CONSORTIUM OF ACCREDITED HEALTH CARE ORGANIZATION
CAHO
Committed to Safer Patient Care

Qimpro FOUNDATION

# World Quality Month 2020 Celebration


*"BE A PART OF SOLUTION Not PART OF THE Pollution"*


***Mr. Neeraj Tandon***

***Chief Engineer***

***Fortis Hospital Limited, Mohali***


TEAM EXCELLENCE AWARDS FOR CQI BREAKTHROUGHS

QualTech PRIZE 2020 HEALTHCARE 28-29 November

# BUILDING DETAILS

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- *Fortis Hospital Mohali Establishes in 2001,* **Approx 2000 sqf/cardiac ICU bed instead of the normal 800-900 sqf/in Indian healthcare** *Hospital set on sprawling 8.22 acres, with built up area of 50336 square meters.*
- *FHM is a 360(435) bedded, JCI and NABH certified multi specialty tertiary care hospital,*
- *Fortis Hospital, Mohali has won several awards, including; Best Design Award from American Institute of Architects,1999*

# GREEN AREA OF CONCERN

In the present era, almost every land is occupied by the buildings on it. The External  appearance—look alike, Functionality- Same yet the difference is Green building Conserve Natural resources, concern for human comfort, Indoor Environment and productivity. The study of environmental impact of buildings is necessary to point out the explanations that how buildings can play important role in energy conservation. Healthcare organizations are continually battling conflicting priorities. There is a need to focus on delivering high quality patient care, preventing infections, maintaining hospital security, and ensuring patient safety – all with extremely stretched resources yet with minimal costs. Thus going green is the need of the hour not only to reduce environmental impacts of emissions but to provide healing environment for faster recovery of patients

# GREEN AREA OF CONCERN



## CAN A BUILDING HELP YOU CURE.?

- Research shows patient recovery much faster

- Connectivity to outside environment.
- Better Daylight and Views.
- Healing benefits for patients.

- Better Indoor Air Quality

- No sick building syndrome.
- Regular $CO_2$ monitoring.
- Increased fresh air ventilation.

# Natural Lighting

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***"Often design strategies for energy efficiency can also have direct benefits for patient outcomes. A recent study has found that daylight in patient rooms helped surgery patients maintain lower stress levels and feel less pain resulting in use of less pain medication and reducing medication costs for these patients by 22%."***

**– Jeffrey Walch, University of Pittsburgh Montefiore Hospital**

# Problem Definition



Fortis Hospital, Mohali started operations in 2001 and soon realizes that it has huge energy costs. Current – Consumption patterns ,Perpetual growth in facilities, diagnostic equipment's, additional beds  thus increased Energy

Consumption patterns aren't fixed, they vary depending on the number of occupied beds, the footfalls & the local weather conditions. Increasing energy & Maintenance costs.

Hospital are energy guzzlers. They not only adds to the operational costs but also to emissions that contribute to the anthropogenic green house gases

Thus hospital devised a sustainable policy and made a team frame to execute and demonstrate sustainable operation through complete Management to build low carbon medical system & to achieve continuous improvement in energy performances, energy efficacy & scientific energy audits regularly. Thus emphasis was to execute environmentally- friendly promotion with robust strategies to build up low carbon medical system and community with smart green public construction with use of highly energy efficient and green and clean energy usage.

# Problem Definition

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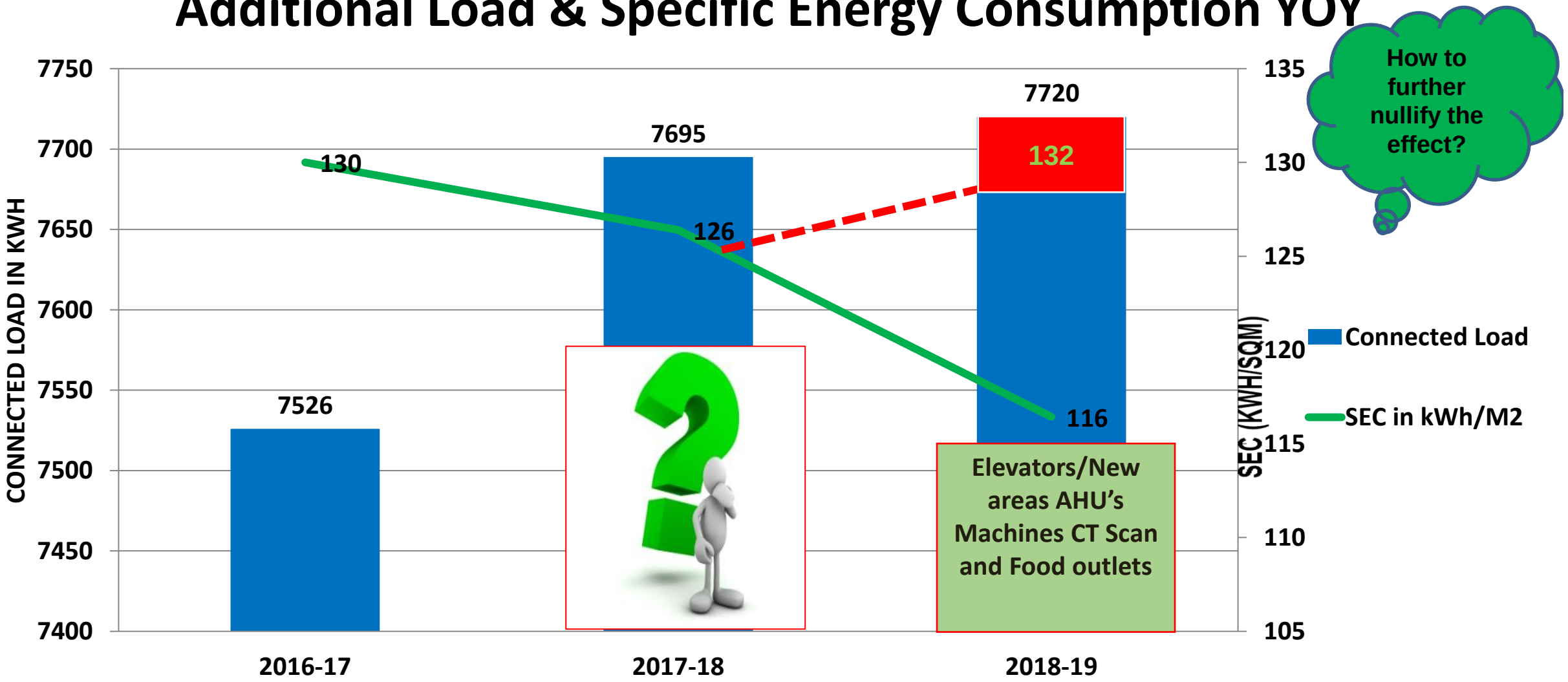
## Additional Load & Specific Energy Consumption YOY



# Problem Diagnosis



The Assessment Criteria adopted included the followings steps:

**Criteria for E-Friendly**

a. Hospital has criteria of the evaluation & acceptance for the environment friendly material usage in the facility.

b. Hospital ensures natural open space for the patients, families and staff of patients.

c. Hospital ensures enough natural light in all parts of the facility i.e. ICUs, Wards etc.

**Optimum usage and conservation of energy resources**

a. Hospital have a strategy for optimization of energy saving and usage.

b. Hospital have developed a plan for usage of renewable energy Self-supply to reduce impact on environment.

c. Hospital have a policy of using energy efficient equipment.

d. Use of LED bulb or solar or other renewable energy source

# Problem Diagnosis



## Optimum usage and conservation of water resources

a. Hospital have a plan for water usage for the whole facility which includes measurement, reduction and verification.

b. Hospital have a plan for usage of alternate source of water like capturing rain water, recycling water etc.

## Process for housekeeping and cleaning agents

Hospital have defined criteria, process and protocols for selection of cleaning products, mops & wipers including;

-Use of Non-hazardous cleaning agents

--Reduce VOC emissions inside and outside buildings.

