



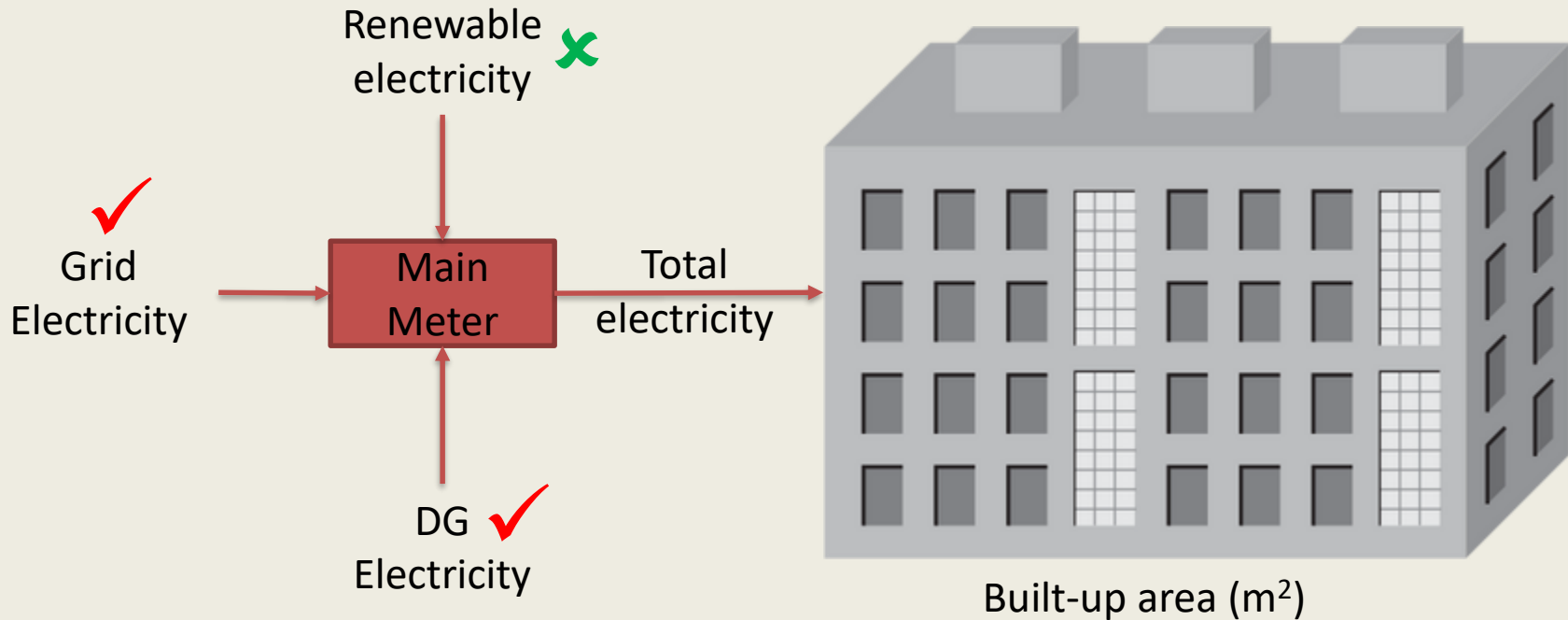
Energy performance of Indian Commercial buildings

