



**Renewable Regulatory Fund (RRF):-  
Implementation Mechanism**

**10.10.2011**

# Outline



- Overview
- Wind generation in SR Grid : Brief Details
- RRF Implementation : Role of Stakeholders
- Issues emerged at Delhi workshop and possible avenues



# RRF: Chronology of events



- IEGC Regulations, 2010 notified on 28.04.2010
- Clause 5 and Clause 7 of Annexure 1 of IEGC :  
UI charges arrived at due to the variation of generation by wind and solar shall be shared amongst all the states through 'Renewable Regulatory Charge' to be operated through 'Renewable Regulatory Fund'.
- Clause 9 of Annexure 1 of IEGC :  
NLDC shall prepare a detailed procedure for implementation of the mechanism of Renewable Regulatory Fund and submit the same for approval by the Commission.
- CERC examined the proposal submitted by NLDC and the modified procedure was notified on 18.02.2011
- Implementation of RRF to be effected from 01.01.2012

## RRF: Objectives at a glance



- » Better prediction of generation by Wind/Solar generators and participation in scheduling
- » Generation from renewable to become more acceptable and market friendly
- » States already having met RPO targets may not find it averse to encourage renewable generation further
- » Better System Operation



## RRF: Approach



- » Achieve better generation prediction using weather forecasting tools
- » Immune wind generators from paying deviation in UI charges upto a certain level of variation
- » No UI charges payable/receivable by Solar Generator
- » Socialize the deviation charges arrived due to variations amongst different state utilities
- » Develop a self sustaining mechanism towards better acceptance of intermittent generation



# Wind generation in SR Grid : Brief Details



# Role of different stakeholders towards RRF Implementation



Case Studies



# Role of Wind Farms/Solar Generators



**Wind farms – 10 MW and above and Solar plants - 5MW and above, connected at 33 KV and above :**

- » Connectivity details to concerned SLDC/RLDC
- » Declaration about agreement if any
- » Provide details of Contracts and Contracted path to the concerned SLDC →RLDC→RPC
- » Generation forecast with periodic updates to SLDC/RLDC
- » To provide Data Acquisition System (DAS) facility to SLDC/RLDC



# Role of SLDCs/RPCs/RLDCs/NLDC



## SLDCs

- » Scheduling on daily basis with periodic revisions
- » Schedule and 'actual generation meter data' to be sent to RLDCs and RPCs
- » Payments/receipts to concerned Generators and Settlement of accounts with RRF

## RPCs

- » Issuance of Statement of Energy Accounting on Weekly basis
- » Data handling of contracts and contracted price for issuance of energy and deviation accounts
- » To work out details towards Capping, Additional UI charges etc. if any.

## RLDCs

- » Processed data of energy meters along with final schedule to be sent to RPCs on weekly basis
- » Vetting of solar generation schedule & Monitoring and performing checks
- » Direct co-ordination with Regional entities for contracts & energy meter data

## NLDC

- » To maintain and operate RRF
- » Settlement of payments from RRF to Various Wind/Solar power plants/ State utilities
- » Issuance of statement & collection of Renewable Regulatory Charge

# RRF: Enablers



- » Weather forecasting and generation prediction mechanism in place
- » SCADA and telemetering facilities
- » SEM at inter-connected points and Compatible metering
- » Collection of Renewable Regulatory Charge from utilities
- » Capacity building of stakeholders
- » Dedicated group in load dispatch centers
- » Institutional Mechanism in place
- » Expediting Ancillary Market




# Issues emerged at Delhi Workshop and possible avenues



# RRF: issues emerged at Delhi workshop & possible avenues



## 1. Submission of requisite information:

- » Specific Information to be furnished by Wind Farms/Solar generators
- 
- » Declaration of PPAs and details thereof
  - » SLDCs to take further initiatives in consolidation of such information

Submission of requisite information from SLDCs/Wind Generators



# RRF: issues emerged at Delhi workshop & possible avenues



## 2. Forecasting and scheduling by all wind generators

- » 14989 MW installed capacity as on 31st Aug 2011
- » 2349 MW and 833 MW capacity installed in 2010-11 & 2011-12 respectively
- » In case only those units for which PPAs are signed after 3.5.2010 are considered then only 3182 MW may be the possible candidate for RRF (~20% of installed capacity)
- » Section 6.5.23 (i).....extend scheduling for all wind generators