## Indoor and Outdoor Environment Management

a. Hospital demonstrates initiative by maintaining good indoor and outdoor environment and have walkways, greenery, landscaping , waste management, environmental friendly transports etc.

b. Hospital have a plan for maintaining good indoor air quality and lighting and ventilation.

c. Initiative on Air quality awareness or presence of Air quality monitors

d. IAQ seeks to reduce volatile organic compounds and other air impurities such as Microbial contaminats.

# Problem Diagnosis



**Management of Waste**

a. Hospital have a protocol for receiving, handling, storing and safe disposal of all kinds of waste including recyclables, hazardous, bio medical and e-waste.

b. Hospital comply all bio-medical waste management rule and ensures biological waste is disposed as recommended by national regulations.

c. Composting of waste done

**Purchase and Procurement**

a. hospital ensures that purchase plan include purchase of environment friendly materials which can be reused or recycled as per manufacturers recommendations.

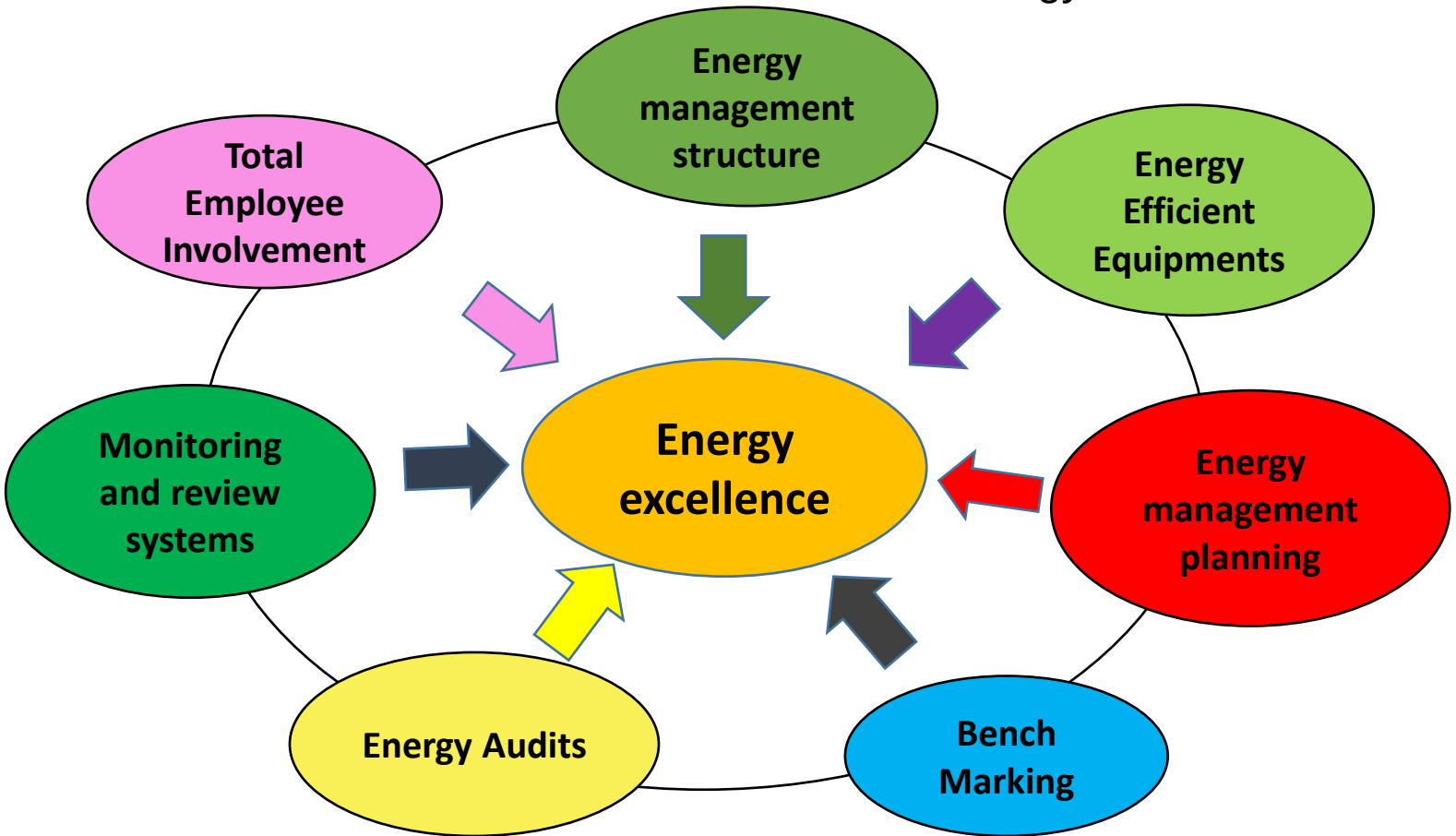
b. Hospital have a purchasing policy that reduce purchase of mercury containing equipment.

c. Hospital have a sustainable food purchasing policies and plan that support human and ecological health.

# Problem Remedy



After successfully building up a professional energy management team and then we constituted an energy management team, commencing with environment friendly system, management & education. In order to stabilize sustainable environmental development towards the goals of “ecology, energy saving, waste reduction, usage of natural lighting, thus continuous efforts over the clean and renewable energy for the carbon foot print reduction.



# Problem Remedy



## OUR ENERGY & ENVIRONMENTAL POLICY

### We Believe In

- **Protect the safety & health of our employees and patients and minimize the environmental footprint for our operations.**
- **Commitment to supply energy on 27x7 basis**
- **Identify, control and endeavor to reduce emissions, waste & inefficient use of resources & energy.**
- **Measure and periodically review our progress and strive for continuous improvement.**

| Fortis | FORTIS HOSPITAL, MOHALI | FHM - 1B |
|---|---|---|
| | | Page No: 1 of 1 |
| | POLICY ON GREEN PURCHASE AND CLEAN HOSPITAL | Reviewed on: 1/7/19 |
| | | Valid till: 30/6/21 |
| PREPARED BY<br>Head Engineering | APPROVED BY<br>Director | |

**1.0 Purpose**

To mitigate ill effects of environment (GREEN) on patients and staff and even hasten the recovery process through infection free ambience (CLEAN).

**2.0 Scope**

The entire hospital building (structural Requirement), processes followed and outcome measured.

**3.0 Procedure**

3.1 The process shall cover the

a) Environment Management Requirement

b) Structural Requirement

c) Process Requirement

d) Outcome Requirement

**4.0 Responsibility**

Various departments across FHM FOLLOWING DIFFERENT LAWS AND REGULATIONS APPLICABLE AS PER STATE, NATIONAL LAWS AND FOLLOWS JCI/NABH/AHPI GUIDELINES.

**5.0 Outcome:-**

a. Hospital has established monitoring, review & verification of Procedures

**b.** Reports ( Third Party Validation)

**c.** Purchasing green products

**5.0 Reference:**

**http://ahpi.in/AHPI%20Standard%20for%20Green%20&%20Clean%20Hospital.pdf**

# Problem Remedy



## We Followed

- Hospital disposes off bio medical waste and hazardous waste as per BMW Rules 1998, and SPCB, Environmental (Protection) Act, 1986
- Use of high efficiency fixtures (water closet &urinal) to reduce the potable water demand.
- Carbon foot print study conducted.
- Conservation through Rain Water Harvesting Pits to ensure water security.
- FHM follows  end-of-life management policy for purchased or inherited equipment till final disposition, including buy back, resale etc.
- FHM follows EIA guidelines under Environmental Protection Act.
- FHM has enumerated goals for elimination of harmful chemical products and choosing safer products and chemicals.
- FHM purchases and uses materials which have less environmental impact in all areas (construction, structure of facility, furnishing, food and cleaning agents, etc.)
- Hospital ensures that pesticides and other chemicals used on the exterior of the facility are applied safely as per MSIHC Rules, 2000
- Housekeeping products as per protocol are procured which are less toxic and environmentally benign

# Problem Remedy

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## WE PRACTISE

## GREEN HOUSEKEEPING

**What is ‘’Green Cleaning’’?**

**Products and Service that reduce the health and environmental impacts compared to similar products similar products and services used for the same purpose.**


