Carrier

turn to the experts

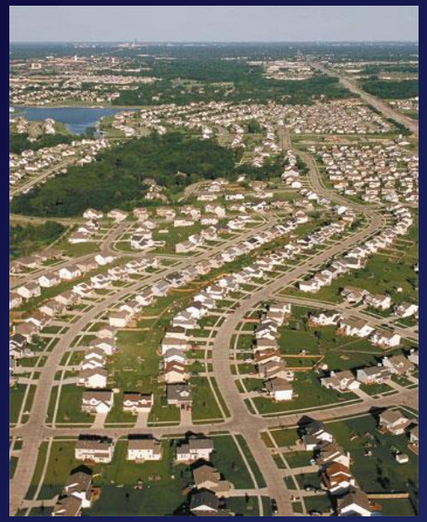
THE 9TH GRIHA SUMMIT 2017

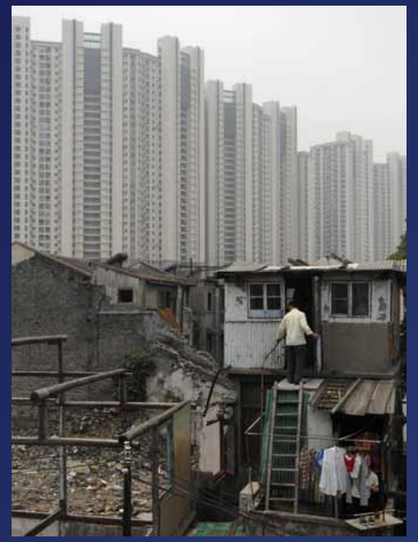
GRIHA

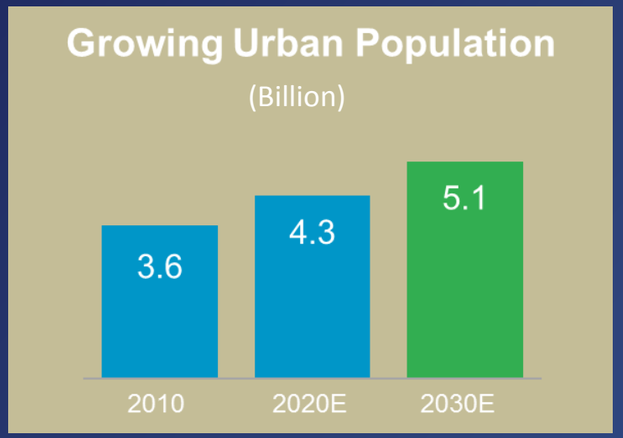
Existing Today
Retrofitted for Tomorrow

Urbanisation

Population Shifts and Energy Demand







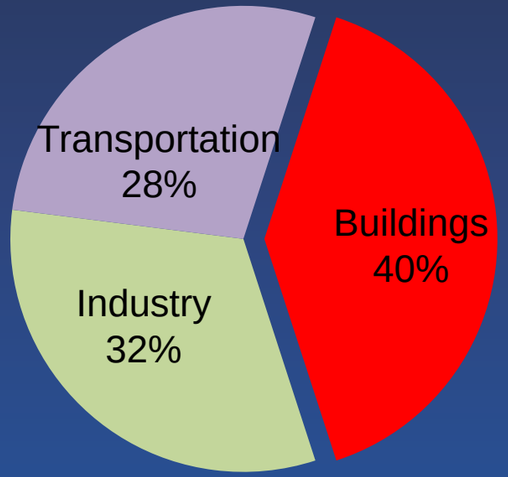
Region	% of Final Energy Use in Urban Areas
North America	86%
Pacific OECD	78%
Western Europe	81%
Eastern Europe	72%
Former USSR	78%
Sub-Saharan Africa	54%
Latin America	85%
North Africa & Middle East	84%
China & Central Pacific Asia	65%
Pacific Asia	75%
South Asia	51%
World	**76%**

Source: Global Energy Assessment (2012)