**For better system monitoring and control .....  
extend scheduling for all wind generators**



# RRF: issues emerged at Delhi workshop & possible avenues



## 3. Commercial and settlement

Handling the situations having :

- » Part collective and part bilateral sale of power
- » A Wind/Solar Generators having part capacity under past PPA and part new capacity

Treatment through pro-rata

## 4. Real time monitoring and data loss

- » Lack of reliability of communication between wind farms to developer's control centre
- » Loss of data resulting into forecasting errors
- » Non availability of telemetry

Infrastructural improvements



# RRF: issues emerged at Delhi workshop & possible avenues



## 5. Administration of RRF

» Parties to RRF spread across the entire country (state utilities, wind generators and other open access users required to fulfill RPO).....>50



» Minimizing the number of parties might be preferable (host state only).....no of parties < 10

RRF to operate as a separate account and .....  
possibility of meeting shortfall from other pool accounts  
and/or other means.....



# RRF: issues emerged at Delhi workshop & possible avenues



## 6. Accuracy towards RRF charge collection

- » Apportionment of RRF Charge collection percentage amongst different state utilities

Possibility for desired accuracy calculations - upto four/six decimal places

## 7. Accounting

- » Purchaser in different region/regions from host state
- » Inter dependency between RPCs/RLDCs/SLDCc
- » Complexity and challenges in reconciliation

Possibility of accounting in a hierarchical manner



## RRF: issues emerged at Delhi workshop & possible avenues



### 8. Generation by WG above 150% schedule:

- » Clause 5.3 of Procedure: Charge payable to WG would be UI charge applicable corresponding to 50-50.02 Hz (Rs. 1.55/ Unit)
- » This would however affect the host state adversely in case frequency  $> 50.02$  Hz

Clause 5.3 of Procedure can be suitably modified





**Thank You**

# Intra-state Wind Generators



# Wind Generator (Intra-State) (Case-I) : UI by WG upto 30%



Generation Schedule: 100 Units  
Actual generation : 120 Units

Contracted Rate @ Rs. 4/Unit  
UI Host state @ Rs. 6/Unit

Pay for 120 Units @ contract price  
Rs. 480 (120\*4)



WG received	=480(120*4)
WG supposed to receive	=480(120*4)
Net Effect	Nil

**Host- State**

Pays to RRF for 20 Units @UI rate-Contracted rate (if UI rate is greater than contracted price)

Paid Rs. 40 (20\*6 – 20\*4)



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RRF

HS paid to (WG+RRF)	=520 (480-40)
HS supposed to pay	=520(100*4+20*6)
Net Effect	Nil

Net effect on RRF	+Rs. 40
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Any loss to Host state on account of Capped rates for Under-drawal on account of Over generation by Solar /Wind generators to be compensated by RRF

# Inter-state Wind Generators



# Wind Generator (Inter-State) (Case-I) : UI by WG upto 30%



Generation Schedule : 100 Units  
 Actual generation : 120 Units

Contracted Rate @ Rs. 4/Unit  
 UI Host state @ Rs. 6/Unit  
 UI Purchasing state @ Rs. 3/Unit

Paid for 120 Units @ contracted price  
 (Rs. 480 @ Rs. 4/unit)



WG received	=480(120*4)
WG supposed to receive	=480(120*4)
Net Effect	Nil

**Purchasing State**

Receives for 20 Units @ UI rate of its Region  
 Rs. 60 (20\*3)



Net effect on RRF	+Rs.60 (120-60)
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**Host State**

Pays for 20 Units @ UI rate of its Region Rs. 120 (20\*6)

PS paid to (WG+RRF)	=420(480-60)
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HS paid	=120(20*6)
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PS supposed to pay	=400(100*4)
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HS supposed to pay	=120(20*6)
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Net Effect	- ₹20
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Net Effect	Nil
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der-drawal on account of over generation



