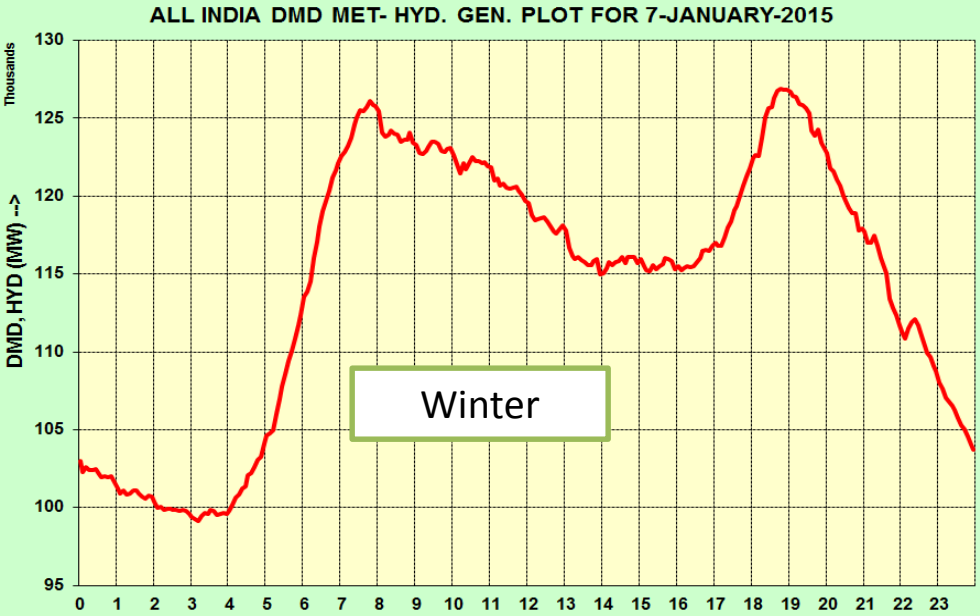


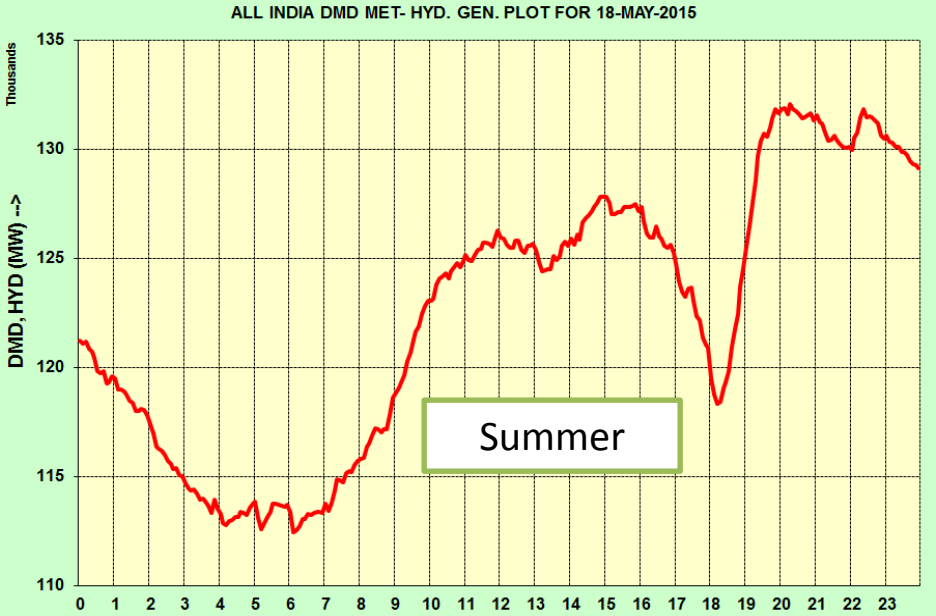
Monsoon

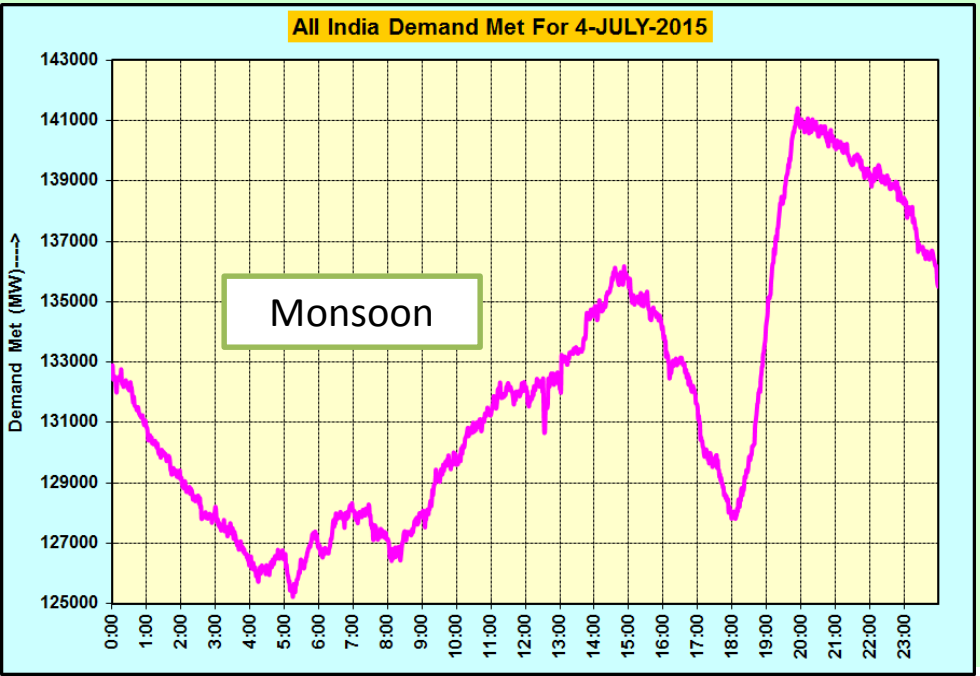


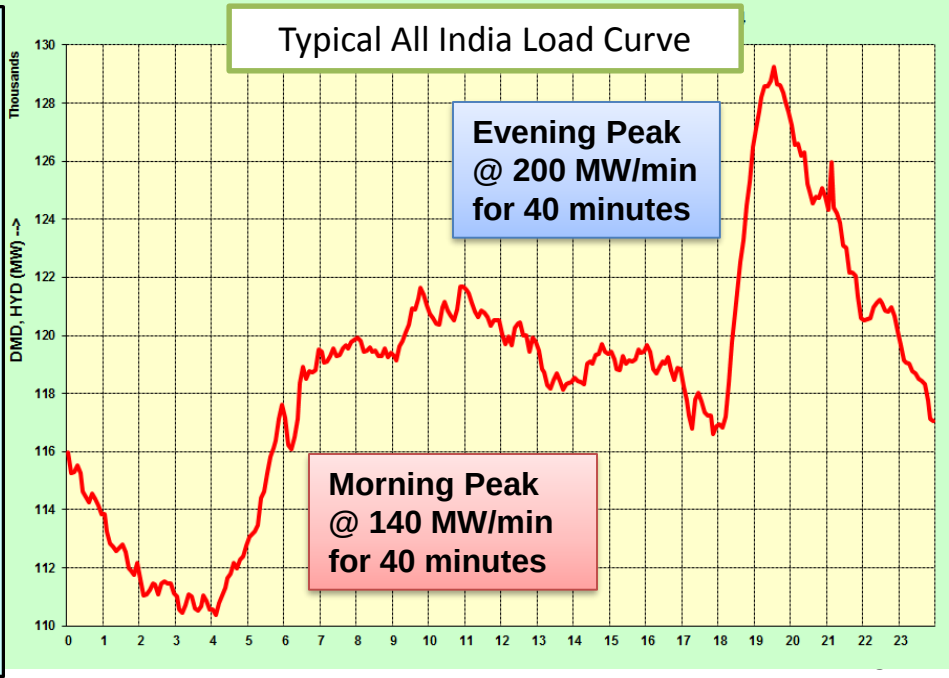
Winter

Typical Load Curves – Ramping Requirement

