Green Journey of Infosys

High performance with low environmental impact & low cost

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Regional Head – Infrastructure / Green Initiatives

Infosys Sustainability

Journey

1. Define unreasonable goals
2. Focused team of experts for driving initiatives
3. Innovations in infrastructure
4. Demonstrate commercial viability for each initiative
5. Measure performance continuously
   - Data driven new designs
   - Data driven retrofits
6. Success stories

Impact on energy bills &
Carbon footprint reduction

Increase in No. of employees in India since 2008

Absolute Increase in energy consumption since 2008

Savings of **2 Billion** kWh of electricity

Savings of **$200** Million in electricity bills

1.7 Million Tons of CO_2 emissions avoided

45+ Million square feet across India

New Ultra Efficient Buildings

Define clear goals

GOAL

HVAC Goal

- Max envelope heat gain 0.75 W/sqft
- Total building @ 750-1000 sqft/TR
- 25 deg C, 55% RH

Lighting Goal

- LPD of 0.45 W/sqft
- 90% of building to be day lit > 110 lux
- No Glare throughout the year

Water Goal

- Less than 25 LPD for office building
- Zero discharge
- 100% self sufficient

TEAM

- Architects
- Facade Specialists
- IT Specialists
- HVAC Engineers
- Lighting Specialists

- Architects
- Facade Specialists
- Lighting Specialists
- Electrical Designers

- PHE Engineers
- Architects
- Landscape Architects

EPI of building - less than 75 kWh/m2/year

EPI: Energy Performance Index

Performance

Parameters in 2008-09

Building Energy (EPI): 200 kWh/m2/year

Average for software buildings (incl. lights, AC, computers, etc.)

AC Design: 350 sqft per TR

Average installed cooling capacity across campuses

Lighting Design: 1.2 W/sqft

Average for software buildings across campuses

Electrical Design: 6.5 W/sqft

Total electrical load for software buildings including chiller plant

* EPI – Energy performance index

New design and

Performance Benchmarks in 2018-19

63% Lower

Building Energy (EPI): 75 kWh/m2/year

Average for software buildings (incl. lights, AC, computers, etc.)