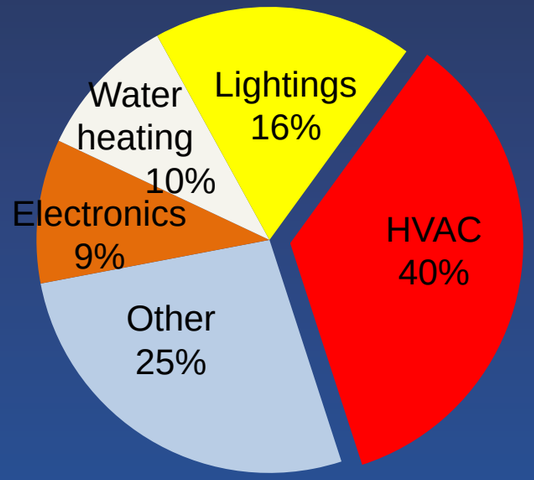
Overview

Energy Pareto

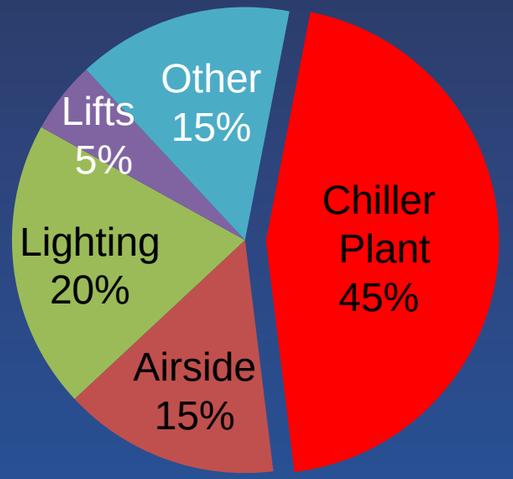
Global



Buildings
(USA)



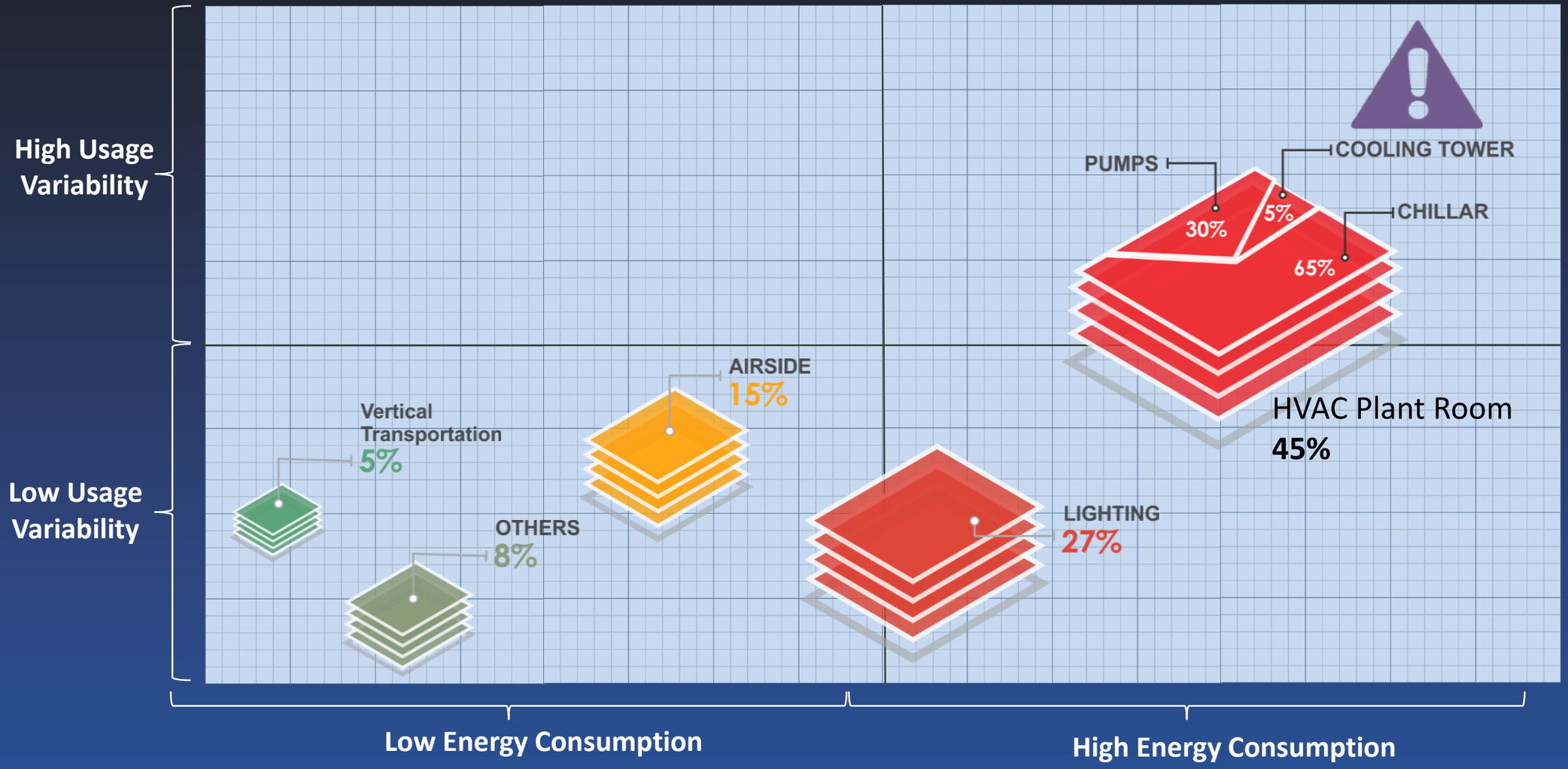
Hotel
(Tropics)



