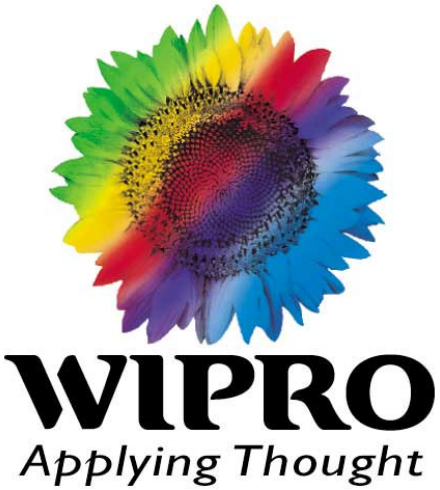
Integrated Approach to Green Buildings



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Environmental Impact of Buildings

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40% of the world's energy

25% of the timber harvested

16% of the fresh water used

50% ozone depleting CFC's

30% of raw materials used

35% of CO_2 emissions

40% of landfill waste

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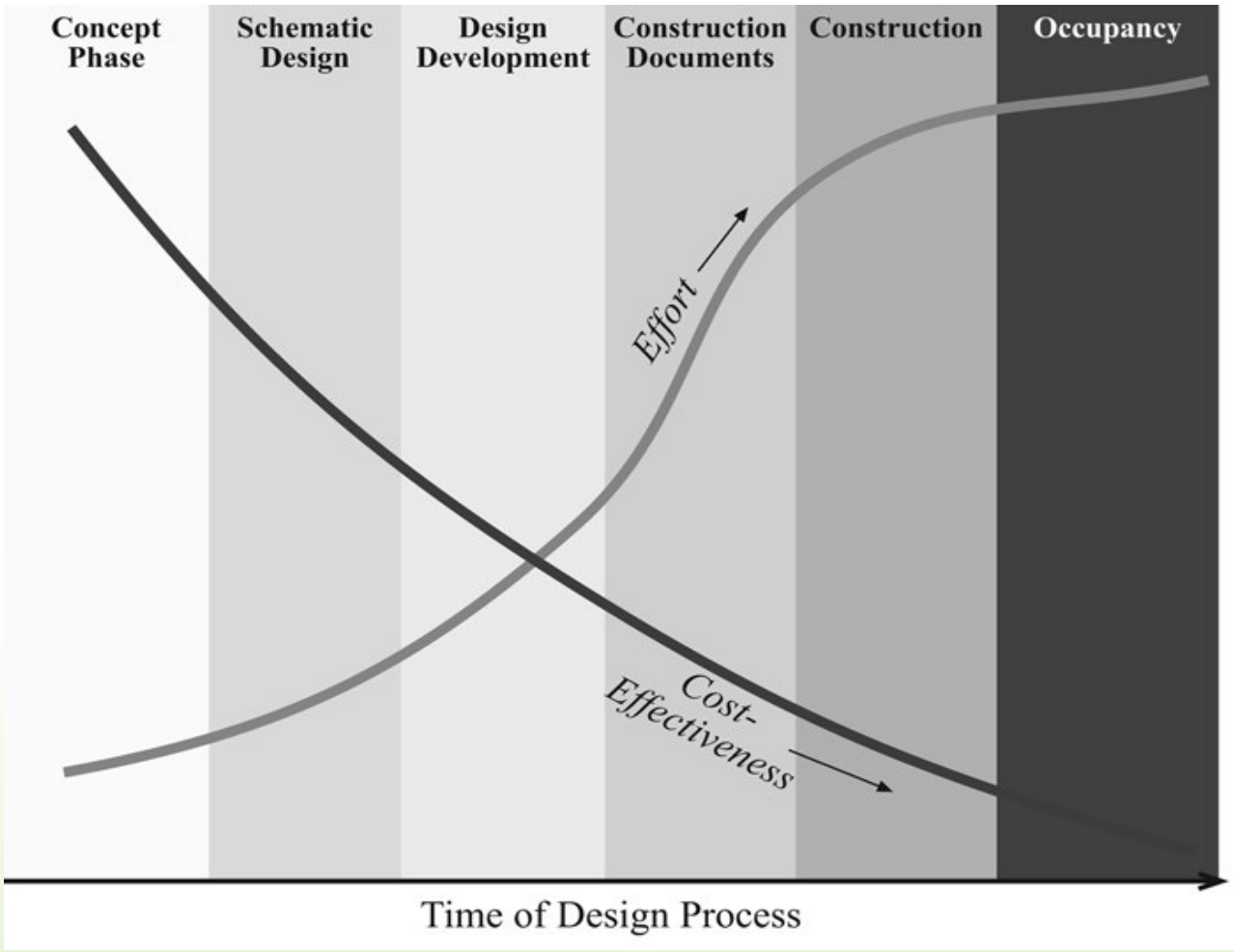
Conventional project delivery