Lighting Design: 0.50 W/sqft

Average for software buildings across campuses

54% Lower

AC Design: 750 sqft per TR

Average installed cooling capacity across campuses

Electrical Design: 3.5 W/sqft

Total electrical load for software buildings including chiller plant

58% Lower

46% Lower

* EPI – Energy performance index

New Buildings

Practicing Energy Efficiency by Design

Building Shape & Orientation

Optimum Window-wall ratio

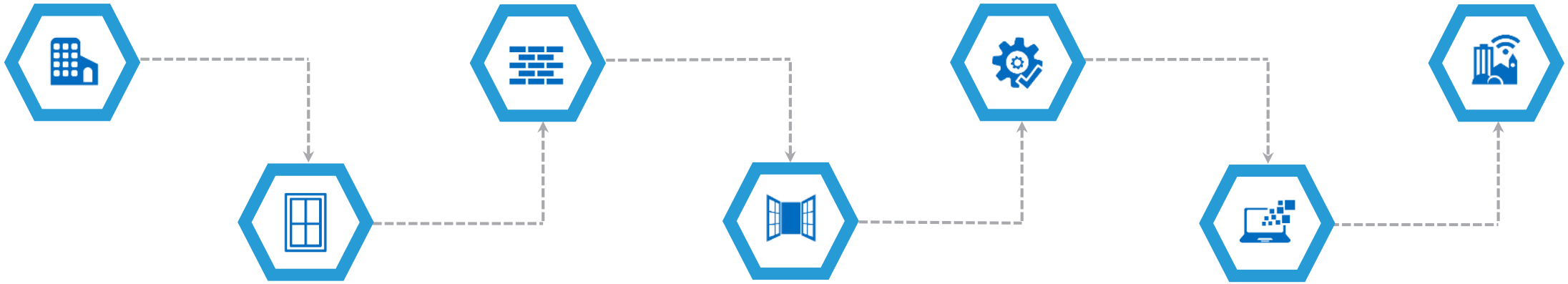
Insulated Walls & Roof

Day lit spaces with efficient windows

Ultra Efficient system design

Efficient technologies - Radiant cooling is 30% more efficient

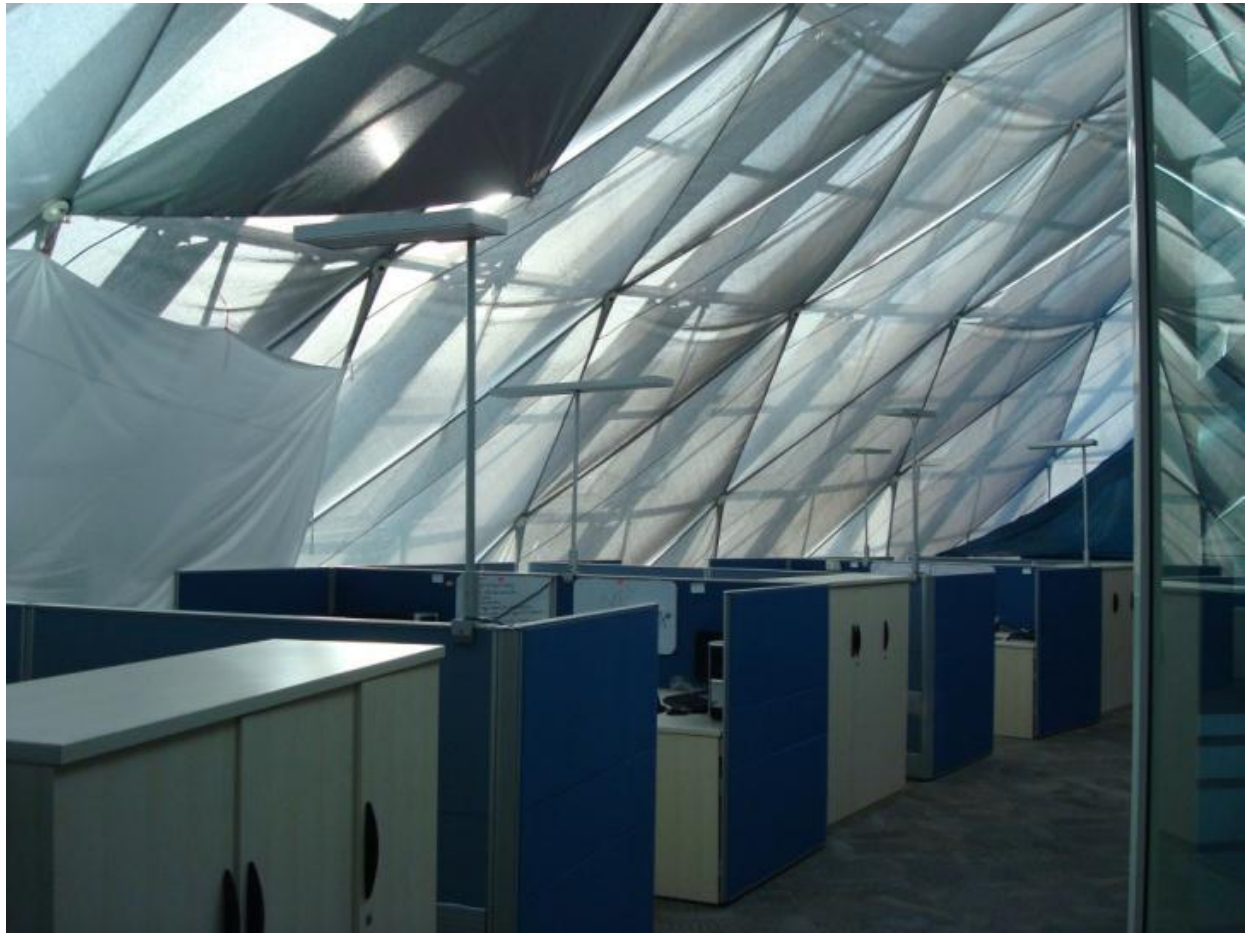
Smart Building Systems



New buildings deliver an EPI of 75 kWh/m2/year

Importance of building facade

Importance of building facade



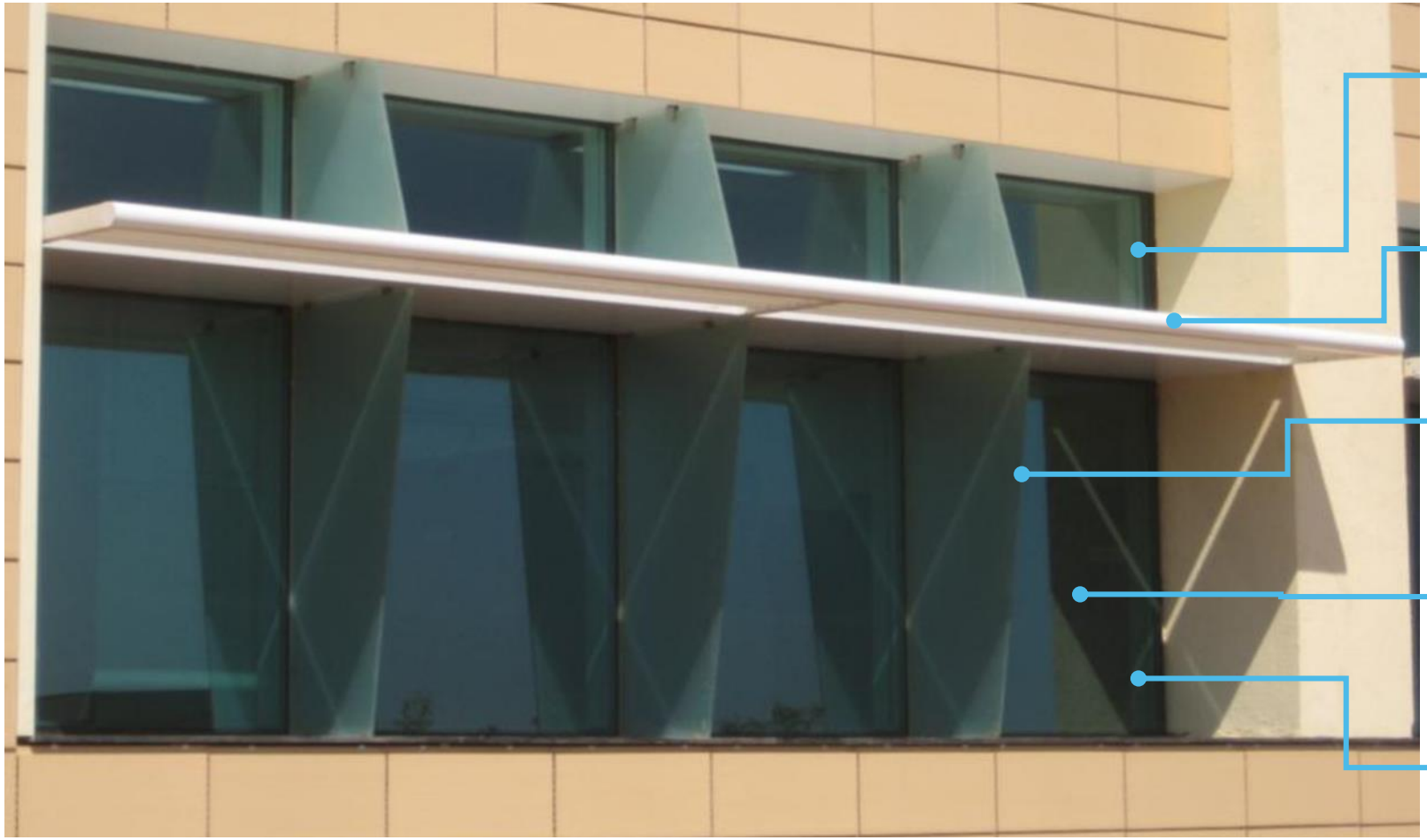
New Buildings

Efficient Design at Lower Cost

- Campus based on sustainability principles from the concept design
- Efficient building facade avoids heat coming inside but lets in natural light

Smart

Window Design



- Day light pane
- External shading
- Smart glazing
- View pane
- Interior light shelf

Impact of
Day Lighting

Improves

- Employee health & well being
- Employee Productivity

Benefit of efficient design on capital cost

Infrastructure required for 1 million sqft,

Sl. No.	System Description	Units	Conventional practice	Efficient design	Cost savings in INR Crores	Cost savings in INR/sqft
01	Total electrical load	MW	8.0	3.5	10 cr.	100
02	Transformer capacity	MVA	10.0	4.5	1.0 cr.	10
03	DG set capacity	MVA	12+2	4.5+1.5	12.0 cr.	120
04	HVAC system	TR	2850	1350	3.0 cr.	30
05	Lighting system	MW	1.2	0.45	1.5 cr.	15
06	Annual energy consumption	Million kWh	25	8	10 cr.	100

