

# Big Box Retail

## Thinking Outside the Box?

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# Major Themes

- Share technical information about what Wal-Mart has done in HVAC, Lighting, Refrigeration and Controls
- Share how we can collectively improve the scale of developing technical markets for HVAC, Lighting, Refrigeration and Controls
- Encourage suppliers and manufacturers to support our design processes so that we can efficiently and sustainably improve the performance and quality of our building systems

# Vision

Started in 2004 with challenges to change our business to take on responsibilities more deeply

Lee Scott's 21<sup>st</sup> Century Leadership Speech on Oct 24<sup>th</sup>, 2005

New stores 25-30% more efficient and 30% fewer greenhouse gases next 4 years

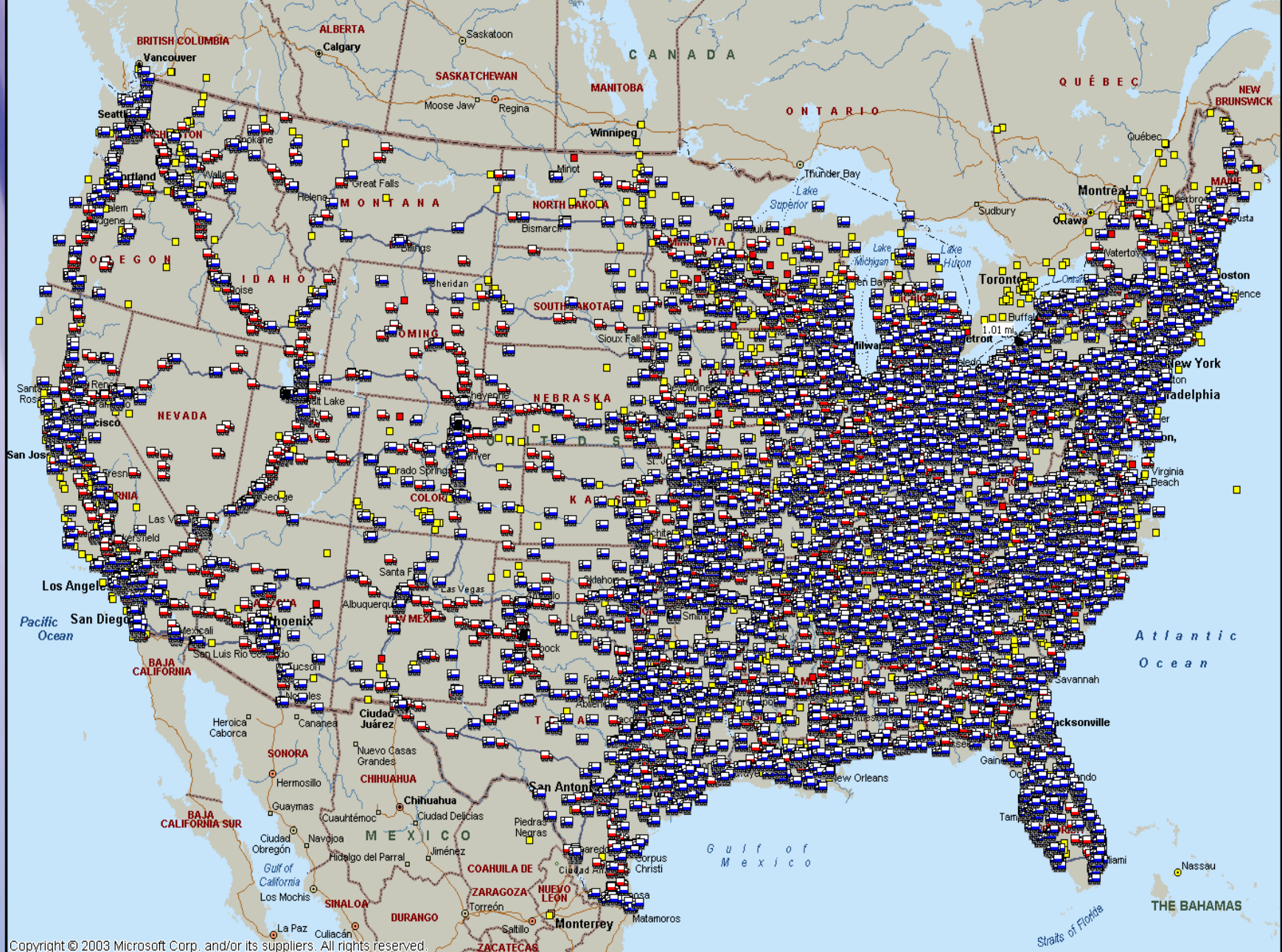
Reducing greenhouse gases at our existing store, club and DC base around the world by 20% next 7 years

Sharing all learnings in technology with the world, including our competitors (the more people who can utilize this type of technology the larger the market and more we can save our customers)

# Getting Started

## Providing the Perspective

- Identifying the Challenges
  - It's a lot of work
  - Finding the right people to work with
  - Lack of definitions / standards
  - Defining a “success metric” to measure by
  - Understanding Scale



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Scale: One of greatest strengths and challenges



GOT SCALE?

# Design Ownership

What does that mean?

- First, it redefines how technologies get into our store designs and how each technology goes to market.
- Secondly, it gives the “owner” greater flexibility to the technical application and still control costs.
- Thirdly, it drives technical industries with scalability by opening up “captive customer markets” with consistent design collaboration processes.