Fragmented

Contractual

Unilateral effort

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An Integrated green project delivery

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Global Standards for sustainable buildings

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BREEAM, United Kingdom	GREEN STAR, Australia	ENERGUIDE, Canada
EEWH, Taiwan	BCA Green Mark, Singapore	CASBEE, Japan
DGNB, Germany	LEED, US	LEED/ GRIHA/ BEE, India

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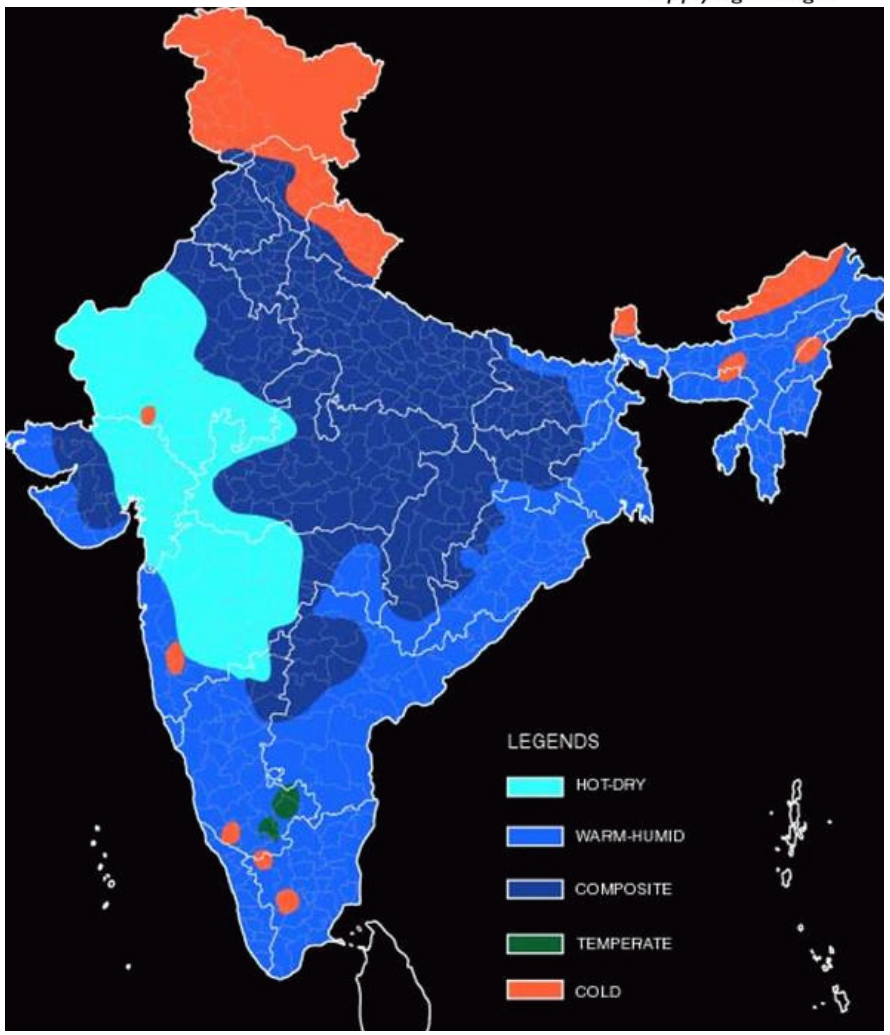
Indian Complexity

- Five climate zones
  - 1. Composite (Delhi)
  - 2. Hot Dry (Ahmadabad)
  - 3. Hot Humid (Kolkata),
  - 4. Moderate (Bangalore)
  - 5. Cold (Shillong)
- Wide variation in climate within each location
- Requires customised solutions



The Concepts

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Occupant Comfort

- Thermal comfort
- Visual comfort & controllability
- Indoor environmental quality
- Connectivity to exterior environment & community

Low Environmental Impact

- Erosion and sedimentation protection
- Reduced resource consumption; Water savings & energy savings
- Exterior light pollution reduction; bio diversity preservation
- Construction waste management
- Protection of Ozone from depletion

Energy Efficiency

- Efficient systems
- Monitoring usage
- Recovery of energy, water
- Onsite renewable systems of Wind, Solar PV, Bio gas; Cooling systems like geothermal, indirect evaporative cooling

