Green DC Initiative of IGBC and LBNL US for Enhanced Energy efficiency In Indian Data centres – Electrical Chair work & Recommendation Version; RO

IGBC and LBNL Workshop, 13 Feb 2019, Bangalore

Team

- Shrirang Deshpande
- Shubam Agarwal
- MV Patil
- Mayank Srivastav
- Pritam Goyal

Approach

- UPS Technology
- Back up Time
- Capacity Selection
- Redundancy
- Modular, Scalable
- Measure & monitor

- Operation Bank
- Mode – VI, Eco
- Configuration
- Sleep Mode
- Type/Green grid levels

- UPTIME Tier Recommendations
- IEC, IEEE, Safety Standards
- TIA 942 Standards

- Prequalification
- Response and Turn around time
- Spares Management
- Analytics, feedback & redeployment

UPS- Shrirang Deshpande

UPS Technology Evolution

- Earlier

- Monolithic SCR Based UPS
- Transformer Based UPS
- Low Efficiency at Lower Load
- Larger footprint
- 2 Level Inverter Design
- Capacity or Redundant Paralleling

- Current

- Higher Ratings(90-3300kVA) supplied in Modular Construction
- Transformer Free UPS
- Higher Efficiency at Lower Load
- High-Density Design lesser footprint
- Inverter Design shifts to multi-level (3, 4 Level Inverter)
- Intelligent Paralleling
- Green UPS conserving energy as well as reducing the carbon footprint

Monolithic to Modular UPS Strategy

Medium Capacity UPS-Modular Construction

T base UPS

- Advantage:
- Reliability
- Disadvantage:
- Maintainability

High Reliability

High Efficiency- 96.4%

High Maintainability

Modular UPS

Advantage:

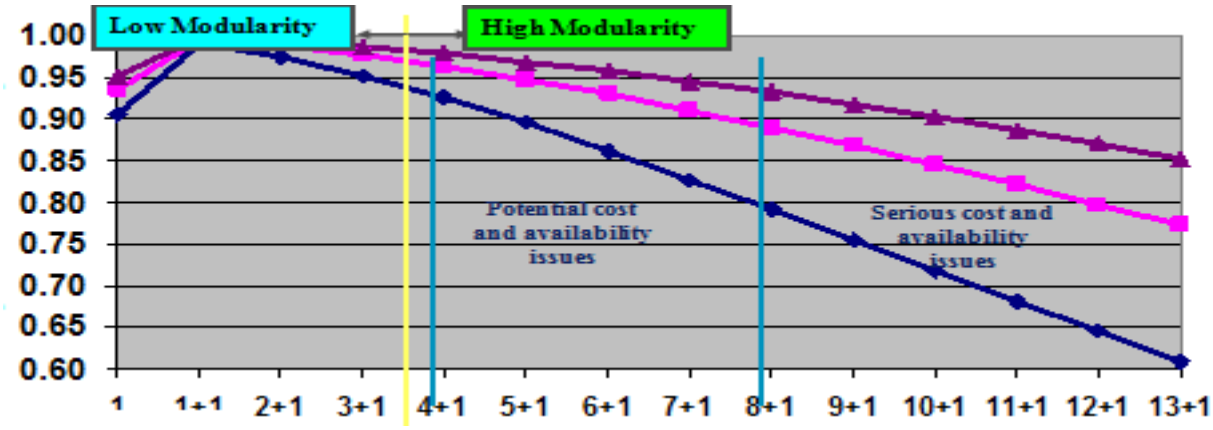
Maintainability

Disadvantage:

Reliability

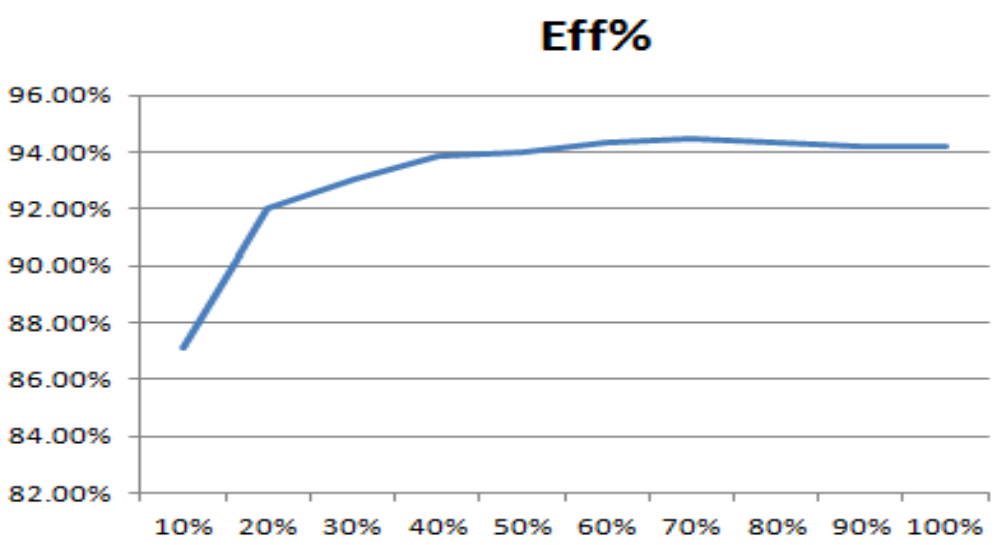
Monolithic VS Modular TFREE

1. Reliability
2. Price
3. Efficiency
4. Maintainability

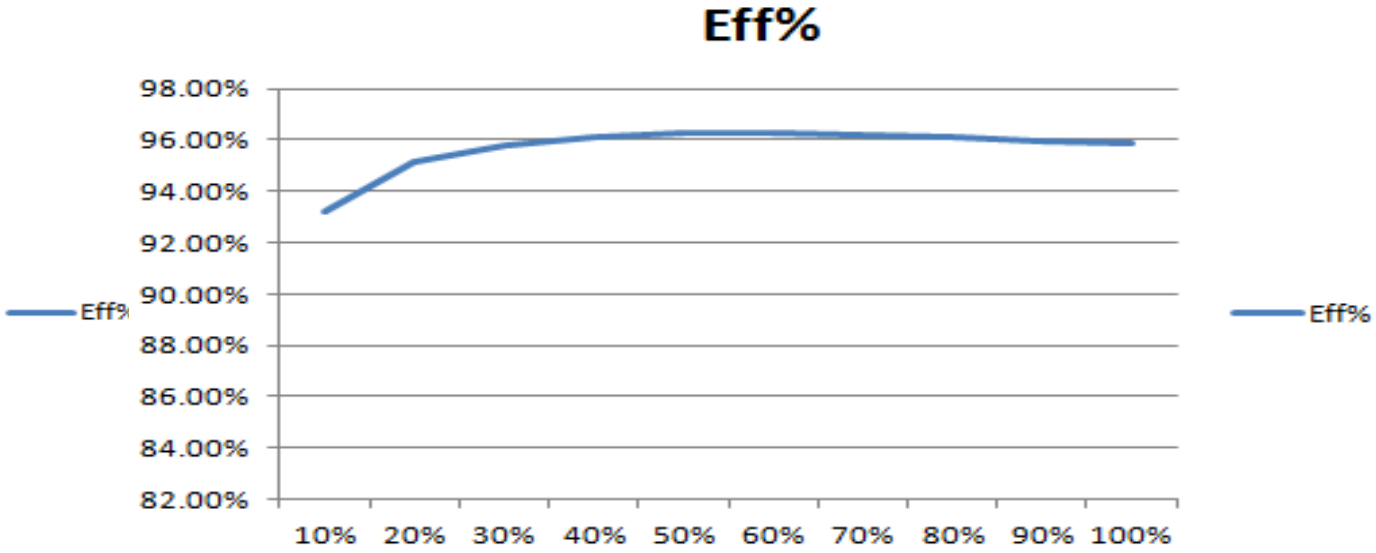


	Reliability	Price
Monolithic	High	Low
Modular	Low	High (30%~50% more Expensive）

Efficiency comparison



Two level technology UPS(before 2011)



Three level technology UPS(after 2011)

	Load rate	Two level Monolithic UPS	Three level Monolithic UPS	Three level Modular UPS
Before Sleep Mode	20%	90%	95.5%	95.5%
After Sleep Mode	45%	94%	96%	96%

Metering & Monitoring- Shubam Agarwal

Existing scenario for Indian Data Center

Metering & monitoring requirement

Not defined

Infra and IT team

Not aligned

Indian Data center specific standard

Required

Remote monitoring benefits

Lack of awareness

Optimization with criticality and efficiency

Not defined

Business Requirement / Expansion plans

Uncertain

WHY DOES IT HAPPEN!