# Defining the Processes

- **COLLABORATION** is one of the primary vehicles used in our developments
- Flow Charting
- Establish a metric for evaluation and measurement
- Proof of Concept



This accident  
could  
Have been  
avoided  
With a “proof of  
concept”

# Las Vegas, NV – Super Center

A Brief Technical Overview of the store's mechanical systems

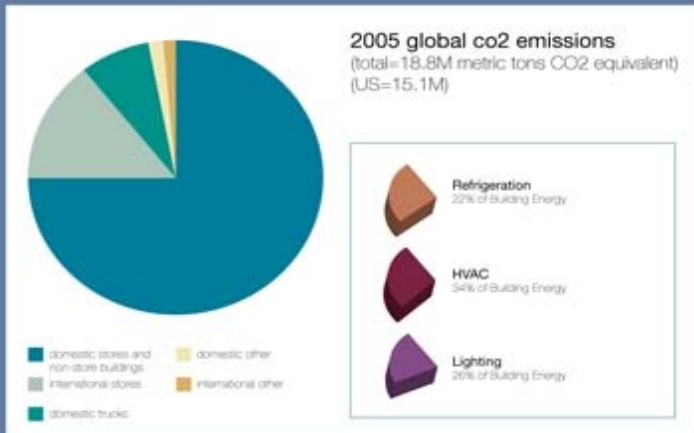
- Radiant Floor
- HVAC
- Refrigeration
- Lighting

- 100% of Space Sensible Load met by Radiant System
- Water has 4 times the Heat Carrying Capacity as Air
- The Evaporation Process displaces 80% of the Annual Cooling Load
- Refrigeration Heat Reclaim accounts for 100% of the Comfort Heating Load, and 70% of the DHW Load
- HE.5/.6 Savings Breakdown making up the 45% Total Reduction is;
  - 45% HVAC
  - 35% Ref
  - 20% Itg



## HE.5 Overview

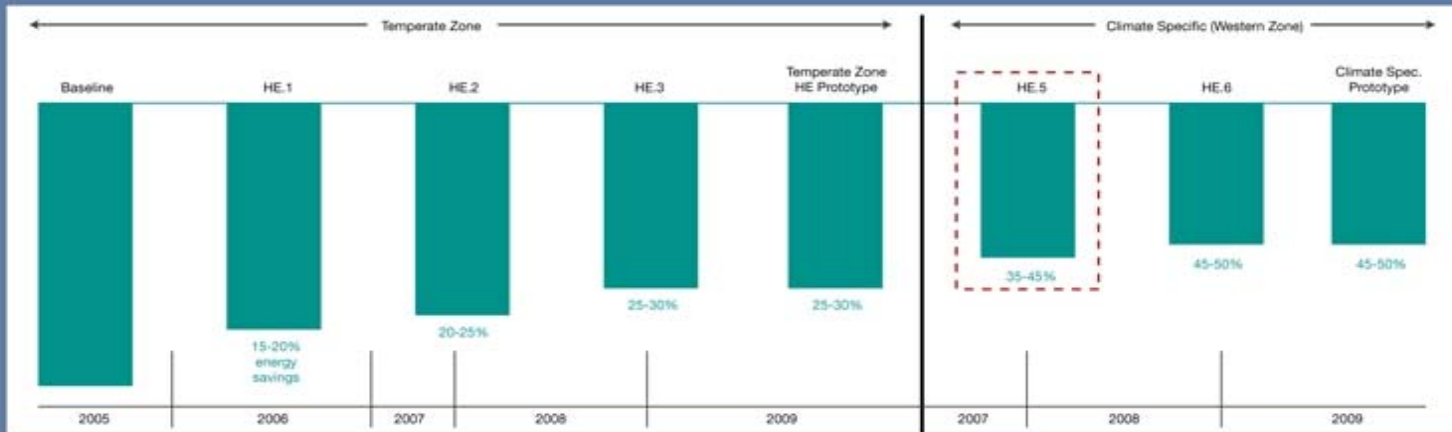




Setting the context



The Climate Challenge



The Iterative Process

- Integrated Design
- Water Source Heat Pump
- Refrigeration Heat Reclaim
- Radiant Cooling
- Evaporative Cooling
- Refrigeration Heat Reclaim

