

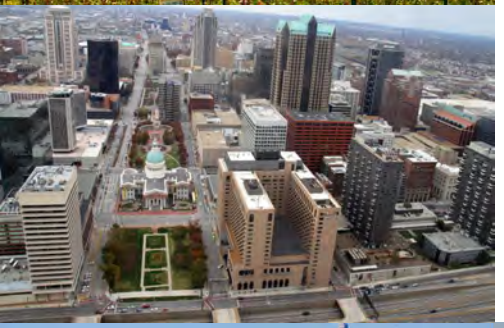

International Conference on Sustainable Cooling

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Washington DC

Super-Efficient AC Program in India

Experience of Bulk Procurement by EESL

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Energy Efficiency Services Ltd. (EESL), India

EESL

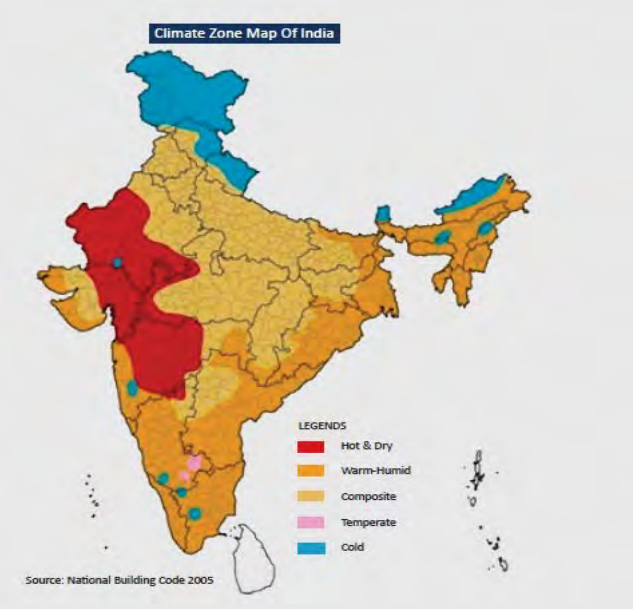
ESMAP
Energy Sector Management Assistance Program

WORLD BANK GROUP
Energy & Extractives



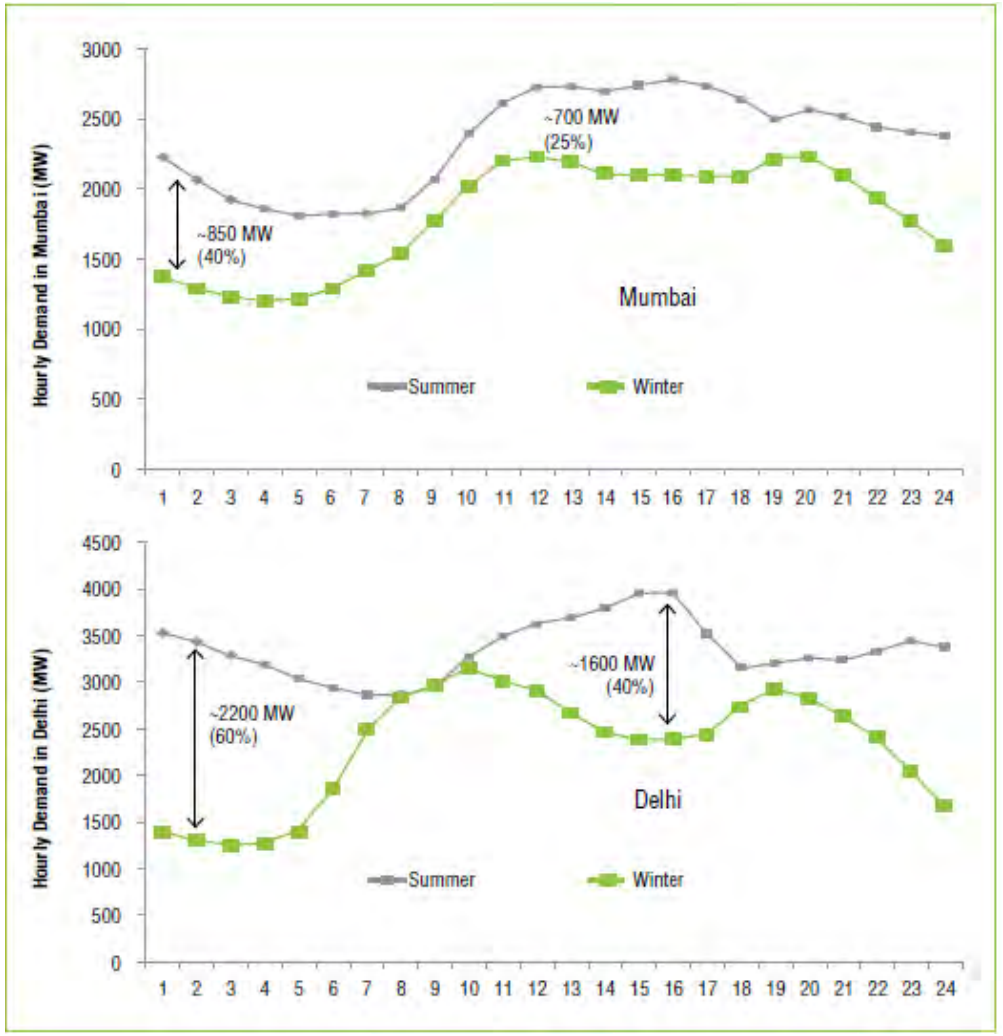


Feel the Land !!!