Outline



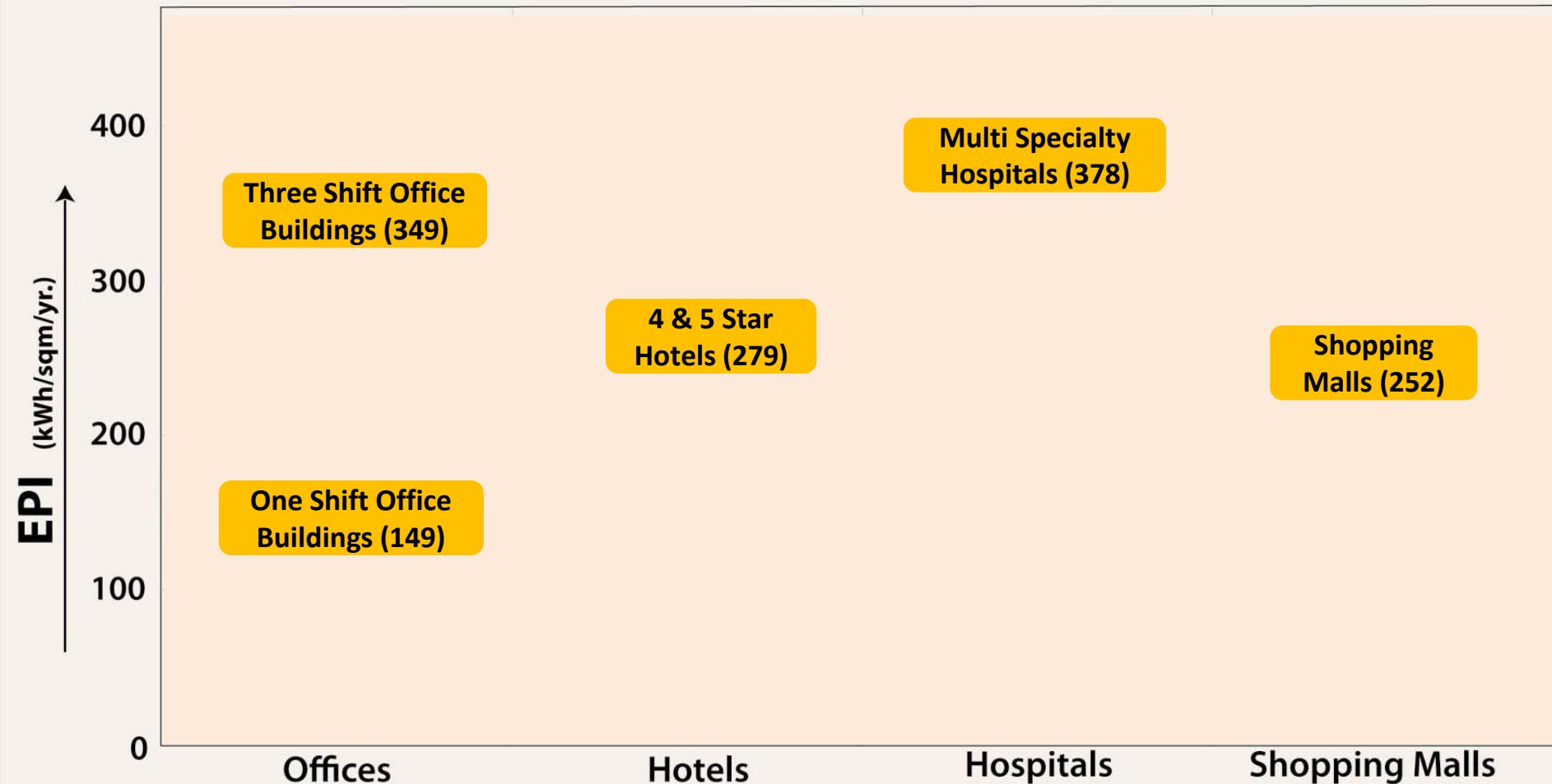
- What is energy performance index for commercial buildings
- Commercial building energy performance
 - ECO-III Benchmarking study
 - IGBC rated buildings
 - BEE star rated buildings

What is energy performance index for commercial buildings



$$\text{Energy Performance Index (EPI) (kWh/m}^2\text{.y)} = \frac{\text{Annual Grid Electricity} + \text{Annual DG Electricity}}{\text{Built-up area}}$$