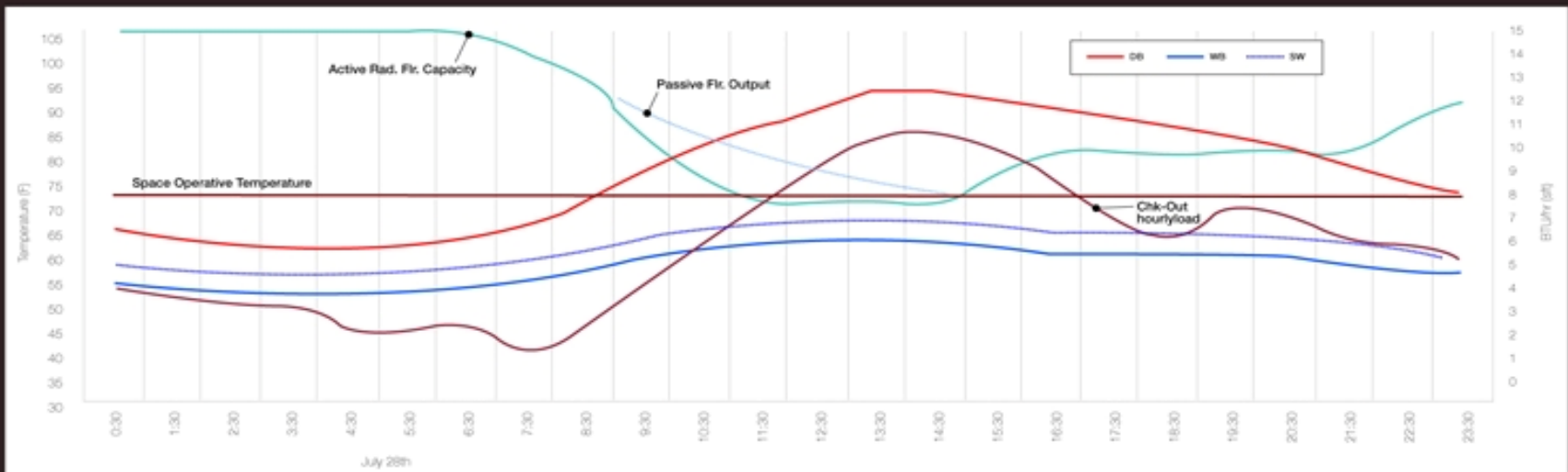


Radiant Floor

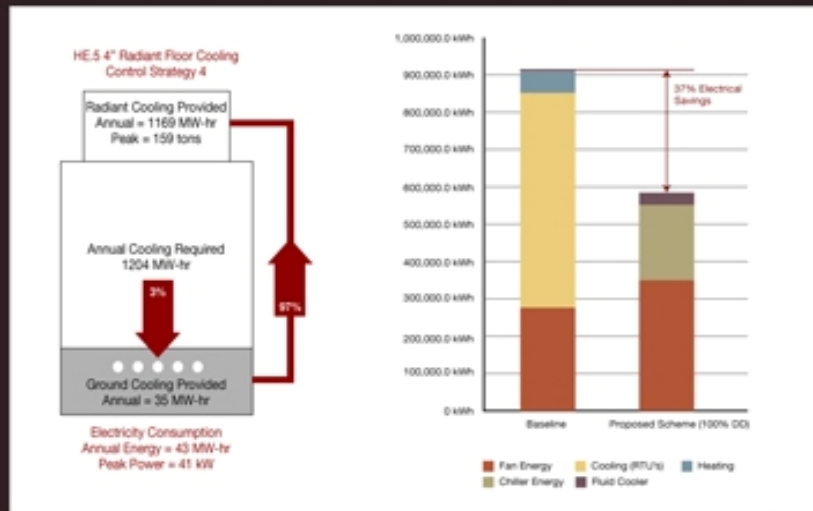


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Thermal Mass: Night-time radiant floor charging



Energy Flow



Reduced Installation Time

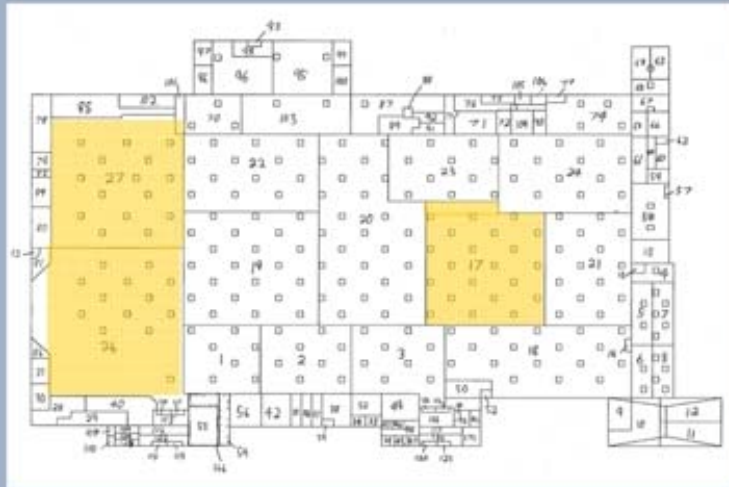


Thermal Zoning

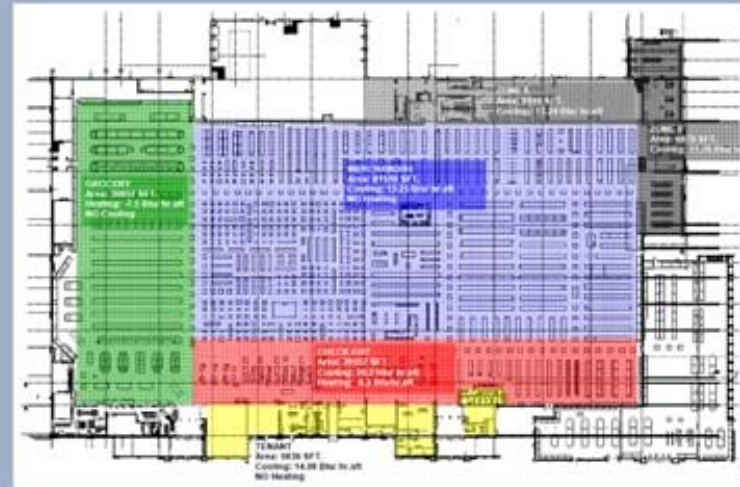


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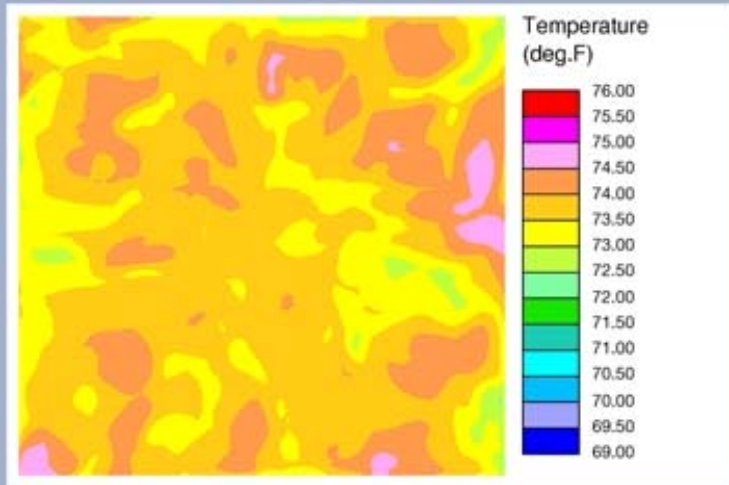




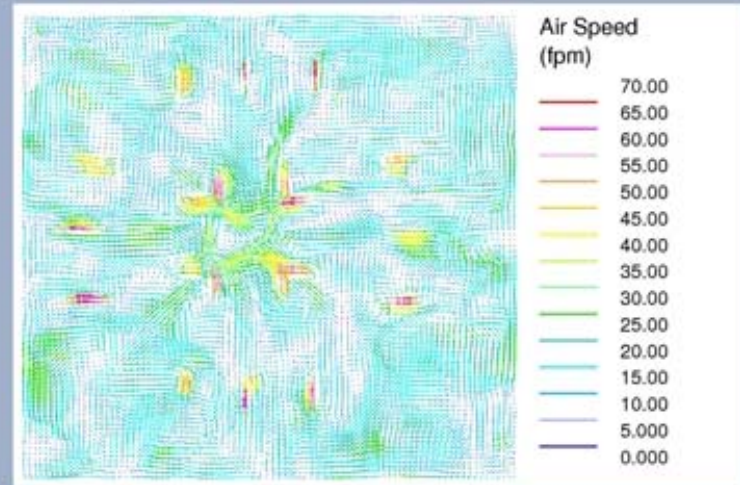
Existing 195 proto zone layout



HE.5 zone layout - roof area "void" of HVAC Plant



CFD analysis: Thermal performance (typ. zone PLAN)



