

Building Energy Management (In a Nutshell)

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What have We Got?

External Conditions

Internal Conditions

Occupancy

Business Operations

Building

What Do We Need?



External Conditions	(Process)
	(Production)
Internal Conditions	Small Power
Occupancy	Air Conditioning
Business Operations	Lighting
Building	Space & Water Heating

What Makes It All Work?

ENERGY

External Conditions	(Process) (Production)
Internal Conditions	Small Power
Occupancy	Air Conditioning
Business Operations	Lighting
Building	Space & Water Heating

What Do We Do With Energy?

ENERGY

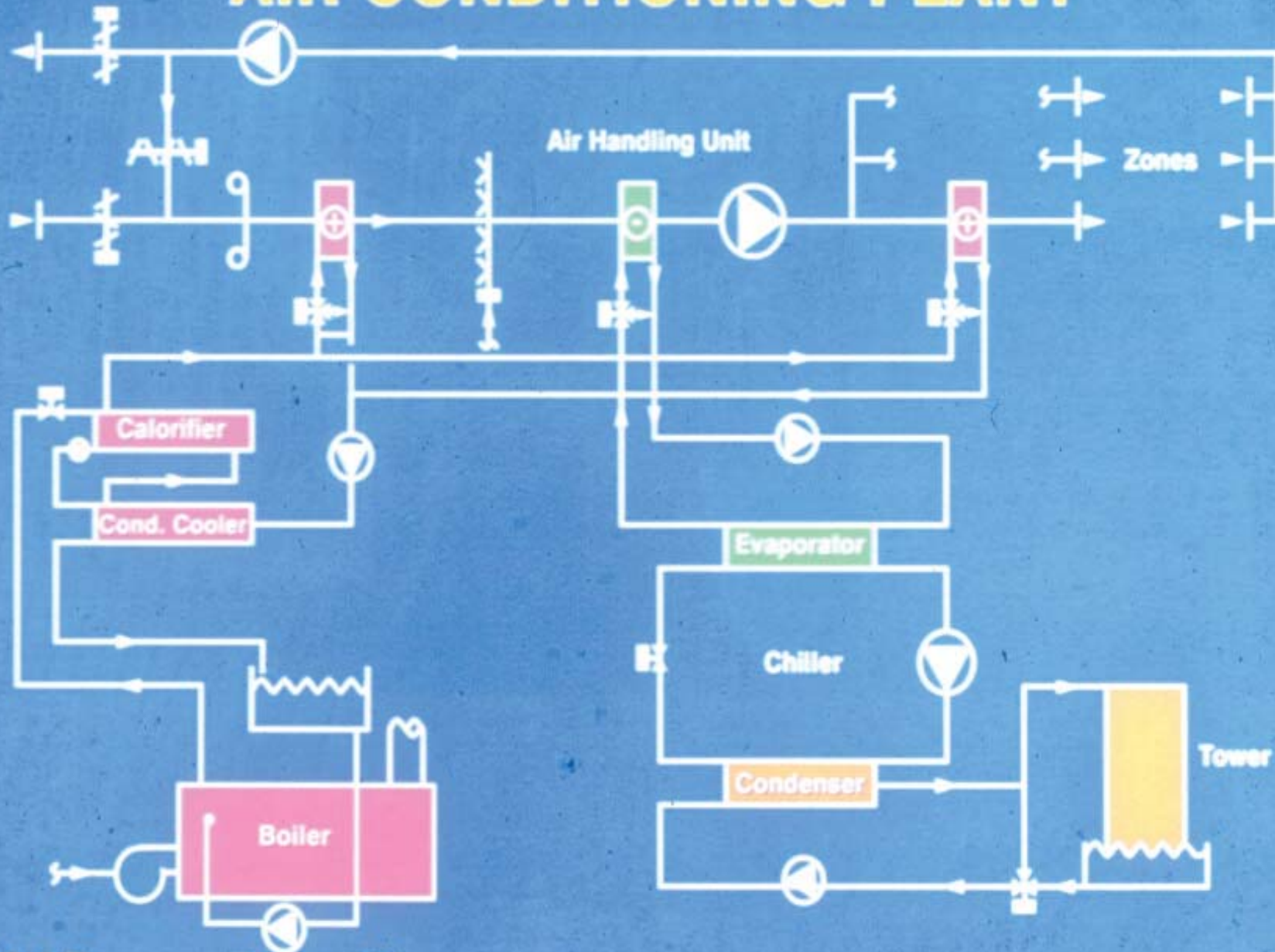
External Conditions	(Process) (Production)
Internal Conditions	Small Power
Occupancy	Air Conditioning
Business Operations	Lighting
Building	Space & Water Heating
	Distribution
	Conversion
	Storage
	Intake