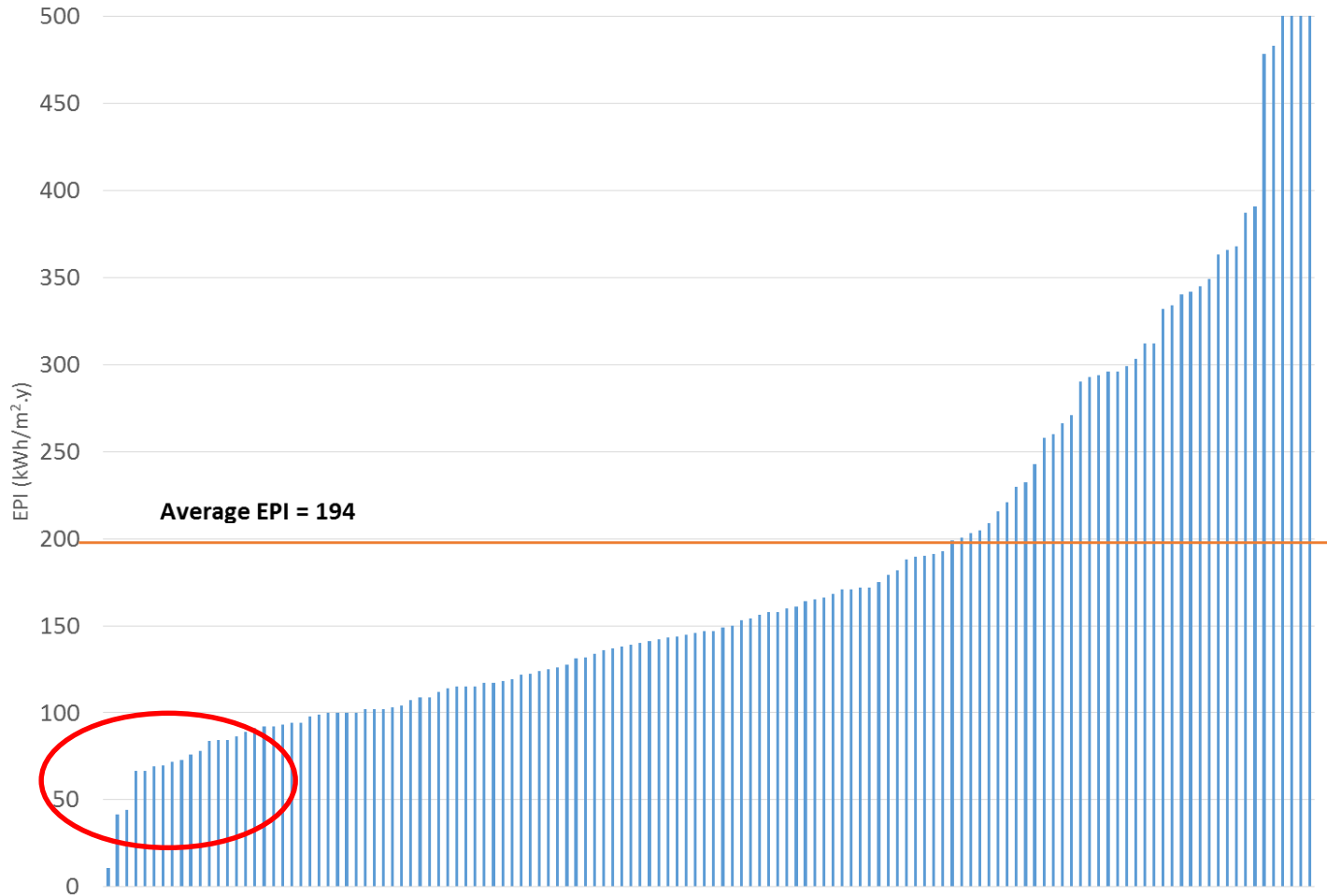
EPI of Commercial Building (2011)



EPI of Office Buildings



EPI (kWh/m².y)



- Sources:
- ECO-III Benchmarking study
 - IGBC rated buildings
 - BEE star rated buildings