CFD analysis: Velocity vectors (typ. zone PLAN)

# Thermal Zoning of Radiant Floor

- The Evaporation Process displaces 80% of the Annual Cooling Load



Evaporative Cooling



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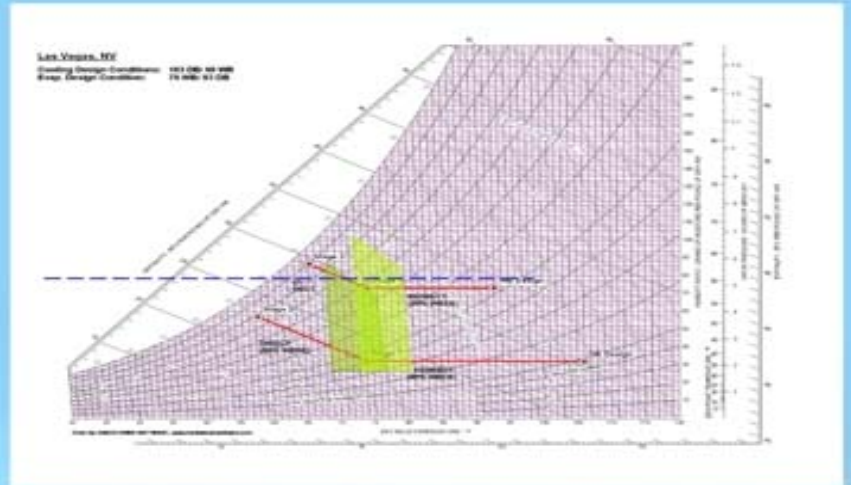
Fluid Cooler on Roof



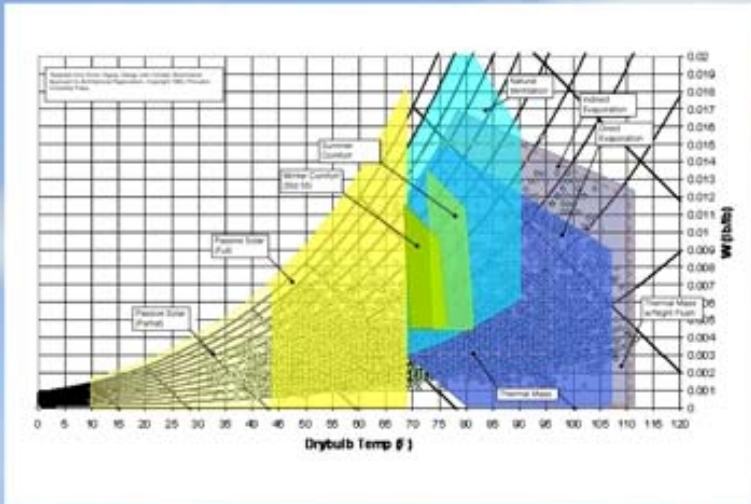
Piping Racks provide Extended Cooling Surface



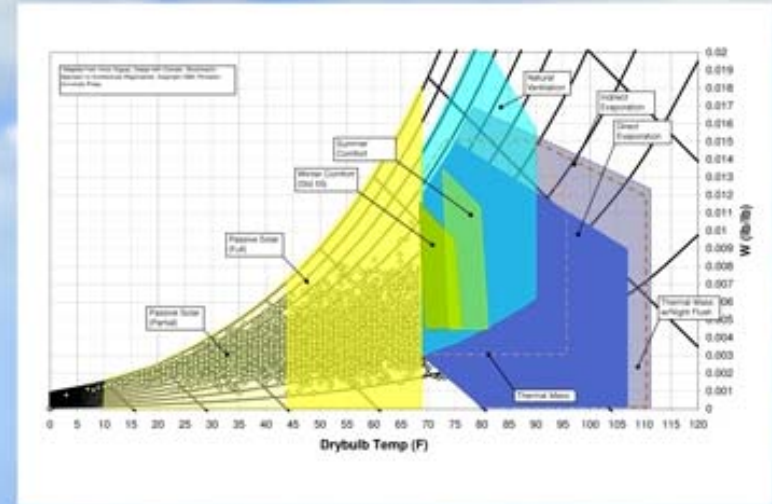
Drift Eliminator



IDEC Process at Design Conditions



Annual Psychrometric Chart of TMY2 Weather Data: Vegas, NV.



Annual Psychrometric Chart of TMY2 Weather Data: Reno, NV.



Improved Air Distribution



Daylight Harvesting



L.E.D. Parking Lot Lights



- 90% Refrigerant Charge Reduction
- Electronic Expansion valves on Heat Exchanger
- Variable Speed Control on Compressors

