

IITMRP

Outstanding Energy Saving Technology



Bringing unlike minds together

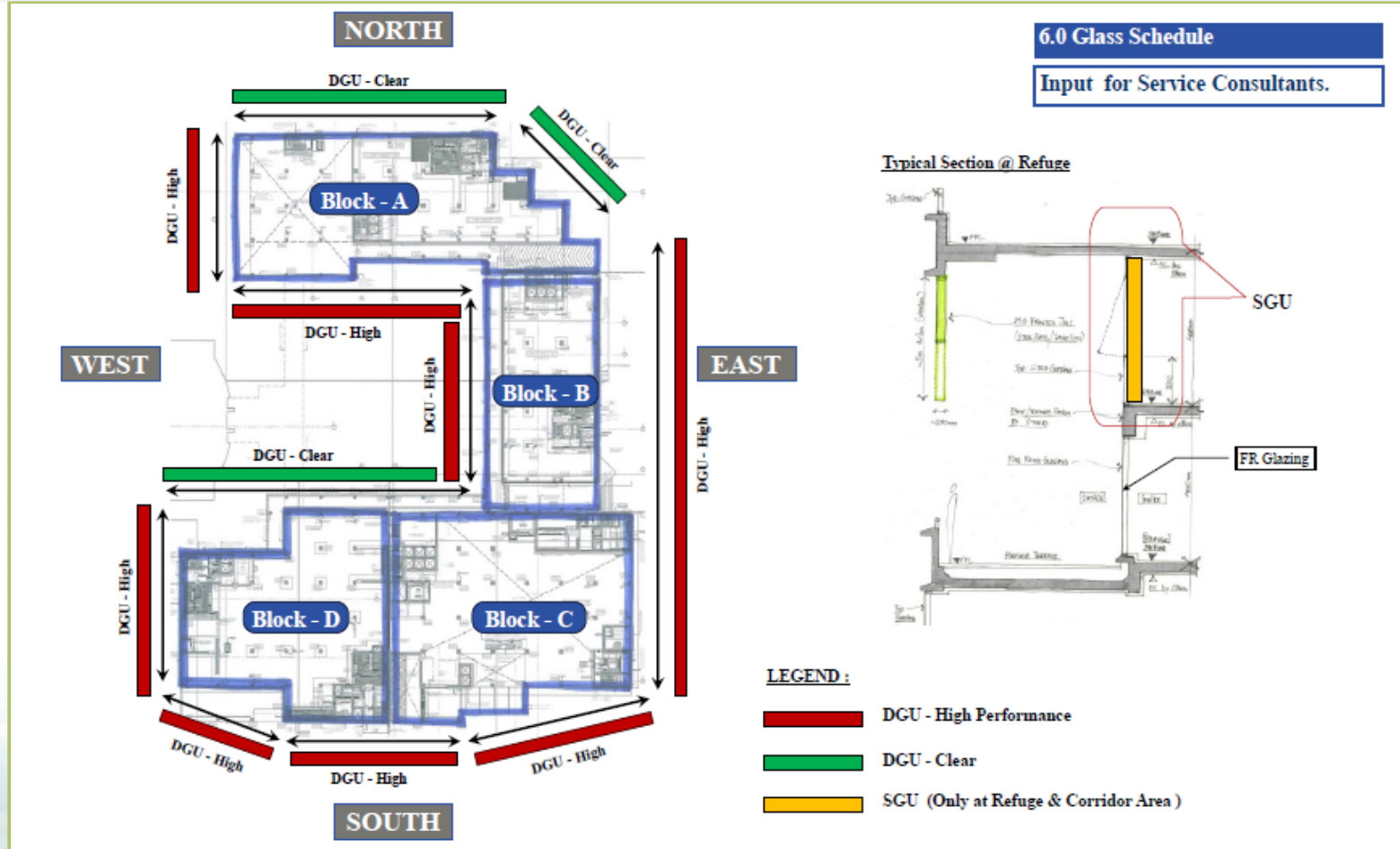
IITMRP



Contents

- Energy Efficient Measures
 - Building Envelope
 - Cooling System
 - Thermal Storage Tank
 - VAV & VFD
 - Commercials for the Energy Efficient HVAC
 - DC Lighting & Appliances
- Energy Efficient Measures- Generic
- IBMS
- Solar Power Consumption