Innovations

HVAC system

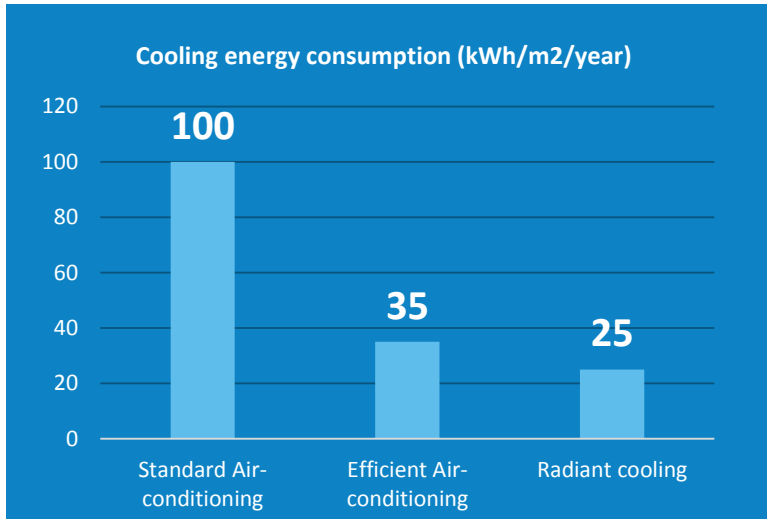
1. Dual loop chilled water system – 8 deg C and 16 deg C
2. All equipment on variable speed drives – chillers, pumps, cooling towers, air system
3. Low velocity design for entire system
4. Efficient equipment - Magnetic chillers
5. Automatic tube cleaning system
6. Use of free cooling (through cooling tower) – economizer
7. STP recycled water for cooling tower makeup
8. Chiller plant efficiency : 0.42 kW/TR (annual avg. for a building in BLR)

Efficient cooling system

Radiant Cooling


Radiant slab

- **30%** more efficient than most efficient conventional cooling
- Requires **75%** less air compared to conventional system
- Frees up valuable real estate space, less equipments
- Higher thermal comfort
- Highest indoor air quality, fresh air circulation
- Cost same as conventional air conditioning