How Do We Apply Energy?

ENERGY

External Conditions	(Process) (Production)
Internal Conditions	Small Power
Occupancy	Air Conditioning
Business Operations	Lighting
Building	Space & Water Heating
Distribution	Compressors
Conversion	Motive Power (Fans, Pumps, etc)
Storage	Boilers
Intake	Transformers

AIR CONDITIONING PLANT



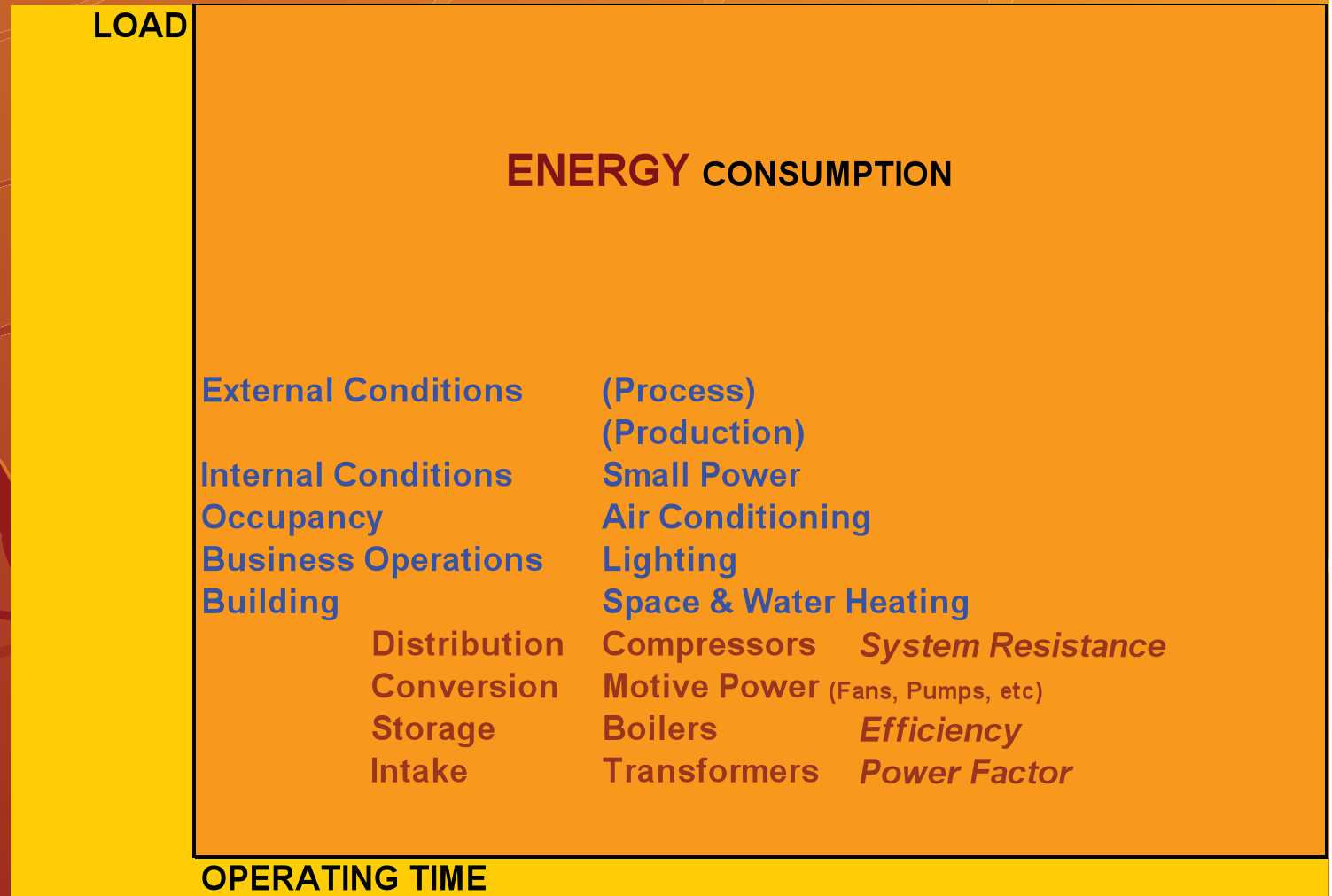
F & I Ranson, Envec '93

What Are The Problems?