A  
b



**UDUMALPET ZONE:PALAKKAD AND KAMBAM PASS:INSTALLED CAPACITYOF WIND FARMS**

SI.No	Name of the	Name of the	OWNER	DEVELOPER	Total Cap.	No.of	Capacity	PPA OR NOT
	Pass	Sub-Station			MVA	Pvt WEGs	in MW	
1	Palakad	Gudimangalam 110/22 KV			89	309	87.740	
2	Palakad	Ponnapuram 110/22 KV			132	305	135.845	
3	Palakad	Thungavi 110/22 KV			116	362	123.270	
4	Palakad	Kongalnagaram 110/22 KV			150	163	150.550	
5	Palakad	Anthiyur 110/22 KV			100	79	103.250	
6	Palakad	Kethanur 110/33-11 KV			98	367	123.900	
7	Palakad	Sulthanpet 110/33-11 KV			107	295	113.975	
8	Palakad	Edayarpalayam 110/33-11 KV			82	228	96.085	
9	Palakad	Elavanthy 110/33			111	230	114.790	
10	Palakad	Chinnaputhur 110/22 KV			150	193	154.440	
11	Palakad	Melkaraipatti 110/22 KV			125	161	128.800	
12	Palakad	Marudhur 110/22 KV			89	335	93.960	
13	Palakad	M.N.Patty 110/33 KV			50	42	25.200	
14	Palakad	Panapatty 110/33 KV			75	49	67.750	
15	Palakad	Sadayapalayam 230/33 KV			100	47	68.750	
16	Palakad	Kinathukadavu 110/22 KV			32	31	16.150	
17	Palakad	Poolavadi 110/22 KV			48	308	82.290	
18	Palakad	Udumalpet 110/22 KV			50	154	68.870	

**UDUMALPET ZONE:PALAKKAD AND KAMBAM PASS:INSTALLED CAPACITYOF WIND FARMS**

Sl.No	Name of the	Name of the	OWNER	DEVELOPER	Total Cap.	No.of	Capacity	PPA OR NOT
	Pass	Sub-Station			MVA	Pvt WEGs	in MW	
19	Palakad	Somanur 110/33-11 KV			91	0	0.000	
20	Palakad	Palladam 110/11 KV			32	129	40.225	
21	Palakad	Peedampalli 110/22 KV			32	24	8.470	
22	Palakad	Pongalur 110/11 KV			58	34	33.000	
23	Palakad	Poolankinar 110/22 KV			57	71	66.150	
24	Palakad	Karadivavi 110/33-11 KV			57	135	55.200	
25	Palakad	Negamam 110/33-22			75	72	38.725	
26	Palakad	Dharapuram 110/22 KV			32	53	34.950	
27	Palakad	Palapappampatti 110/22 KV			50	65	33.100	
28	(Chennai Dist)	Thirumazhisai 110/22 KV			16	1	0.225	
29	Palakad	Thalayouthu 110/22 KV			57	88	62.800	
30	Palakad	Kundadam 110/22 KV			48	50	51.250	
31	Palakad	Madathukulam 110/22 KV			32	39	29.700	
32	Palakad	Kalivelampatty 110/22 KV			16	3	3.500	
33	Palakad	Vagarai 110/22 KV			16	1	1.500	
34	Palakad	Koluthupalayam 110/22 KV			32	10	15.000	
35	Palakad	Rasipalayam 110/33 KV			75	59	50.150	
36	Palakad	Pethappampatti 110/33 KV			50	32	27.200	

**UDUMALPET ZONE:PALAKKAD AND KAMBAM PASS:INSTALLED CAPACITYOF WIND FARMS**

Sl.No	Name of the	Name of the	OWNER	DEVELOPER	Total Cap.	No.of	Capacity	PPA OR NOT
	Pass	Sub-Station			MVA	Pvt WEGs	in MW	
37	Palakad	Anikadavu 230/33 KV			100	39	58.500	
38	Kambam	Kandamanur 110/22 KV			75	45	72.250	
39	Kambam	Kamachipuram 110/22 KV			70	42	69.300	
40	Kambam	Andipatti 110/22 KV			70	42	69.300	
41	Kambam	Theni 110/22 KV			41	14	21.000	
42	Kambam	Kadamalaikundu 110/22 KV			20	24	20.400	
43	Kambam	Rasingapuram 110/22 KV			20	6	3.600	
44	Kambam	Vaigai 110/22 KV			16	6	9.000	
45	Kambam	Markeyankottai 110/22 KV			10	15	9.000	
46	Kambam	Uthamapalayam 110/22 KV			32	4	2.400	
49	Kambam	Regen SS of Kandamanur 110/33 KV			50	34	51.000	
50	Kambam	Gamesa SS of Kadamalaikundu 110/33 KV			25	29	24.650	
51	Kambam	Sri Rangapuram SS of Gamesa 110/33 KV			50	51	43.350	
52	Kambam	Regen SS of Kamachipuram 110/33 KV			50	34	51.000	
		<b>GRAND TOTAL</b>			<b>3159</b>	<b>4909</b>	<b>2811.510</b>	