Energy Efficient Measures- Building Envelope



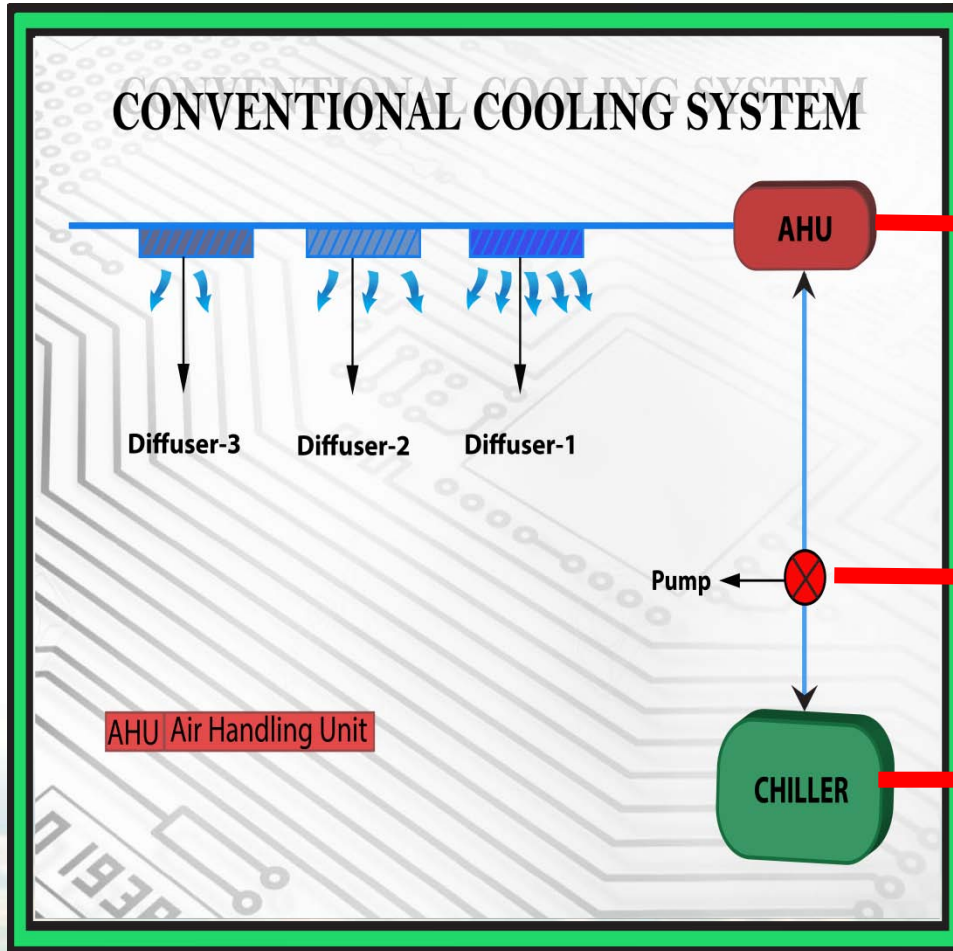
Energy Efficient Measures- Building Envelope

The Glass used for the Façade is Doubly Glazed Unitised Glass:

- DGU High Performance Glass for the South and West Side
- DGU Clear Glass for the North and East Side

Type of product	Double Silver - Offline coated glass
confirming to ECBC standards	< 0.20 solar factor
Energy efficiency possibilities compared to base case (clear DGU)	57%
Energy efficacy possibilities compared to ECBC standards	30%
Average Lux levels (170Lux) area achieved	80%
Selectivity ratio	1.9
light transmission %	32-39%