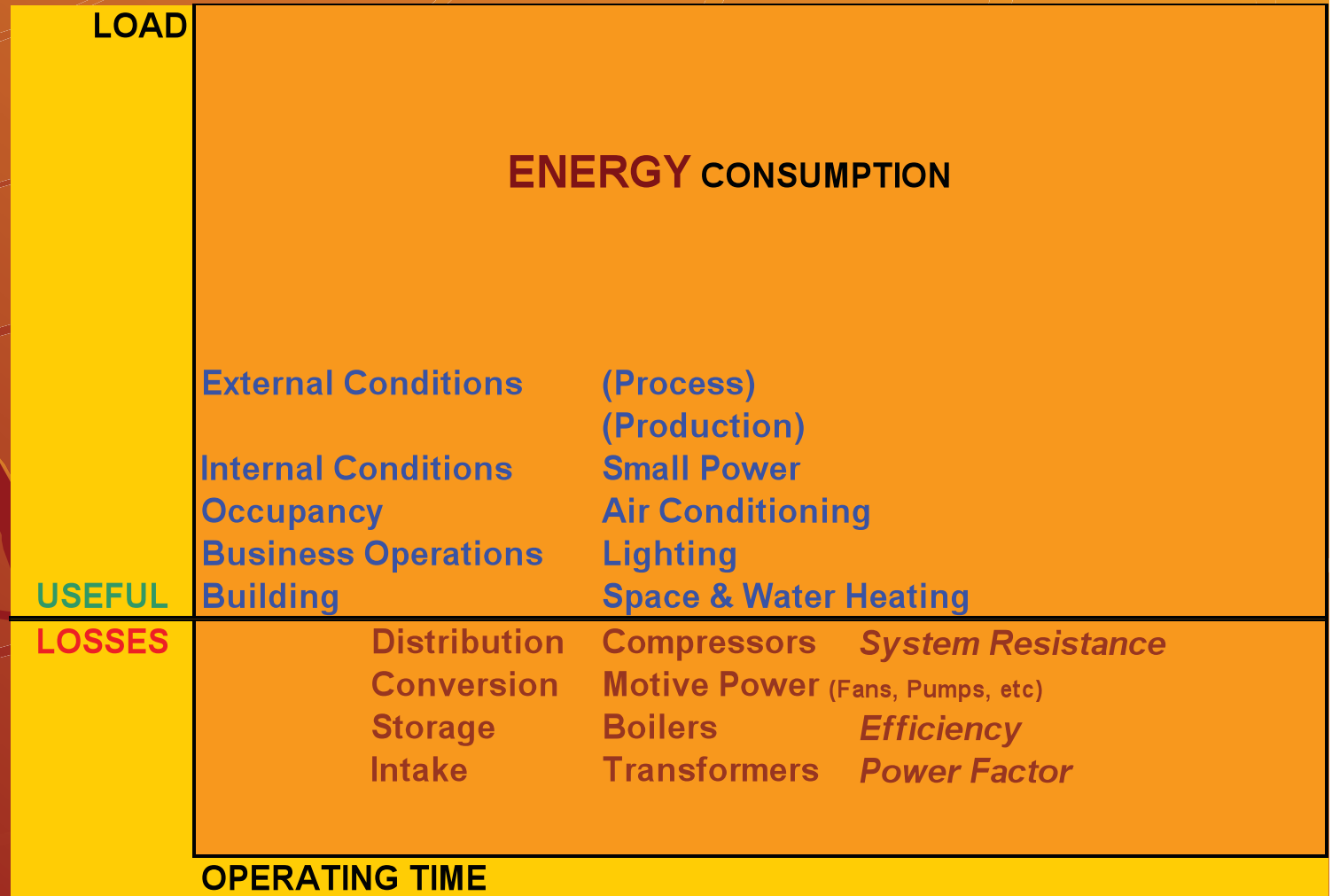
ENERGY

External Conditions	(Process)
	(Production)
Internal Conditions	Small Power
Occupancy	Air Conditioning
Business Operations	Lighting
Building	Space & Water Heating
	Compressors <i>System Resistance</i>
Distribution	Motive Power (Fans, Pumps, etc)
Conversion	Boilers <i>Efficiency</i>
Storage	Transformers <i>Power Factor</i>
Intake	

Energy Consumption



What Are The Implications?



What Can We Control & Manage?

Equation 1 Consumption = Load X *Operating Time*

Equation 2a Load = Unit Energy Requirement X *Condition Difference*

Equation 2b Energy Delivered to satisfy Load = Delivery Capacity of Medium X *Flow Rate*

Equation 3 Delivery Capacity of Medium = Unit Energy Requirement X *F to R Condition Difference*