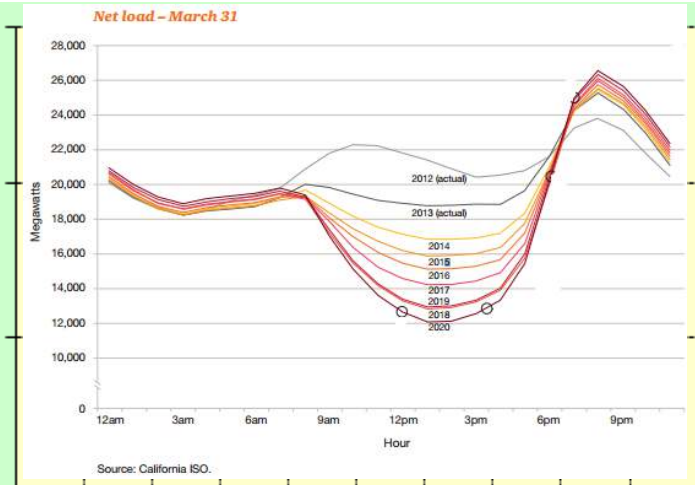








Expected All India Duck Curve
(Sample: 20000 MW of Solar Generation)



Thousands

DMD (MW) -->

225
220
215
210
205
200
195
190

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