Source : WBCSD, Report 2009. U.S. DOE, Energy Data Book, Oct. 2009

Source : Carrier Singapore's estimates

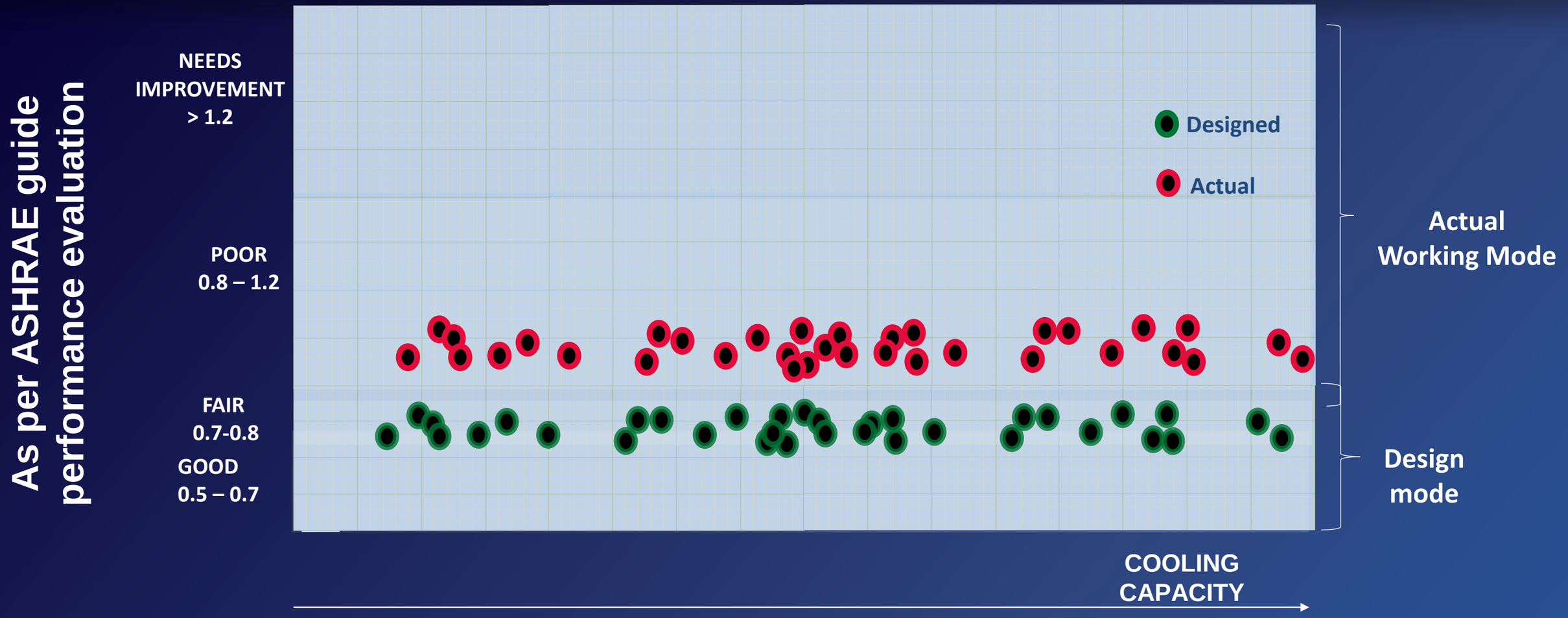
ENERGY IN BUILDINGS



HIGHER VARIABILITY AND HIGHER ENERGY CONSUMPTION OF THE CHILLER PLANT IS LEADING TOWARDS HIGHER OPERATIONAL COST

PLANT ROOM ENERGY CONSUMPTION

Efficiency Variance Vs Design



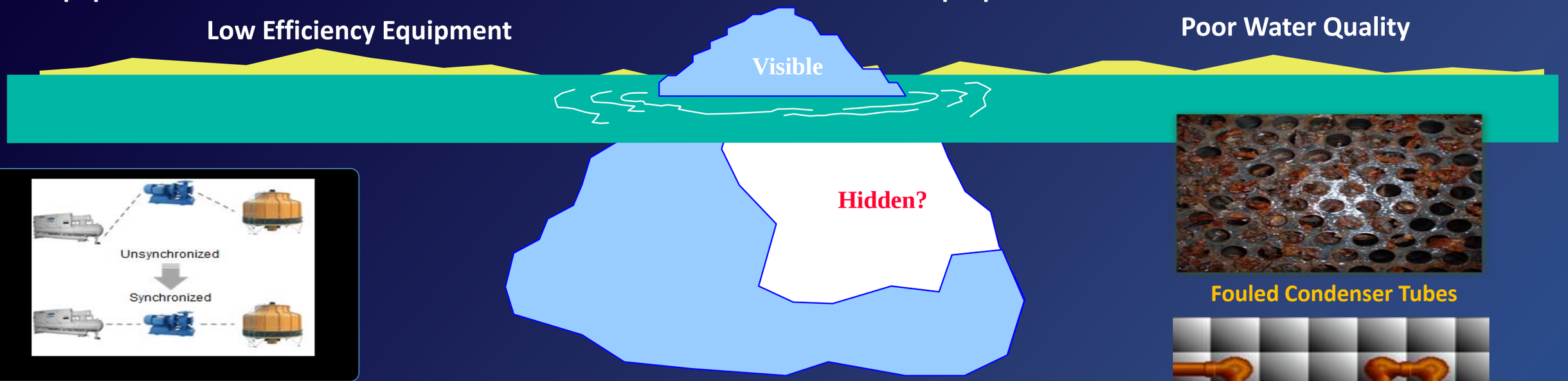
REASONS OF ENERGY LOSS

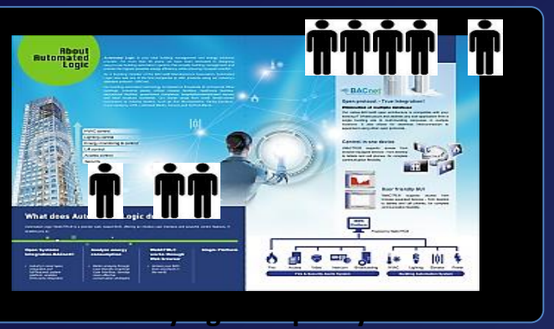
Old Equipment

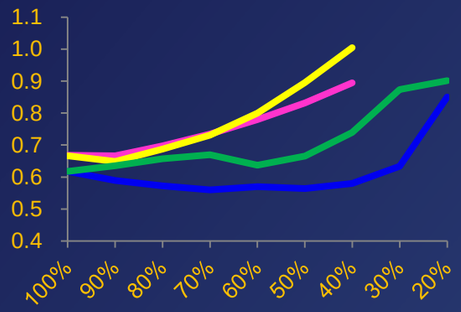