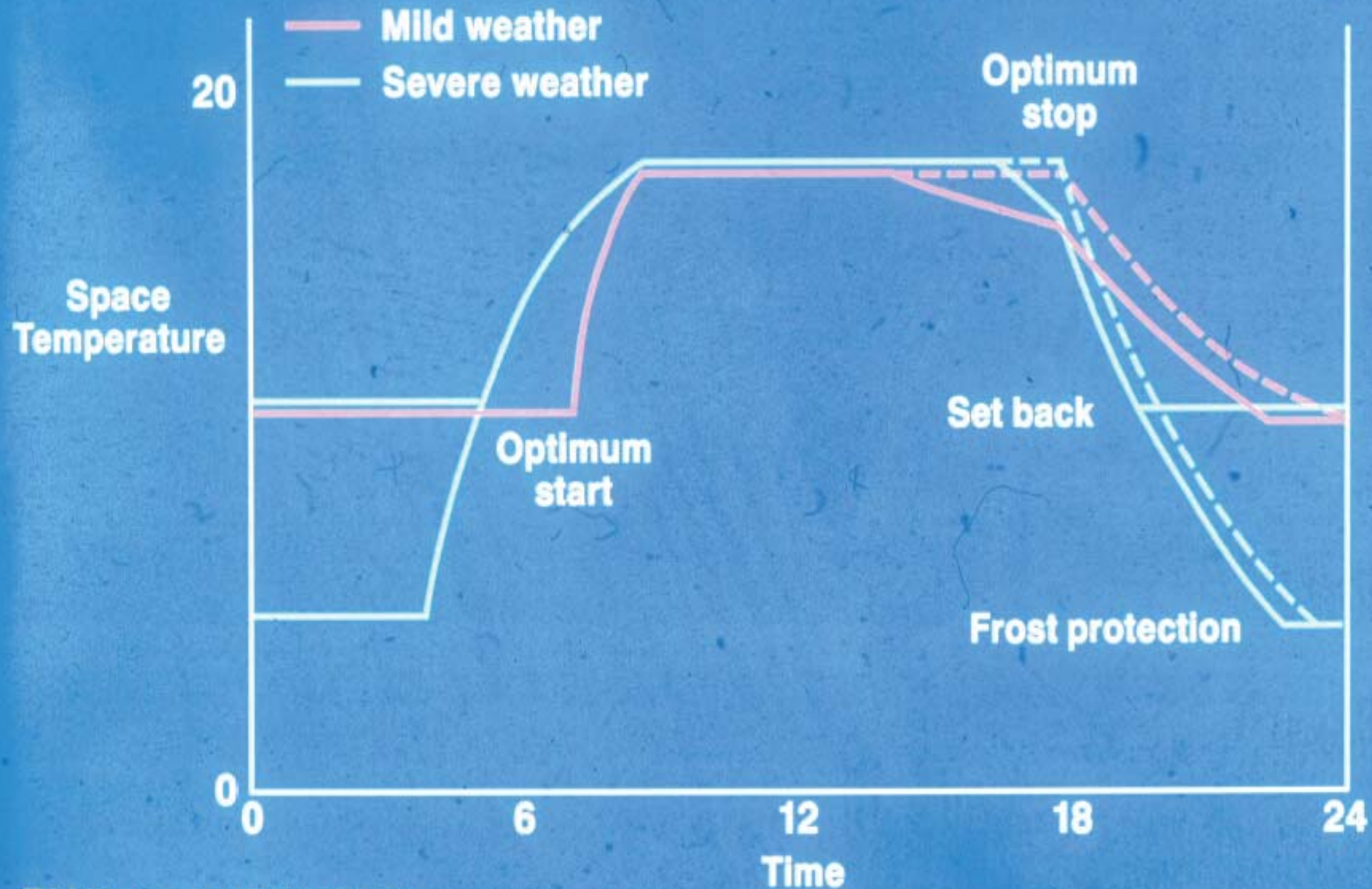
Equation 4 Energy Input to Medium = Delivery Capacity PLUS *Losses*

Equation 5 Installing a **BMS** = *Saving Energy & Money*

What Are Our Objectives?

LOAD	LOAD SAVINGS			
Avoidable				
Optimum	OPTIMUM ENERGY CONSUMPTION			TIME SAVINGS
USEFUL	External Conditions	(Process) (Production)		
LOSSES	Internal Conditions Occupancy Business Operations Building	Small Power Air Conditioning Lighting Space & Water Heating		
Optimum?	Distribution Conversion Storage Intake	Compressors Motive Power (Fans, Pumps, etc) Boilers Transformers	<i>System Resistance</i> <i>Efficiency</i> <i>Power Factor</i>	
Avoidable	RECOUPED LOSSES			
	OPERATING TIME			Optimum Avoidable

CONTROL & OPTIMISATION



How Can A BMS Help Us?

Aspect	Monitor & Record	Utilize Data	Control	Integrate & Optimise	Management Reporting
External Ambient Conditions	Yes	Yes	No	Yes	Yes
Building Energy Characteristic	Yes	Yes	?	Yes	Yes
Occupancy	Yes	Yes	?	Yes	Yes
Internal Air Quality	Yes	Yes	Yes	Yes	Yes
Internal Ambient Conditions	Yes	Yes	Yes	Yes	Yes
Lighting Operation	Yes	Yes	Yes	Yes	Yes
Plant Operation & Sequencing	Yes	Yes	Yes	Yes	Yes
Systems Flow Rates	Yes	Yes	Yes	Yes	Yes
Systems Operating Times	Yes	Yes	Yes	Yes	Yes
Electrical Load Management	Yes	Yes	Yes	Yes	Yes
Energy Consumption	Yes	Yes	Yes	Yes	Yes

B M S

◆ Building Management System

◆ B****y Marvellous Solution

◆ Bespoke Maximised Savings

◆ Buy Me and Start:

Saving Energy, Saving Money