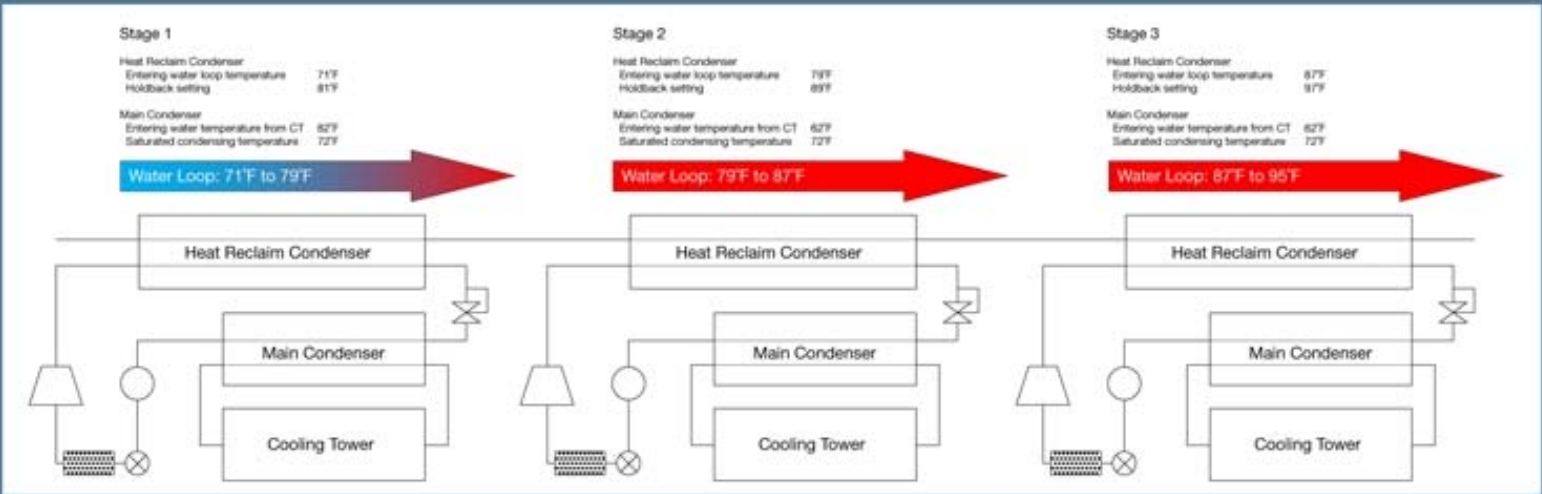


Refrigeration



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Refrigeration Heat Reclaim: 100% of Comfort Heating for store is from Heat Reclaim



Modular Compressors



VFD Controllers

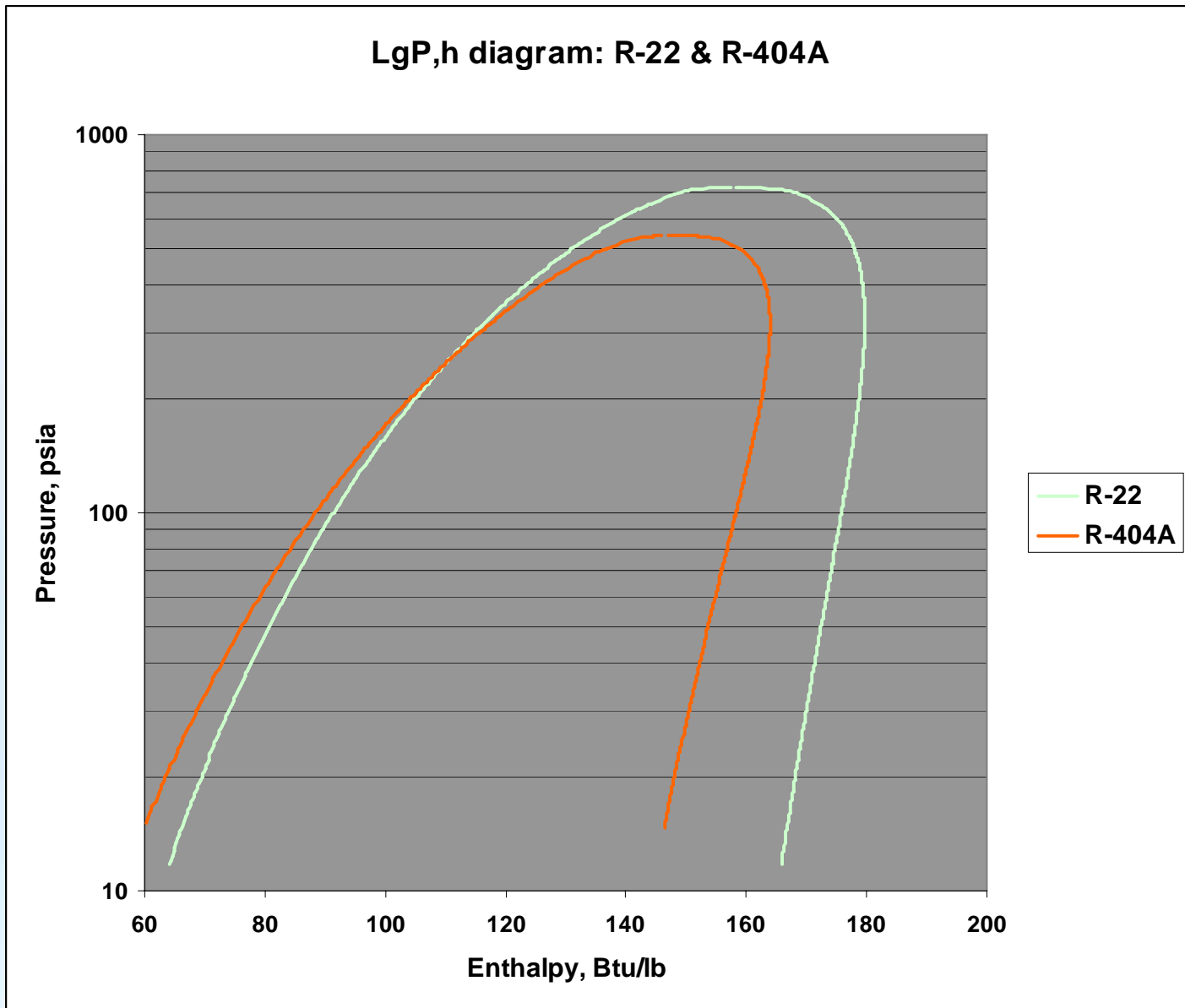
# Refrigeration

There are three primary directives;

