Revenue and Tariff Analysis for Electric Utilities (RATE) model for Andhra Pradesh

Scenario based Analysis and Observations

Prayas (Energy Group)

January 8, 2018

Hyderabad

प्रयास

Outline

- Background and Context
- About RATE-AP
- Scenarios and related variables, assumptions
- Major scenario results

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Utility Business Model at crossroads

Renewable energy boom	Uncertainty in Demand Growth	Generation and Power Procurement
• ↓Solar PV, wind price • Wheeling ,CSS concessions • Net metering • RE – 175 GW	• ACOS @ Rs. 6/unit and ↑ • ↑ in open access, captive sales migration • Impact of EE efforts • Unmetered demand • Make in India	• Performance of power plants • Backing down • Coal, gas: ↑ prices, issues with availability, quality

- New thinking needed for power procurement
  - Surplus management: Backing down strategies, sale of surplus power
  - New opportunities for medium term contracts
- Tariff design needs to be re-imagined
  - Sales migration leaves little room to ↑ cross subsidy
  - Additional surcharge, increased fixed charges etc. could encourage further migration to captive
- **Major trends→ inter-related→ need to think of assessing cumulative impacts**
  - **An analytical tool for 'what-if' scenario based sense making of various trends/possibilities**

RATE Model: Features and Possibilities

- **Features**
  - Excel-based financial and performance analysis model *developed by Prayas*
  - Provision for disaggregated inputs for various components of utility operations
  - Structured to assess cumulative impacts of changes in various parameters
  - Useful for medium term sense making (5-6 year time horizon)
  - Annual treatment of most cost and performance heads
  - Customisable to suit State/DISCOM/Genco needs
- **Possibilities with RATE**

What RATE can help with:	What RATE is not designed for:
☑ 'What-if?' scenario impacts	☒ Dispatch modeling
☑ Understanding cumulative impacts	☒ Accurate ARR estimation
☑ Identification of key issues	☒ Monthly, quarterly seasonal analysis
☑ Evaluate innovative ideas, regulatory decisions	☒ Transmission pricing
☑ Sense making for different stakeholders	☒ Load profile estimation

Background and Context

- PEG developed RATE, a scenario building model to inform power sector decision making
- RATE in other states
  - customized for Maharashtra
    - Used for regulatory interventions in Genco and DISCOM matters
  - Gujarat RATE adaptation in 2018
    - Based on consultations with the GUVNL and GERC
- APERC requested PEG to adapt model for AP
  - RATE-AP developed between June and October 2017
  - Model based on discussions with APERC staff, relevant regulations, orders and petitions, state government policies
  - Model is highly flexible and thus key assumptions can be changed as required
  - All assumptions and estimations for the model are made by PEG

Purpose of the presentation

- **Scope of Presentation**
  - Showcase usefulness and functions of RATE-AP
  - Not about numbers and conclusions but about ways in which model can be used
  - Sense-making scenarios to compare order of magnitude impacts due to changes.
  - Presentation is part of the documentation that goes with the excel-based model along with user guide, narrative on scenarios

- **Scenarios and Results**
  - The results and scenarios presented are by PEG
  - The scenarios and results are not prescriptive. They are only examples to demonstrate the functions of the model
  - Any sense-making and scenario building for prescriptive purposes can be done by APERC, utilities, consumers and other stakeholders

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- **About RATE-AP**
- Scenarios and related variables, assumptions
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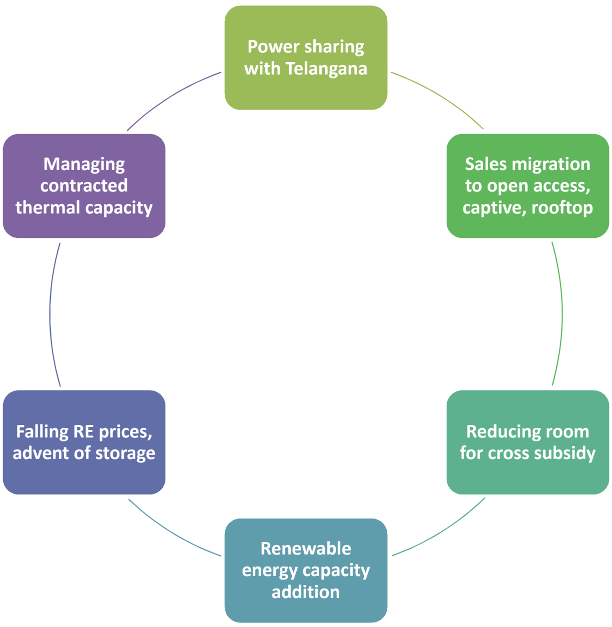
ABOUT RATE-AP

1. *Need*
2. *Features*
3. *Structure*

Need for sense-making for AP utilities



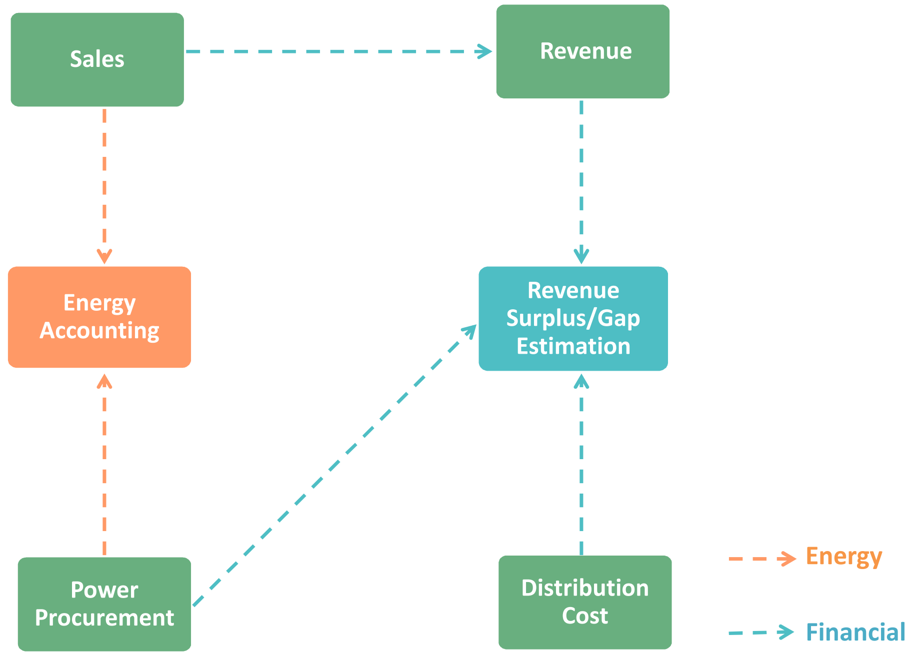
Features of RATE-AP: Power Procurement

- **Firm power procurement**
  - Station-wise disaggregation of generation and costs
  - Treatment of costs based on type of PPA
  - Option to specify PLFs and escalation rates for fixed and variable costs
  - Reconciliation of RE capacity addition with RPO targets
  - Possible to assess cost impact of capacity addition in excess of RPO
- ‘**Surplus’/Shortage management**
  - Annual estimates for backing down in the face of surplus
  - Options for purchase/sale in case of annual shortage/surplus
- **Intra/inter-state transmission charges**
  - Based on historical trends
  - Bottom up calculation not present