Low Efficiency Equipment

Improper Maintenance

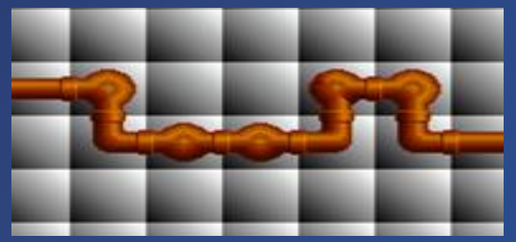
Poor Water Quality







Fouled Condenser Tubes



Many Piping Bends

Wrong Cooling Tower Installation

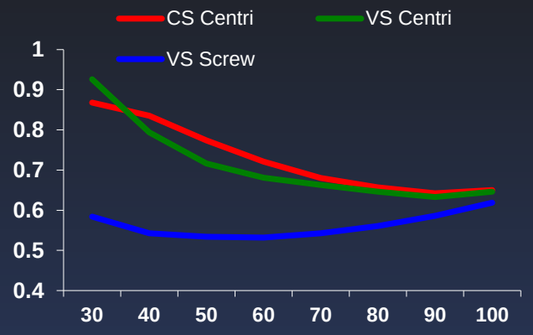
Non Coordinated System

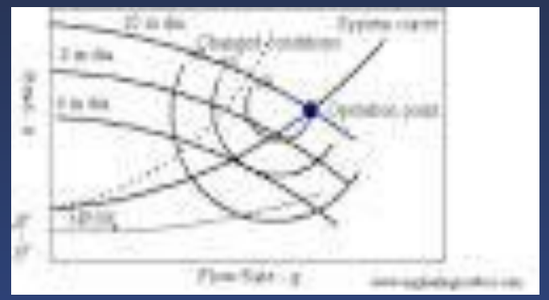
Wrong Equipment Selection

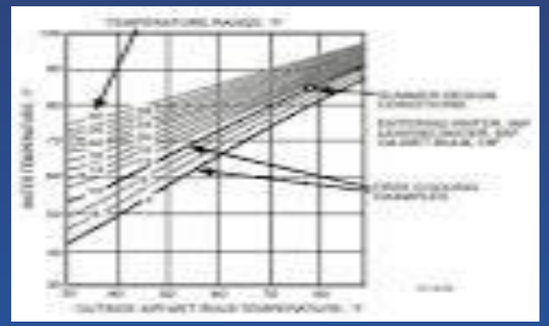
No Measurement / Diagnostics

System Waste

PLANT ROOM SYSTEM





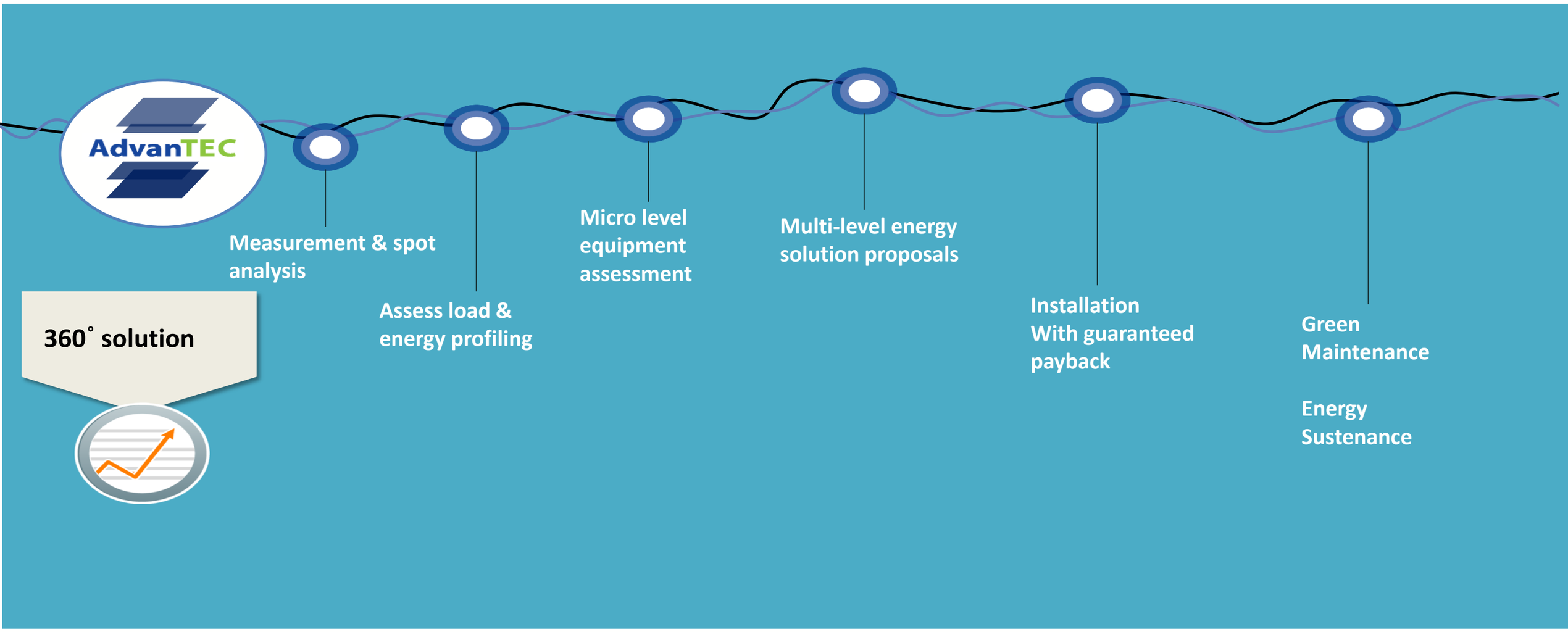


Each equipment has its own Operating Curve at various Load and Ambient (Operating) Conditions

System Level efficiency depends on :

- ❖ Equipment Efficiencies
- ❖ Synchronization between equipment at varying operating conditions
- ❖ Optimization algorithms to deliver the output at lowest energy

PLANT ROOM ENERGY CONSUMPTION
Efficiency Improvement



Case Studies : India

Carrier
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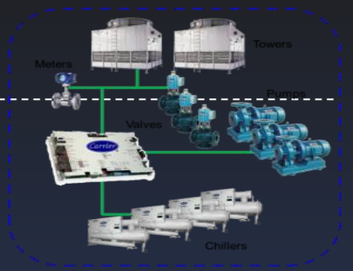


ASHRAE Guide

Chiller Plant System Efficiency (ikW/ton)