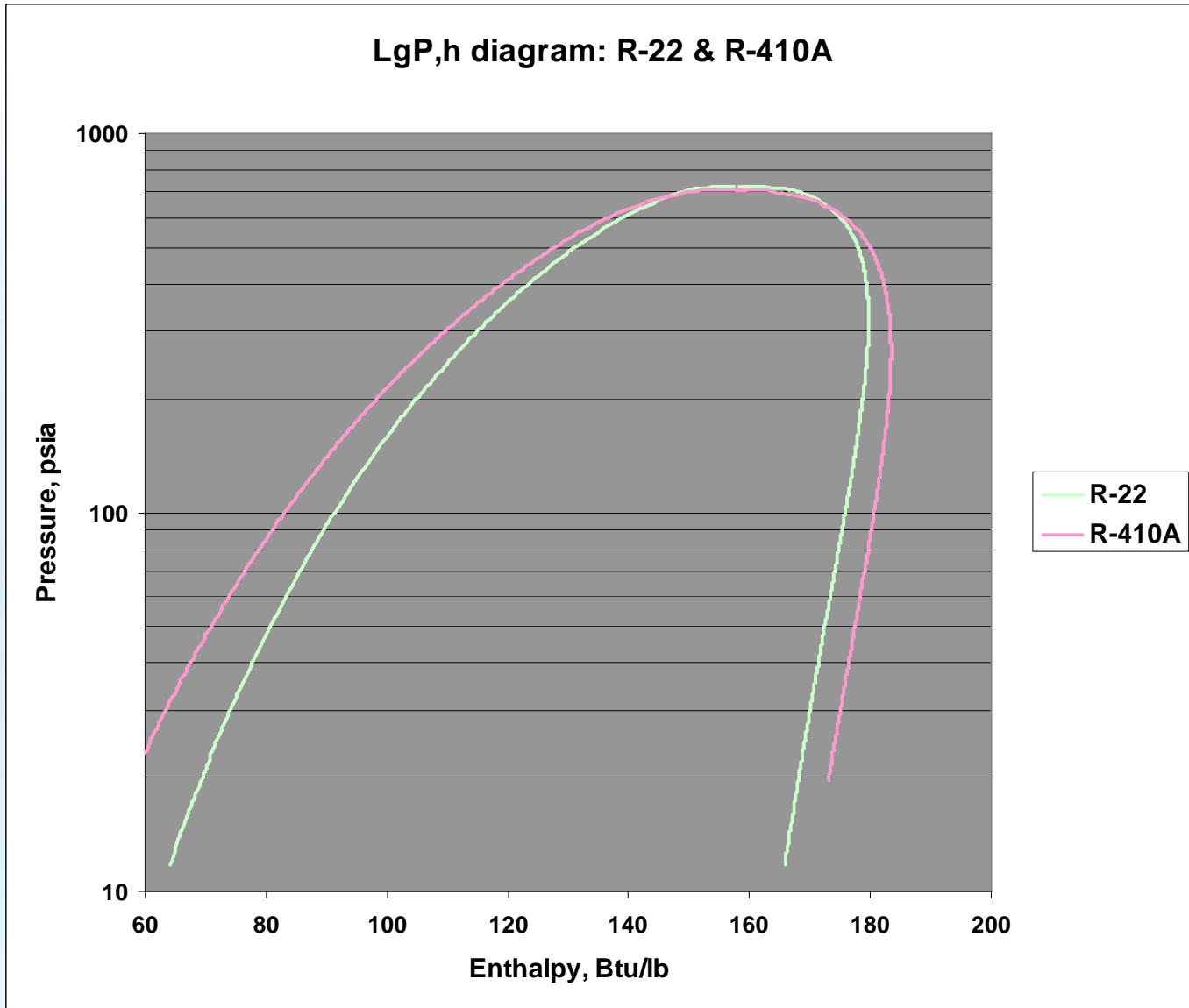
- Design Ownership
  - Collaborative Design with MEPR and OEM
- Integration of Equipment and Controls
  - Open Protocol, Integrated System
- Refrigerant Selection
  - Performance and reduced inventories

# Building and Equipment Controls

- Open Architecture, Open Protocol
- Integrated Systems
- Sequence of Operation
- Functional Performance Testing
- Failure Detection and Diagnostics
- Dash Boarding

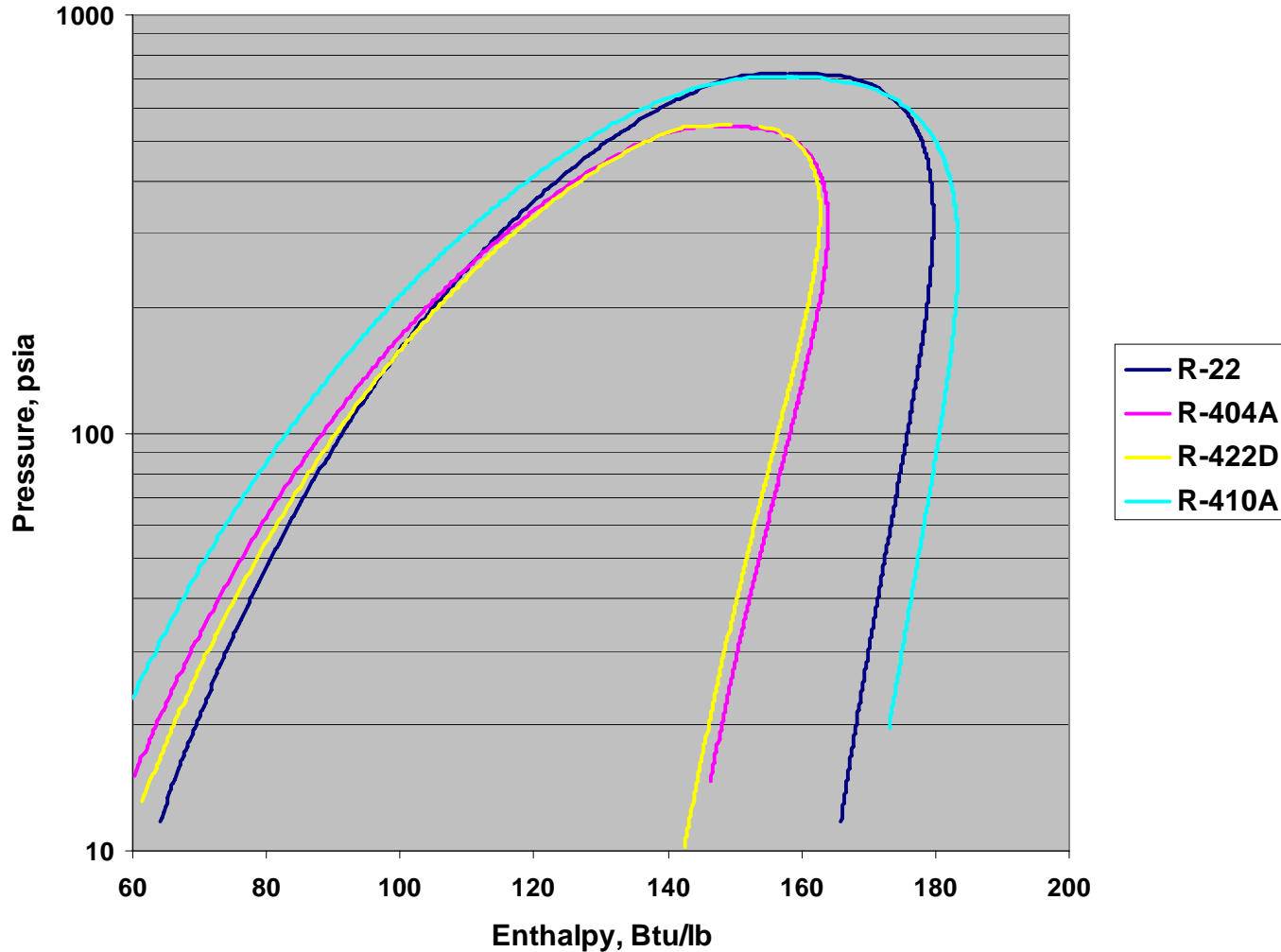


New Store Refrigeration System Refrigerant Comparison; 20% more mass flow required