Features of RATE-AP: Distribution

- **Separate treatment for APEPDCL and APSPDCL**
- **Category wise sales and revenue from tariff estimates**
  - Further differentiation based on voltage and tariff slabs.
  - Option to input tariff increase and change tariff design
  - Energy accounting based on transmission and distribution loss trajectories
- **Category wise sales migration**
  - Due to Open Access, Captive and Rooftop solar
  - Estimation of revenue from sales migration charges
- **Distribution cost**
  - Capital Expenditure (Tariff regulations)
  - Operation and Maintenance (past trends)

Structure



Structure

Overview
- Index of sheets
- Outline of structure
- Definitions and Notes

Sales
- Category wise, voltage wise sales projections,
- Sales migration

Energy Accounting
- Power surplus /shortage based on procurement, voltage wise losses
- RPO requirement and assessment of excess/shortfall capacity addition
- Sale of surplus power/ purchase of short term power

Power Procurement
- Assumptions
- Station-wise Capacity, Generation and Cost
- Backing down by adjustment of PLFs

Revenue
- Revenue from retail tariffs based on tariff projections, tariff design
- Separate estimation of category wise fixed and variable costs, revenue from sales migration, revenue from surplus sale, subsidy payments

Revenue Surplus/Gap Estimation
- Revenue gap carry forward
- Applicable carrying cost

Distribution Cost
- Capital Expenditure
- Other expenses
- Operation and Maintenance

SCREENSHOTS OF THE MODEL

Power Procurement

Plant specification

Contracted Capacity

Unit	Fuel	Date of Commercial Operation (COD)	Capacity- AP Share (MW) FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
NTTPS-I	Coal	U1-1/11/1979 U2-10/10/1980	160	160	194	194	194	194	194	194	194
NTTPS-II	Coal	U3-5/10/1989 U4-23/08/1990	160	160	194	194	194	194	194	194	194
NTTPS-III	Coal	U5-31/03/1994 U6-24/02/1995	160	160	194	194	194	194	194	194	194
NTTPS-IV	Coal	28.1.2010	190	190	231	231	231	231	231	231	231
Rayalaseema-I	Coal	U1- 31.3.1994 U2-25.2.1995	160	160	194	194	194	194	194	194	194
Rayalaseema-II	Coal	U1- 12.8.2007 U2-29.3.2008	160	160	194	194	194	194	194	194	194
Rayalaseema-III	Coal	10.2.2011	80	80	97	97	97	97	97	97	97
Rayalaseema-IV	Coal	01-Oct-17	0	0	0	0	600	600	600	600	600
Sanjeevaiah I	Coal	01-Mar-14	0	305	800	800	800	800	800	800	800

Unit	Normative Availability - NAPAF (%)	Availability (%) FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
NTTPS-I	80%	81%	95%	76%	70%	85%	85%	85%	85%	85%
NTTPS-II	80%	81%	95%	76%	70%	85%	85%	85%	85%	85%
NTTPS-III	80%	81%	94%	76%	70%	85%	85%	85%	85%	85%
NTTPS-IV	80%	90%	101%	68%	78%	87%	87%	87%	87%	87%
Rayalaseema-I	80%	69%	84%	69%	68%	86%	86%	86%	86%	86%
Rayalaseema-II	80%	82%	95%	76%	66%	82%	82%	82%	82%	82%
Rayalaseema-III	80%	76%	89%	72%	70%	86%	86%	86%	86%	86%
Rayalaseema-IV	80%	0%	0%	0%	0%	40%	85%	85%	85%	85%
Sanjeevaiah I	80%	0%	40%	44%	70%	78%	78%	78%	78%	78%

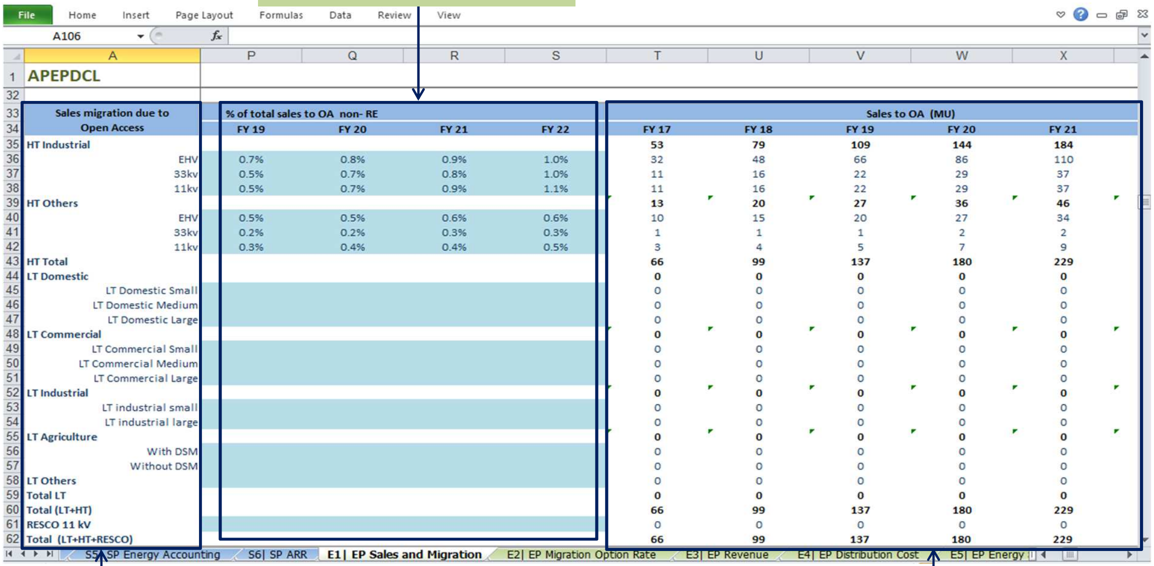
P0| PP Assumptions | P1| PP All | P2| GenCo Thermal | P3| GenCo Hydro | P4| Central | P5| Private | H2| RPO | P6| NCE | S1| SP Sales and Migration | S2| SP