TIME -->

Head:
Evening Peak

Actual Demand

Neck:
Steep ramping

Net Load

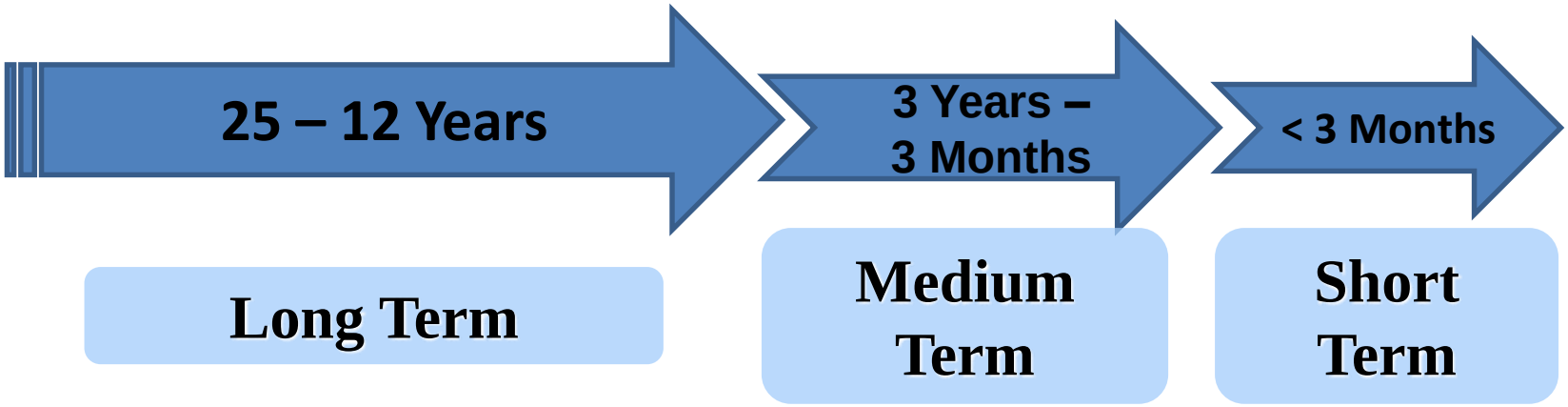
Belly:
Decrease in net load

Increase in AC loads would reduce the belly!!