India is largely a hot country with uncomfortably hot summers, sometimes with very high relative humidity!

Climate type	Summer temperatures (C)	Winter temperatures (C)	RH (%)
Hot & Dry	20 to 45	0 to 25	55
Warm-humid	25 to 35	20 to 30	70-90
Composite	27 to 43	4 to 25	20-95
Temperate	17 to 34	16 to 33	<75
Cold	17 to 30	-3 to 8	70-80

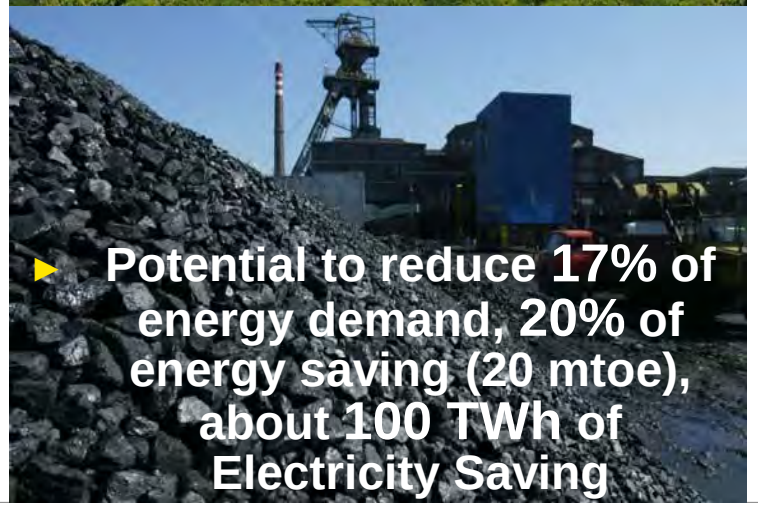


Source : LBNL (2014)

Key Points on Cooling Challenge in India

- **Cooling Demand to Double by 2027**
- Primary Energy requirement to grow by 2.1 times by 2027 @ 2017 baseline
- Tonnes of Refrigeration to grow by 3.1 times by 2027 @ 2017 baseline

- **25 GW of New Coal Based Power Plants can be avoided by Energy Efficient Cooling**

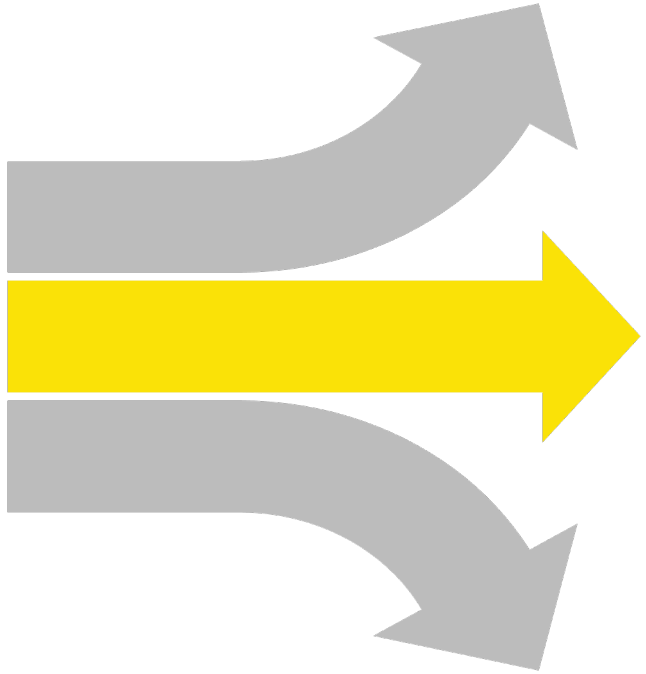


- Potential to reduce 17% of energy demand, 20% of energy saving (20 mtoe), about 100 TWh of Electricity Saving

- **57% of Energy Demand for Cooling to come from Buildings**

- Refrigeration is next largest contributor (about 25%)

In India, Air Condition Market has been fuelled by Efficiency Rating Programs



Policy Drivers

- Energy Conservation Act, 2001
- Standard & Labeling Program – Mandatory MEPS
- National Action Plan on Climate Change, 2008
- National Cooling Action Plan (NCAP), 2018
- Energy Conservation Building Codes

