

Mainstreaming Renewable Energy : *Complementary Market Design* **India Perspective**

1

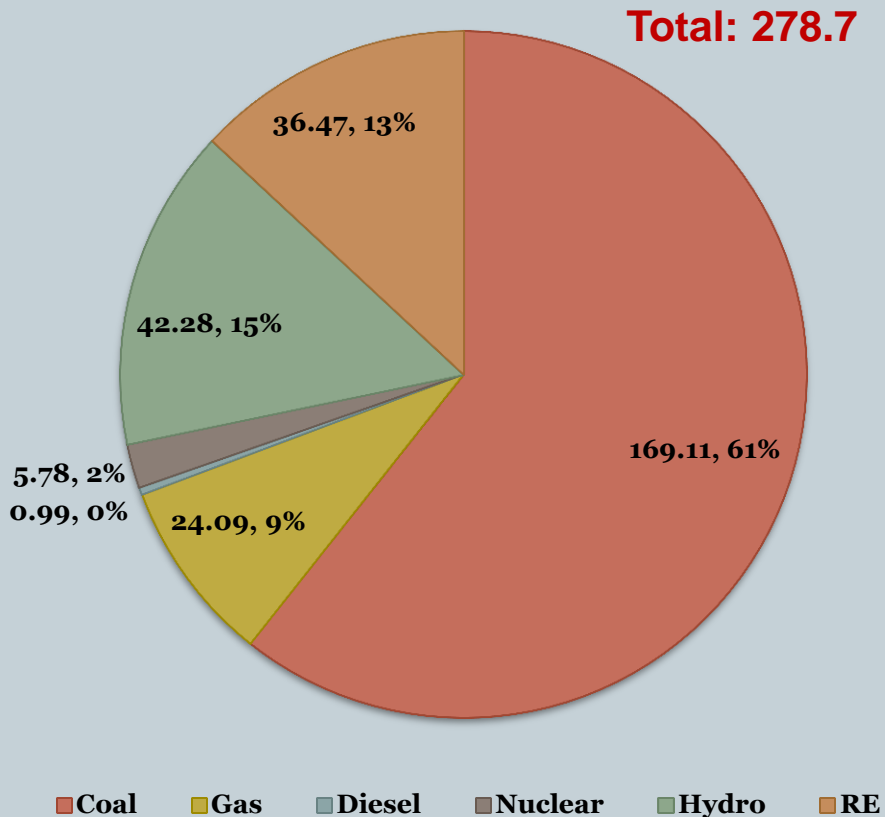
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LONDON SCHOOL OF ECONOMICS
12-13 NOVEMBER 2015