Efficient cooling system

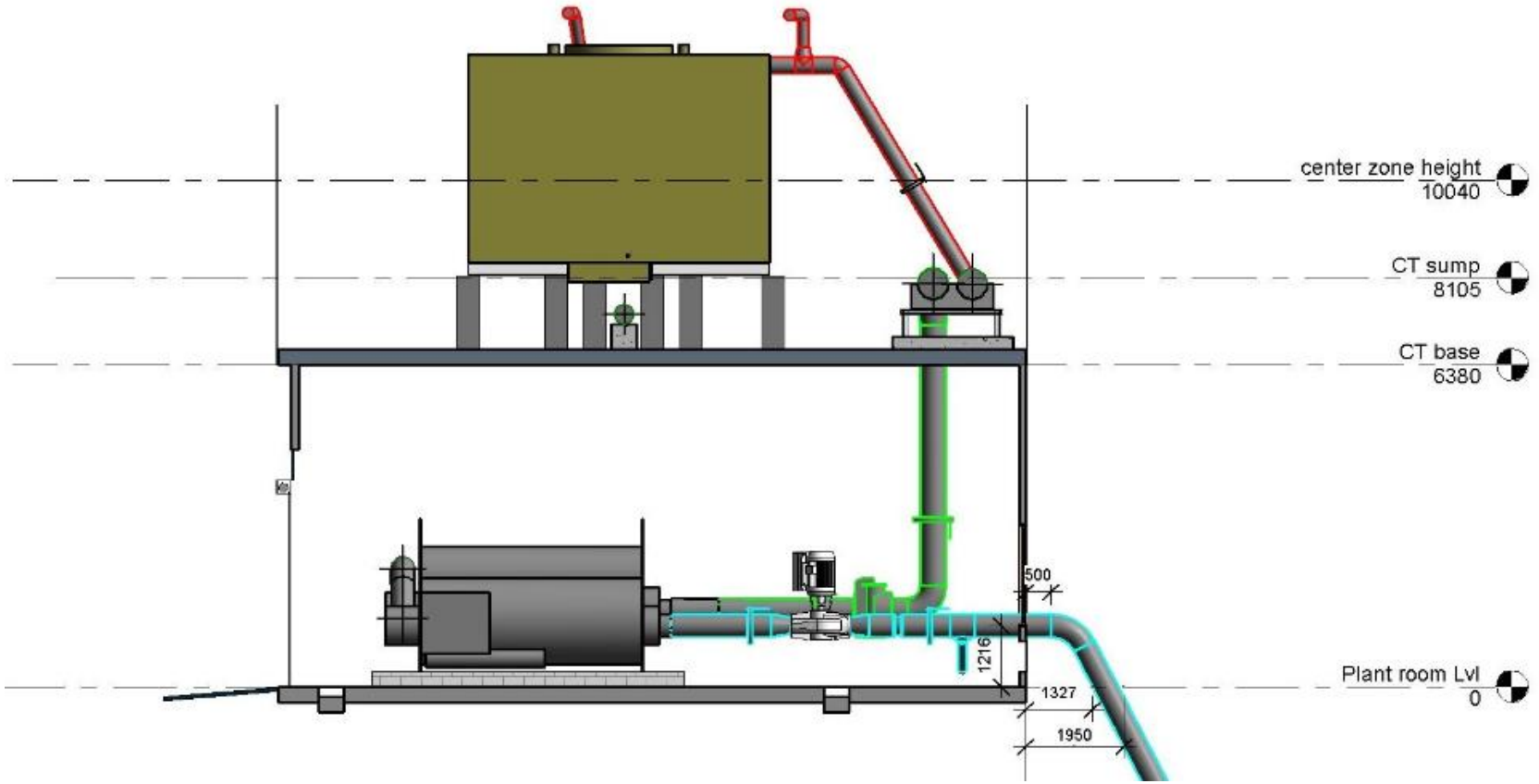
Radiant Cooling

Radiant panels

- Radiant panels developed by Infosys team
- High cooling capacity
- Quick installation
- Cost effective
- Patent pending – Europe, US and India

Ultra Efficient Engineering

Collaboration with global experts / academia



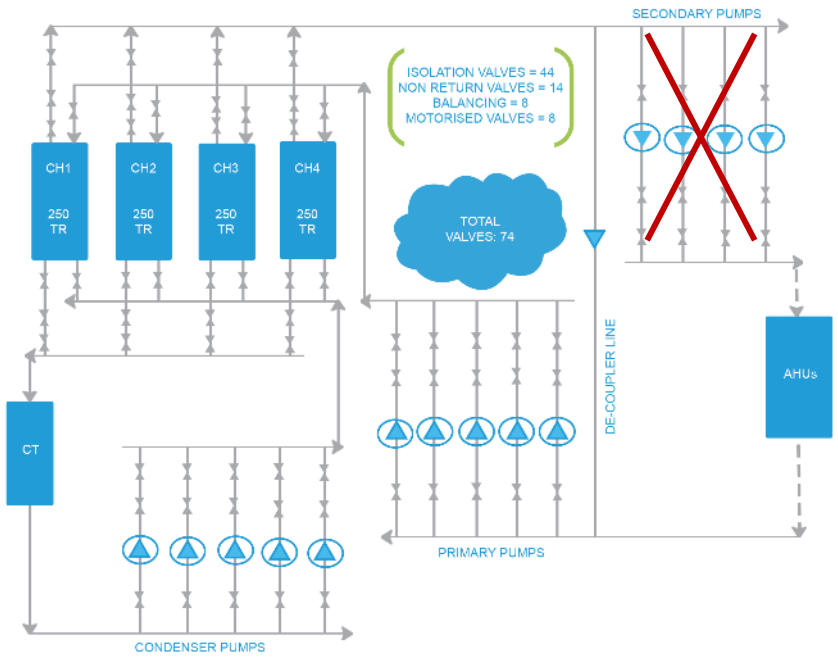
High Performance Design

Minimal bends and pressure drop

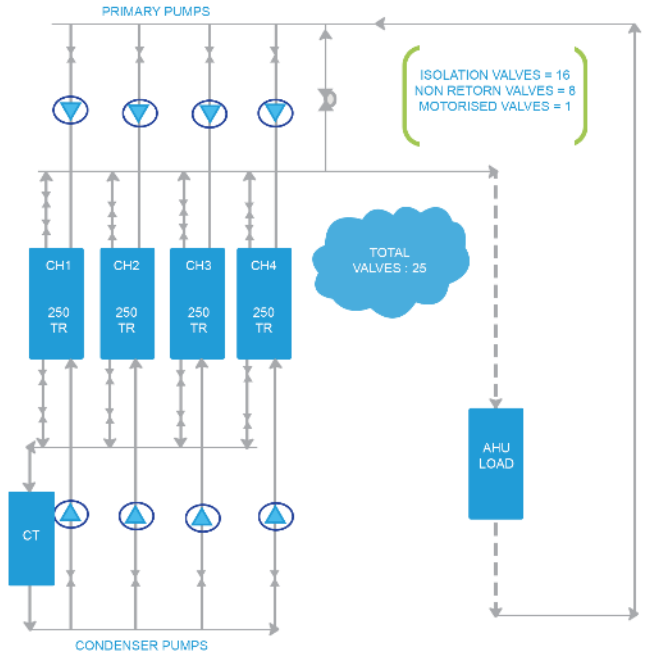
Deep Green Retrofits

Key Drivers for
Deep Retrofits

Re-engineered chiller plants
(Conversion to variable primary systems – 40 Central Plants)