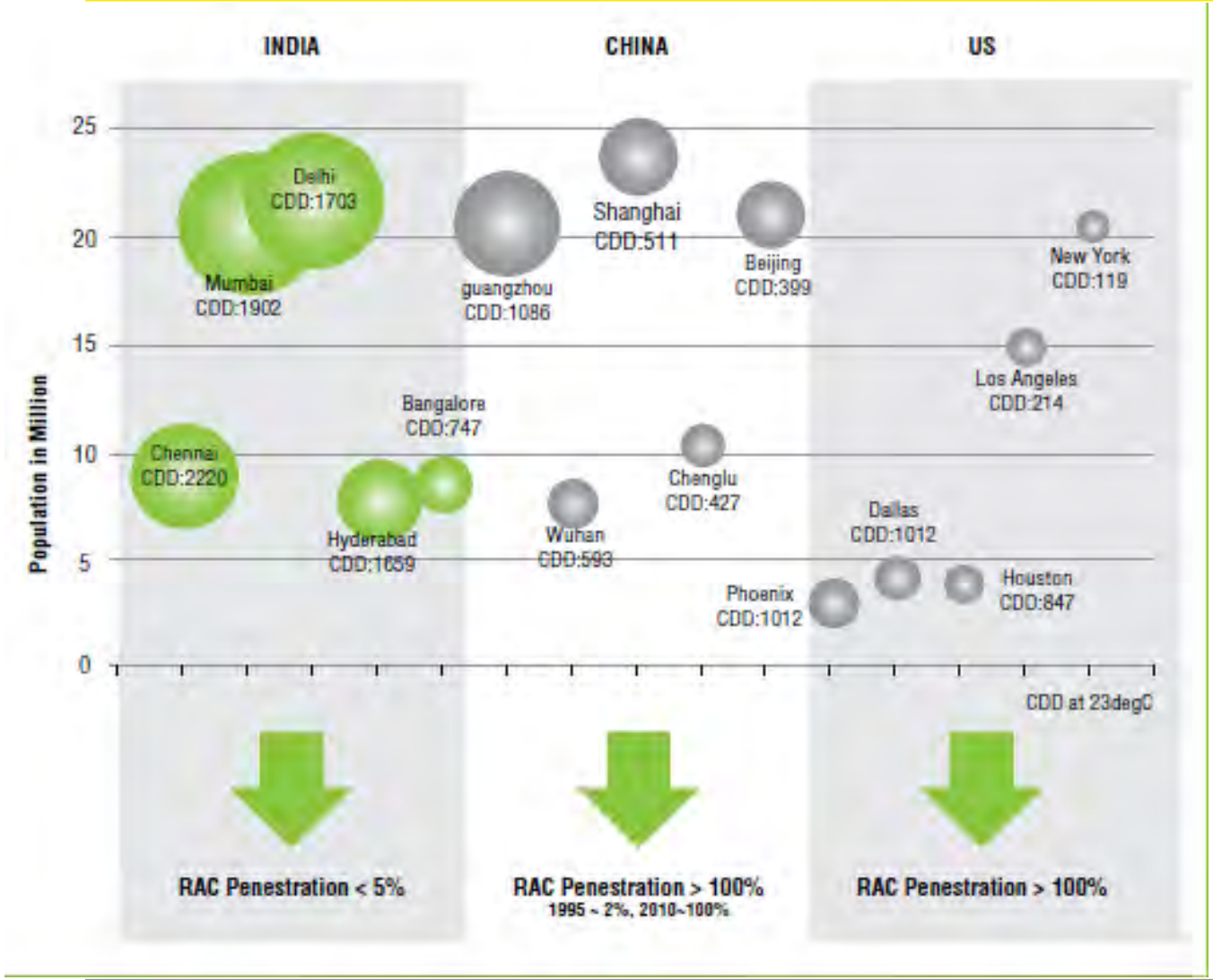
Technology Drivers

- Upgradation of MEPS – Standard get tightened in every 2 years for ACs
- Inverter ACs – 30% of sold ACs in 2017 are of Inverter Type
- New Technologies – Green Refrigerants, Tri-generation, Solar Air-Conditioning

Market Drivers

- Rising energy demand for domestic / institutional and commercial sectors
- DSM and DR Programs by Utilities
- Bulk Procurement – by State Run entity EESL
- Consumer Awareness for EE products and increase in per-capita income