Standard Requirement

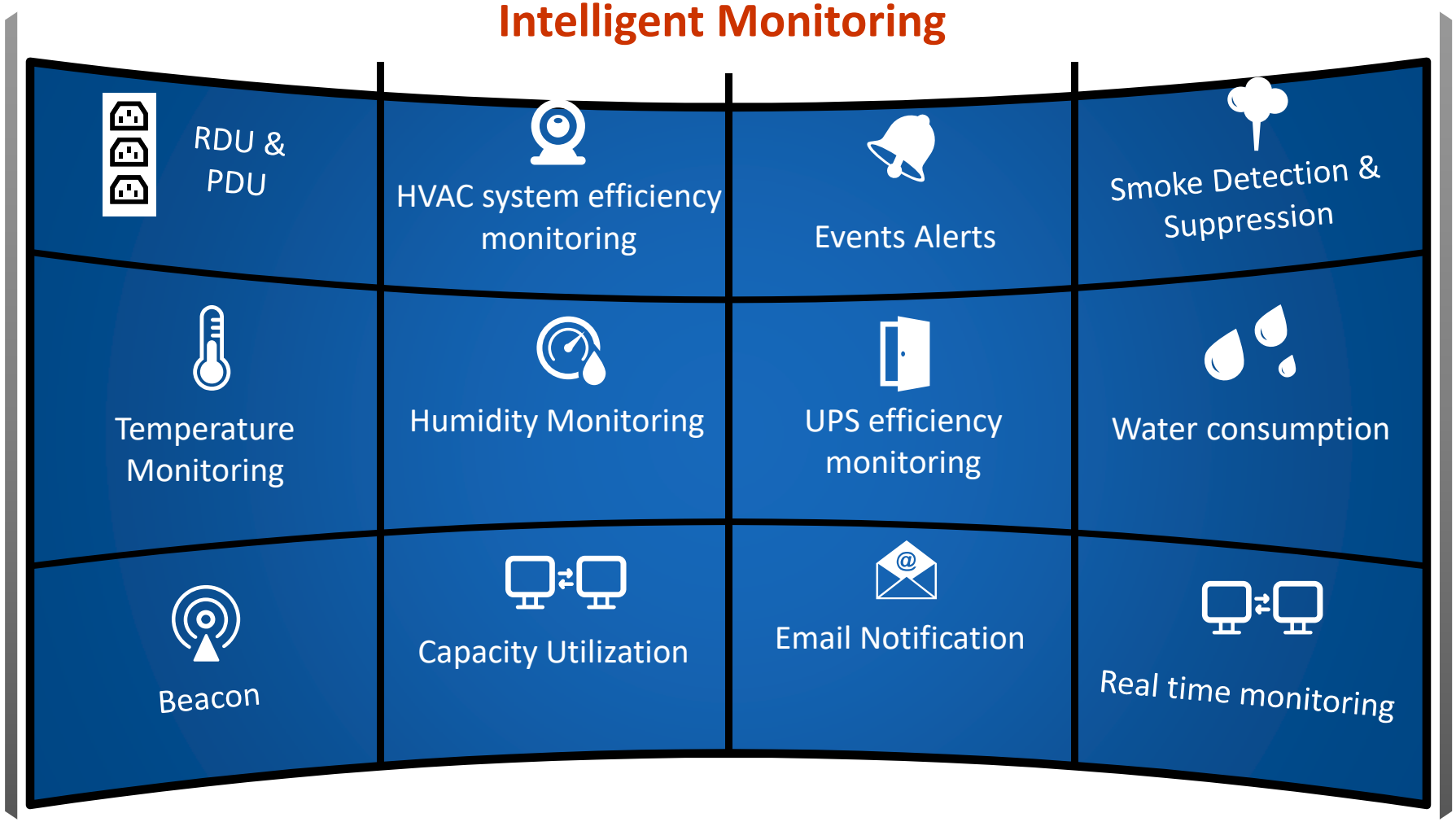
- To strike out balance between criticality and efficiency
- To align Infra and IT team- migration & consolidation
- To provide design guideline in context with uncertain data center loading requirement.
- To monitor the design versus actual
- To differentiate but standardize the need of different Data Center as per their design, loading, location and usage.
- To monitor space & power utilization up to every U rack space