**TIRUNELVELI ZONE: ARALVAIMOZHI & SHENCOTTAH PASS INSTALLED CAPACITY OF WIND GENERATION**

Sl. No	NAME OF THE PASS	Name of SS	OWNER	DEVELOPER	Existing Capacity in MVA	CONNECTED LOAD		PPA OR NOT
						No.of WECS	MW	
1	Aralvaimozhi Pass	Anna Nagar 110/33-11 KV SS			64	119	66.775	
2	Aralvaimozhi Pass	Aralvaimozhi 110 / 11KV SS			48	211	53.565	
3	Aralvaimozhi Pass	Chidambarapuram 110/33- 11 KV SS			73	229	79.975	
4	Aralvaimozhi Pass	Irukkanthurai 110/33 KV SS			48	26	29.200	
5	Aralvaimozhi Pass	Kannanallur 110 / 11 KV SS			32	148	36.250	
6	Aralvaimozhi Pass	Karungulam 110/33-11 KV SS			89	320	111.905	
7	Aralvaimozhi Pass	Koodankulam 110/33-11 KV SS			85	90	100.000	
8	Aralvaimozhi Pass	Kottaikarungulam 110/33-11 KV SS			73	104	68.115	
9	Aralvaimozhi Pass	Kanyakumari 110 / 11 KV SS			16	15	7.450	
10	Aralvaimozhi Pass	Maharajapuram 110/33-11 KV SS			91	133	83.980	
11	Aralvaimozhi Pass	Muppandal 110 / 11KV SS			50	243	59.125	
12	Aralvaimozhi Pass	Panagudi 110/11 KV SS			48	96	47.875	
13	Aralvaimozhi Pass	Pazhavor 110/11 KV SS			82	320	91.505	
14	Aralvaimozhi Pass	Perungudi 110/33-11 KV SS			76	346	102.455	
15	Aralvaimozhi Pass	Radhapuram 110/33-11 KV SS			132	180	139.215	
16	Aralvaimozhi Pass	Sanganeri 230 / 33 KV SS			150	140	156.550	
17	Aralvaimozhi Pass	Shenbagarampudhur 110/11 KV SS			10	9	2.250	
18	Aralvaimozhi Pass	Thandaiyarkulam 110/33-11KV SS			98	181	111.825	
19	Aralvaimozhi Pass	Udayathur 230 KV SS			200	145	213.050	
20	Aralvaimozhi Pass	Vadakkankulam 110/33-11 KV SS			116	272	134.980	
21	Aralvaimozhi Pass	Vallioor SS 110/11 KV SS			20	12	6.300	