Plant name, fuel type, CoD

Availability …

Sales Migration

% Sales Migration



APEPDCL

Sales migration due to Open Access	% of total sales to OA non- RE FY 19	FY 20	FY 21	FY 22	Sales to OA (MU) FY 17	FY 18	FY 19	FY 20	FY 21
HT Industrial					53	79	109	144	184
EHV	0.7%	0.8%	0.9%	1.0%	32	48	66	86	110
33kv	0.5%	0.7%	0.8%	1.0%	11	16	22	29	37
11kv	0.5%	0.7%	0.9%	1.1%	11	16	22	29	37
HT Others					13	20	27	36	46
EHV	0.5%	0.5%	0.6%	0.6%	10	15	20	27	34
33kv	0.2%	0.2%	0.3%	0.3%	1	1	1	2	2
11kv	0.3%	0.4%	0.4%	0.5%	3	4	5	7	9
HT Total					66	99	137	180	229
LT Domestic					0	0	0	0	0
LT Domestic Small					0	0	0	0	0
LT Domestic Medium					0	0	0	0	0
LT Domestic Large					0	0	0	0	0
LT Commercial					0	0	0	0	0
LT Commercial Small					0	0	0	0	0
LT Commercial Medium					0	0	0	0	0
LT Commercial Large					0	0	0	0	0
LT Industrial					0	0	0	0	0
LT industrial small					0	0	0	0	0
LT industrial large					0	0	0	0	0
LT Agriculture					0	0	0	0	0
With DSM					0	0	0	0	0
Without DSM					0	0	0	0	0
LT Others					0	0	0	0	0
Total LT					0	0	0	0	0
Total (LT+HT)					66	99	137	180	229
RESCO 11 kV					0	0	0	0	0
Total (LT+HT+RESCO)					66	99	137	180	229

S5| SP Energy Accounting | S6| SP ARR | E1| EP Sales and Migration | E2| EP Migration Option Rate | E3| EP Revenue | E4| EP Distribution Cost | E5| EP Energy

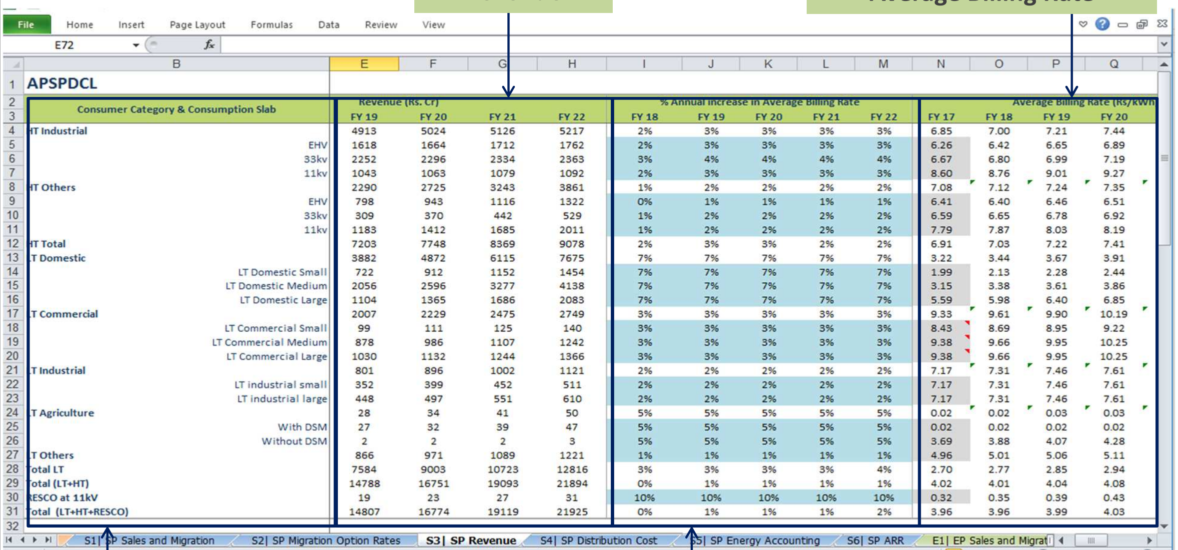
Category-wise/ slab-wise sales

Quantum of Sales Migration

Revenue

Revenue

Average Billing Rate



APSPDCL

Consumer Category & Consumption Slab	Revenue (Rs. Cr) FY 19	FY 20	FY 21	FY 22	% Annual increase in Average Billing Rate FY 18	FY 19	FY 20	FY 21	FY 22	Average Billing Rate (Rs/kWh) FY 17	FY 18	FY 19	FY 20
HT Industrial	4913	5024	5126	5217	2%	3%	3%	3%	3%	6.85	7.00	7.21	7.44
EHV	1618	1664	1712	1762	2%	3%	3%	3%	3%	6.26	6.42	6.65	6.89
33kv	2252	2296	2334	2363	3%	4%	4%	4%	4%	6.67	6.80	6.99	7.19
11kv	1043	1063	1079	1092	2%	3%	3%	3%	3%	8.60	8.76	9.01	9.27
HT Others	2290	2725	3243	3861	1%	2%	2%	2%	2%	7.08	7.12	7.24	7.35
EHV	798	943	1116	1322	0%	1%	1%	1%	1%	6.41	6.40	6.46	6.51
33kv	309	370	442	529	1%	2%	2%	2%	2%	6.59	6.65	6.78	6.92
11kv	1183	1412	1685	2011	1%	2%	2%	2%	2%	7.79	7.87	8.03	8.19
HT Total	7203	7748	8369	9078	2%	3%	3%	2%	2%	6.91	7.03	7.22	7.41
LT Domestic	3882	4872	6115	7675	7%	7%	7%	7%	7%	3.22	3.44	3.67	3.91
LT Domestic Small	722	912	1152	1454	7%	7%	7%	7%	7%	1.99	2.13	2.28	2.44
LT Domestic Medium	2056	2596	3277	4138	7%	7%	7%	7%	7%	3.15	3.38	3.61	3.86
LT Domestic Large	1104	1365	1686	2083	7%	7%	7%	7%	7%	5.59	5.98	6.40	6.85
LT Commercial	2007	2229	2475	2749	3%	3%	3%	3%	3%	9.33	9.61	9.90	10.19
LT Commercial Small	99	111	125	140	3%	3%	3%	3%	3%	8.43	8.69	8.95	9.22
LT Commercial Medium	878	986	1107	1242	3%	3%	3%	3%	3%	9.38	9.66	9.95	10.25
LT Commercial Large	1030	1132	1244	1366	3%	3%	3%	3%	3%	9.38	9.66	9.95	10.25
LT Industrial	801	896	1002	1121	2%	2%	2%	2%	2%	7.17	7.31	7.46	7.61
LT industrial small	352	399	452	511	2%	2%	2%	2%	2%	7.17	7.31	7.46	7.61
LT industrial large	448	497	551	610	2%	2%	2%	2%	2%	7.17	7.31	7.46	7.61
LT Agriculture	28	34	41	50	5%	5%	5%	5%	5%	0.02	0.02	0.03	0.03
With DSM	27	32	39	47	5%	5%	5%	5%	5%	0.02	0.02	0.02	0.02
Without DSM	2	2	2	3	5%	5%	5%	5%	5%	3.69	3.88	4.07	4.28
LT Others	866	971	1089	1221	1%	1%	1%	1%	1%	4.96	5.01	5.06	5.11
Total LT	7584	9003	10723	12816	3%	3%	3%	3%	4%	2.70	2.77	2.85	2.94
Total (LT+HT)	14788	16751	19093	21894	0%	1%	1%	1%	1%	4.02	4.01	4.04	4.08
RESCO at 11kV	19	23	27	31	10%	10%	10%	10%	10%	0.32	0.35	0.39	0.43
Total (LT+HT+RESCO)	14807	16774	19119	21925	0%	1%	1%	1%	2%	3.96	3.96	3.99	4.03