AC in India –
Low Present Penetration, Huge Future Growth



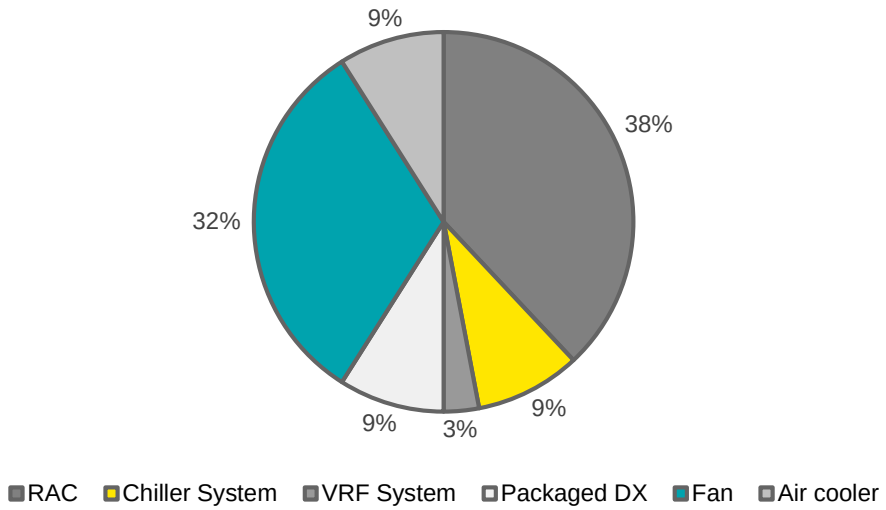
- About 1000 BU electricity consumption in a year – increase @7%
- 30% consumption in Building Sector – 57% contributed by ACs
- About 5 million new AC enter into market every year – Existing fleet is over 20 million
- Average EER is 2.8 (w/w) – room for Efficiency Improvement

By improving its AC energy efficiency policies, India can save almost **$17 billion** cumulatively for consumers through 2030. If 'access to cooling' is to be prioritized as a development goal, India needs a strong facilitative framework, which will help reach a comprehensive solution for curtailing emissions from the cooling sector

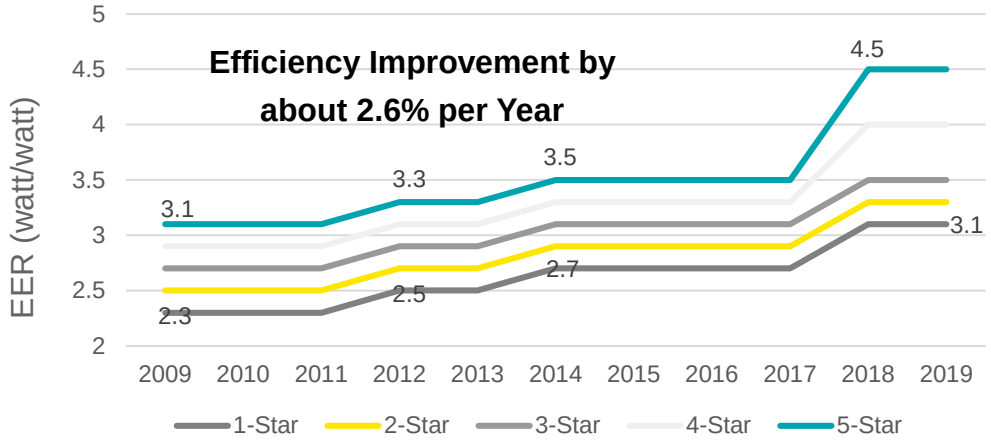
----- Ministry of Environment, Forest & Climate Change, India

AC Scenario in India – Efficiency Improves by 2.6% pa

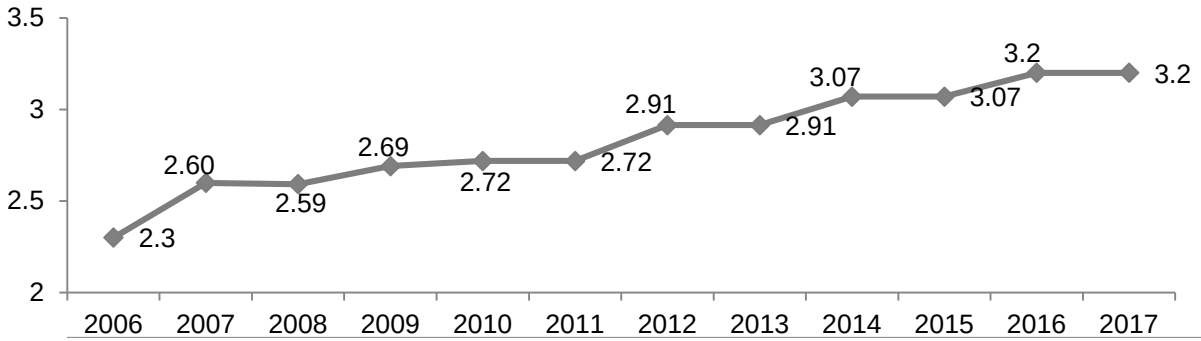
Energy Consumption by Various Types of Cooling System (Total 126 TWh in 2017)