**TIRUNELVELI ZONE: ARALVAIMOZHI & SHENCOTTAH PASS INSTALLED CAPACITY OF WIND GENERATION**

Sl. No	NAME OF THE PASS	Name of SS	OWNER	DEVELOPER	Existing Capacity in MVA	CONNECTED LOAD		PPA OR NOT
						No. of WECS	MW	
22	Ramnad Sea Shore	Mandapam 110/33-11 KV SS			26	4	0.900	
23	Ramnad Sea Shore	Rameshwaram 110/11 KV SS			16	2	0.500	
24	Shencottai Pass	Alankulam 110 / 11 KV SS			95	158	87.800	
25	Shencottai Pass	Amuthapuram 230/33 KV SS			200	80	138.000	
26	Shencottai Pass	Ayyanaruthu 110 / 11 KV SS			98	246	92.715	
27	Shencottai Pass	Chettikurichy 66 / 11 KV SS			5	3	4.400	
28	Shencottai Pass	Gangaikondan 110/11 KV SS			10	11	10.055	
29	Shencottai Pass	Kadayanallur 100 / 11 KV SS			20	54	24.975	
30	Shencottai Pass	Kayathar 66 / 11 KV SS			10	35	11.680	
31	Shencottai Pass	Keelaveeranam 110/33-11 KV SS			132	324	144.275	
32	Shencottai Pass	Kodikurichi 110/33-11KV SS			116	178	78.400	
33	Shencottai Pass	Malayankulam 110/11 KV SS			10	11	9.350	
34	Shencottai Pass	Manur 110/11 KV SS			60	70	56.000	
35	Shencottai Pass	Pavoorchathiram 110 /33-11 KV SS			95	135	85.750	
36	Shencottai Pass	Rastha 110/33 KV SS			100	38	60.600	
37	Shencottai Pass	Shencottah 110/11 KV SS			10	29	10.825	
38	Shencottai Pass	Sundankuruchi 110/33-11 KV SS			110	118	116.400	
39	Shencottai Pass	Surandai 110/11 KV SS			45	82	51.250	
40	Shencottai Pass	Tenkasi 110 / 11 KV SS			20	36	17.400	
41	Shencottai Pass	Uthumalai 110/33-11 KV SS			85	85	95.100	
42	Shencottai Pass	Vadakarai 110/11 KV SS			16	46	15.950	

**TIRUNELVELI ZONE: ARALVAIMOZHI & SHENCOTTAI PASS INSTALLED CAPACITY OF WIND GENERATION**

Sl. No	NAME OF THE PASS	Name of SS	OWNER	DEVELOPER	Existing Capacity in MVA	CONNECTED LOAD		PPA OR NOT
						No. of WECS	MW	
43	Shencottai Pass	Vannikonenthal 66 / 11 KV SS			10	42	12.545	
44	Shencottai Pass	Veeranam 230/33 KV SS			200	192	205.350	
45	Shencottai Pass	Veerasingamani 110/66-33-11 KV SS			160	259	106.075	
46	Shencottai Pass	Therkupatti 110/33 KV SS Section (10/1)			125	87	69.600	
47	Shencottai Pass	Kadayam 110/11 KV			10	5	1.125	
48	Shencottai Pass	Kazhugumalai 110/33-11 KV			10	6	5.100	
49	Shencottai Pass	O Thulukkapatti 110/11 KV			10	16	9.600	
50	Shencottai Pass	Thalaiyuthu 110/33-11 KV SS			25	7	5.250	
51	Tuticorin Sea Shore	SPIC 230 / 110 / 22 KV SS			16	20	1.100	
		<b>TOTAL</b>				5718	3230.415	



## State/UT/DVC share in Renewable Regulatory Charges (% Contribution) (August 2011-Provisional)

S. No.	State/UTs/DVC	Peak Demand Met (MW)	Contribution to RRF (%)
1	Maharashtra	14904	12.4024
2	Andhra Pradesh	11377	9.4674
3	Uttar Pradesh	10388	8.6444
4	Tamil Nadu	10203	8.4905
5	Gujarat	8637	7.1873
6	Punjab	7882	6.5590
7	Karnataka	7085	5.8958
8	Haryana	6147	5.1153
9	West Bengal	5968	4.9663
10	Rajasthan	5880	4.8931
11	Madhya Pradesh	5322	4.4287
12	Delhi	5028	4.1841
13	Orissa	3341	2.7802
14	Kerala	2890	2.4049
15	Chattisgarh	2739	2.2793
16	DVC	2098	1.7459
17	Bihar	1738	1.4463
18	Jammu & Kashmir	1451	1.2075



## State/UT/DVC share in Renewable Regulatory Charges (% Contribution) (August 2011-Provisional)

S. No.	State/UTs/DVC	Peak Demand Met (MW)	Contribution to RRF (%)
19	Uttarakhand	1429	1.1891
20	Assam	1014	0.8438
21	Himachal Pradesh	1011	0.8413
22	Jharkhand	811	0.6749
23	Dadar Nagar Haveli	605	0.5035
24	Goa	426	0.3545
25	Puducherry	310	0.2580
26	Chandigarh	273	0.2272
27	Daman & Diu	272	0.2263
28	Meghalaya	261	0.2172
29	Tripura	191	0.1589
30	Arunachal Pradesh	103	0.0857
31	Manipur	102	0.0849
32	Nagaland	102	0.0849
33	Sikkim	90	0.0749
34	Mizoram	53	0.0441
35	Andaman- Nicobar	32	0.0266
36	Lakshadweep	7	0.0058
	<b>TOTAL</b>	<b>120170</b>	<b>100</b>