**Not Just chemicals, it includes various components such as:**

- **Chemicals**
- **Parking space**
- **Entrance matting**
- **Micro fiber**
- **Recycling and waste reduction**
- **Water and Energy conservation**
- **Procedures, Training, loading and Scheduling**
- **Communications**
- **Recycle Programs / Waste Reduction / Conservation**
- **Equipment and Custodial Hardware**
- **Filters and Paper**
- **Ice Melter**
- **Pest Management**

# Problem Remedy

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## ENVIRONMENT FRIENDLY CLEANING

- Minimize exposure of building occupants and cleaning personnel to potentially hazardous chemical, biological and particulate contaminants
- For all chemicals- avoid /minimize the aerosols
- Minimize atomizing chemicals
- Use toggle top bottles or spray chemicals onto cloths
- Reduce use of virgin paper in janitorial paper
- Use microfiber based cleaning equipment which:
- Cut chemical waste up to :80%
- Increase performance up to 6 times
- Reduce labor up to 70%

# Problem Remedy

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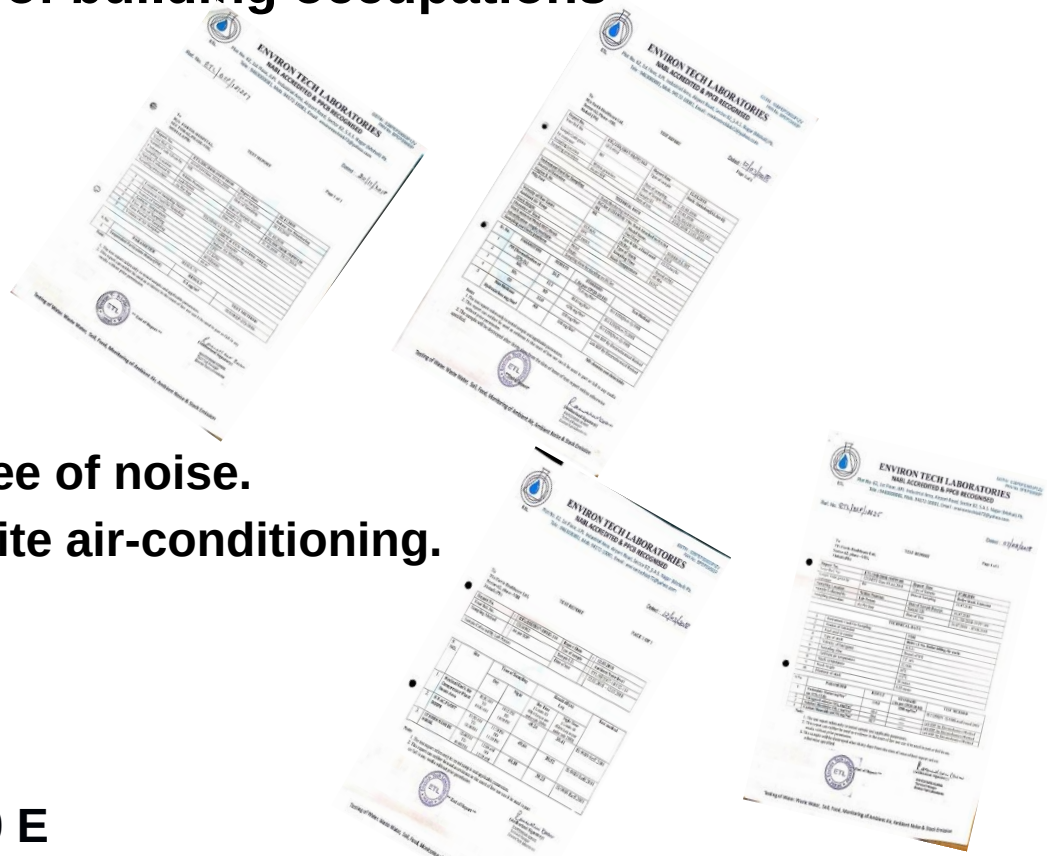
## WE ENSURED

### Indoor Chemical Contaminant Reduction

**Reduce and eliminate the use and improper disposal of chemical hazards and toxic materials with in the health care facility to safeguard the health of building occupations**

### Regulated Medical Waste Reduction

- **Facility policy for regulated medical waste disposal.**
- **Segregate all non-medical waste before incineration.**
- **Alternate method to treat Medical Waste**




### Sound Reduction

- **Provide building occupants with a healing environment free of noise.**
- **Locating patient rooms away from any source of noise quite air-conditioning.**
- **Insulation in the walls that prevents noise**

### Environmental Monitoring

**100% Compliance against the pollution norms**
**Medical Compressed Air Validation as per ISO 8573-1: 2010 E**

# Problem Remedy



## Best Practices Implemented on Energy, Water & Environment

- Metering of individual buildings is implemented to monitor water consumption trends.
- Maintaining almost zero discharge policy.
- Conducting Daily inspection walkthroughs for identification of any water losses.
- Use of separate storm, sewage and oil water separators drains to avoid ground water contamination.
- Celebration of Environmental day, Engineers day etc.
- Celebration of hand hygiene awareness week.
- Continuous maintaining of Power factor above 0.98 from past 4 years.
- Regular de-dusting of lighting fixture.
- Cleaning of filters in air conditioning system.
- Switching off lights/monitors/AC when not in use.
- Use of high –efficiency fixtures (water closet & urinal) to reduce the potable water demand.
- Raw and treated sewage quality monitoring.

# Problem Remedy

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## *Green Supply Chain*

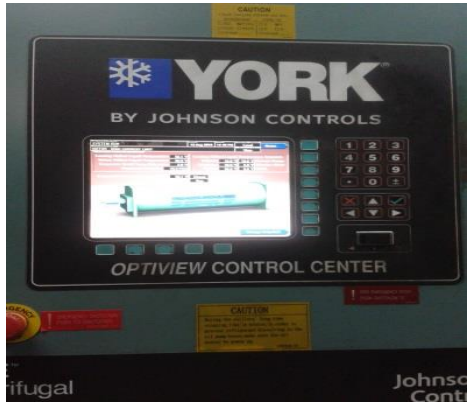
***a. Information on Projects implemented–*** **Our Housekeeping cleaning Agents & Card Board and Wooden Packing Boxes are purchased from identified vendor who manufactures with Recycled material.**

***b. Information on Evaluation done–*** **Different vendors were evaluated and manufacturing processes and materials used were certified by FHM as per FHM standard before giving clearance for the Boxes.**

***c. Information on Benefits achieved-*** **50% reduction in cost and contribution to green initiative by the company.**


**Segregation of dry and wet garbage at kitchen**
**Wet garbage 100% recycling through AGGA for piggery**

**Our Green chillers provide air conditioning comfort with lowest electrical energy**






**Minimize exposure of building occupants and cleaning personnel to potentially hazardous chemical, biological and particulate contaminants**

# Problem Remedy

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## Environment projects & Projects linking with Carbon Emission Reduction

**Landscaping -5Acre Approx..**

The Hospital consists over 45% of landscapes with over 150 varieties of green plantation of native, less water consumption plants. Hence reduction in water and power consumption which caters to reduction in carbon emission and environmental friendly. All water is being utilized STP water.


**Rain water harvesting pits**

Creation of rain water harvesting pit which is having the capacity to percolate over 76% of rain water considering 3 years of average rainfall, Which is environmental friendly as it improves ground water table.