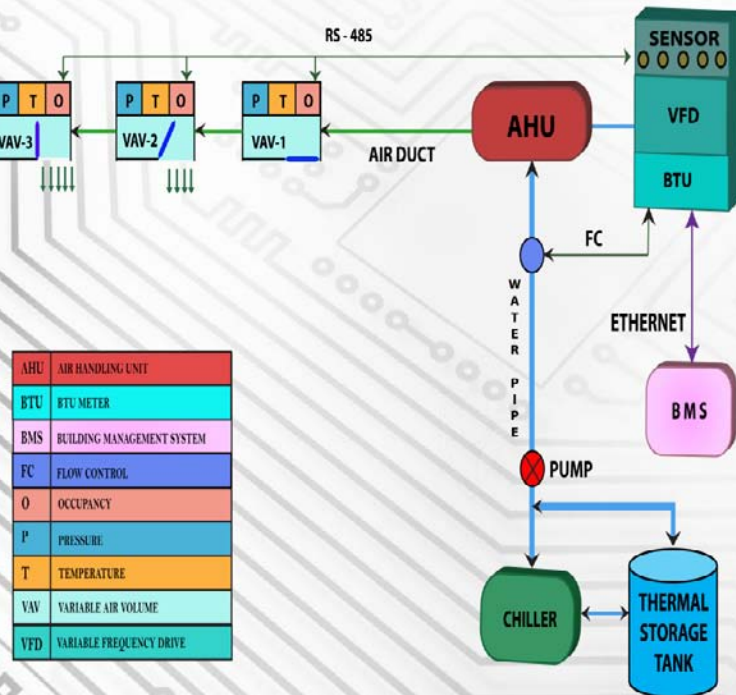
Energy Efficient Measures- Cooling System



- Uneven Cold Air Distribution
- Cooling at Unoccupied zone
- No Controls and Automation
 - Results in excessive cooling
 - Discomforts
 - High Electricity bills

Energy Efficient Measures- Cooling System

GREEN BUILDING COOLING SYSTEM

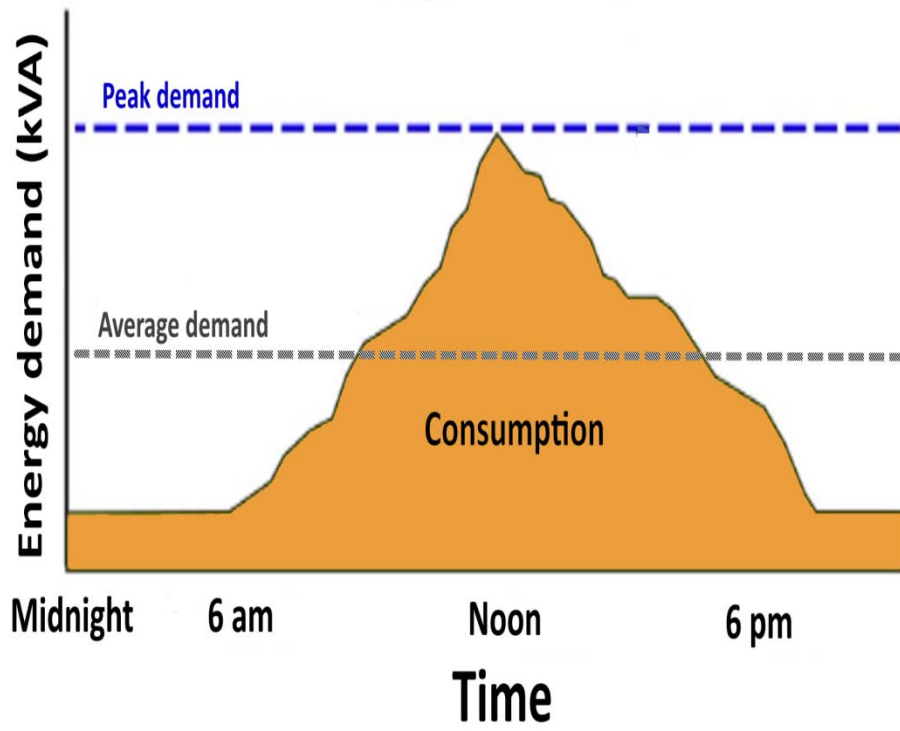


- CO2, humidity and return air/ fresh air temperature sensors and flow-control and metering at AHU
- Communication of parameters to optimise performance
 - RS-485 Comm between VAV and VFD and Ethernet between VFD and ACMS / BMS
- Use of Thermal Storage Tank for chilled water
 - Use the chillers when power available at lowest rate