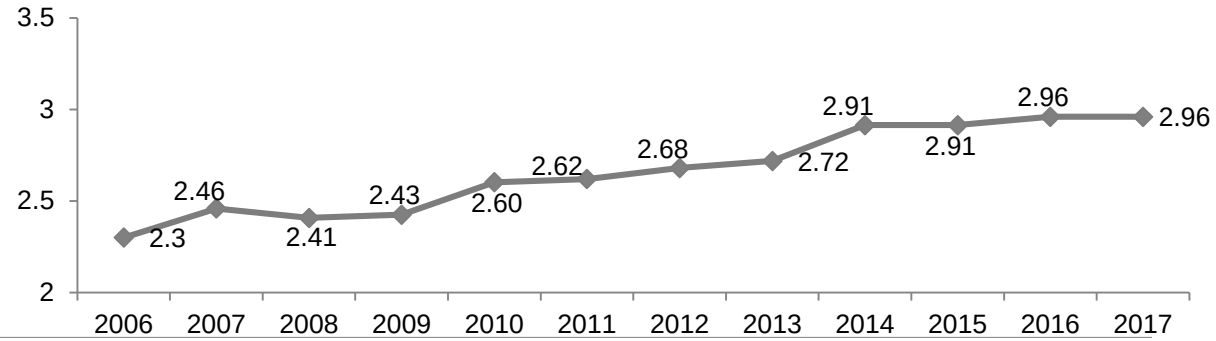
Upgradation of Star Ratings in Split AC in Last 10 Years