# Problem Remedy

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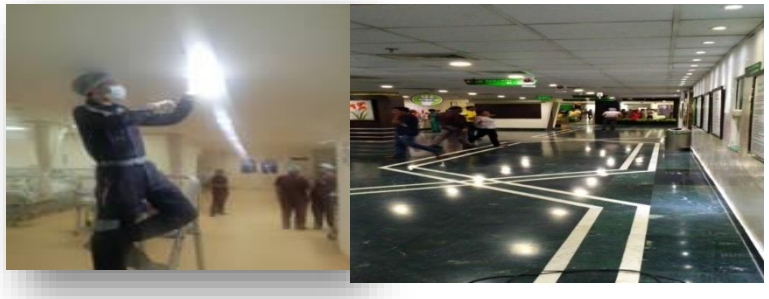
| Green Initiatives4538 | Amount Saving INR (Million) | CO2t Reduction | Equivalent to trees planted |
|---|---|---|---|
| Going the LED way | 3.39 | 432 | 29376 |
| Solar electricity generation Rooftop | 0.25 | 68 | 4674 |
| Solar water heating | 1.98 | 57 | 148 |
| Solar electricity generation in car parking | 0.2 | 65 | 4538 |
| Rain water harvesting pits | | | Improved ground water security |

Reduction of 622 CO2t by these projects



**Going the LED way**

**Rain water harvesting pits**

**Solar electricity generation Rooftop**

**Solar water heating**

**Solar electricity generation in car parking**

# Problem Remedy

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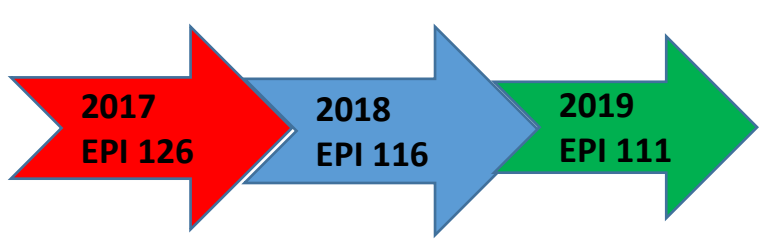
## Our Journey on Energy Conservation




BEE National Benchmark 200

**1999**

Best Design Award from American Institute of Architects

**2017**

1. Replacement of Old Vacuum Pumps with new VFD operated Vacuum Pumps
2. Solar Photovoltaic Panel Parking and lift mumty
3. Hot water generation through solar water heating system

**2018**

1. Chillers on VSD
2. PNG for Boilers
3. Installation of ETP and reutilization of Water
4. VFD operated Air compressor

**2019**

1. Automatic Chiller Tube cleaning System
2. PNG for Kitchen
3. Replacement of Conventional AHU's with VFD operated AHU's
4. Additional Automatic power factor controller
5. STP Modification with UV

# Problem Remedy

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## WATER – CONSERVATION METHODOLOGY

### Use of New Technology

- Automated Water Taps
- Sprinkler System for Irrigation
- Automated Urinals


### Renewable Substitution

- Rain Water Harvesting
- Municipal Waste Water Treatment and Reprocessing

### Water Recycling

- STP Plant
- ETP Plant
- UV/SOFTNER in STP
- RO Reject Water

### Efficiency Improvement

- Benchmarking
- Auditing
- Monitoring & Analysis
- Improving

### Innovation

- MGF Backwash
- AHU Condensate
- Cooling Tower blow down Reuse

Water Less Urinals - Bio Tabs

Water Flow Restrictors

# Locking the Improvement

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1. The Energy team has monthly meetings scheduled and Data is analyze and presented to Energy Head and progress is continuously monitored. The benefits of the projects is reviewed

2. The results of initiatives are checked in real time for example Energy Consumption:-Reduction of 10.76% compared to 2016-17.

Morning Meet with all HOD & GM

Engineering Executive Meet

Engineering Staff level meet

Daily Energy consumption compared to last year

Online energy data capturing system

Online HVAC monitoring system (BMS)

Energy meters for load capturing

Compare and analyze deviation in shift, shift-wise

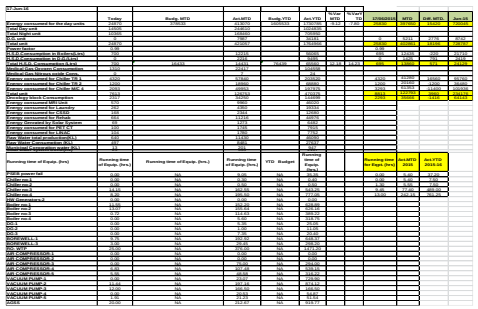
Daily energy report

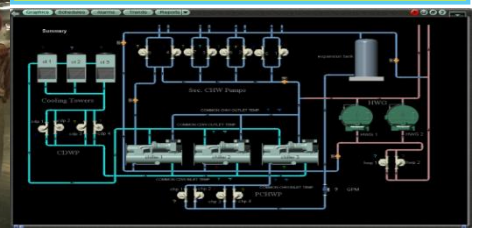
Monthly report on the energy indices

Monthly performance review

Energy trends analysis

Action plan for any deviation





**ELECTRICIAN**

- Recording Units shift wise

**SHIFT ENGINEER**

- Formatting Daily Report

**CHIEF ENGINEER**

- Discussing and Analyzing with All HOD's and Engineers

# Locking the Improvement -ENCON Roadmap

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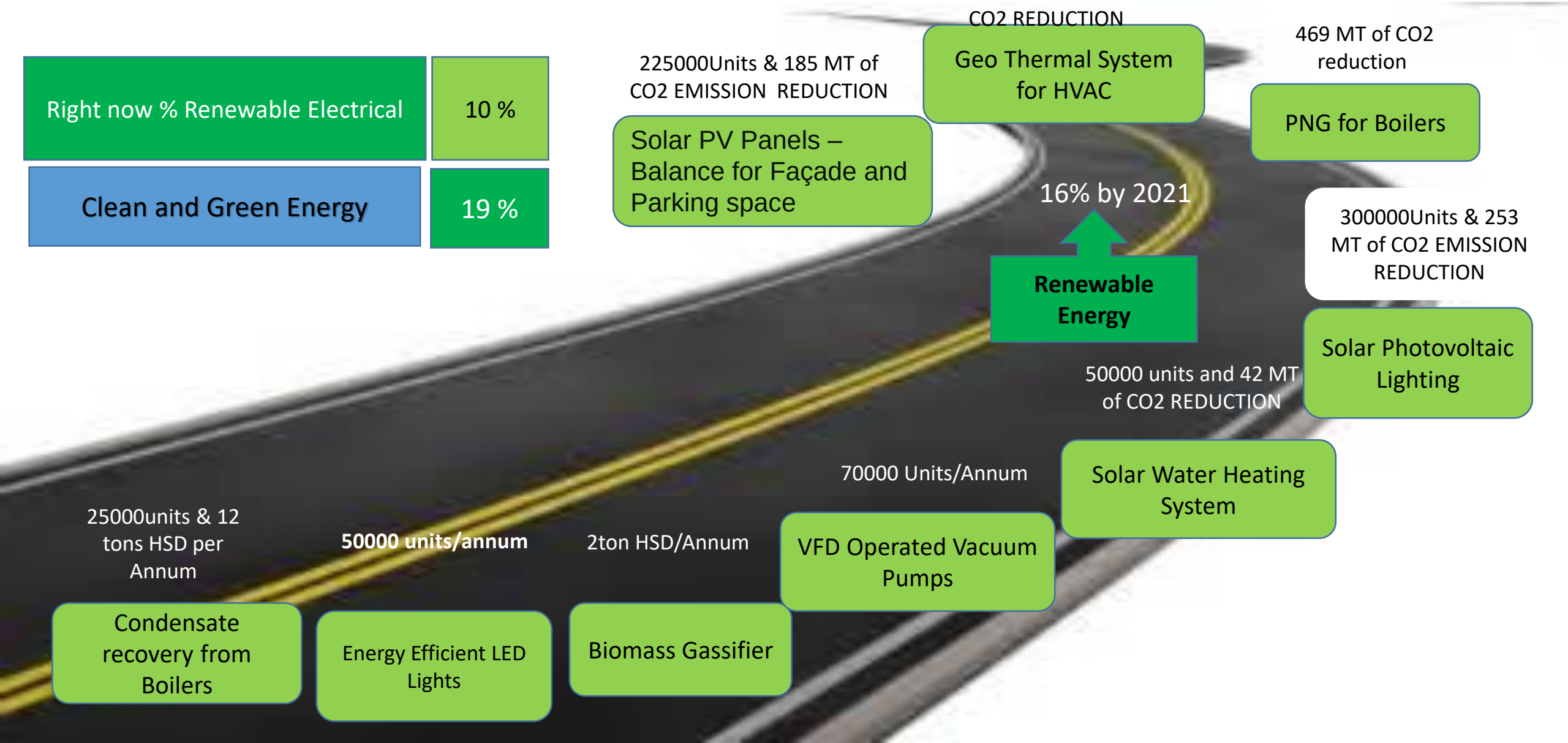