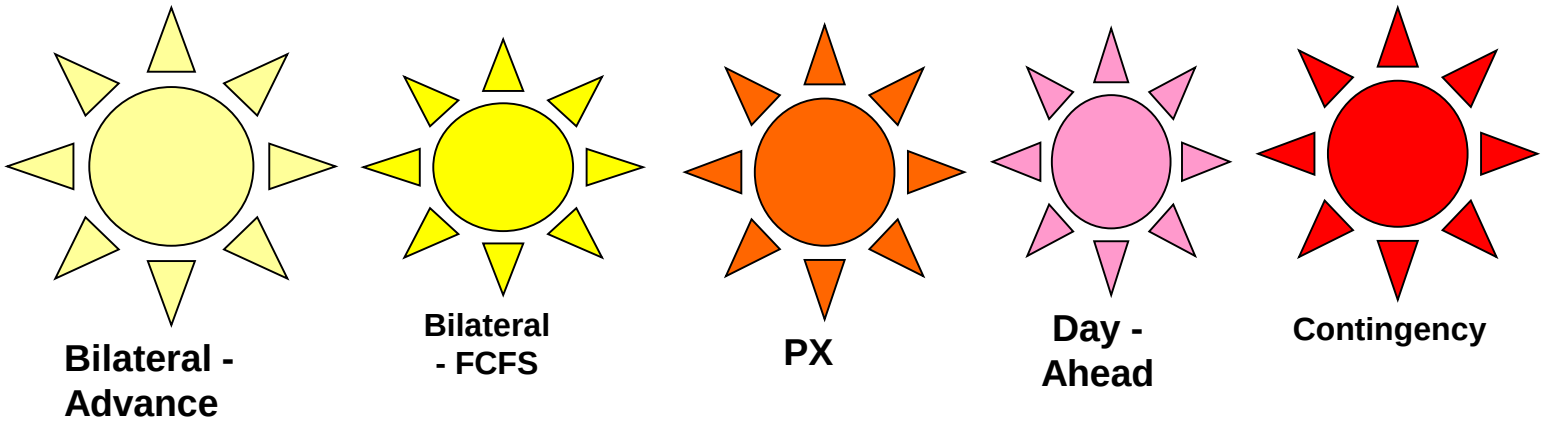
Source: NLDC SCADA data, CAGR assumed: 8%