Why online Energy Monitoring

- Cumbersome Excel based computation of PUE
- Manually reporting; Time consuming
- Real time data analysis is not possible
- Energy saving; minimal

- Energy efficiency measurement; real-time PUE measurement
- Real-time PUE ; a level of granularity up to individual equipment
- Benchmarking
- Online Energy efficiency enabler :

Intelligent Monitoring



To fulfill all the objectives of any standard - Metering and Monitoring is the most reliable and important tool

Recommendation for ECBC Metering and Monitoring Guidelines

Data center capacity	ECBC Compliant	Level II	Level III
Data center less than 100 KW of IT load	Data center services <100 kVA of IT load shall have permanently installed electrical metering to record energy (kWh).	Data center services <100 kVA of IT load shall have permanently installed electrical metering to record total energy as well as Data center total and HVAC energy(kWh).	Data center services <100 kVA of IT load should have permanently installed electrical metering to record total energy as well as Data center total and HVAC energy(kWh) with UPS efficiency
For 100-250 KW of IT load	Data center services >100 < 250kVA of IT load shall meter energy kWh, demand kVa, and total power factor with submeter for HVAC and UPS efficiency	For Data Center services between 100 - 250 KW of IT design load, sub metering at the data center shall be provided to allow the monitoring and calculation of Power Usage Effectiveness (PUE). PUE to be measured as per the Green Grid Level 1 guidelines.* Minimum metering includes IT equipment energy and total data center energy including cooling energy (e.g., compressors, fans and pumps), electrical distribution system losses (e.g., UPS), and lighting. Also Thermal monitoring of the room is required at 5 critical points	For Data Center services between 100 - 250 KW of IT design load, sub metering at the data center shall be provided to allow the monitoring and calculation of Power Usage Effectiveness (PUE). PUE to be measured as per the Green Grid Level 1 guidelines. Also provide power measuremenrt to each IT rack. In addition to adherence for ECBC level 2, All data shall be available in real time in an automated data center infrastructure management (DCIM) system.*

Data center capacity	ECBC Compliant	Level II	Level III
For Data center >250 KW of IT load	Data cneter services >250 kVA with data centers shall, in addition to requirements of 100-250 KW, sub-metering required for lighting, and plug loads. Also Thermal monitoring of the room is required at 5 critical points. Calculation of Power Usage Effectiveness (PUE). PUE to be measured as per the Green Grid Level 1 guidelines.* Alarm for temperature set point breach	Data cneter services >250 kVA with data centers shall, in addition to requirements of 100-250 KW, thermal monitoring is also required at rack level. Minimum requirement for thermal (air) monitoring shall be at the inlet of the IT rack at the top of every 4th rack in the cold aisle. Alarm for temperature setpoint breach Monitoring of tonnage provided by cooling system along with specific efficiency monitoring of cooling system and UPS system and its loading Total Data center and each rack electrical Capacity utilization	Data cneter services >250 kVA with data centers shall, in addition to requirements of 100-250 KW, thermal and IT electrical load monitoring is also required at rack level. Minimum requirement for thermal (air) monitoring shall be at the inlet of the IT rack at the top of every rack in the cold aisle. Alarm for temperature setpoint breach alongwith message or mail alert Monitoring of tonnage provided by cooling system along with specific efficency monitoring of HVAC and UPS system Monitoring of Supply air temperature and PAC setpoint Monitoring of PAC unit air filter status Monitoring of Water consumption in HVAC system Monitoring of Battery & UPS room Temp. & RH Total Data center and each rack electrical and space Capacity utilization

Q&A