# Case Study : UI beyond 50% and Proposed Alternative (Hierarchical Mechanism)

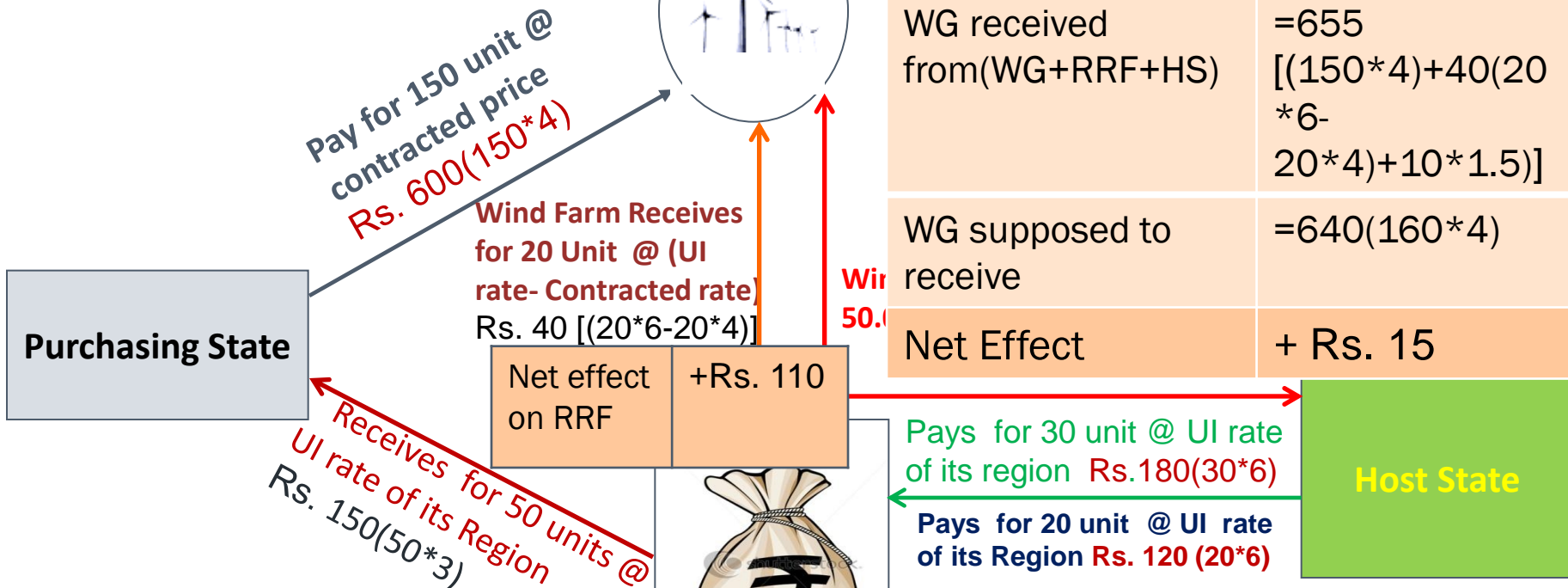


# Wind Generator (Inter-state) (Case-IV): UI beyond 50%



Generation Schedule: 100 Unit  
Actual generation : 160 Unit

Contracted Rate @ Rs. 4/Unit  
UI Host state @ Rs. 6/Unit  
UI Purchasing state @ Rs. 3/Unit  
UI rate(50-50.02) @ Rs. 1.5/Unit