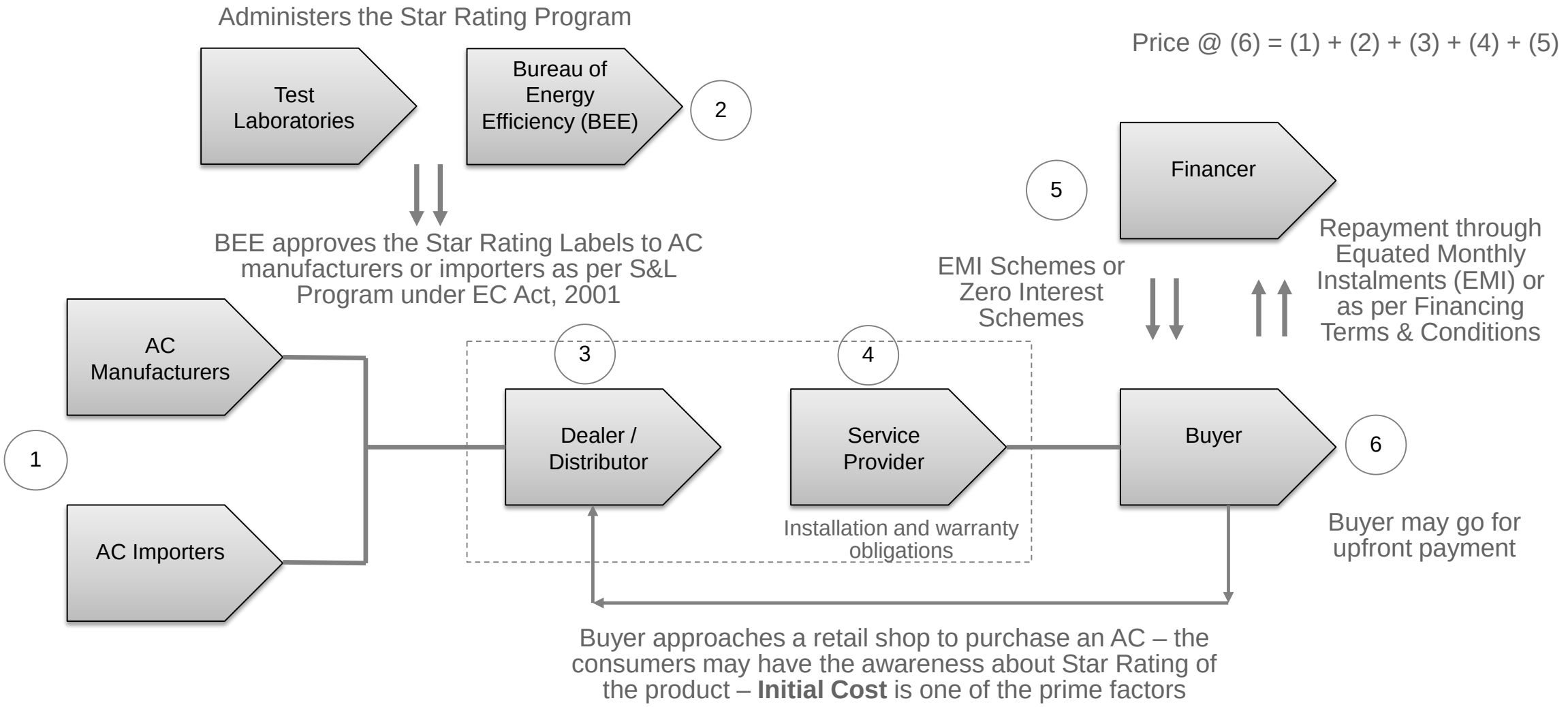
Average EER (W/W) for Split ACs



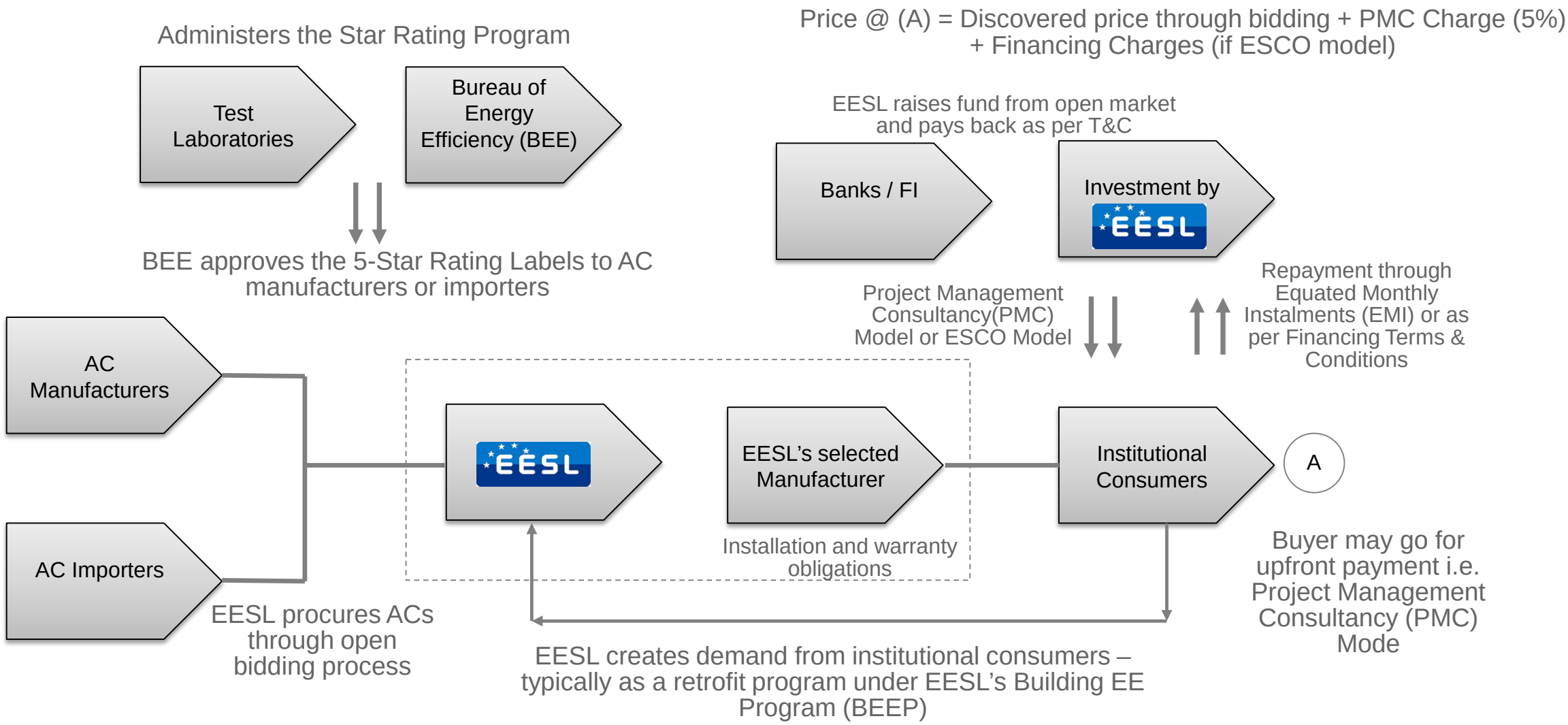
Average EER (W/W) for Window ACs



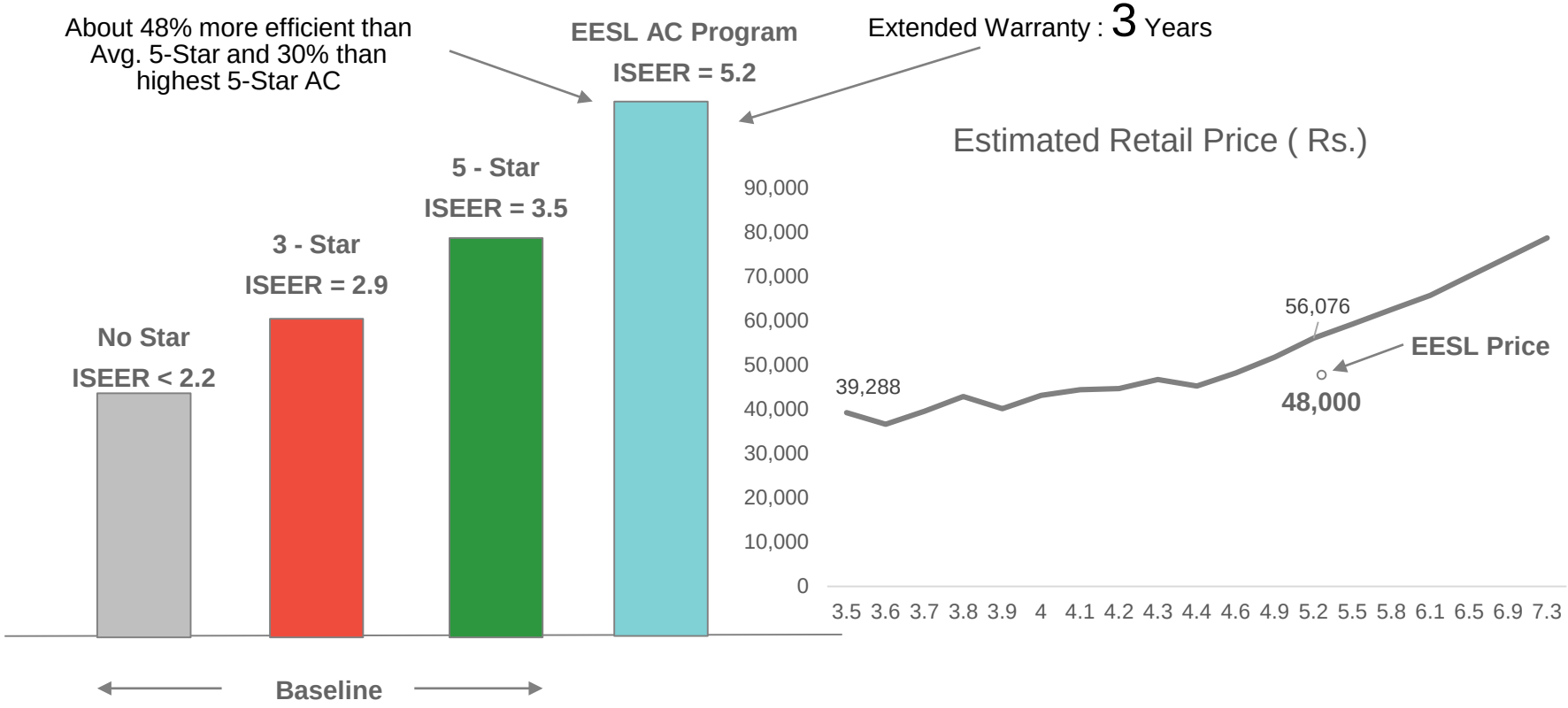
Value Chain and Key Participants in the Air Conditioner Market in India



EESL's Model of Super Efficient AC Program



Attributes of Super-Efficient AC Program



- **15% reduction in Price due to Bulk Procurement**
- **No-upfront investment by consumer**
- **Pay-as-You-Save (PAYS) model**

Target of 100,000 AC in 1st Phase

10,000 Govt. Buildings

800 Railway Stations

125,000 ATMs

Cost-Benefit Analysis of EESL's AC Program

CAPEX Model

Parameter	No Star AC EER 2.3	3 star AC EER 2.9	5 star AC EER 3.3
Annual Energy Saving with installation of ISEER = 5.2 AC (in kWh)	2876	1809	1313
Energy Tariff (in INR)	8.5	8.5	8.5
Annual operating Cost Savings (INR)	24443	15375	11162
Annual maintenance Cost Savings (INR)	2000	2000	2000
Total Savings (INR)	26443	17375	13162
AC Cost (INR)	51840	51840	51840
Pay Back (Years)	2.0	3.0	3.9

ESCO Model

Parameter	No Star AC EER 2.3	3 star AC EER 2.9	5 star AC EER 3.3
Annual Energy Saving with installation of ISEER = 5.2 AC (in kWh)	2876	1809	1313
Energy Tariff (in INR)	8.5	8.5	8.5
Annual operating Cost Savings (INR)	24443	15375	11162
Annual maintenance Cost Savings (INR)	2000	2000	2000
Total Savings (INR)	26443	17375	13162
AC Cost (INR)	58800	58800	58800
Pay Back (Years)	2.2	3.4	4.5

Approach & Methodology of AC Program

Finding Opportunities in Lighting, AC, Water Pumping, DG Sets etc.

Walk-Through Survey

Inventory Collection

Estimate Baseline

Prepare Scheme

Sign Agreement

Deemed Saving = (Baseline Watt – New Watt) x No. of Inventory x Run Hour per day X Days per Year