# Locking the Improvement



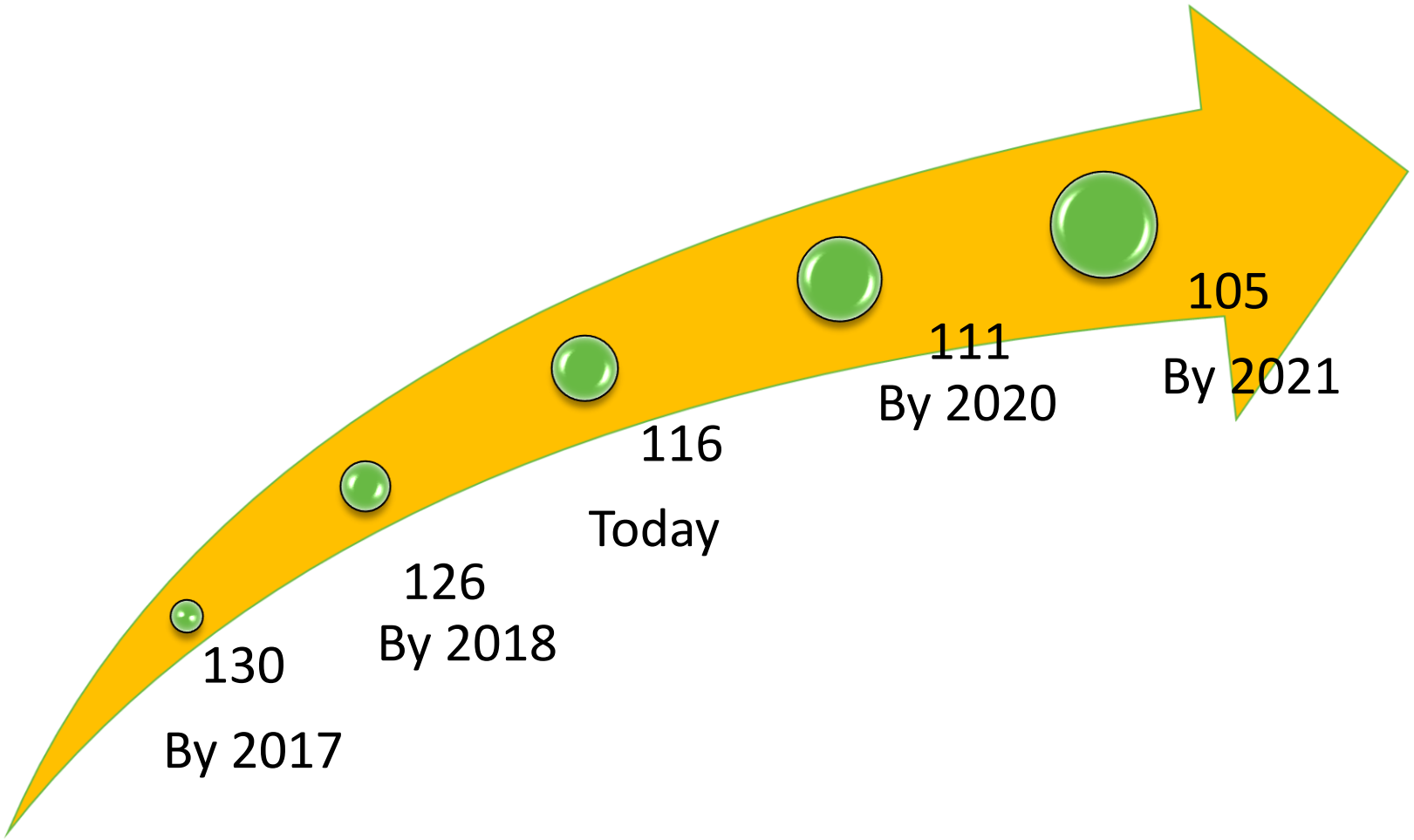
| FUTURE ENCON PROJECTS | |
|---|---|
| **Year** | **Description** |
| **2019-20** | **VFD's on Identified AHU's for Patients wards** |
| **2019-20** | **Geo Thermal system to stop usage of Cooling Towers for water cooled Chillers** |
| **2020-21** | **Solar PV Panels – Balance for Façade and Parking space** |
| **2020-21** | **Heat Pump for Hot Water** |
| **2021-22** | **Power Optimizer for Chiller Machines** |

# Locking the Improvement



## Going forward

### SEC kWh/SQM



# Cloning the Improvement

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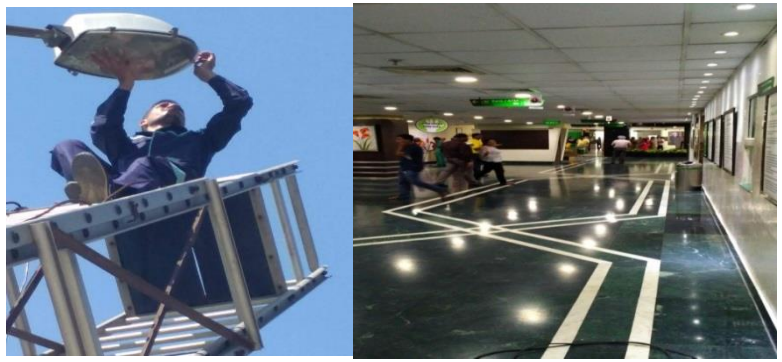
Yes, the initiatives have been discussed and based on the location. The projects for energy conservation have been replicated after panel discussion by energy managers across all Fortis Hospitals.

**LED Lighting**



**Solar electricity generation**

**Solar water heating**

**PNG for Boilers/Kitchen.**

**Rain water harvesting pits**

**Energy Efficient Motors**

**ETP and Re utilization of STP Water**



**Use of foam flow in taps.**


**Segregation of dry and wet garbage at kitchen**

# Tangible Results

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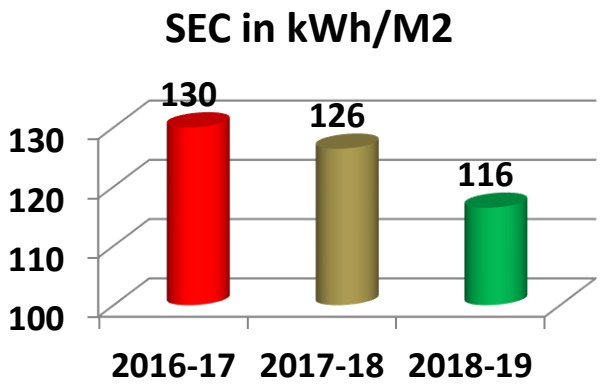
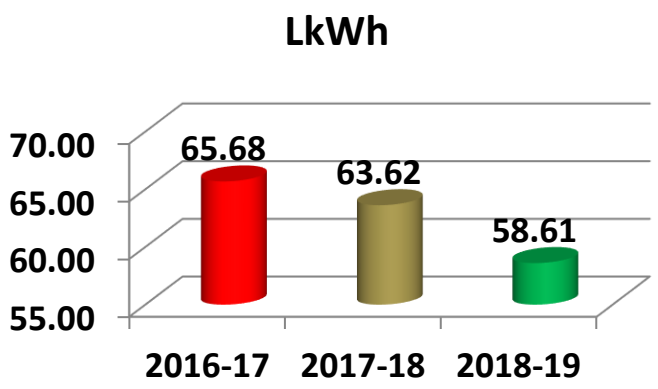
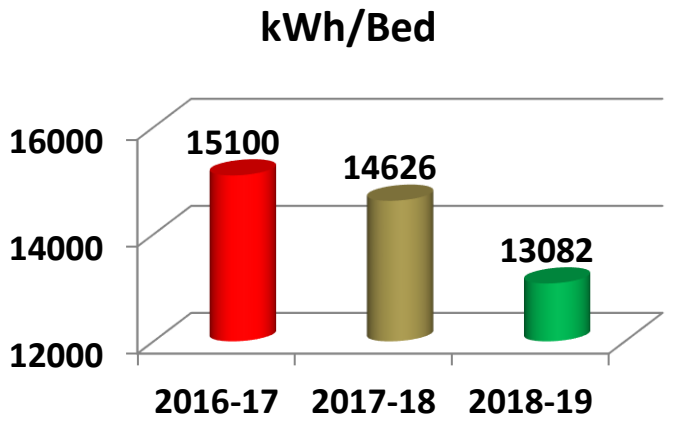
## SPECIFIC ENERGY PERFORMANCE IN LAST 3 YEARS FOR ELECTRICAL ENERGY