S1| SP Sales and Migration | S2| SP Migration Option Rates | S3| SP Revenue | S4| SP Distribution Cost | S5| SP Energy Accounting | S6| SP ARR | E1| EP Sales and Migrat

Consumer Categories

Tariff Increase

Outline

- Background and Context
- About RATE-AP
- **Scenarios and related variables, assumptions**
- Major scenario results

प्रयास

Scenarios and Key Variables

1. *Brief Description of Scenarios*
2. *Variables, assumptions related to*
   i. *Power Procurement*
   ii. *Sales and sales migration*
   iii. *Cost escalation and tariffs*

प्रयास

Baseline Scenario: Power Procurement

Conventional Capacity Addition	FY 18	RTPP IV (600 MW)	
	FY 20	SDSTPS III (800 MW)	
		VTPS V (800 MW)	
	FY 22	Polavaram HEP (960 MW)	
PLF for GENCO Projects	Across Years	80%	
Capacity Charge Escalation Rate	Across Years	2-5%	
Energy Charge Escalation Rate	Across Years	4%	
RE Tariffs (Rs./kWh)	Year	FY 18	FY22
	Wind	4.20	3.50
	Solar	4.00	3.00
	Biomass	5.15	5.07
	SHP	2.33	2.33
Transmission Losses	Across Years	~3%	
Transmission Cost Escalation	Across Years	13%	

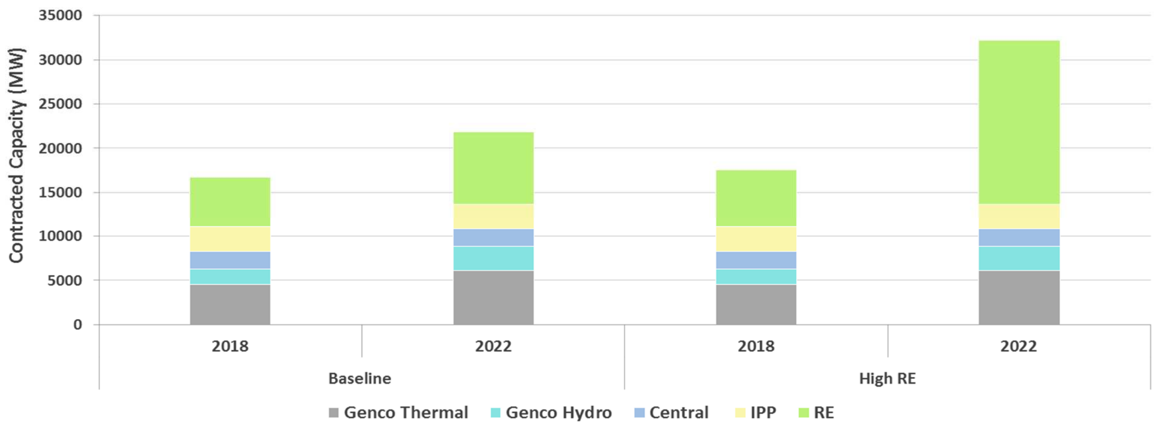
Baseline Scenario: Distribution

Power Purchase Share	SPDCL	66%
	EPDCL	34%
Sales growth projections	SPDCL	7.2% p.a
	EPDCL	12.7% p.a
Sales migration charges	CSS	As per NTP
	Additional Surcharge	Rs.1/kWh from 2018
	Wheeling	As per FY17 charges
	RE rebates	100% of wheeling charges 100% of CSS for in-state solar
% tariff increase	Overall, across years	1.2% p.a
Distribution cost escalation rates	Across Years	14-16%
Strategy and Rate of Sale of Surplus	Power Exchange	30% sale @ Rs. 2.70/kWh
	Bilateral	50% sale @ Rs. 3.00/kWh
	DSM	20% sale @ Rs. 1.25/kWh