Poor
Fair
Good
Excellent

1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50

$98k/yr Committed savings

$131K/yr Committed savings

$545k/yr Committed savings

$221k/yr Committed savings

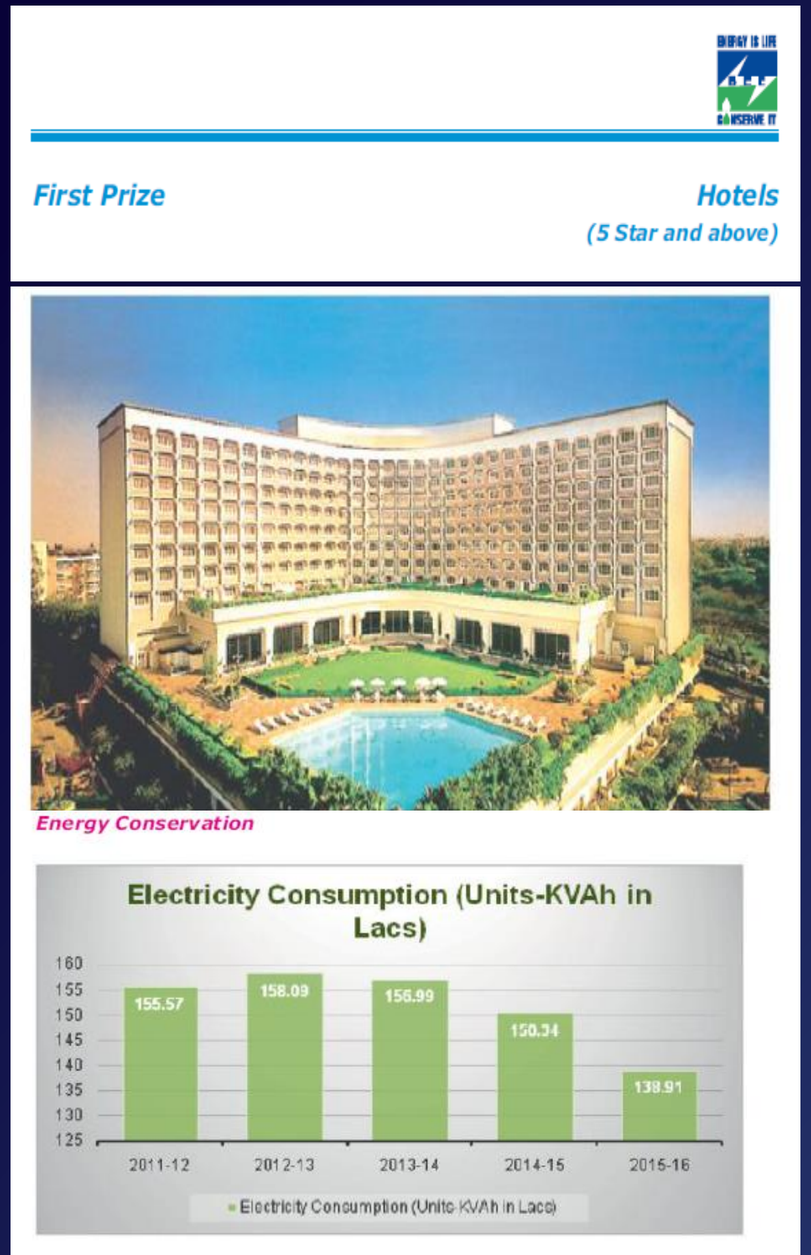
$130k/yr Committed savings

$90k/yr Committed savings **$98k 3 Months saving**

AdvanTEC

10.4 Million Units of energy saved in 2017

Taj Hotel Case study



2014 Baseline

- 52-58% Electricity Consumption from HVAC
- 40-45% Contribution from Chillers, Pumps &CT

Intervention :

Building Audit
Energy Efficient VFD Chiller Retrofit
Plant System Manager with advanced controls

Results : Nine Months – July'15 to Mar'16 (without peak months Apr-June)

- ✓ 26% Plant Room Efficiency Improvement
- ✓ 100,000 KWH Savings
- ✓ 90 Lacs Monetary Savings
- ✓ 23000 Litres of HSD Savings for Diesel Generator