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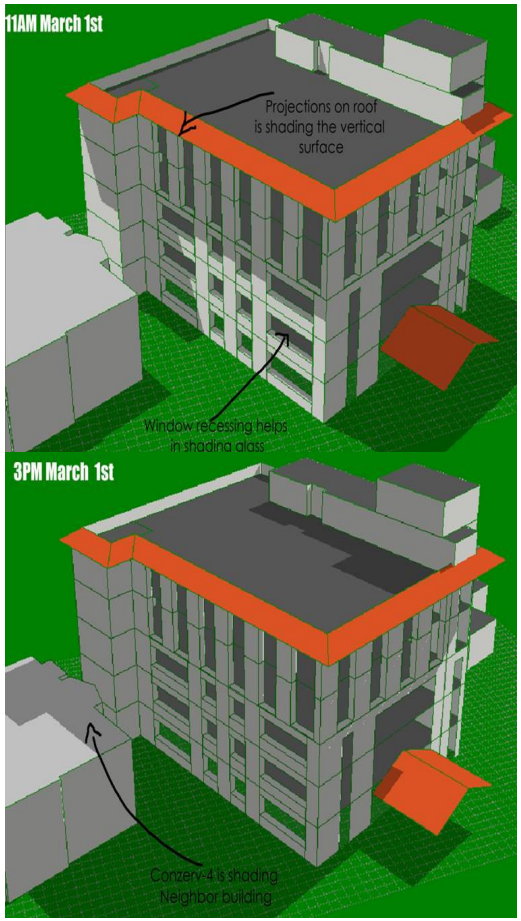
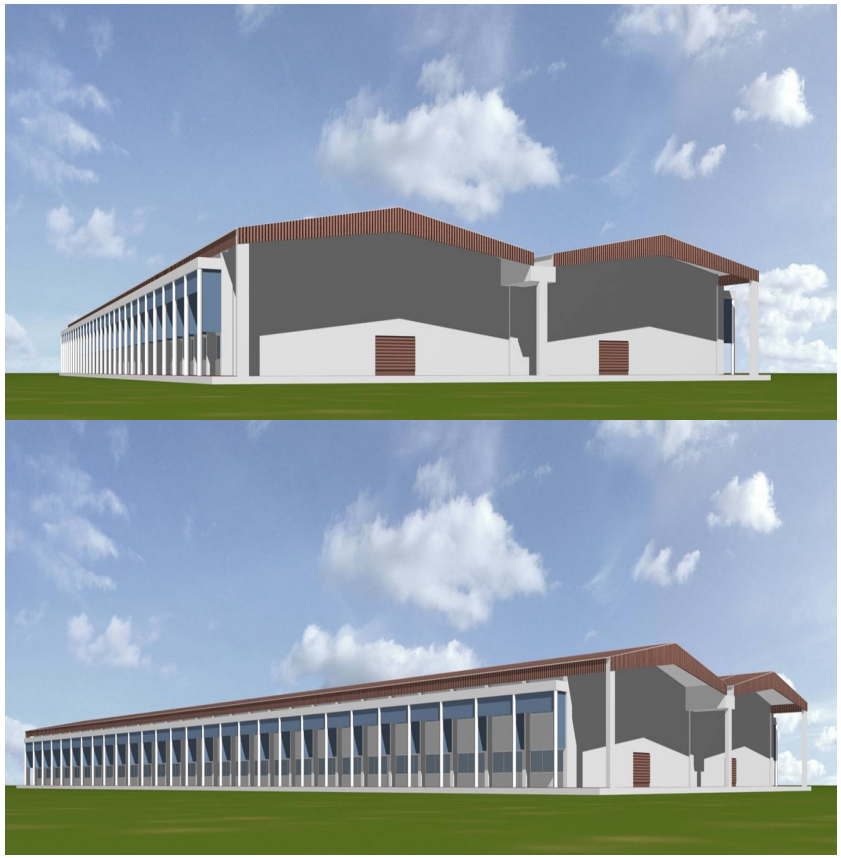
Building Design – Shade Analysis