BEE Star Rating for office building



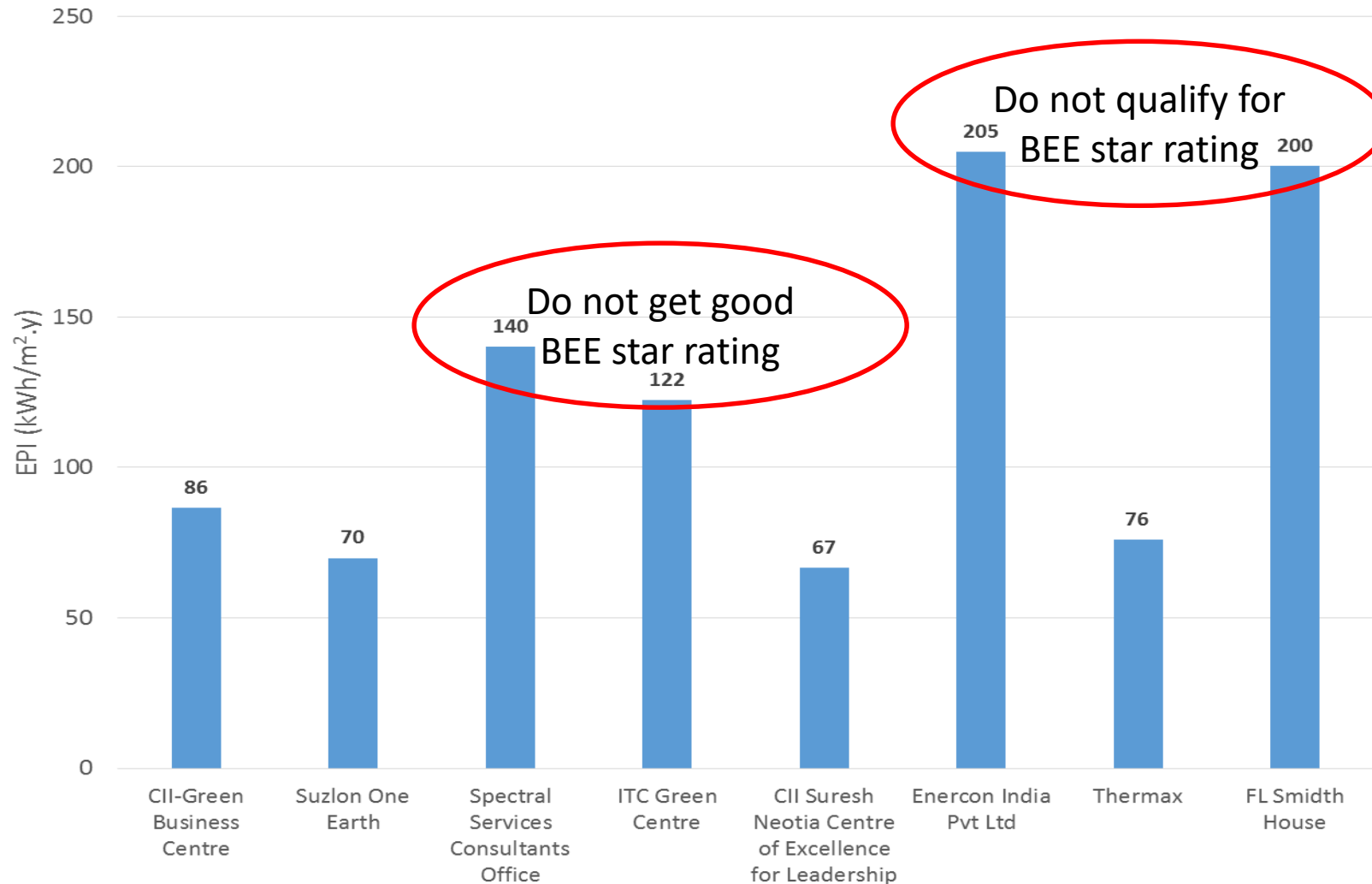
Hot & Dry Climate



EPI of IGBC rated office buildings



IGBC Rated Office Buildings





EXAMPLES OF ENERGY EFFICIENT OFFICE BUILDING

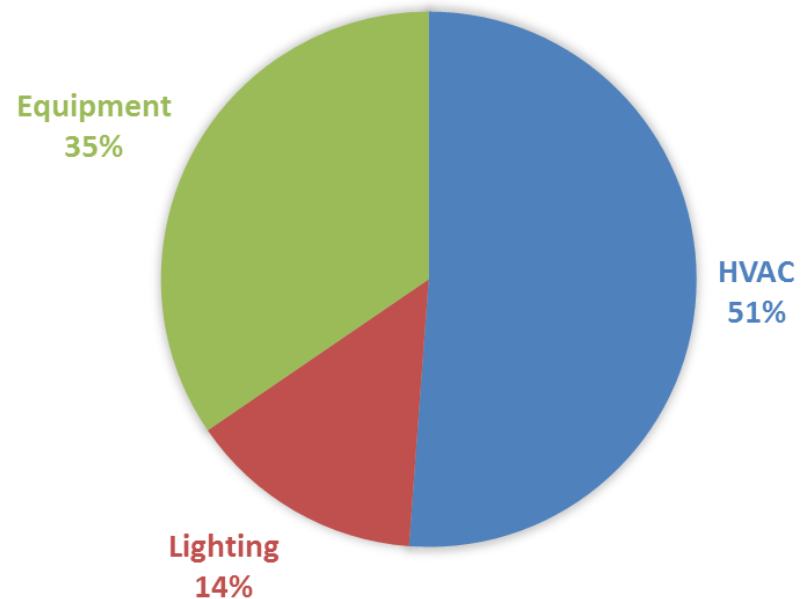
Institute of Rural Research and Development (IRRAD), Gurgaon



- Day-use office building
- Built-up area: 7069 m²
- EPI: 48 kWh/m².y



BREAK UP OF ENERGY USE FOR 2013-14



Source: Ashok B Lall Architects

Infosys, SDB 1, Pocharan Campus, Hyderabad



- Day-use office building
- Built-up area: 11,600 m²
- EPI: 86 kWh/m².y

Infosys Journey towards Energy Efficiency



	2007-08	2012-13	Saving
Average EPI (kWh/m ² .y)	200	90	55%
Lighting Design (W/ft ²)	1.2	0.45	62%
AC Design (ft ² /TR)	350	550	36%
Electrical design (W/ft ²)	6.5	3.5	46%



BPO BUILDINGS

Performance indicator for BPO



- Annual Average hourly Energy Performance Index (AAhEPI) (Wh/h.m²)

$$\text{AAhEPI (Wh/h.m}^2\text{)} = \frac{\text{EPI (kWh/m}^2\text{.y)} \times 1000}{\text{Annual hours of operation}}$$