Before Retrofit



After Retrofit

Reduction in Energy
30%

Reduction in no. of Equipment
45%

Reduction in space
25%

Reduction in Maintenance Costs

Data Centers: Cold aisle containment and
DX to chilled water conversion

- Converted to water-cooled, chilled water based system – 50% reduction in energy
- Cold aisle containment for existing data centres

Replacement of

Electric heaters/steam boilers with heat pumps

Air source heat pump, draws heat from atmosphere

3.5 times more efficient than electric heating

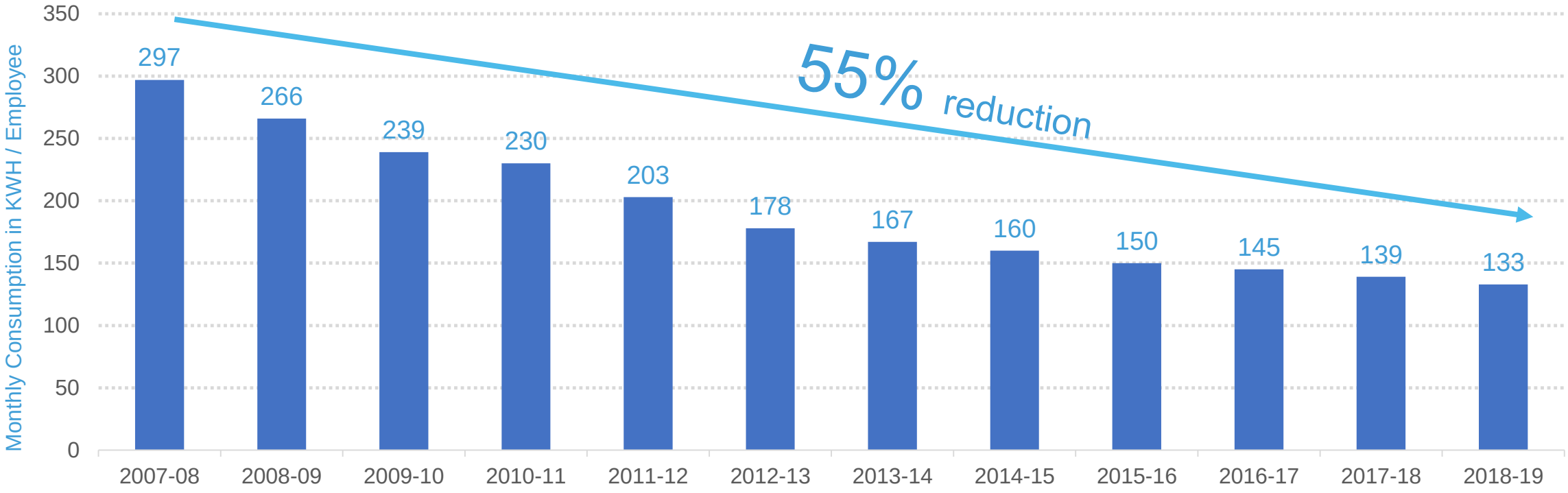
2 MW of connected load reduced across campuses

550kL savings in annual diesel consumption

1kW electricity	Electric Water Heater	0.95 kW of heating
1kW electricity	Heat Pump	3.5 kW of heating

Achievement on
Energy Efficiency

On account of both – New buildings & retrofits



Smart Campuses

Sustaining Performance through
Remote Performance Mgmt.

Review & Optimization of

Thermal Comfort	Indoor Air Quality	Energy and Water use
Renewable Energy	Building Assets	Critical Operations
Central Utilities	Alerts & Diagnostics	Safety & Security