- Reduces glare without loss of sunlight. Improves thermal performance

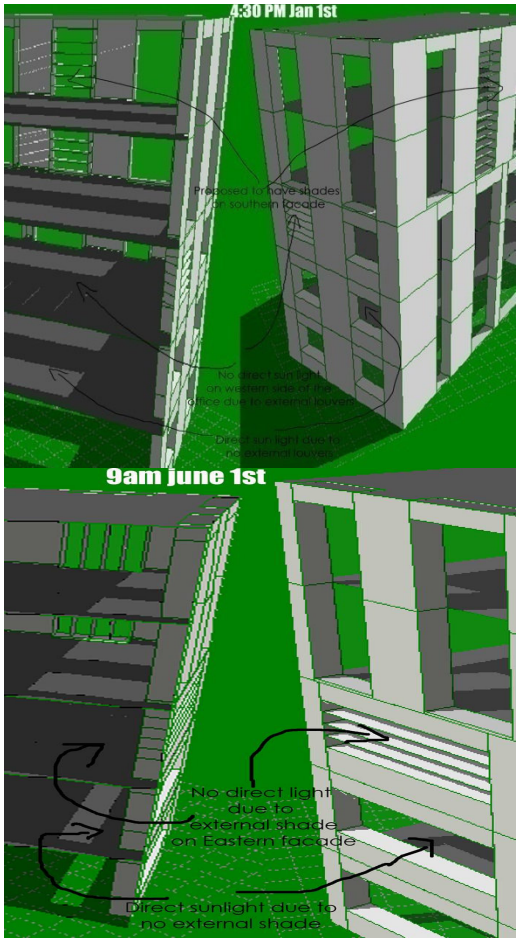
Full Building



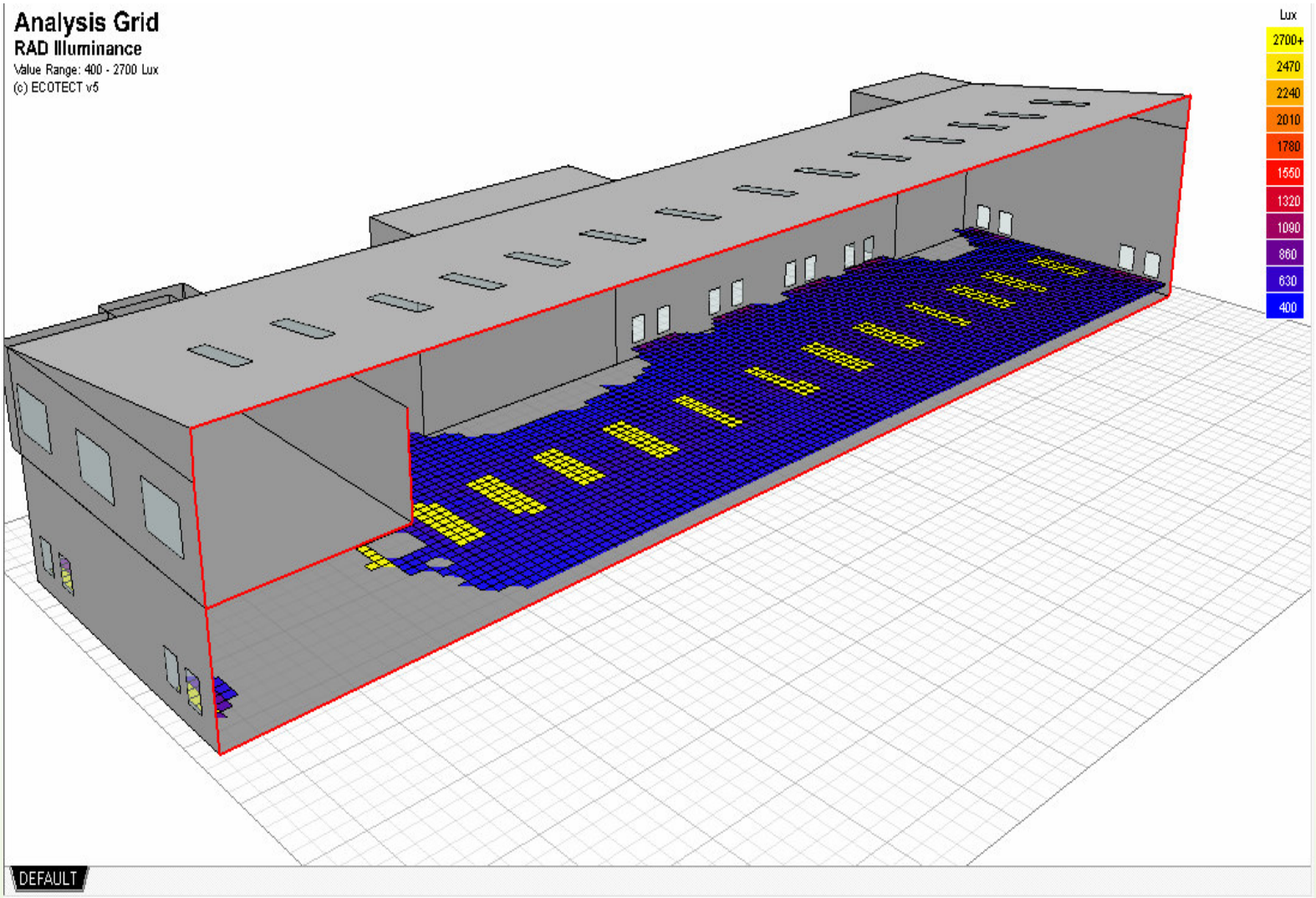
Facade



Individual Window



Day lighting analysis



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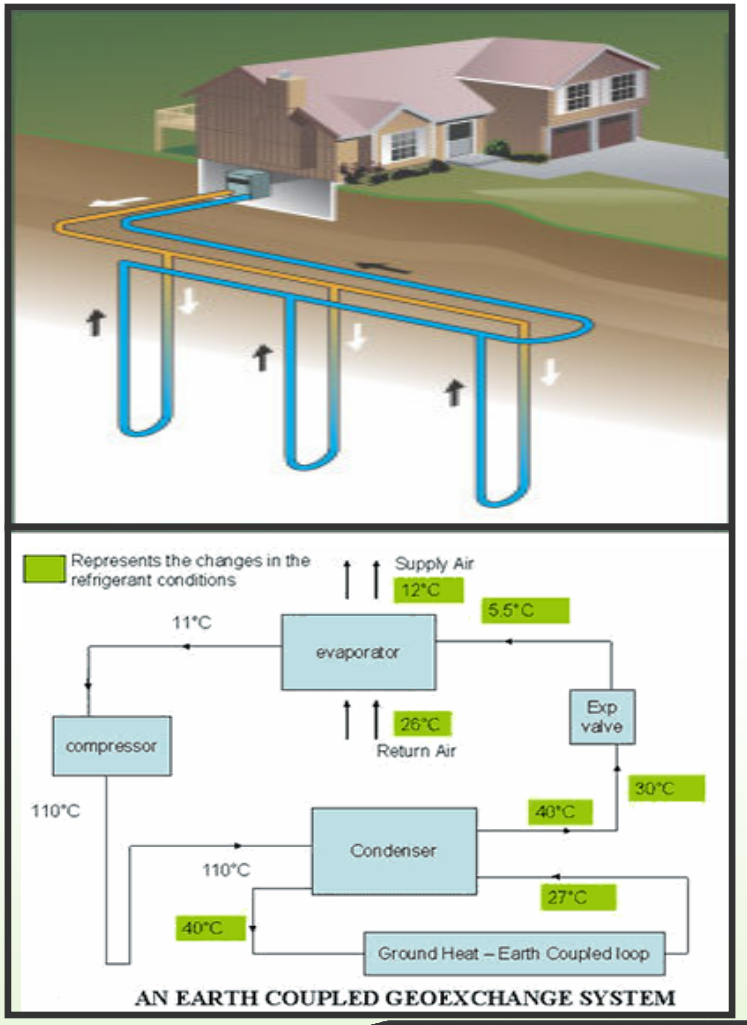
Innovative Cooling Solutions – Geothermal

- *At a depth of 30-500 feet, temperatures remain constant through the year*