Procurement of Material

100% upfront investment by EESL

Open Competitive Bidding

Price Discovery

Implementation

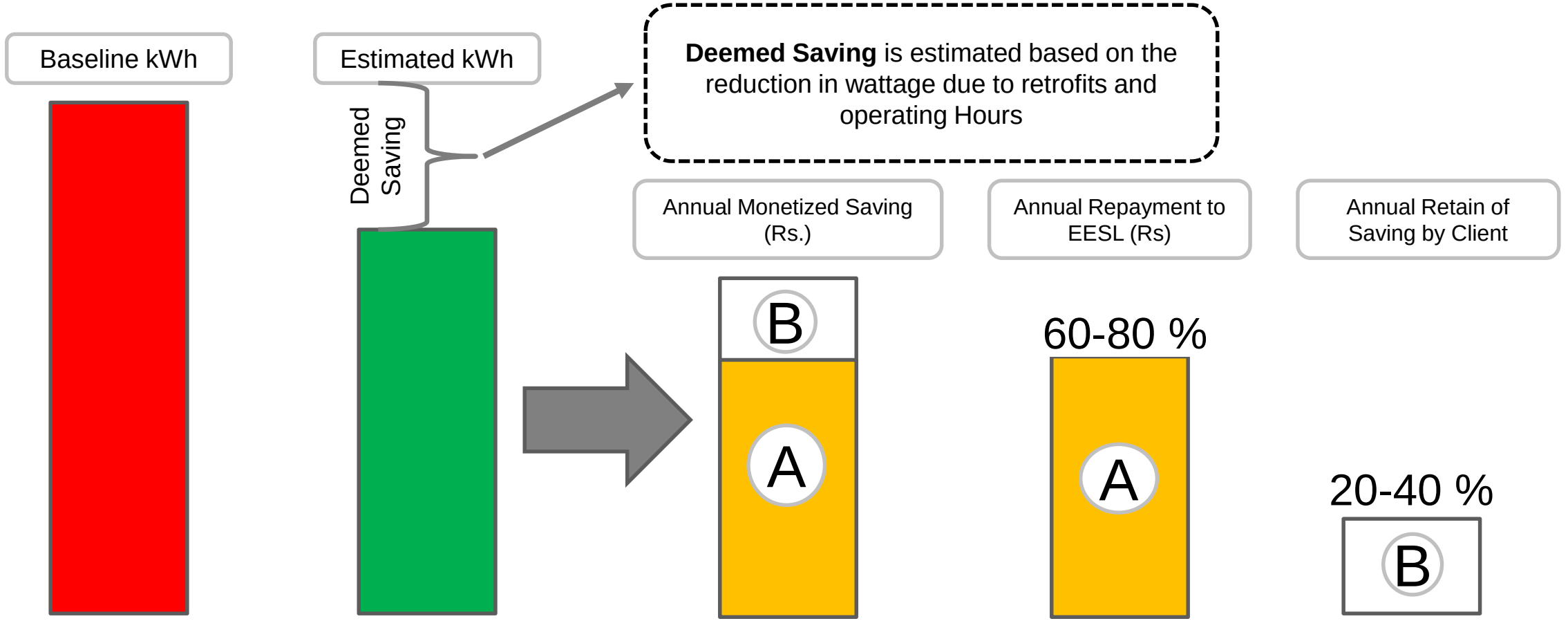
Quarterly Repayment to EESL

1-3 months

2-6 months

After Implementation

Shared Saving Approach



Project Period : 3-5 Years

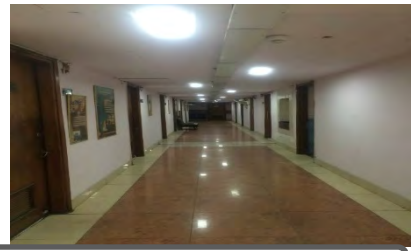
Project Cost : Material Cost + PMC + ROI

3 Years Warranty

Successful ESCO Project by EESL : A Case

Project : Energy Efficiency Retrofit Program in a High-Rising Building

- Energy Audit (Walk Through)
- Preparation of Scheme
- Identification of Intervention
- Signing of MoU with Client
- Implementation
- Warranty Support & Payment Recovery

Lighting (LEDs)


Air Conditioning (Super Efficient ACs)

Deemed Saving Approach

28% Reduction in Energy Consumption

HEAD	UNIT	Values
Estimated Energy Savings	KVAh	123638
Fixed Tariff, Rs. per kVAh	$ Per KVAh	0.125
Estimated Annual Cost Savings	$ Per year	15465
AMC getting free for Client on Air Conditioning ($ 12.3/AC/Annum)	Per year	332.30
Total Cost Savings	$ Per year	15796
Investment, Rs.	$	35888
EESL PMC fee	$	4306
Estimated Capital Cost of the project	$	40194
Equity Portion (20% of capital cost)	$	8039
Return on Equity (23.7%)	$	5894
Debt portion (80% Cost of capital)	$	32156
Debt Interest (11%)	$.	10078
Total Estimated Repayment to EESL	$	56167
Contract Period	Years	5
Pay out to EESL annually	$	11233
EESL Share	%	71%
EESL Quarterly repayment	$	2808
No. of repayments	Quarterly	20

Challenges in the Program

Challenges

- Demand Aggregation
- Participation by more number of manufacturers in the bidding process
- Buy-back arrangement
- Use of LGWP refrigerant




THANKS FOR YOUR ATTENTION

Soumya Garnaik

Chief General Manager (Tech)

Energy Efficiency Servicers Ltd.

Ministry of Power, Govt. of India