Optimizes operations across 16 Infosys campuses/ 26 million sqft in India

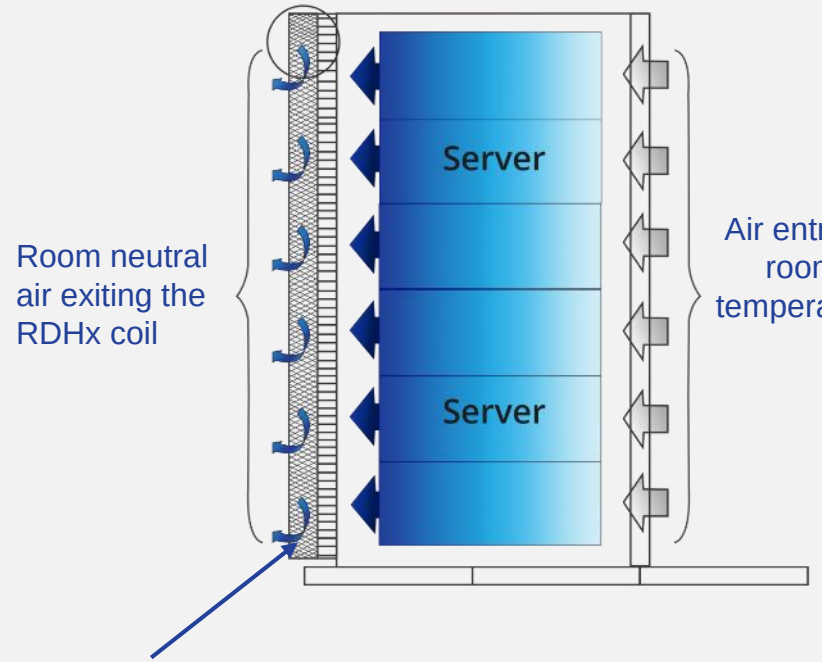
Infosys Central Command Center

Latest Data Centers

Ultra high efficiency
with Power UE of 1.12

- Global average PUE of data centers is 1.8*
- Best data centers in the world deliver a PUE of about 1.08 (Facebook, Google) under cold climate (Scandinavian countries)
- We designed DC with a PUE of 1.12 at Bangalore. Currently operating at about 1.18, at partial loading
- Uses free cooling from cooling towers
- Unique Rear Door Heat Exchanger technology

Air entry Room Temperature- 27deg C
Air Exiting- 24deg C



*PUE – Power Utilization Effectiveness

Renewable Energy & Green Power

Green Power and Renewable Energy

Currently 46% of our electricity is sourced from Green Power sources *

19 MW of captive roof top as well as ground mount installations

Commissioned 30 MW offsite Solar PV plant in Karnataka

In-house lab setup to test various PV technologies under same weather conditions

Tie-ups with NREL, ISES, IIT Bombay and IISC, Bangalore for research and innovation in Solar PV design, installation and operation

Infosys is the first Indian company to join RE100 initiative in May 2015

RE 100 | NREL National Renewable Energy Laboratory | ISES International Solar Energy Society

Water Management

Water Efficiency by design

New Buildings

Building Type	Infosys Design Standards	National Building Code/UPCI	Improvement
Software Development Blocks	25 liters/person	45 liters/person	45%
Food Courts	40 liters/seat	70 liters/seat	43%
Employee Care Centers	90 liters/person	135 liters/person	33%
Shower	6 liters/min	12-16 liters/min	50%
Taps	1.9 liters/min	6-9 liters/min	68%
Water Closet	3-6 liters/flush	6-9 liters/flush	50%

Specify flow rate along with design of fixtures

Water Conservation in Buildings

End Use Consumption Strategies

Low flow fixtures – Taps, Shower heads, Health Faucets	Pressure Compensating Aerators (PCA)	Sensor controlled taps	Dual flush system
Pressure regulating valves at buildings	Landscape retrofits, Native plantation	Root zone irrigation	Employee awareness campaigns

Artificial Grass at Infosys Mysore

Smart water metering

Water Recycling

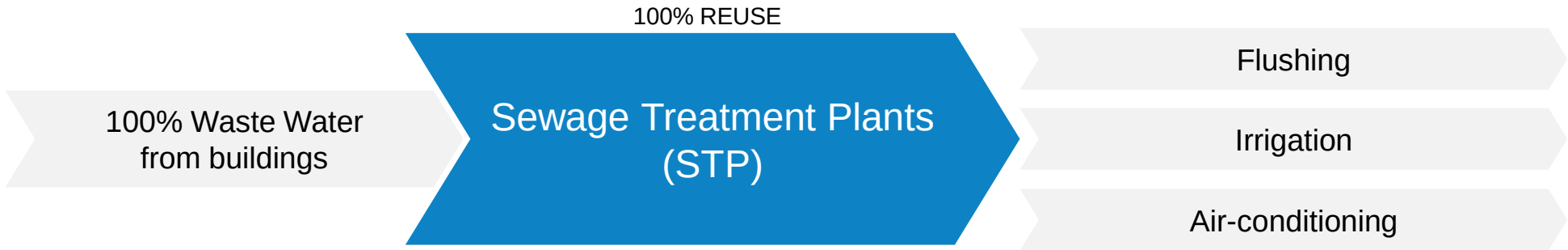
100% of waste water is recycled and reused