Scenario Assumptions

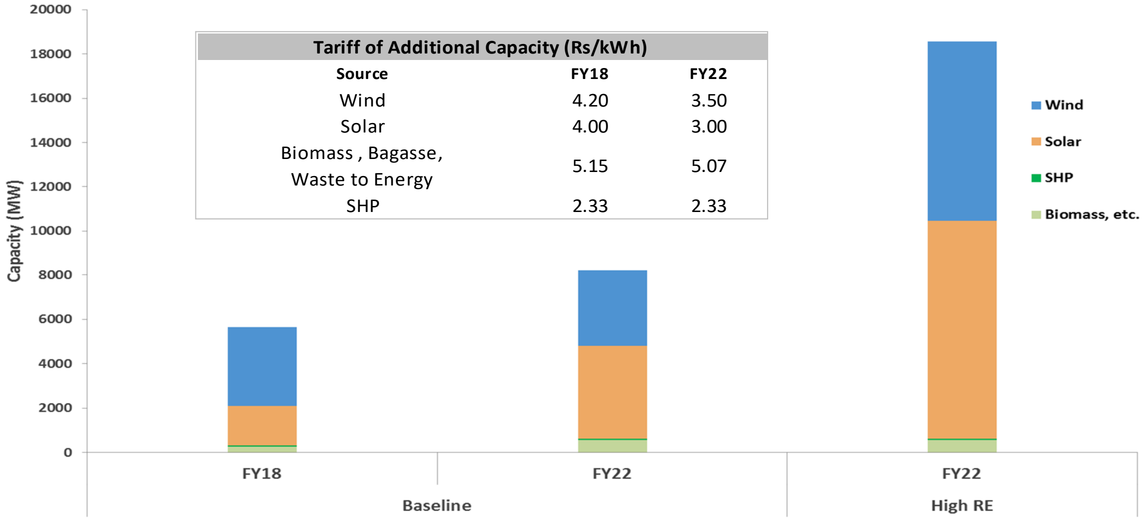
Assumptions by FY 22	Baseline Scenario	High RE Scenario	Sales Migration Scenario	No sharing Scenario	Sales Migration + High RE Scenario	Sales Migration + High RE + No Sharing Scenario
RE Capacity	4,687 MW	15,053 MW	Same as Baseline Scenario	Same as Baseline Scenario	Same as High RE Scenario	Same as High RE Scenario
Sales Migration	HT sales: 9-10% RTPV: 1.3-1.6%	Same as Baseline Scenario	HT sales: 46-50% RTPV : 6.3-8.8%	Same as Baseline Scenario	Same as Sales Migration Scenario	Same as Sales Migration Scenario
Sharing of Power	AP: 46% TS: 54%	Same as Baseline Scenario	Same as Baseline Scenario	AP: 100% TS: 0%	Same as Baseline Scenario	Same as No Sharing Scenario

Assumptions: Total capacity contracted across scenarios



- FY 18: Rayalseema IV- 600 MW
- FY 20: Sanjeeviah III - 800 MW and VTPS V- 800 MW
- FY 22: Polavaram HEP - 960 MW
- Due to issues with gas availability, gas based IPP plants shut down
  - Spectrum Kakinada, Lanco Kondapalli, GMR Vemagiri and Rajahmundry etc.

Assumptions- RE contracted capacity and prices



Tariff of Additional Capacity (Rs/kWh)		
Source	FY18	FY22
Wind	4.20	3.50
Solar	4.00	3.00
Biomass , Bagasse, Waste to Energy	5.15	5.07
SHP	2.33	2.33

- Solar RPO: 3% in FY 18 → 7% in FY 22
- Non Solar RPO: 6% in FY 18 → 10% in FY 22
- RE assumed must-run in all scenarios

Assumptions: Surplus Management strategy

- **PLF and surplus**
  - Normative PLF of 80% in all scenarios
  - In case of surplus, utility can sell power or back down
    - ~1,000 MU of surplus available for sale, rest is backed down
  - Backing down : modeled by PLF adjustments
    - TS units are first backed down to 0%
    - Then, reduce PLFs to 50% for plants with highest variable cost as per Merit Order
    - In high surplus scenarios, reduce PLFs to 25% or 0% as applicable
  - Strategy assumed for sale of surplus power
    - 50% of power through bilateral traders @ Rs. 3/unit, 30% through power exchanges @ Rs. 2.70/unit and 20% via DSM at Rs. 1.25/unit
    - Average sale of surplus is at Rs 2.56/unit, i.e., **18% lower** than the average variable cost of backed down units at Rs. 3.12/ unit
- **Plants often backed down as per MoD across scenarios in FY 22:**

Name of Unit	Variable charges (Rs./kWh)
RTPP I –IV	3.57
Simhadri I & II	3.04
NTTPS I –III	3.03
NTTPS IV-V	2.74

Assumptions : Sales and sales migration

- Sales Projections
  - Gross sales growth at 7.2% p.a for EPDCL and 11.9% p.a for SPDCL

Sales migration assumptions and impact on sales growth

Scenarios	Sales Migration Assumptions
Baseline	• *~10% of total HT sales move to open access and captive sources* • *~1.5 % of total LT sales move to rooftop solar*
High RE	
No sharing	
Sales Migration	• *~50% of to total HT sales move to open access and captive sources* • *6-9 % of LT total move to rooftop solar*
Sales Migration +High RE	
All combined	

- Power loss trajectories same as AP DISCOM Resource Plans :
  - Transmission Losses at 3% across years
  - Distribution Losses :
    - SPDCL @ 11% in FY 18 and FY 22, EPDCL @ 10% in FY 18 and 9% in FY22

Assumptions: Sales Migration potential and charges

- **Sales migration potential**
  - In FY 17, 60% of non-agricultural sales in EPDCL and SPDCL is eligible - have tariffs above Rs.5/unit
  - With a 10% increase in tariff, about 70% of sales will have tariffs above Rs.5/unit
  - At this rate, even LT consumers can migrate to rooftop solar options

- **Sales migration charges across scenarios**
  - CSS: as per NTP formula, Additional Surcharge : Levy of Rs.1/kWh from FY 18
  - Wheeling charges: FY17 estimates used across years, scenarios
  - Rebates for RE : Wheeling and CSS
  - Standby power: 1.5 times applicable tariff, based on assumed deviation for RE and conventional power.

Assumptions: Cost escalation and tariffs

- Power Procurement
  - Variable cost escalation at average of 4% p.a
  - Fixed cost escalation at average of 2-5% p.a
- Distribution : Capex and O&M related costs to increase at 14% p.a
- Subsidies: Assumed to be Rs. 4000 crores for both DISCOMs from FY 17 to FY 22.
  - Share of SPDCL is Rs. 2800 crores and Share of EPDCL is Rs. 1200 crores
- Tariffs : Considering todays tariffs (without subsidy) , overall tariff escalation at 1.2% p.a
  - based on 3 year and year on year trends

Consumer category	% of total sales (FY 17)	FY 17 ABR (Rs/kWh)	Tariff increase per annum
HT Consumers	35%	6.89	*2%*
LT Domestic	28%	3.17	*6%*
LT Commercial	6%	9.30	*3%*
LT Industrial	3%	7.18	*2%*
LT Agriculture (Average for with and without DSM)	23%	0.03	*2%*

Weighted average tariff escalation is lower than category-wise tariff escalation due to change in sales mix due to variations in sales growth, migration

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- **Major scenario results**