Design of a Green Air- Conditioning System

- Replacing fixed opening Dispenser by Variable Air-flow Volume (VAV) dispenser controlling chilled air-flow in each space
 - Add temperature, occupancy, pressure sensor
 - **Reduce chilled air requirement, saves cooling energy**
- New AHU driven by BLDC Motor / SR Motor / Variable Frequency Drive (VFD) for AC induction motor
 - **Brings in 25 to 30% energy savings**
- Chilled water Controller associated with each AHU
 - Reduce chilled water requirement as AHU runs at lower speed
 - **Can save 30 to 40% chilled water / chiller energy**

Peak Load

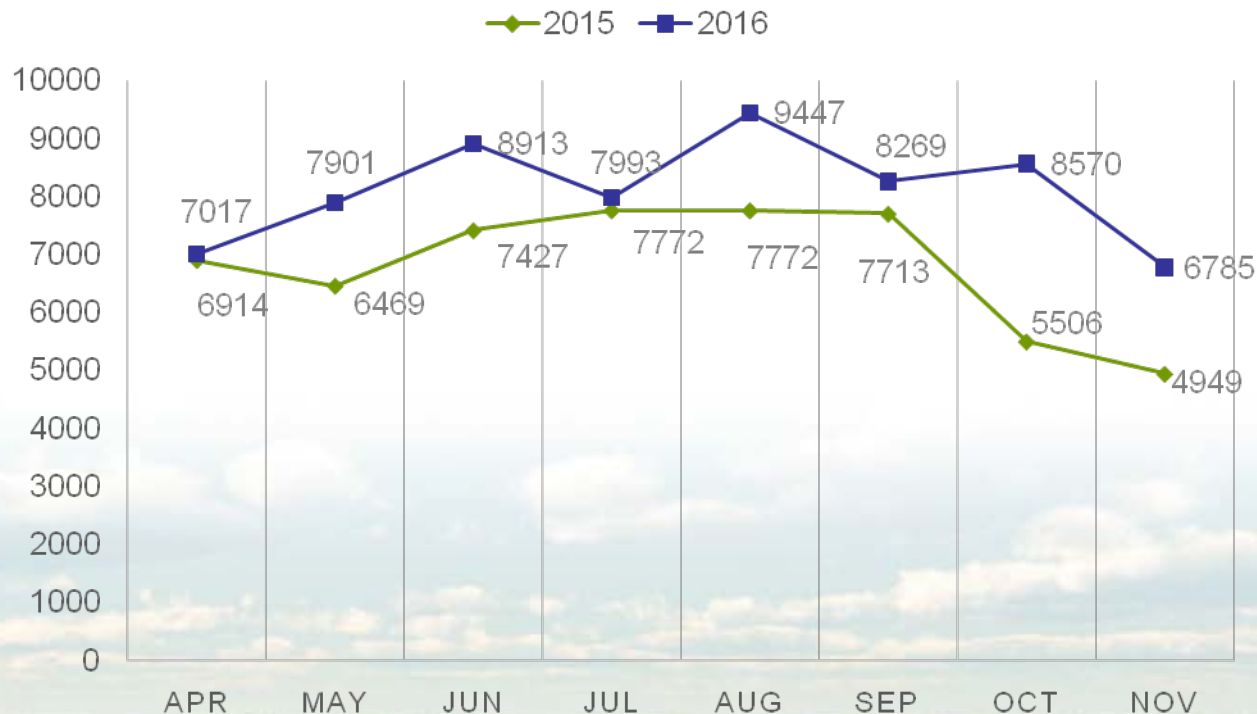


- Minimum charge - ₹ 350/ kVA
- Peak demand of Research Park: 320 kVA
 - It pays minimum ₹ 12 Lakhs

Before and after VFD & VAV

A comparison of power consumption before and after putting up VFD & VAV.