New Buildings/Campuses

- 100% of waste water is recycled
- Efficient treatment technology - Membrane bio-reactor (MBR) technology
- Recycled water is used for irrigation, flushing and air-conditioning

Existing Buildings/Campuses

- Retrofits to upgrade treated water quality in line with new CPCB norms
- Retrofits to reduce waste water treatment cost
- Dual piping system retrofits in existing buildings



Rain water harvesting

Harvest 100% of on-site rain water

Natural and Artificial lakes/ponds on campus to harvest rain water

Roof top rain water harvesting systems (New & retrofits)

Deep well injection system to recharge ground water

35 lakes across campuses in India

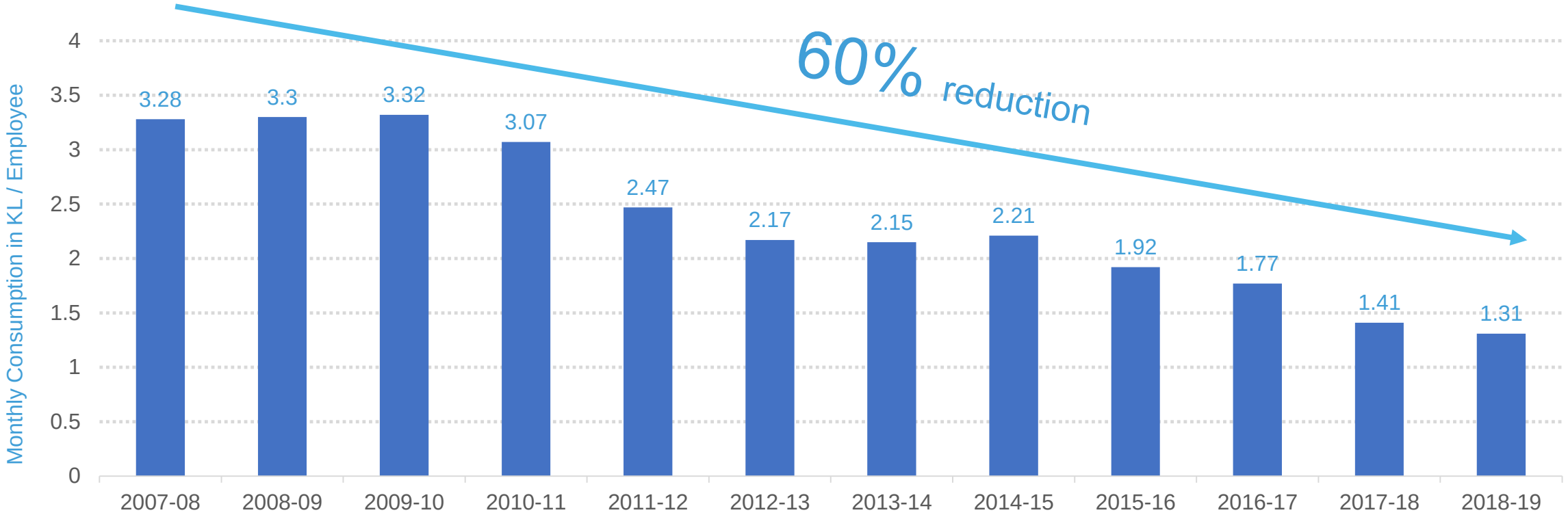
(Holding capacity of ~330 million liters)

Roof top rain water harvesting

350+ deep well injection systems

(Recharge capacity of 17.5 million liters per day)

Achievement on
Water Efficiency



Waste Management

Zero waste to landfills

Organic Waste

To be treated on campus

- 100% on-site treatment of food waste
- 9 Automated biogas producing 6800 LPG cylinders/year
- 8 Composting plants producing compost 400 tons/year

In-organic, Non-Hazardous waste

To be recycled

- Recycled through authorized vendors
- 2400 Tons/year of waste recycled

Hazardous waste

To be treated by certified recyclers only

- Treated through PCB authorized vendors
- 500 Tons/year of recyclable waste sent to authorized recyclers

Achieved 85% waste diversion from Landfills

Achieving Sustainability in

Physical Infrastructure

1. Question every assumption
2. Push the boundaries
3. Use of technology
4. Focused efforts
5. Turn challenges to opportunities
6. Measure data, Monitor performance

Thank you

For more info:
https://www.infosys.com/sustainability/Documents/infosys-sustainability-report-2018-19.pdf