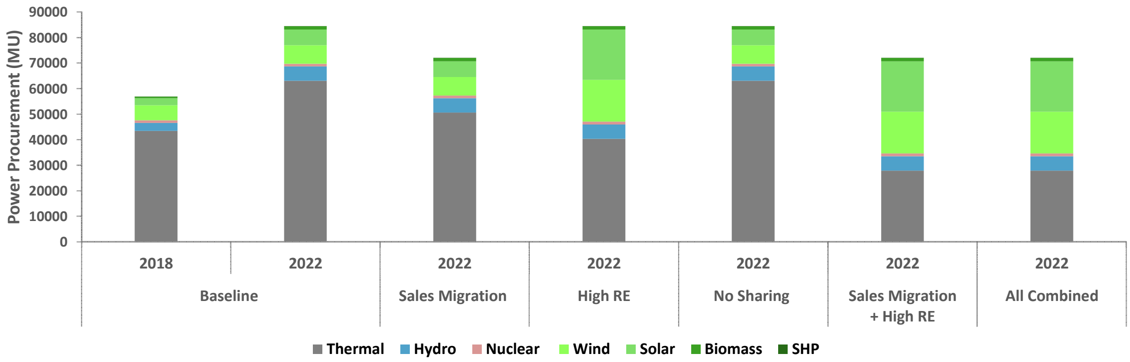
Major Scenario Results

- *Power Procurement costs under various scenarios*
- *Impact of surplus management strategies with High RE capacity*
- *Impact of strategies to eliminate revenue gap*
  - Increase tariff
  - Increase subsidy
  - Sale of surplus at rates high enough to compensate revenue gap (theoretical)
- *Tariff design to manage sales migration*
  - Increase fixed cost while keeping average tariffs the same
  - Levy of additional surcharge, concessions for renewable energy based open access

Power Procurement across scenarios

1. *Costs impact across scenarios*
2. *Sensitivity of cost related parameters*
3. *Impact of backing down across scenarios*
4. *Impact of surplus management strategies with high RE capacity*

Power Procurement across scenarios



Particulars	Year	Baseline	Sales Migration	High RE	No sharing	Sales Migration + High RE	All Combined
% RE Generation	FY 22	17%	21%	44%	17%	52%	52%
Surplus (MU)	FY 22	8,800	21,300	31,600	12,000	45,200	48,400
APPC (Rs./unit)	FY 18	3.69	3.74	3.78	3.80	3.85	3.89
	FY 22	4.10	4.25	4.23	4.14	4.52	4.55
Total power procurement cost across scenarios (Rs Cr.)*	FY 18	21,000	-1.9%	2.2%	2.8%	0.9%	2.0%
	FY 22	34,700	-11.6%	3.2%	1.0%	-6.0%	-5.3%

**Order of magnitude analysis- all numbers rounded off to nearest hundred. All % to one decimal point*

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Power Procurement costs across scenarios

Baseline 5 year growth in power procurement : 13% ↑ in APPC, 84% ↑ in total costs.

Sales Migration : In spite of backing down, total power purchase cost falls by 12% due to savings in variable cost. However, APPC goes up by 4%.

High RE: Cost increases by 3% with 10,366 MW additional RE capacity addition by FY22.

No sharing: Additional ~320 Cr increase in fixed costs. Deviation reduces due to variable costs saving with increased backing down.

Combination Scenarios: 10%-11% increase in APPC due to cumulative effects.

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Sensitivity to cost assumptions

Parameter	Values	Changed Range	Effect on Power Purchase Cost across scenarios in FY22
Fixed Cost	Escalation: 5% 2% for depreciated plants	-2% to +2%, +1% to -1% for depreciated plants	-2% to 2.1%
Thermal Variable Cost	Escalation: 4%	-2% to 1%	-3.7% to 1.9%
Solar Tariff	Rs. 3 in FY22	-1 to +1 Re/unit in FY22	-0.8% to 0.8% in Baseline -2.5% to 2.5% in High RE
Wind Tariff	Rs. 3.5 in FY22	-1 to +0.7 Re/unit in FY22	-0.4% to 0.3% in Baseline -1.7% to 1.5% in High RE
Cumulative Cost Impact			-6.9% to 5.1% in Baseline -8.4% to 7.2% in High RE

- Significant uncertainty in RE costs
- Above changes result in 7% variation in non-RE costs, 13% variation in RE costs
- Variation in total power purchase costs :
  - 7% in baseline scenario , 8.5% in the High RE scenario

Extent of backing down across scenarios

Year	Scenarios	Fixed cost payments as a % of total power procurement costs	'Surplus' Power Backed down (MU)
FY 18	Baseline	30%	16,600
FY 22		30%	8,200
FY 22	Sales Migration	34%	20,600
	High RE	29%	30,900
	No sharing	30%	11,400
	Sales Migration + High RE	32%	44,400
	All Combined	33%	47,700

Order of magnitude analysis- all numbers rounded off to nearest hundred.

- As RE tariffs are accounted as variable costs, share of fixed cost payments is lower in High RE scenarios
- Higher share of fixed cost in Sales migration scenarios and No sharing scenarios due to backing down
- Impact of backing down is high in Sales Migration and High RE scenarios where about 1/3rd of the fixed cost paid to generators is due to backing down
- Impact is aggravated in the combination scenarios with more than ½ the fixed cost payments to generators is for capacity that is backed down.

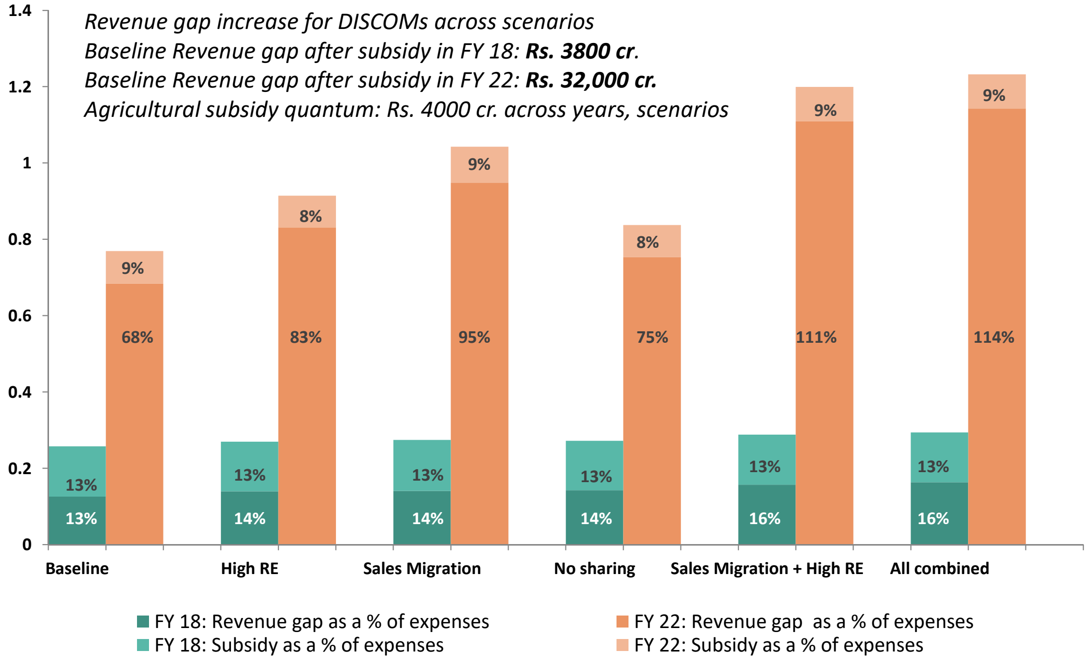
Surplus Management Strategies with High RE Capacity