| Parameter | 2016-17 | 2017-18 | 2018-19 |
|---|---|---|---|
| KWH (in Lakhs) | 65.68 | 63.62 | 58.61 |
| SEC in kWh/M2 | 130 | 126 | 116 |
| kWh/Bed | 15100 | 14626 | 13082 |
| No. Of Beds | 435 | 435 | 448 |
| Average Occupancy% | 89 | 89 | 88 |
| Built Up area | 50336 | 50336 | 50336 |



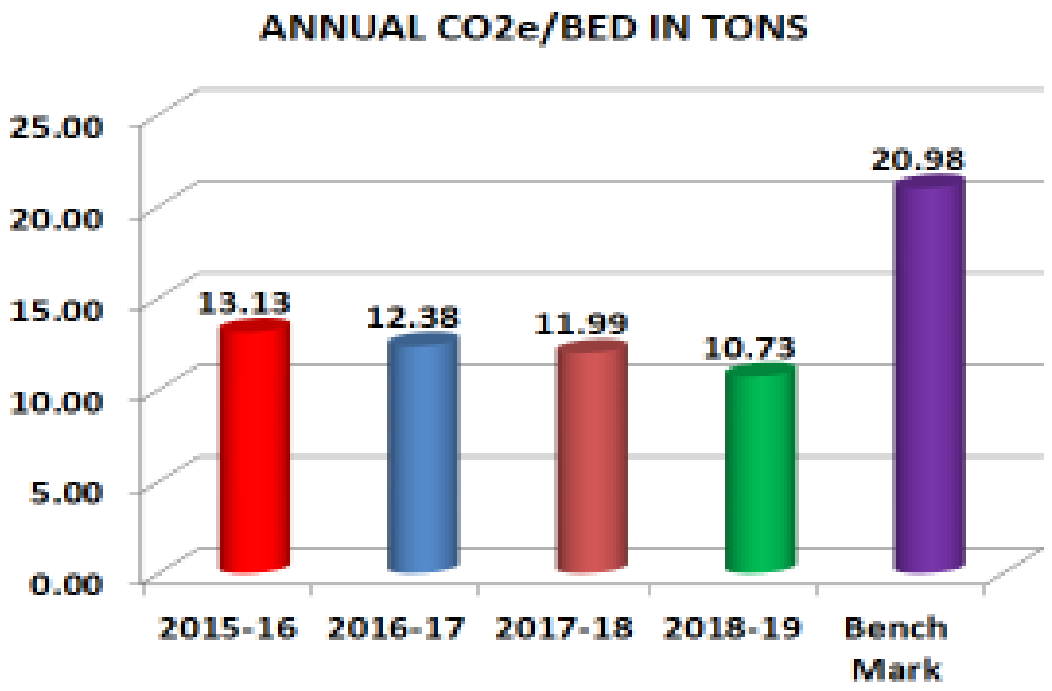



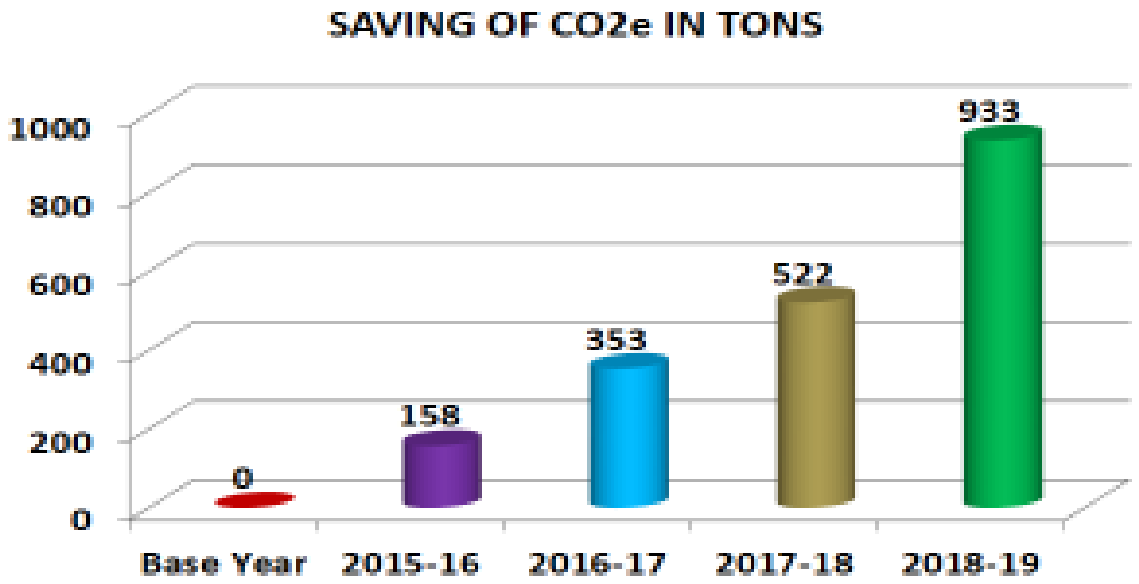

- ✓ SEC:- There is a reduction of 10.76% compared to 2016-17
- ✓ Energy Consumption:-Reduction of 10.76% compared to 2016-17
- ✓ kWh/Bed:- Reduction of 13.76% since 2016-17