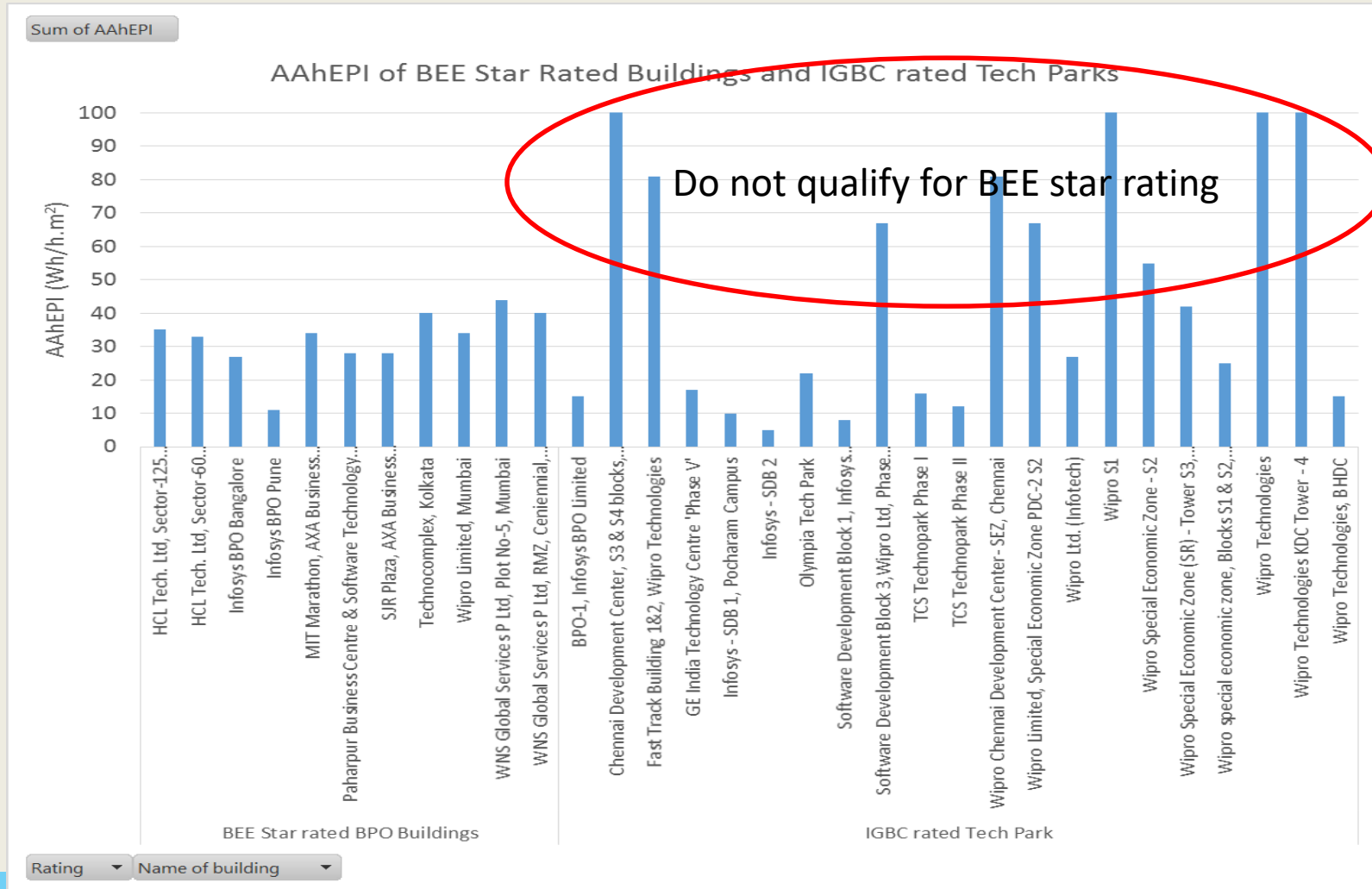
BEE Star Rating for BPO building



Hot & Dry Climate



Performance of BEE Star BPO Buildings & IGBC rated Tech Parks



Source: BEE Star rating of BPO buildings (2011 data) & IGBC rating for Tech Parks (2012 data)

Summing up



- Green rating may not be sufficient to ensure energy efficiency in the buildings
- Need for absolute benchmarking for energy performance
 - Type of building
 - Performance indicator (AAhEPI OR EPI)
- Start with high energy performance benchmarks (e.g. BEE 5-star rating OR best energy efficient buildings)



THANK YOU !