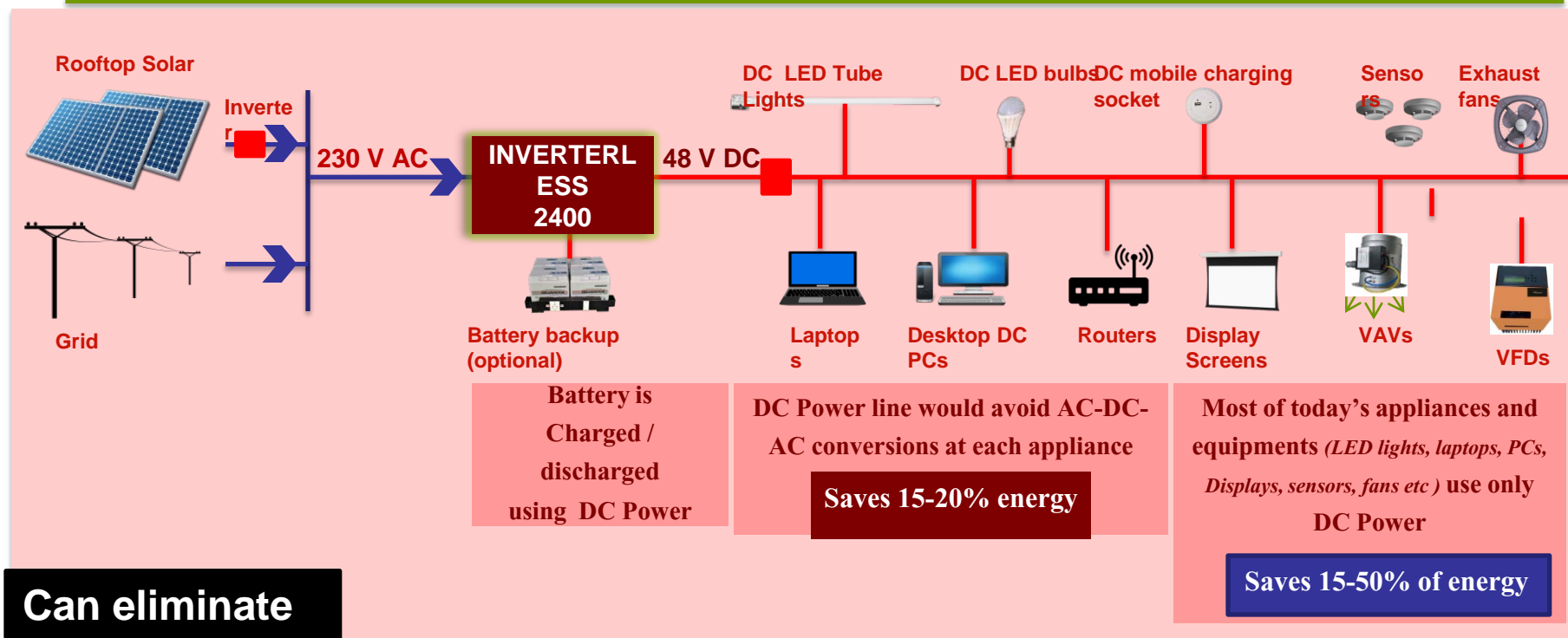
TCOE in IITMRP, shifted to VFD and VAV enabled HVAC systems in April 2016.



Energy Efficient Measures- DC Lighting

- Consumes close to 20% of total electric power
 - Depends on Diesel Generator for 24 x 7 power
 - With power cuts ranging from **an hour or 6 hours**
 - More in smaller towns
 - **Expensive** (4 times grid power) and **polluting**
- Building Loads
 - Lights, Appliances, electronics, exhaust fans, cooling load, lift and water pumps
 - Appliances and electronics are quickly **becoming all DC loads**
 - will benefit from **DC power-lines** within buildings

Energy Efficient Measures- DC Lighting



Can eliminate

DC
APPLICATIONS:



respark.iitm.ac.in

Apartments



Offices



Hospitals



Commercial Complex



Educational Institutes

Energy Efficient Measures- Appliances



- 5W LED Bulb instead of 18W CFL Bulb



Cell phone Charger/Socket

- DC charger with USB port



BLDC Fan

- 30W instead of 72W AC Induction Fan
- 9W at lowest speed



LED Tube light

- 15W - dimmable to 4W, instead of 36W fluorescent tube



Remote Control for Fan & Tube light

- ON/OFF and for dimming

Energy Efficient Measures- Generic

- Roof-top Solar Powered
- Should use **LVDC Power line (48V DC)** to power its lights, fans and electronic load (including all sensors)
- AHU should have Variable Airflow Volumes (VAVs) with sensors for air-distribution
 - Power VAVs and sensors using **DC Power**
 - AHU should have integrated chilled-water BTU meters and flow-control
- Water Pumps should have VFD or have BLDC / SRM motor and driven by solar directly
 - Should be able to pump **most water when sun is there**
- Feeder to each office could either be **230V AC of a 380V DC power-line**
 - Can be connected to solar
 - Could drive chiller, pumps, lifts (with VFDs) and AHUs