- Significant surplus of 30,000 MUs with High RE capacity addition
  - Backing down with average PLF at 45%
  - MoD based scheduling may not be able to address balancing and seasonal issues due to VRE
- **Strategy 1: Shut down high cost plants all year, in case of significant all year surplus**
  - Rs 500 to Rs 600 Cr savings as compared to MoD
- **Strategy 2: To facilitate integration, run plants at >50% PLF and sell surplus at market rate (less than VC)**
  - ~Rs 2600 Cr additional variable cost as opposed to shutting down high cost units.
- Managing VRE has significant cost implications

Strategies to manage revenue gap

1. Revenue gap across scenarios
2. Strategies to manage revenue gap
   - Increase tariffs
   - Increase subsidy

Revenue gap across scenarios



Revenue gap across scenarios…2

- **Baseline**:
  - Over 5 years, revenue gap after subsidy ↑ from Rs. 3,800 cr. to Rs. 32,000 cr.
  - This accounts for about 13% to 68% of total expenses.
- **Observations in scenarios**:
  - Revenue gap higher in scenarios due to significant increase in costs (RE capacity addition, No sharing with TS) and fall in revenue (sales migration)
  - Sales migration scenarios responsible for highest losses
- **Unsustainable operations:**
  - 70% increase in revenue gap per annum due to increase in cost and fall in revenue in Baseline itself
  - Revenue gap deterioration is significant in combination scenarios

% Excess revenue gap over baseline	Sales Migration	High RE	No sharing	Sales Migration + High RE	All Combined
FY 18	10%	12%	15%	25%	31%
FY 22	25%	25%	11%	53%	59%

Strategies to eliminate revenue gaps

- **Strategy 1: Increase tariff till full revenue recovery**
  - Increase in tariff for each category based on average overall tariff increase required
  - Cross subsidy and tariff design remain the same

- **Strategy 2 : Increase in subsidy to meet revenue gap**
  - This is over and above the current assumed Rs. 4000 crores for both DISCOMs

प्रयास

Strategy 1 -Tariff increase

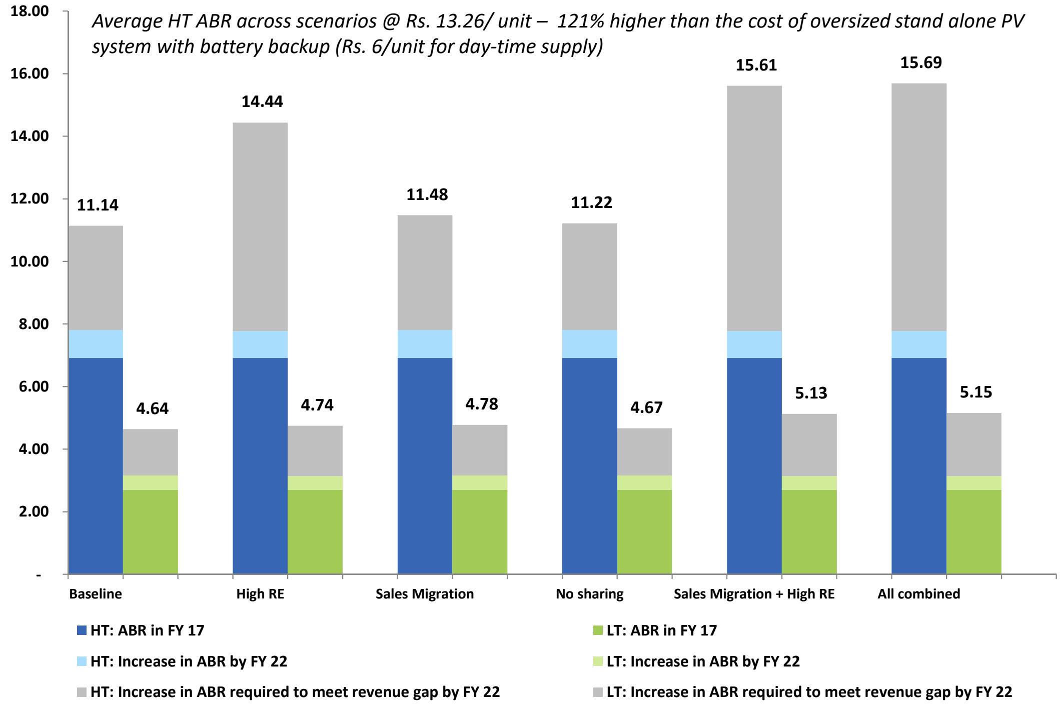
- Without meeting revenue gap
  - Average tariff increase over five years in Baseline: 7.5% (HT: 14%, LT : 17%)
  - Average tariff about 1% (FY18) to 8% (FY 22) lower in Sales Migration

Tariff increase required to eliminate revenue gap over five years	Scenarios
23% to 24%	Baseline, No Sharing
26% to 31%	High RE, Sales Migration
37% to 38%	Sales Migration + High RE, All combined