- *Geothermal systems use this temperature differential (surface vs. depth) as a heat-sink*
- *Geothermal systems can eliminate the need for cooling tower*
- *This will reduce operating expenses by up to 50%*



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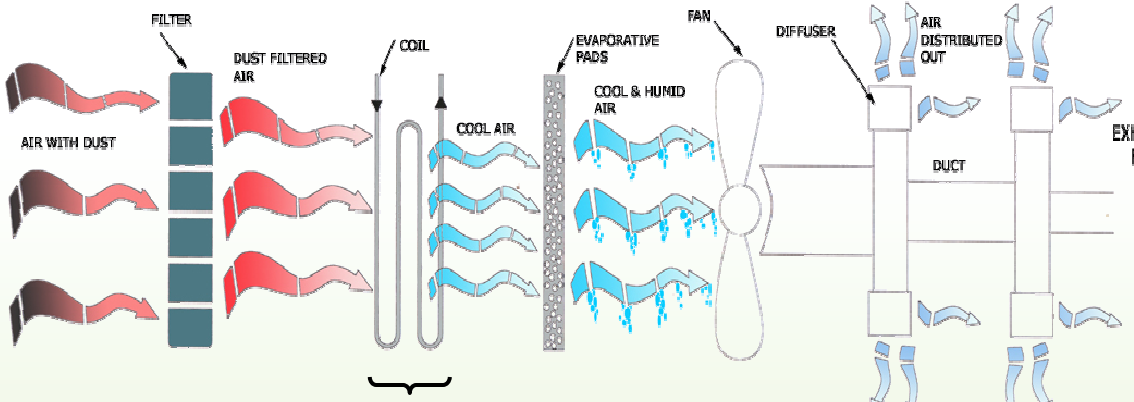
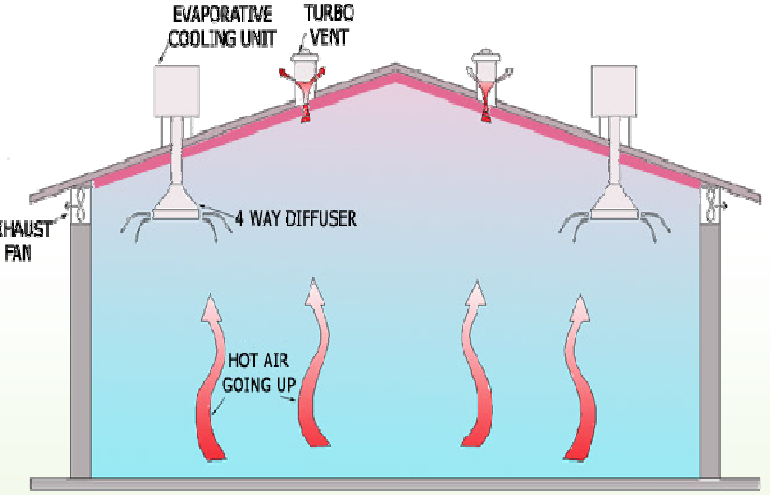
Passive Cooling Solutions