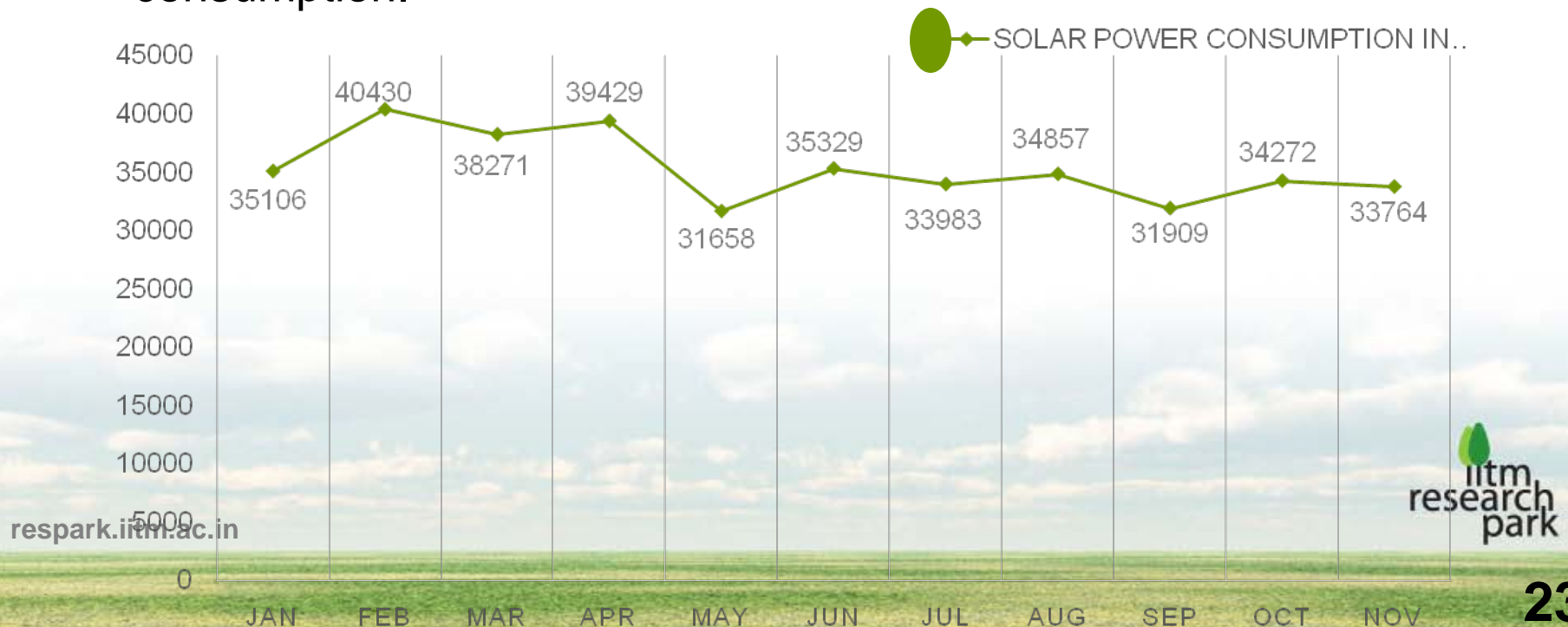
IBMS

List of items **monitored and controlled through the in- house IBMS:**

- Energy Meters
- DGs
- Chillers
- AHUs
- Fire Alarm Panels/Sensors
- Lifts
- Inverterless 2500
- Roof-top solar
- CCTVs
- Exhaust FANs
- Level Sensors

Solar Power Consumption

- A 286KW of Solar Power has been set up in Research Park; Cost of elevated structure: Rs.1.8 cr.
- The below chart indicates Solar Power consumed in IITMRP from January to November 2016. Till 30th November, a total of 3,89,008 units (Rs. 31,12,064) of solar power has been consumed. On an average, Solar Power contributes 6% of IITMRP's total power consumption.



THANK YOU