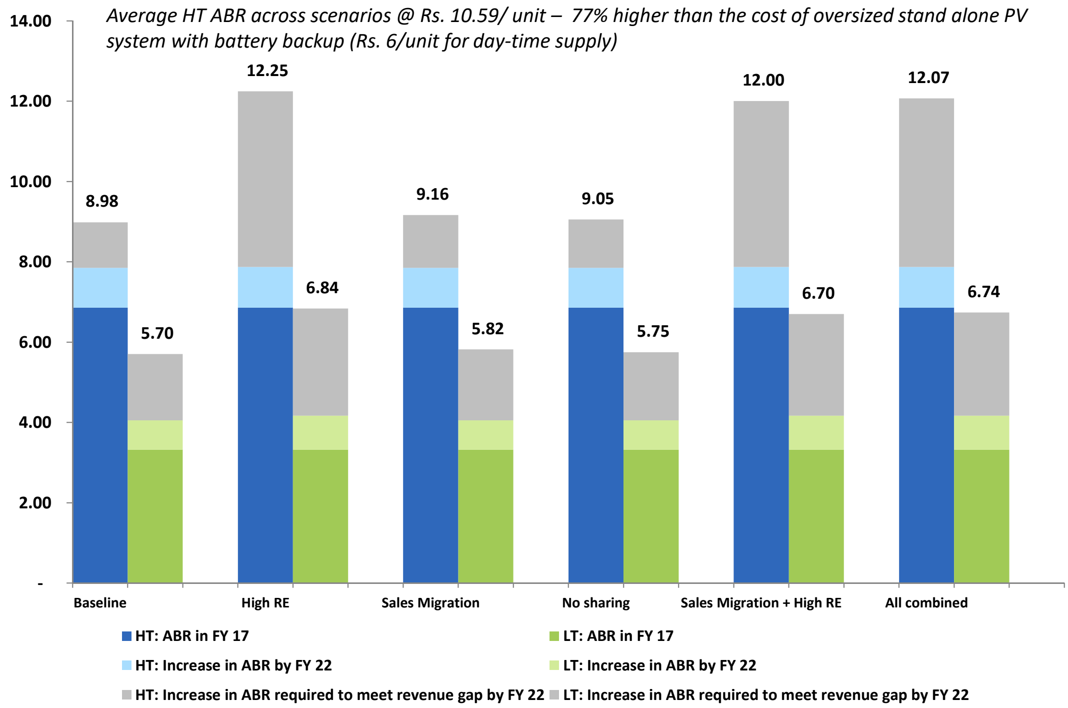
- Tariffs will now have to increase by 4% to 7% p.a
- Skipping tariff increase for 1 year would > double tariff increase required next year.
- Rate of increase can be determined based on desired cross subsidy design
- Unsustainably high tariffs will encourage sales migration

प्रयास

SPDCL: Tariff increase required to meet revenue gap with current tariff design



EPDCL: Tariff increase required to meet revenue gap with current tariff design



Strategy 2 –Increase Subsidy

FY 22	Unit	Baseline	Sales Migration	High RE	No sharing	Sales Migration +High RE	All combined
Revenue Gap	Rs. Cr.	32,100	40,100	40,000	35,600	49,200	50,900
Additional Subsidy	Rs. Cr	8,600	10,900	9,800	8,900	12,900	13,100

Order of magnitude analysis- All numbers rounded off to nearest hundred. Rates specified up to two decimal points.

- Subsidies at Rs. 8,600 crores to Rs. 13,100 crores per year by 2022
  - This does not include the Rs. 4000 cr assumed across scenarios in the baseline
  - Subsidy is 3 to 4 times the current assumed subsidy of Rs. 4,000 crores
  - If only 65% of the subsidy payments are given annually:
    - additional Rs. 11,200 crores - Rs.17,800 crores carrying cost will be incurred by FY22.

प्रयास

Strategies to deter sales migration

1. Increase fixed costs while keeping average tariffs the same
2. Rationalise additional surcharge, concessions for RE- based open access.

प्रयास

Strategies to deter sales migration

- Scenarios with higher sales migration have the highest revenue gaps
- ERCs can tweak tariff design to deter sales migration and compensate DISCOM for costs by:
  - **Strategy 1: Change in tariff design**
    - Increase fixed charges for all consumers while keeping average tariffs the same
  - **Strategy 2**: **Variation in RE rebates and additional surcharge**
    - Both the options under Strategy 2 can be incremental in nature to assess individual effects

Strategy 1: Change in tariff design

Impact of 100% increase in fixed charges with the same average tariff

Category	Average per unit fixed cost in 2022 (Rs./kWh)		Average per unit variable cost in 2022 (Rs./kWh)		% decrease in variable cost	
	APEPDCL	APSPDCL	APEPDCL	APSPDCL	APEPDCL	APSPDCL
HT Industrial	2.08	2.40	5.16	5.50	17%	18%
LT Commercial	1.16	0.92	9.56	9.89	5%	4%
LT Domestic	0.46	0.53	3.08	3.93	13%	12%
LT Industrial	1.54	1.45	6.42	6.47	11%	10%
Overall	1.09	0.77	4.21	3.38	13%	13%

- Variable cost reduction not enough to prevent sales migration, still higher than indicative rooftop solar prices (Rs.5/unit)
- Annual fixed cost payments for 1MW+ consumers increase of Rs.60 lakhs/year/MW to Rs.1.25 crores/year/MW
- This is comparable to 13% to 28% of capital costs needed for a 1 MW solar PV system.
- Thus increase in fixed cost might incentivize migration to captive options

Sales migration

Strategy 2: Variation in rates/concessions

Strategies	EPDCL FY18	EPDCL FY20	EPDCL FY22	SPDCL FY18	SPDCL FY20	SPDCL FY22
% change in revenue from sales migration due to removal of additional surcharge	-23%	-24%	-26%	-22%	-23%	-23%
% change in revenue from sales migration due to removal of all renewable energy related open access concessions	23%	27%	32%	19%	24%	29%

- Additional surcharge removal results in a loss in revenue from sales migration of about 22-26% as compared to the sales migration scenario in each year.
- Removal of RE rebates results in additional revenue from sales migration of about 29-32% as compared to the sales migration scenario in each year.
- Removal of RE concessions results in a 2-6% increase in revenue as compared to a levy of Additional Surcharge on all consumers.

Key Observations

- AP DISCOMs may face severe financial crisis in the near future, especially with sales migration
- Need for transition support is critical to ensure uninterrupted supply to small consumers
- Tweaks in tariff design may not make significant impacts

Way Forward

- *Role of PEG*
  - PEG has designed the scenario building model for use in Andhra Pradesh
  - We would like to thank APERC for support in customizing the model
  - However, the responsibility for scenarios and results in this presentation is with PEG
  - The model and the necessary documentation will be submitted to APERC
  - Request APERC to upload the model and the documentation on their website
- *Need for analysis from various stakeholders*
  - PEG scenarios demonstrate utility of model and showcases options available for analysis
  - Consumer groups, ERCs, utilities must develop own scenarios
  - Different scenarios and strategies need to compared to arrive at a way forward

THANK YOU

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