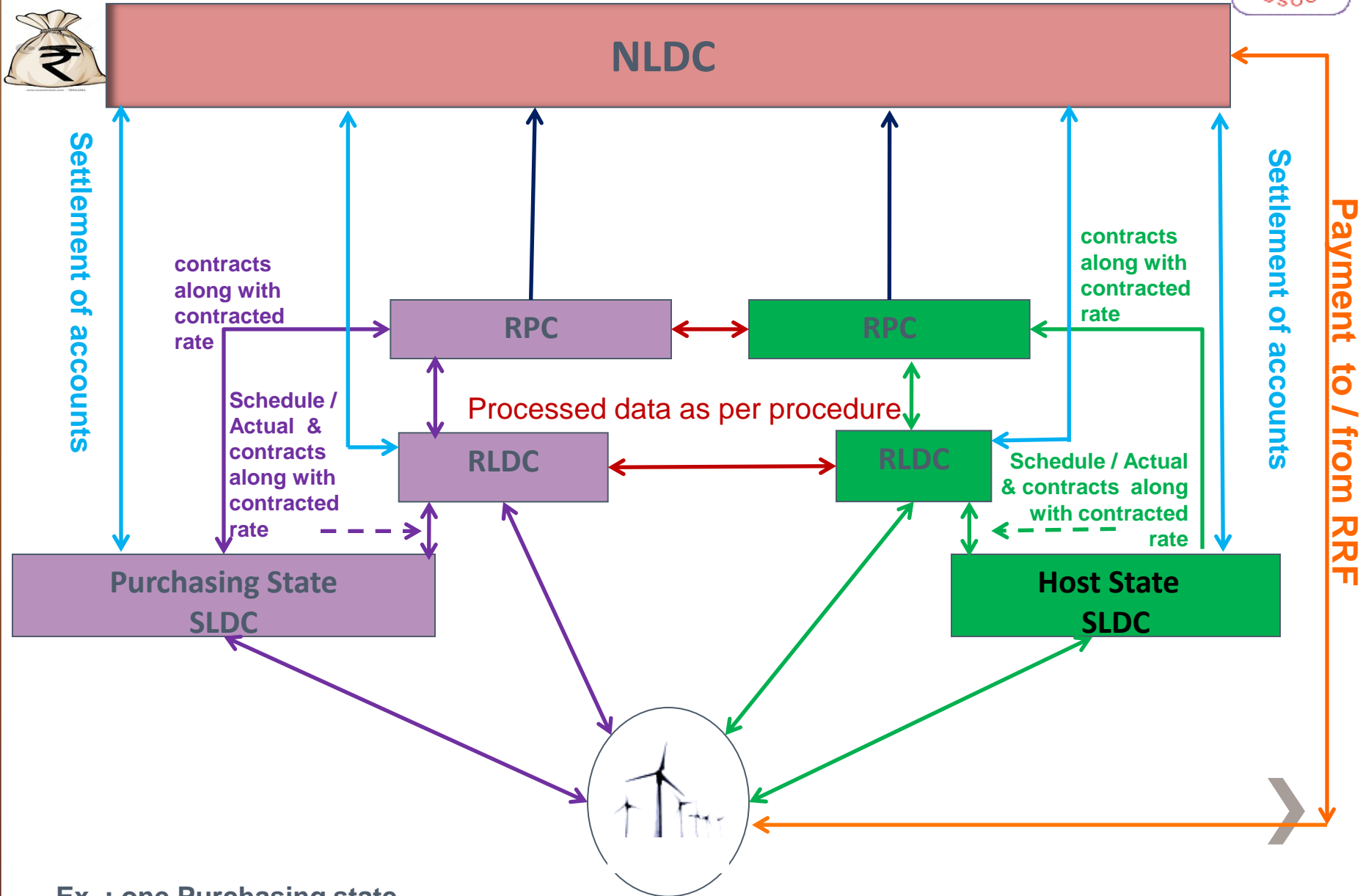
WG received from(WG+RRF+HS)	=655 [(150*4)+40(20*6-20*4)+10*1.5]
WG supposed to receive	=640(160*4)
Net Effect	+ Rs. 15

Net paid by PS (WG-RRF)	=450(600-150)
PS supposed to pay	=400(100*4)
Net Effect	- Rs. 50

Net paid by HS (RRF+WG)	=315(180+120+15)
HS supposed to pay	=360(60*6)
Net Effect	+ Rs. 45