- *Passive and low energy indirect evaporative cooling system can be used to maintain:*
  - *ambient temperature of 28-32 deg C even in peak summer*
  - *relative humidity at < 65%*
- *Especially useful for brewery warehouses, where high summer temperatures lead to bottle breakage*



replaceable with synthetic fills



COOLING WITH EVAPORATIVE COOLING UNIT

Choice of Materials

- *Low VOC Paints, coatings, finishes, adhesives, sealants for interi*
- *High SRI paints, roofing materials for exteriors*
- *Low e glass, solar control reflective glass*
- *Shading structures*
- *Composite wood materials free from urea formaldehyde*
- *Recycled materials like fly ash blocks, gypsum board, flooring sys*
- *Light weight concrete*
- *Polystyrene Insulation*
- *Low flow flush fixtures*

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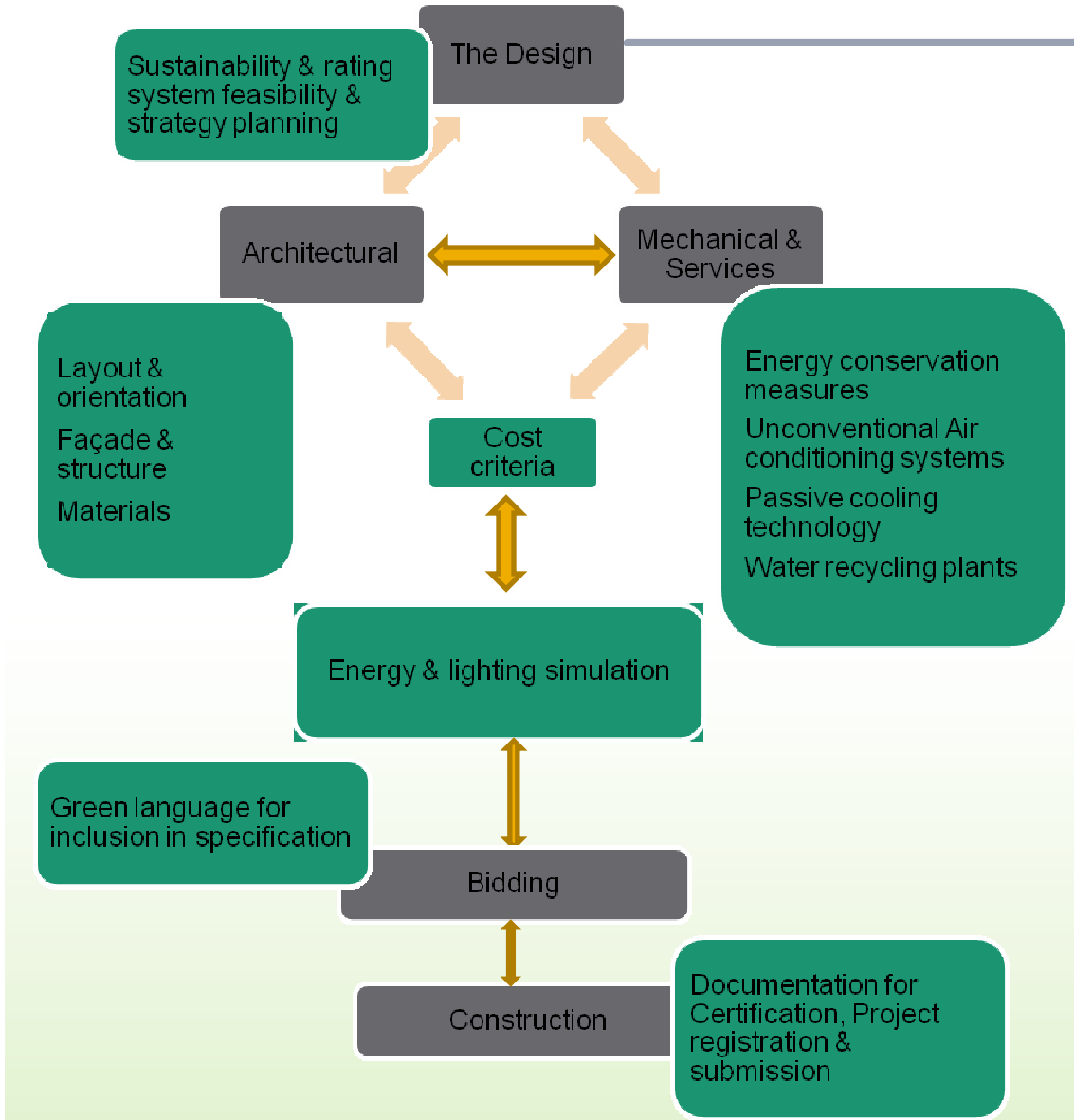
Sustainable Energy Alternatives