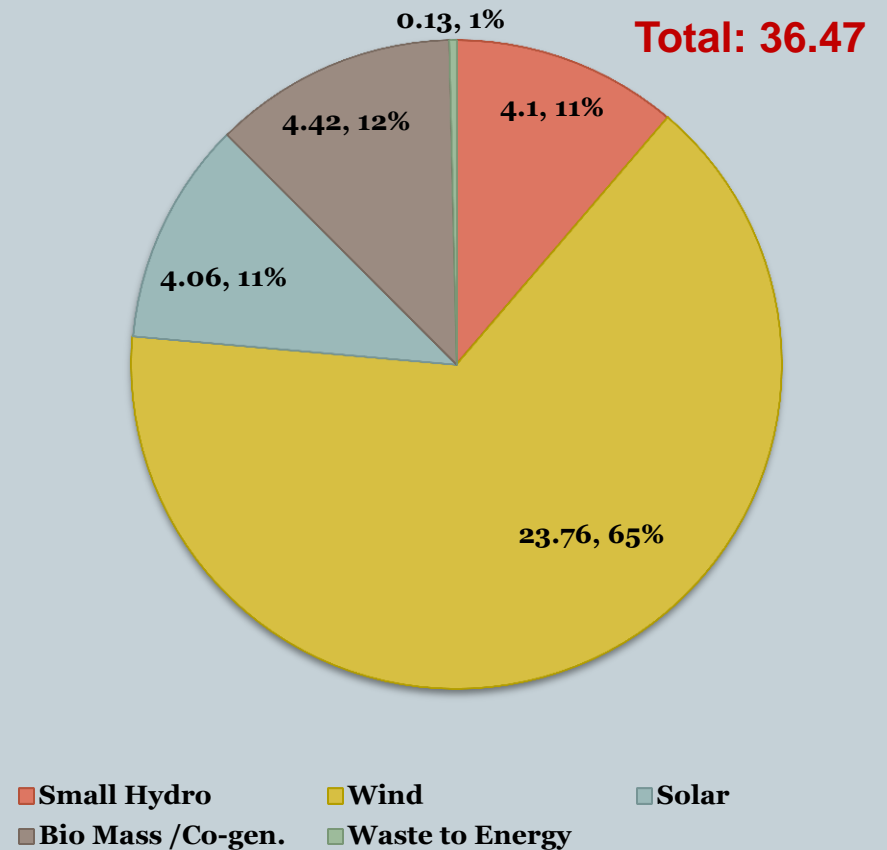
Current Scenario - India

2

**Source-wise Grid Connected
Installed Capacity (GW)**

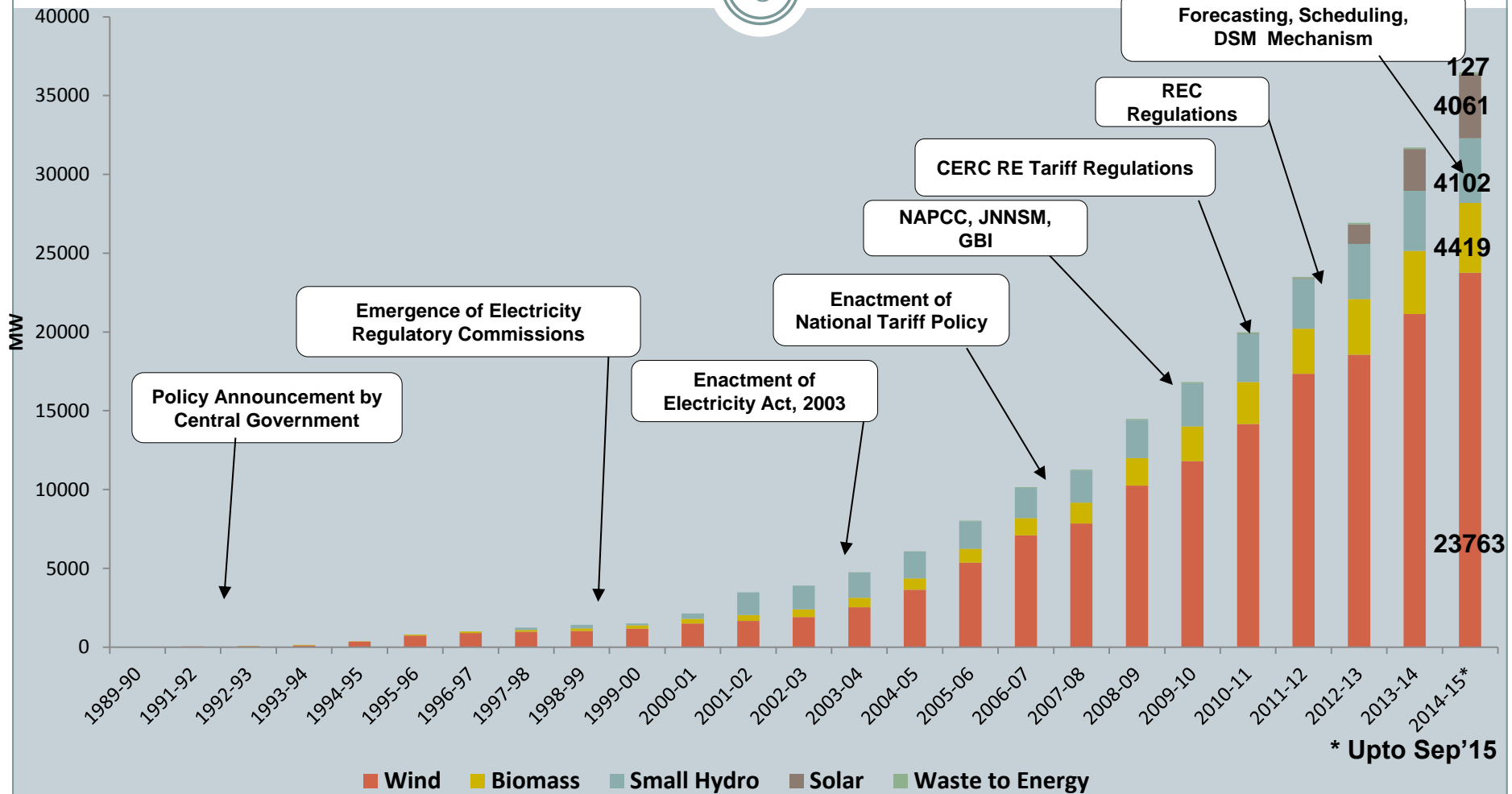


**Source-wise Grid Connected 'RE'
Installed Capacity (GW)**



Growth of RE in India

3



* Upto Sep'15

- Thrust on RE – in the wake of Energy Security and Climate Change concerns
- Target of 175 GW RE generation capacity by 2022