# Tangible Results



## Carbon Footprint Reduction



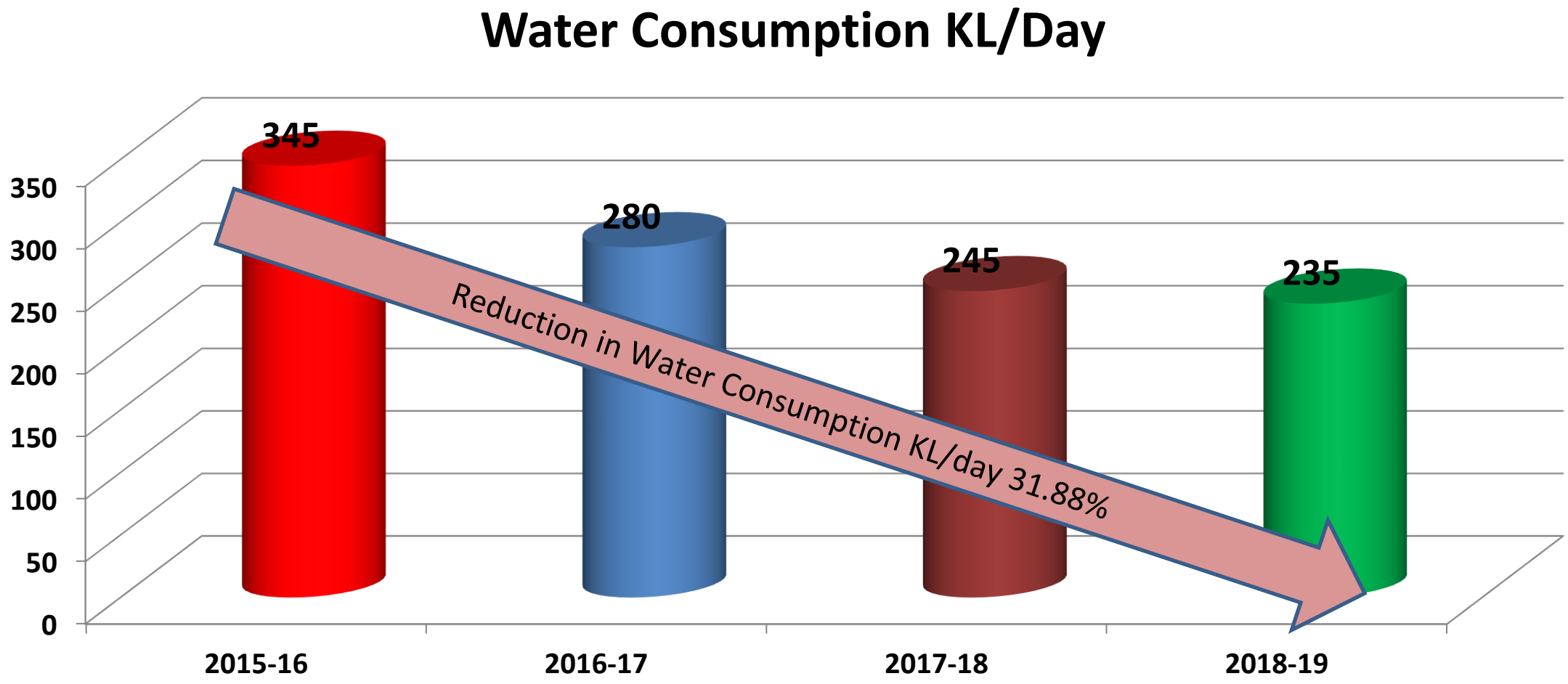

**Reference** IFHE : International Federation of Hospital Engineering 2013

**CO2e Calculation for EB units from Central Electricity Authority of India (0.82kg/unit)**
**CO2e Calculation for PNG from www.epa.Gov/energy/greenhouses (1.95mtCO2/SCM)**
**CO2e Calculation for HSD from ecoscore.be (2.64kg/ltr)**

# Tangible Results



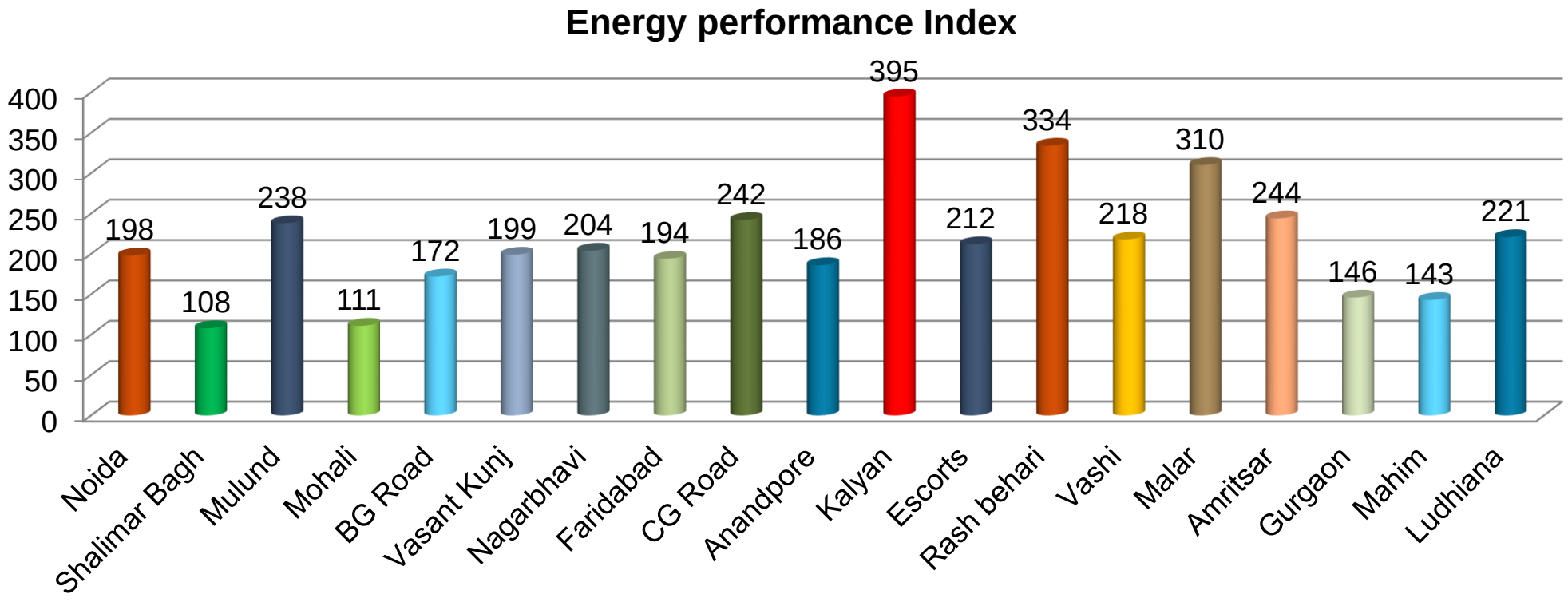
## Average Water Consumption Trend



# Tangible Results



## EPI Index across Fortis Hospitals




**Energy performance Index for Fortis Group Hospitals All Weather**

# Tangible Results

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## FROM UTILIZATION OF RENEWABLE AND GREEN ENERGY

| SNo | Description of scheme | Amount INR | Year | Remarks |
|---|---|---|---|---|
| 1 | Installation of ETP and reutilization of water | 1000000 | 2018-19 | Annual saving of 60000 Units & Maintain Ground Water table |
| 2 | Use of foam flow in taps | 70000 | 2018-19 | Annual saving of 20000 Units |
| 3 | Shutting off One AHU instead of 2 during night operations | 10000 | 2018-19 | Annual saving of 24000 Units |
| 4 | PNG (Piped Natural Gas) for Kitchen | 70000 | 2018-19 | Annual saving of 00 Units |
| 5 | PNG (Piped Natural Gas) for boilers | 750000 | 2018-19 | Annual saving of 28800 Units |
| 6 | LED Replacemwent (Phase 3) | 1000000 | 2018-19 | Annual saving of 99000 Units |
| 7 | LED Replacement for balance CFL Lights | 100000 | 2017-18 | Annual saving of 50000 Units |
| 8 | Solar Photovoltaic Panels in Parking and lift mumty | 9000000 | 2017-18 | Annual saving of 275000 Units |
| 9 | Solar Lighting 200 KW | 9800000 | 2016-17 | Annual Saving of 300000 Units |
| 10 | Energy efficient LED lights Placed at Number of Places | 4900000 | 2016-17 | Annual saving of 472000 Units |
| 11 | Water Conservation by utilizing STP water in toilets etc. | 600000 | 2016-17 | Annual saving of 10000 Units and 1000Ltrs HSD |
| | Summary Co2 Emission Reduction 933 MT (App) | 27300000 | | Savings 13.39LkWh Units |