- *Solar PV based industrial applications for distributed energy infrastructure*
- *Waste -to-energy solutions*

Green Infrastructure Expertise

- *15 LEED Platinum/Gold rated buildings, including the 2nd highest rated platinum green building at Gurgaon, India.*
- *Expertise in building execution from inception to completion*
- *Strong network of suppliers for quick sourcing of green/ sustainable materials*
- *Expertise in all types of buildings like IT, ITES, Factories etc.*
- *Has set up the largest number of green facilities in India with 19 registered projects aiming at various levels of LEED certification.*

The Integration process – how we do it?



Ongoing Certification "Action Items" Reporting

Fundamental &"Additional Commissioning" Review; product submittals review

Building Commissioning and Post Occupancy Evaluations

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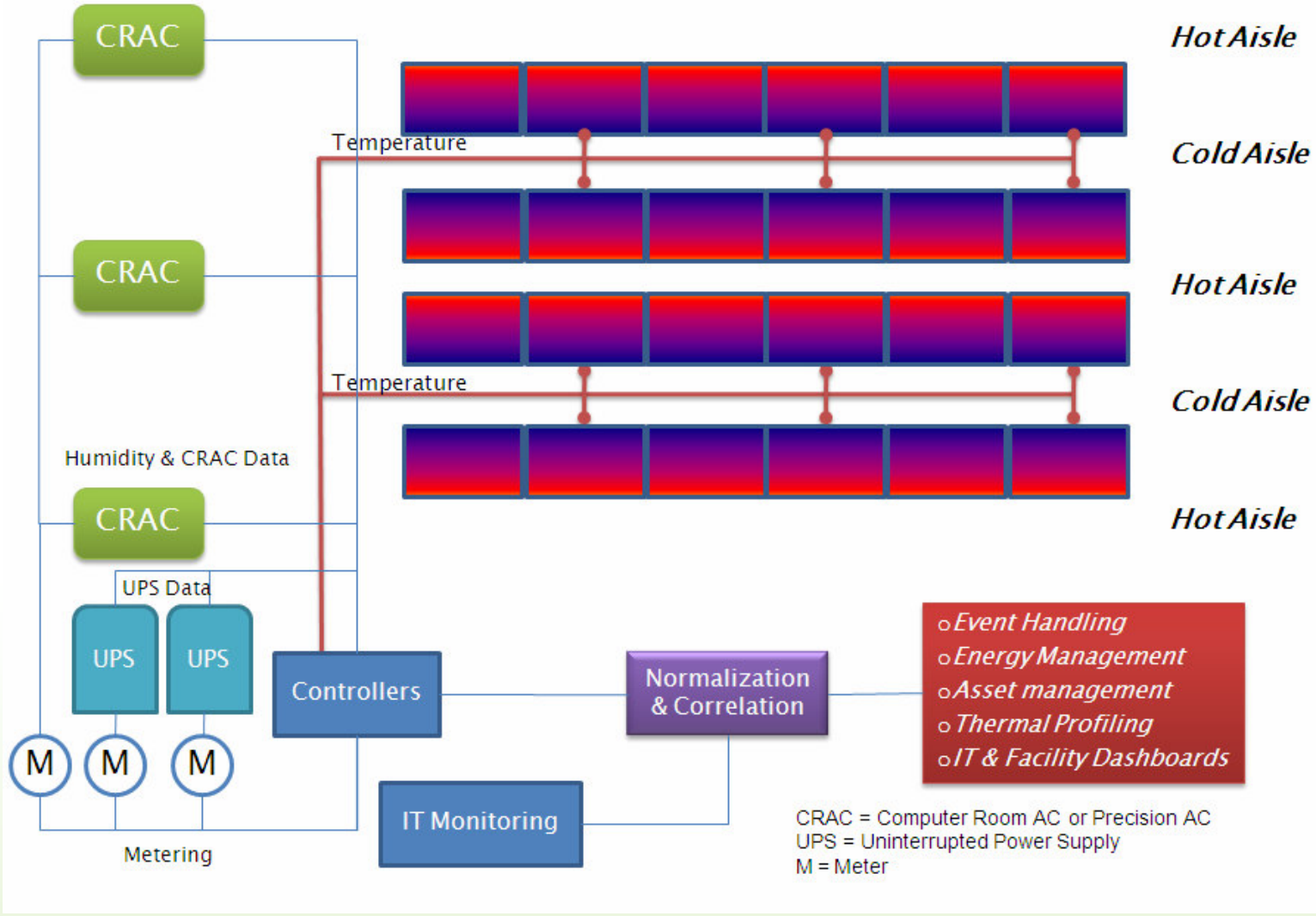
Technology approach to Data Center energy efficiency