CASE STUDIES - ASIA

Savings: 30%
Payback: 2.2 years

Savings: 30%
Payback: 2.7 years

Savings: 35%
Payback: 2.8 years

Savings: 13%
Payback: 3.5 years

Savings: 56%
Payback: 3.8 years

Savings: 33%
Payback: 7.5 years

UTC TERI CENTRE OF EXCELLENCE

ASHRAE Level 2 Audit

Report Submission with ECM & Payback Analysis

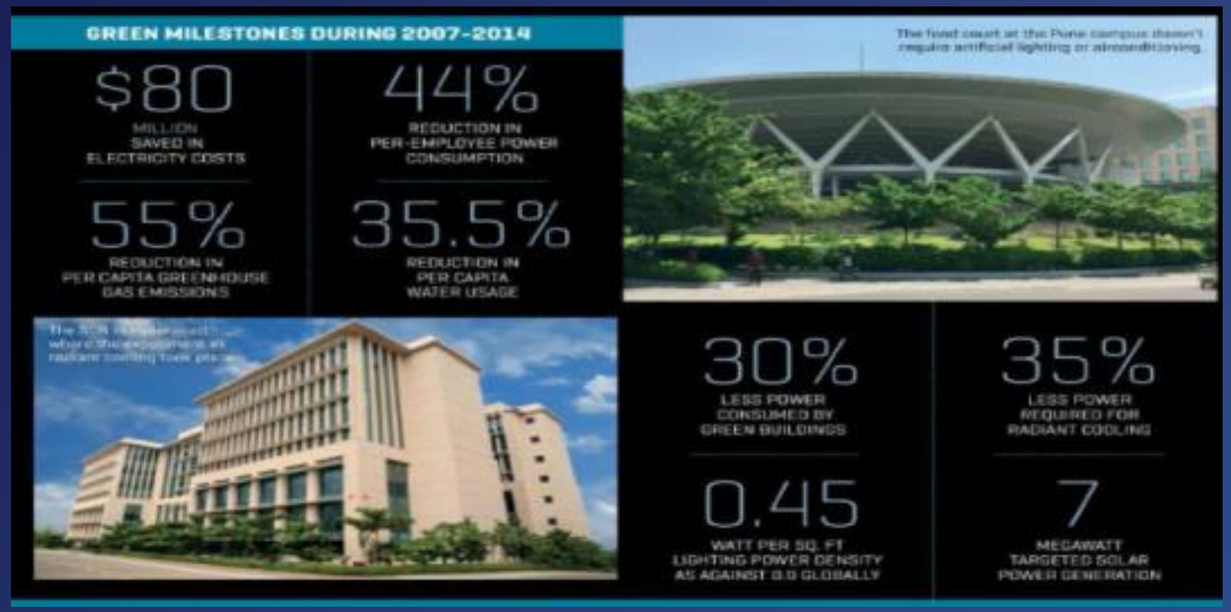
Retrofit Financing Solutions & Implementation

M & V Post Implementation

Submission of Findings to BEE

- Study of Energy Efficiency in Building in five climatic zone in India
- ASHRAE Level 2 Audits
- Enabling Asset owners to realize the energy savings potential
- 32 Detailed Audits Completed & 26 Mil KWH Savings potential identified per annum
- TERI UTC COE program intends to cover the Retrofit Project Cycle .
- COE can assist in sourcing technology to implementation and verification of energy savings.