Refrigerant Comparison for HVAC Systems;  
7% less mass flow required

### LgP,h diagram: R-22, R-404A & R-422D



HVAC and Refrigeration Refrigerant Comparison

# Contributions to Climate Change from Air Conditioning and Refrigeration

## Direct Emissions

### Refrigerant Emissions:

- Installation/Servicing
  - Leaks
  - Failures
- End of Life

1 lb R-22 = 1,780 lbs CO<sub>2</sub>

1 lb R-134a = 1,300 lbs CO<sub>2</sub>

1 lb R-410A = 1,730 lbs CO<sub>2</sub>

1 lb R-422D = 2,232 lbs CO<sub>2</sub>

1 lb R-404A = 3,260 lbs CO<sub>2</sub>

## Indirect Emissions

### CO<sub>2</sub> Emissions from Generating Electricity

U.S. Average

1,340 lbs CO<sub>2</sub>/MWh

# What is Sustainability to Wal-Mart?

*Wal-Mart's opportunity and responsibility to make a difference in this world for our customers, our shareholders and our Associates by:*

- Making sustainable products that more affordable
- Cutting waste out of our supply chain
- Using resources more efficiently

# Wal-Mart's Sustainability Goals



*To be supplied 100%  
by renewable energy*



*To create zero waste*



*To sell products that sustain  
our resources and environment*

***A More Energy-Efficient Future***



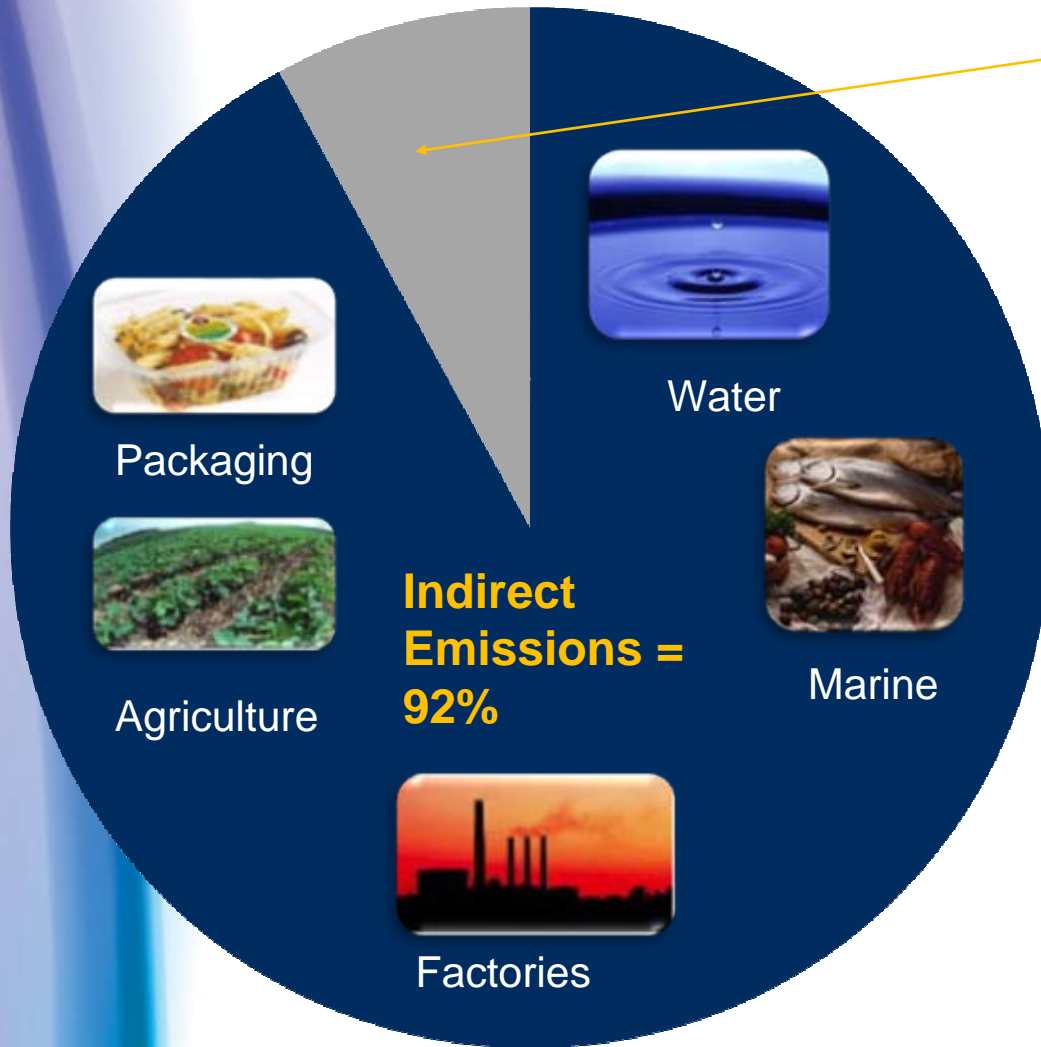
***Supply Chain of the Future***



***More Affordable Health Care  
Through Efficiency***



# Wal-Mart Footprint



**Direct Emissions = 8%**



# Today's Sustainable Value Networks



1. Greenhouse Gas
2. Sustainable Buildings
3. Global Logistics
4. Alternative Fuels
5. Waste
6. Packaging
7. Textiles
8. Electronics
9. Agriculture and Seafood
10. Wood and Paper
11. Chemicals
12. Jewelry
13. China

# Greenhouse Gas Network



## Goal:

Measure, reduce and eliminate the use of fossil fuels in our stores, supply chain and by customers

## Initiatives:

- Measuring Wal-Mart's GHG footprint
- Working with suppliers to reduce energy use and GHG emissions

## Actions:

Solar Power Pilot Project

# Sustainable Buildings Network

## Goal:

- Reduce GHG emissions at existing facilities by 20% by 2012
- Build a viable store prototype that is 25-30% more efficient and produces 30% fewer GHG emissions by 2009

## Initiatives:

- Retrofitting existing stores
- Developing new efficient store prototype

## Actions:

- High Efficiency Stores



# Our Commitment

*As retailers, we can help **customers** make better decisions for themselves, their **families**, their **communities** and the **environment**.*



You can't sell for less if you are spending more.