# Tangible Results

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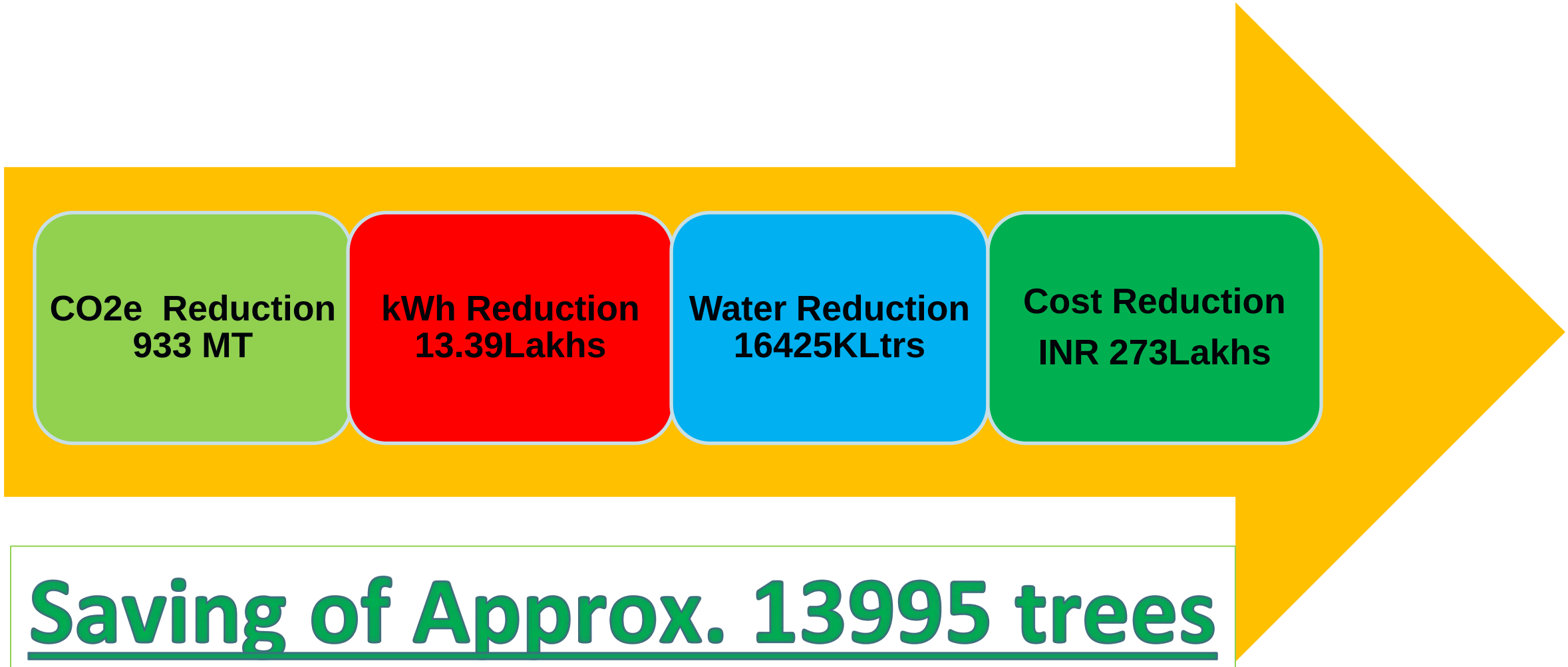


**Saving of Approx. 13995 trees**

Source: https: carbonneutral.com.au/faqs/

# Intangible Results

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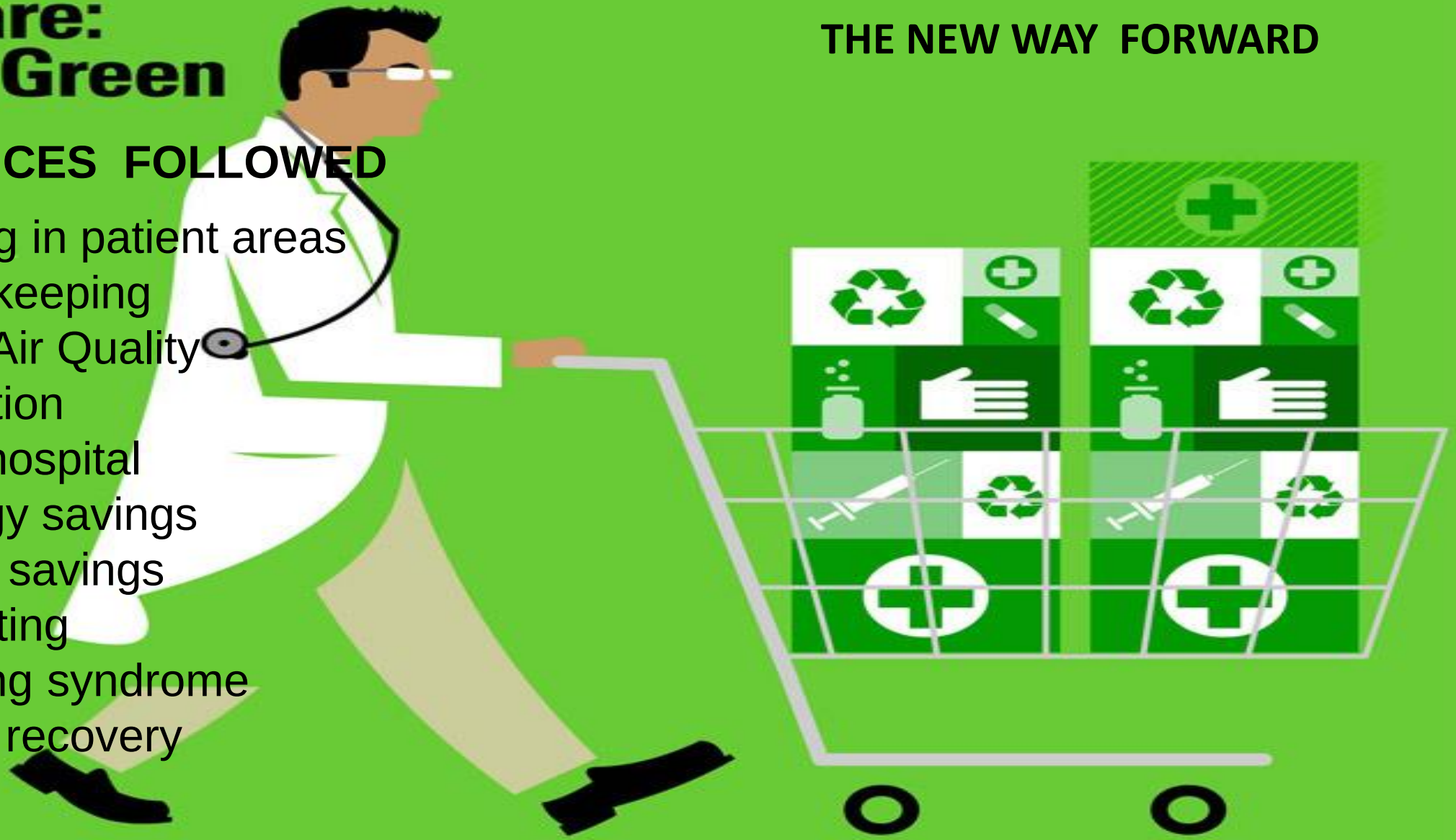
## Healthcare: Globally Green

### BEST PRACTICES FOLLOWED

- Natural lighting in patient areas
- Green house keeping
- Better Indoor Air Quality
- Sound Reduction
- Mercury free hospital
- 13-30% Energy savings
- 35-40% water savings
- Good day lighting
- No sick building syndrome
- Faster patient recovery

### THE NEW WAY FORWARD



# FHM Awards & Recognition

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***Healthcare***


- AHPI Award for Quality Beyond Accreditation - 2019
- AHPI Award for Best Green Hospital-2016-2019
- NABH Nursing Excellence- 2016
- CII National award for Excellence in Energy Management- 2016, 2017,2018, 2019,2020
- Indian Health & Wellness Awards 2016
- BEE NATIONAL ENERGY CONSERVATION AWARD 2015
- AHPI Award for Quality Beyond Accreditation - 2015
- Asia Pacific Hand Hygiene Excellence Award- 2015
- No. 1 Private Multispecialty Hospital in Chandigarh – The Week – Nielsen Best Hospitals Survey -2015
- State Energy Conservation Award PEDA-2019
- Multispecialty Hospital in Chandigarh – The Week – Nielsen Best Hospitals Survey – 2015, 2014
- Doc n Doc Gammex Saviour - Best Multispecialty Hospital - 2014
- Best Sustainable Hospital Project Award by HBII-MEDGATE - 2014
- Pan Fortis Innovation Award - 2014
- Intel Embedded Challenge Award for Innovation in Industry (Catheter reprocessing) 2014

# *Minimizing Wastage >>> Innovation*

***Not just lives, but saving the earth as well.***