Infosys Case study



$80M
ELECTRICAL ENERGY COST

3X
LIGHTING ENERGY

3X
AIR-CON ENERGY

Optimum Energy Use

Improved Comfort

Operational Efficiency

Lower Breakdown

CONVERGING BUILDING TRENDS

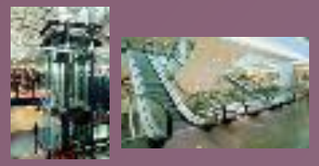
Energy efficiency

HVAC

Controls

Operational efficiency

Vertical Transportation

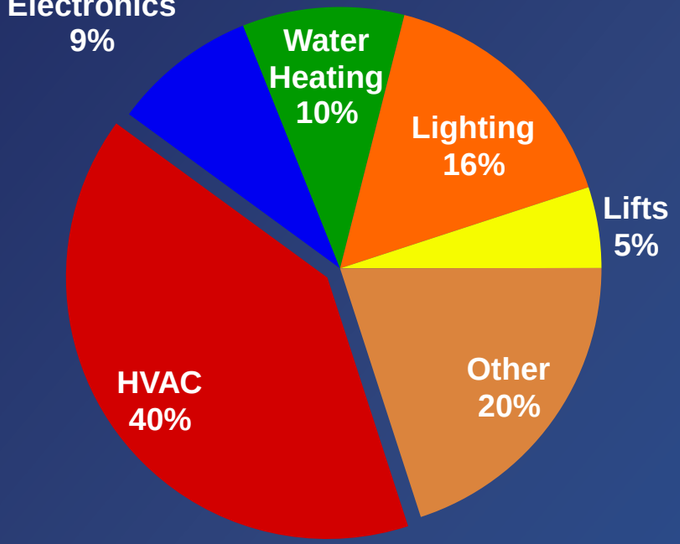


Security systems

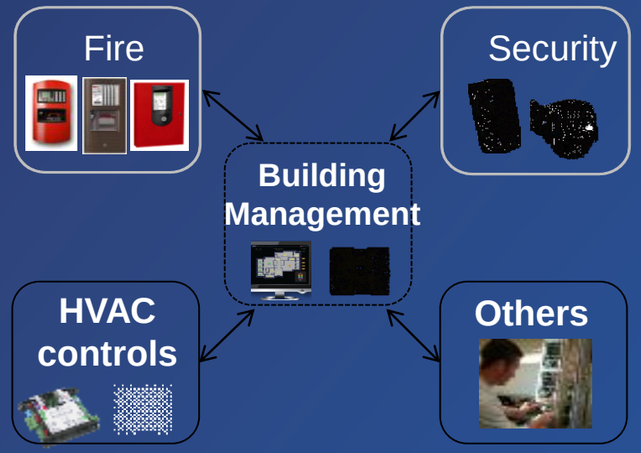
Fire systems

Building management

Energy efficiency

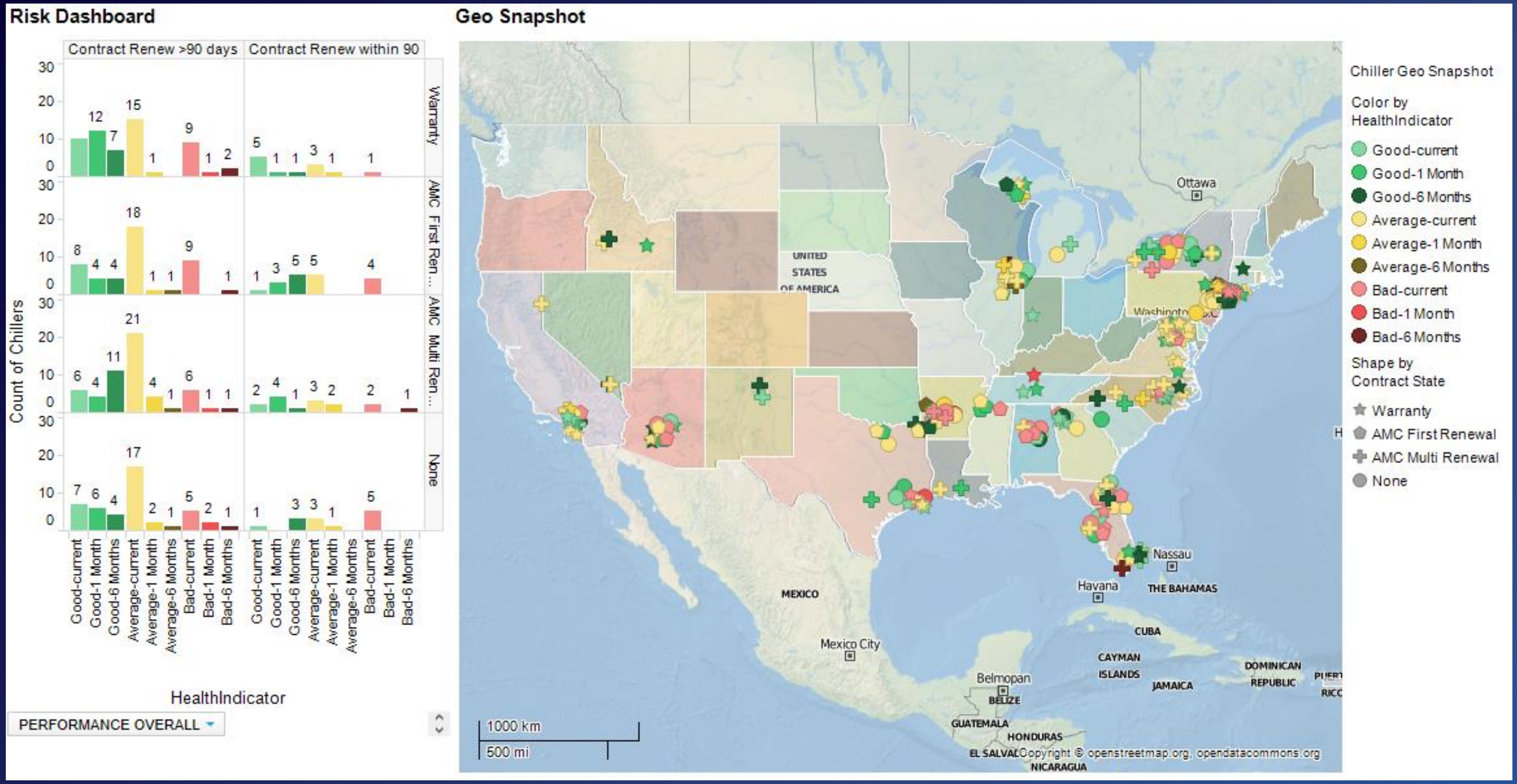


Operational efficiency



Data source: U.S. DOE, building energy book

The Next Evolution….Analytics using IOT !




United
Technologies