**Walmart**   
Save money. Live better.

# Personal Sustainability Projects

“Pssst.  
What’s your  
PSP?”

Introducing the Personal  
Sustainability Project

**WAL★MART**  
**SMART**

Healthy People, Healthy Planet.

The **Personal Sustainability Project** is all about helping Associates incorporate the principles of sustainability into their personal lives. It’s a bottom-up, grassroots effort



# 2000s – Building Perspective

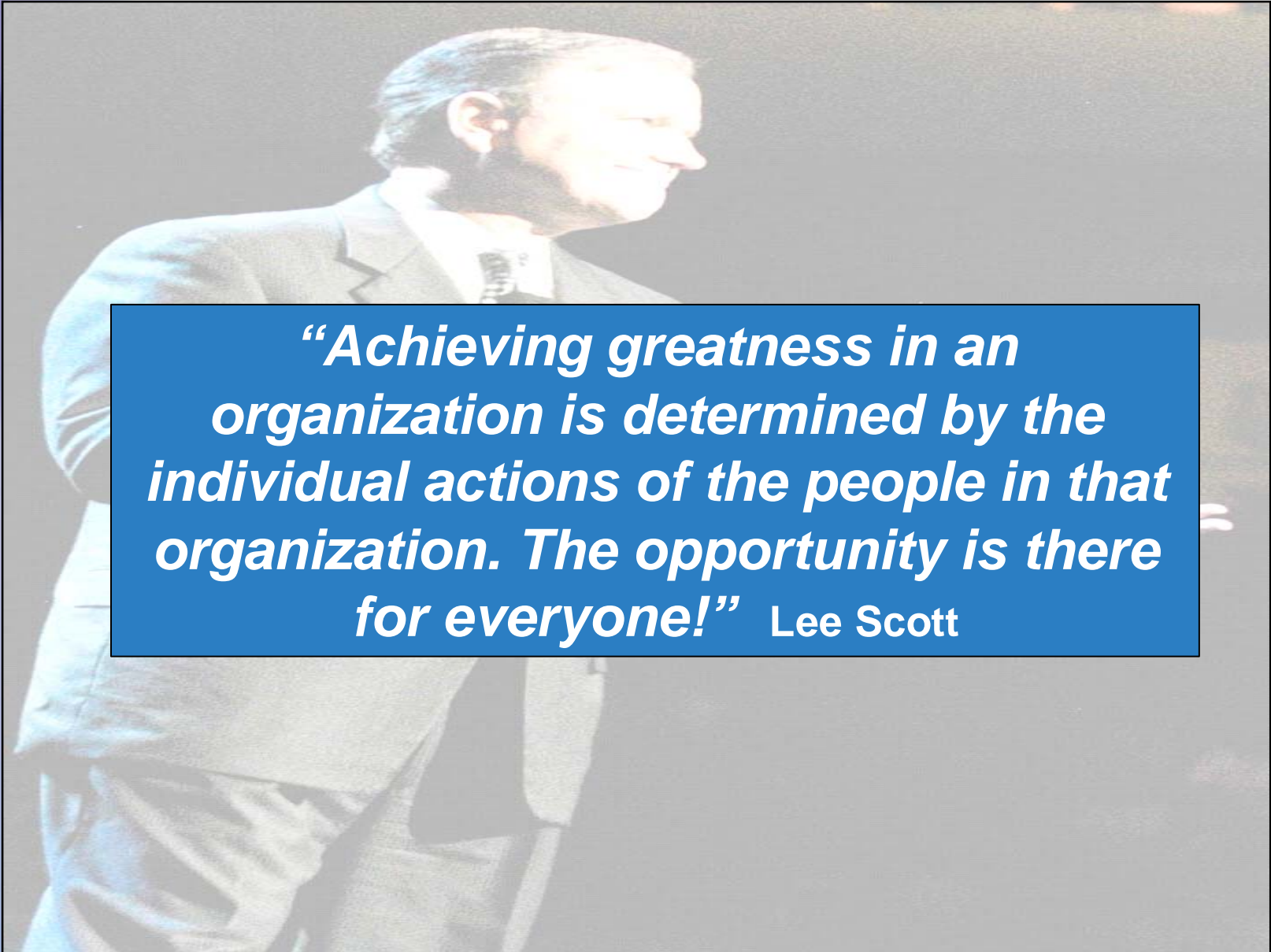
**Be Loyal to The Company & the Three Beliefs**

**Be Thoughtful in Decision Making**

**Right Communications Motivate Right Behaviors**

**Broaden Your Perspective – Provide the Vision**

**“Manage” well – Direction, target dates, controls,  
course-corrections**

A man in a light-colored suit and tie is shown from the waist up, speaking at a podium. He is looking to his right with a slight smile. The background is dark and out of focus.

***“Achieving greatness in an organization is determined by the individual actions of the people in that organization. The opportunity is there for everyone!”*** Lee Scott

**Wal-Mart's business was built upon a foundation of honesty, respect, fairness and integrity.**



You can't just keep doing what works one time, everything around you is always changing. To succeed, stay out in front of that change.

Sam Walton



There's absolutely no limit to what plain ordinary working people can accomplish, if they're given the opportunity, encouragement and incentive to do their best.

Sam Walton



So, what would it take for our company to be at its best, all the time?

Courage

Integrity

Commitment to change