RE Sources: Challenges

4

- **Higher cost of generation** : Higher Capital Cost and Cost of Capital; lower capacity utilisation factor
- **Variability**: Infirm nature of Solar, Wind. Seasonal Variations
- **Disperse location** : Location-specific potential (concentrated in areas away from consumers or the grid).
- **Creation of Transmission corridor** : High evacuation cost due to remote location and low utilisation factor.
- **Financial Health of distribution companies (discoms)** – influences decision on expensive and variable RE.

Towards Mainstreaming RE

5

- **Approaching grid parity in price:** Solar PV price from 30¢/kWh to less than 10¢/kWh now.
- **Handling variability:** remains the major challenge

Way forward:

*Forecasting, Scheduling and Deviation Settlement; and
complementary market design*

Towards Mainstreaming RE.....

6

Handling variability: *Forecasting, Scheduling and Deviation Settlement*

- *Debate/Way Forward* :

- *Centralised vs Decentralised Forecasting;*
- *forecasting at what level?*
- *Mandatory scheduling requirement!!*
- *Payment as per actual or schedule?*
- *Should there be a deviation penalty for variable RE?*

Central Electricity Regulatory Commission (CERC) has provided a framework in this context

Towards Mainstreaming RE.....

7

Handling Variability : *Complementary Market Design*

- *Debate/Way Forward:*

- *Deviation Settlement/Accounting Framework.*
- *Day Ahead / Intra Day Products.*
- *Reserves/Flexible Generation.*
- *Ancillary Services – Administered vs Market Mode?*

Gross Pool vs Net Pool – A Market Design Issue !!

***Key to questions around optimized dispatch of resources and
issues around handling variation of RE***

An ongoing debate in India....

THANK YOU

8

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9

Handling variability: Forecasting, Scheduling and Deviation Settlement

- **Debate/Way Forward (CERC framework) :**
 - **Centralised vs Decentralised Forecasting;**
Initially forecasting at both Centralized and Decentralized levels.
 - **Forecasting at what level**
Forecasting at pooling station level in a State
 - **Mandatory scheduling requirement!!**
Scheduling is mandatory for proper accounting and grid discipline.
 - **Payment as per actual or schedule?**
As per 'Actual' at State level & as per 'Schedule' at National/inter-state level
 - **Should there be a deviation penalty for variable RE?**
No penalty within tolerance limit. Deviation charge beyond tolerance limit



Towards Mainstreaming RE.....

10

Handling Variability : *Complementary Market Design*

- **Debate/Way Forward (CERC framework) :**
 - ***Deviation Settlement/Accounting Framework!***
Requirement of deviation settlement / accounting at State level in line with that at inter-State level
 - ***Day Ahead / Intra Day Products.***
Day Ahead and Intra Day products for meeting short term / closer to real time energy needs.
 - ***Reserves/Flexible Generation***
Creation of reserves for meeting last mile imbalances.
 - ***Ancillary Services – Administered vs Market Mode?***
Ancillary Services being operationalized. Presently Ancillary Services are administered, but aimed at turning to Market Mode by 2017.
 - ***Gross Pool vs Net Pool!!...ongoing debate...→***



Net & Gross Settlement

11

Net Settlement				
With Contracts Settled by the System Operator (all quantities in MW)				
	Seller	Buyer	Others	Total
Actual Generation	110		10	120
Actual Consumption		-120		-120
Contract Notified to System Operator	-100	100		
Imbalance settled with system operator at the spot price	10	-20	10	0
Gross Settlement				
With Contracts Differences (CfDs) Settled Bilaterally (all quantities in MW)				
	Seller	Buyer	Others	Total
Actual Generation	110		10	120
Actual Consumption		-120		
Contract Notified to System Operator	-	-	-	-
Imbalance settled with system operator at the spot price	110	-120		
Contract Amount Settled Bilaterally*	-100	100		
Difference effectively settled at the spot price	10	-20	10	0
*This quantity is settled at the contract price <i>minus</i> the spot price – the <i>difference</i> between contract and spot. Hence the contracts are called “Contracts for differences” of CfDs.				