Evolution of Power Market in India

Products in Different Time Frames

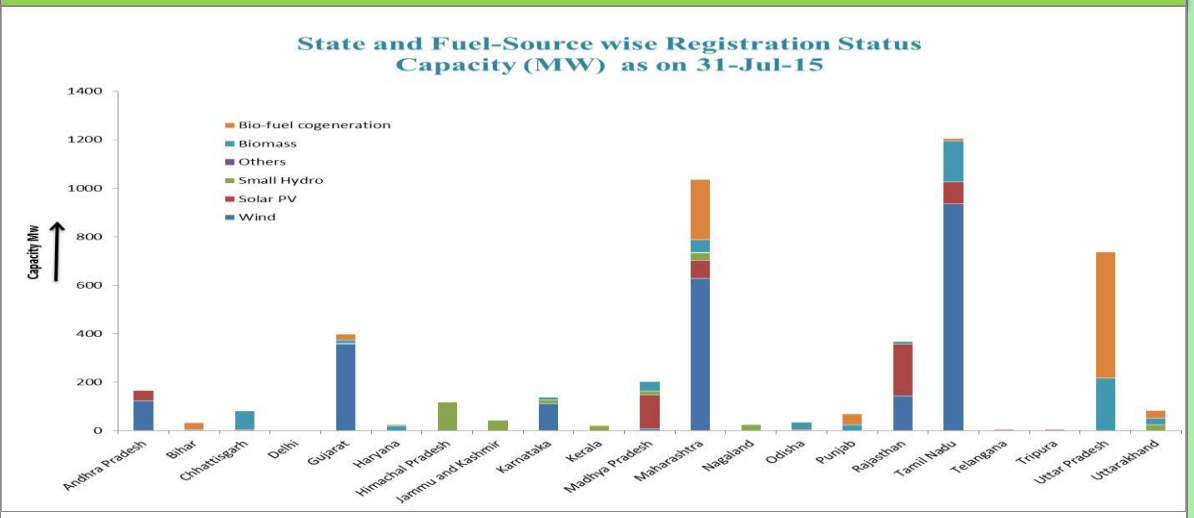


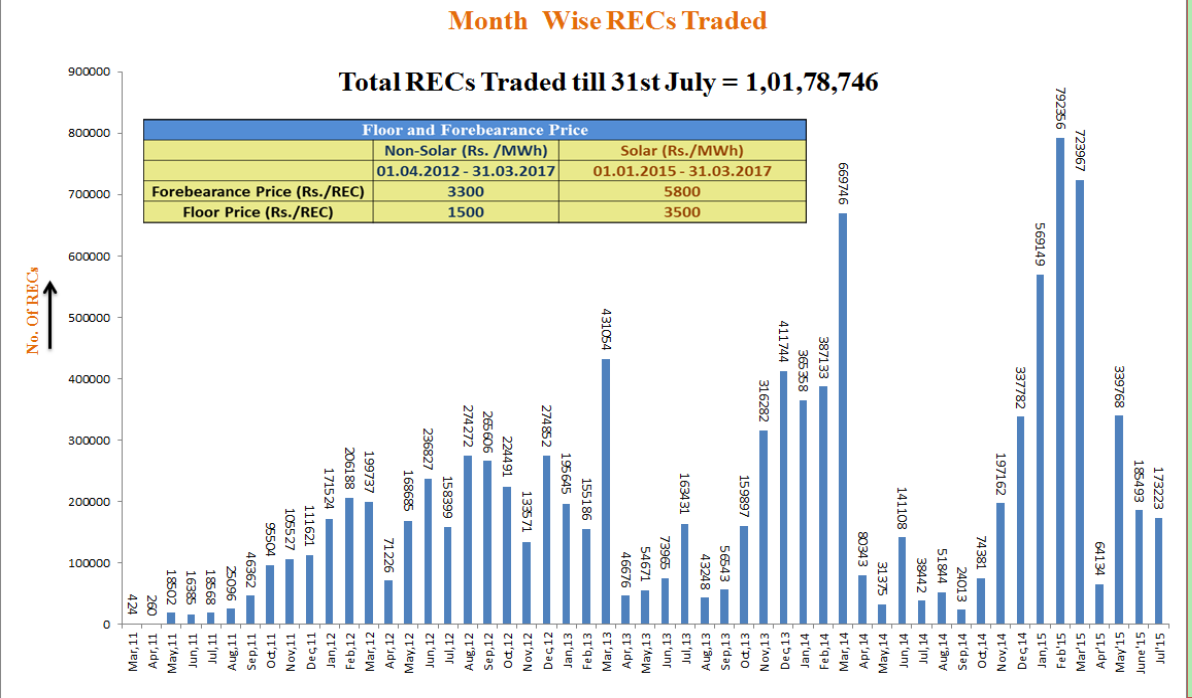
Products in the Short Term Market



Vibrant REC Market

Web Portal - www.recregistryindia.nic.in





- Introduced in 2010
- Registered Generators – 1094 Nos.
- Registered Capacity – 4809 MW
- More than 26.5 Million RECs issued
- Trading Volume of more than 18 Billion Rupees

REC Portal Home Page | https://www.recregistryindia.nic.in

भारतीय अक्षय ऊर्जा प्रमाणपत्र पंजीकरण
RENEWABLE ENERGY CERTIFICATE REGISTRY OF INDIA

मुख्य पृष्ठ / Home | आरईसी के बारे में / About REC | संबंधित दस्तावेज़ / Reference Documents | कार्यप्रणाली / Procedures | आरई जेनरेटर / RE Generators | राज्य एजेंसियां / State Agencies | रिपोर्ट / Reports
सहायता / Help | हमसे संपर्क करें / Contact Us | पंजीकरण/निर्गमन जांच सूची / Registration / Issuance Checklist | पंजीकरण/निर्गमन शुल्क / Registration / Issuance Fee | क्षमता अभिवृद्धि / Capacity Building
मुख्य बिन्दु / Highlights | मानचित्र / Map | डाक प्रक्रिया / Dak Procedure | प्रतिक्रिया / Feedback