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India's Green Data Centre

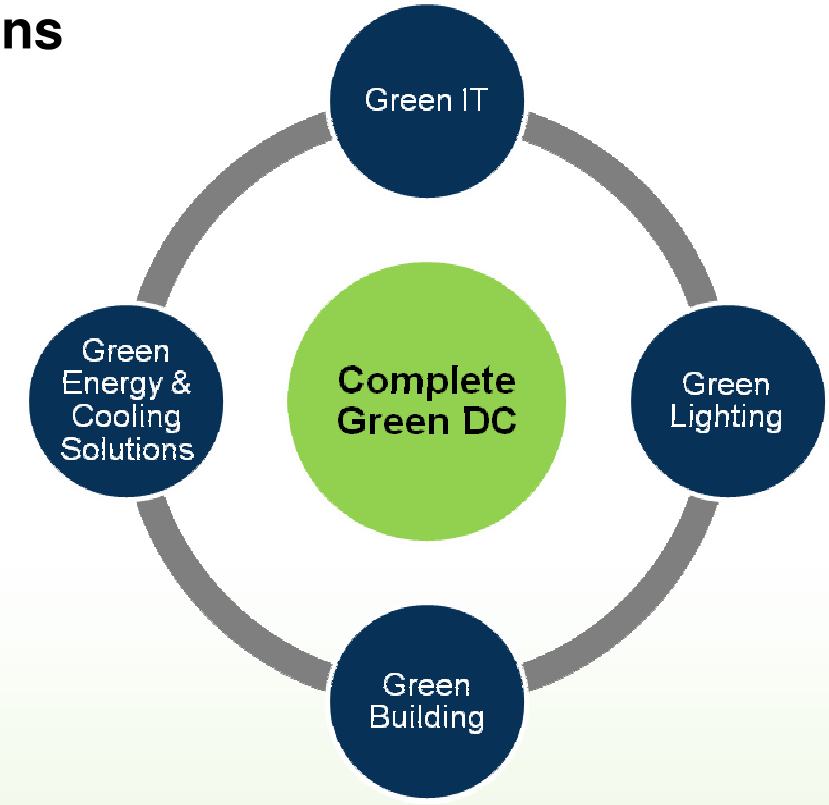
Some of the Technology Applications

-Closed Loop Cooling system

-Variable CFM

- Power consumption based on the dynamic heat load.

- Air tunnel pre cooling of incoming fresh air to chiller



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WIPRO LEED rated buildings

CDC-5

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Electronic City - Bangalore

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GDC-FTB1

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Hyderabad GPL

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Kolkata

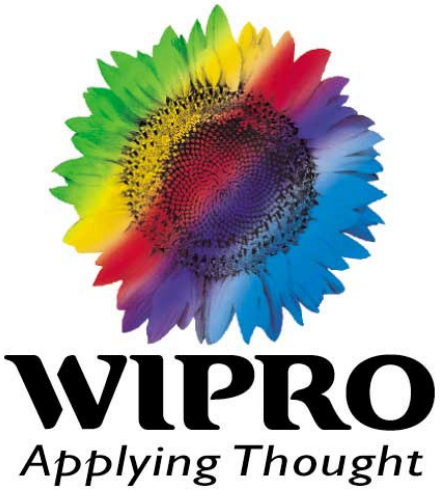
Wipro EcoEnergy

Sarjapur- Bangalore

Vizag

Thank you

sudarshan.ananth@wipro.com



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