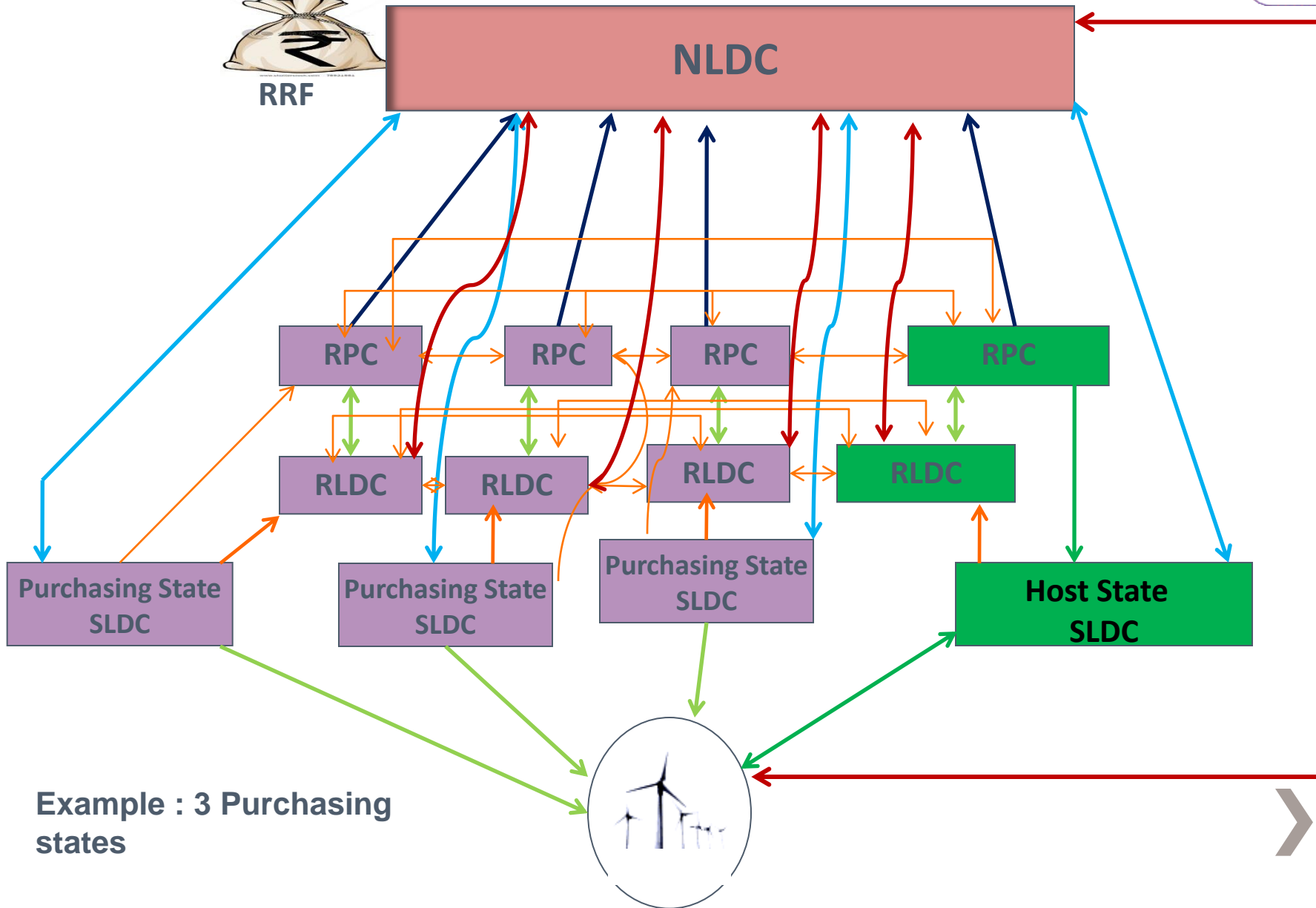
Any loss to Host state on account of Capped rates for Under-drawal /Wind generators to be compensated by RRF

# Settlement between different agencies : Inter-State- case IV



Ex. : one Purchasing state

# Settlement between different agencies : Inter-State- case



Example : 3 Purchasing states



# Settlement between different agencies: (Proposed Alternative) Hierarchical Institutional Mechanism