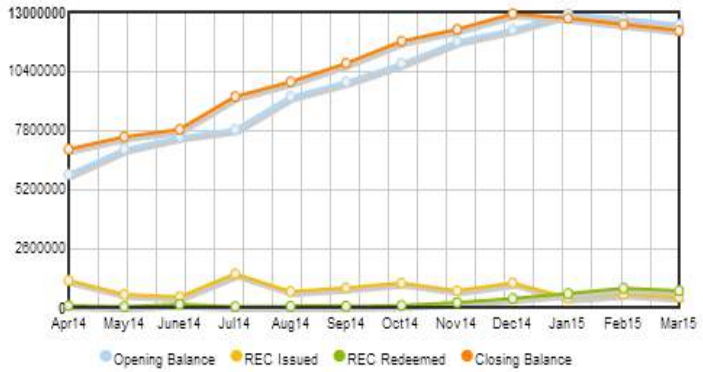
Service Tax Pending details View Details NEW!
Annual Fees Pending for the Financial Year 2014-15 View Details NEW!

What is REC?

The Electricity Act, 2003, the policies framed under the Act, as also the National Action Plan on Climate Change (NAPCC) provide for a roadmap for increasing the share of renewable in the total generation capacity in the country.However, Renewable Energy (RE) sources are not evenly spread across different parts of the country. Read More >>

Total Signed Up RE Generators Till Now - 2646

REC Graph



REC Summary

Month, Year	Opening Balance (A)	REC Issued (B)	No. of REC Redeemed		Total E=(C+D)	Closing Balance (F=A+B-E)
			RECs Redeemed through Power Exchanges (C)	RECs retained by RE Generators (D)		
Apr, 2014	5862511	1186270	80343	-	80343	6968438
May, 2014	6968438	568843	31375	-	31375	7505906
June, 2014	7505906	471982	141108	-	141108	7836780
Jul, 2014	7836780	1485060	38442	-	38442	9283398
Aug, 2014	9283398	702700	51844	-	51844	9934254
Sep, 2014	9934254	859795	24013	25000	49013	10745036
Oct, 2014	10745036	1074046	74381	20000	94381	11724701
Nov, 2014	11724701	731207	197162	25457	222619	12233289
Dec, 2014	12233289	1087197	337782	60400	398182	12922304
Jan, 2015	12922304	411590	569149	46085	615234	12718660
Feb, 2015	12718660	593085	792356	57747	850103	12461642
Mar, 2015	12461642	453091	723967	13543	737510	12177223
Total:		21841583	9416128	248232	9664360	

Log In
Password
Log In
Forget/Resend Password
Sign Up New RE Generators

Related Links

- MNRE
- MoP
- CERC
- FOR
- Central Agency/NLDC
- SERCs
- State Agencies
- Power Exchange

Visitor Number - 5394946
PhotoGallery

Steps for REC

1 of 4

The basic procedure for accreditation of the RE generation project shall cover following steps:

Key Highlights:-

- Transparent
- Accessible pan India
- User Friendly
- Real Time Data on REC
- Single Touch Point for information for RE Generators

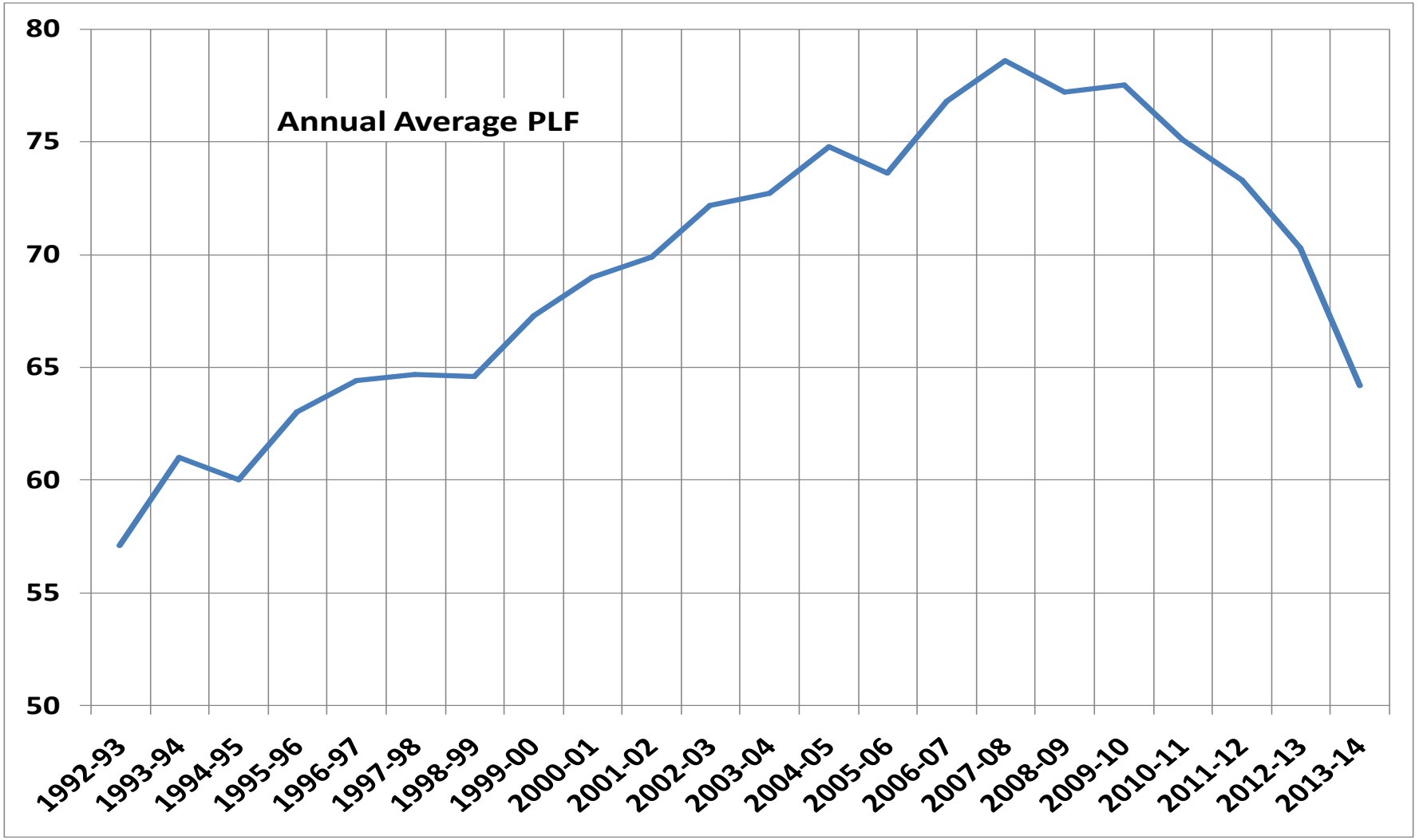
Paradigm shift in operations

- Classical despatch
  - Forecast your load; generation fleet has to follow load
- Renewable Generation: the first game changer
  - Forecast load as well as RE; Load-RE or Net Load more important
  - Conventional generation has to follow net load
- Storage/Distributed Generation/Electric Vehicles
  - From consumers to prosumers
- A flexible power system
  - but one that does not break.

Provisions Regarding Ramping

- Provisions in the Indian Electricity Grid Code (IEGC):
  - Operating Code (Section 5.2):
    - System Security Aspects - Ramping of
      - All thermal units greater than 200 MW.
      - All Hydro units greater than 10 MW
    - Sudden change in generation / load by the utilities of more than 100 MW without prior intimation to and consent of the RLDC.
  - Scheduling and Despatch Code (Section 6.4)
    - Generators to declare rate of ramping up / ramping down in a 15 minute block.
    - Acceptable ramping rate – 200 MW/Hour (in NER 50 MW/Hour)
- CEA Standard Technical Features of Super-Critical Units
  - Ramp rate: + 3% per minute (above 30% loading)
  - Technical minimum load of super critical units – 40%
  - Two shift operation

All India Plant Load Factor (PLF) – Coal & Lignite based plants



Fuel shortage , Change in 'Peak-to-off-Peak Ratio'