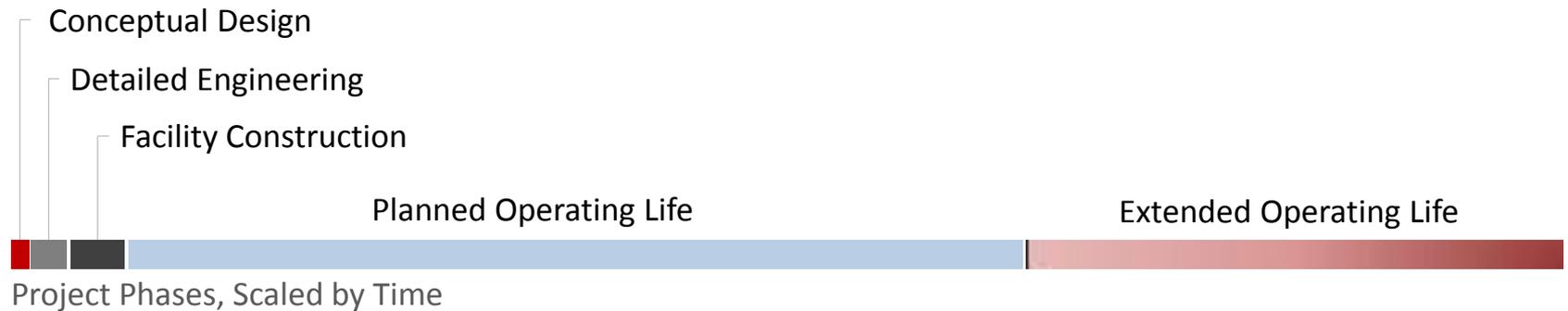


WALDRON

Good Systems Start With Good Engineering Practices for Operational Maintainability

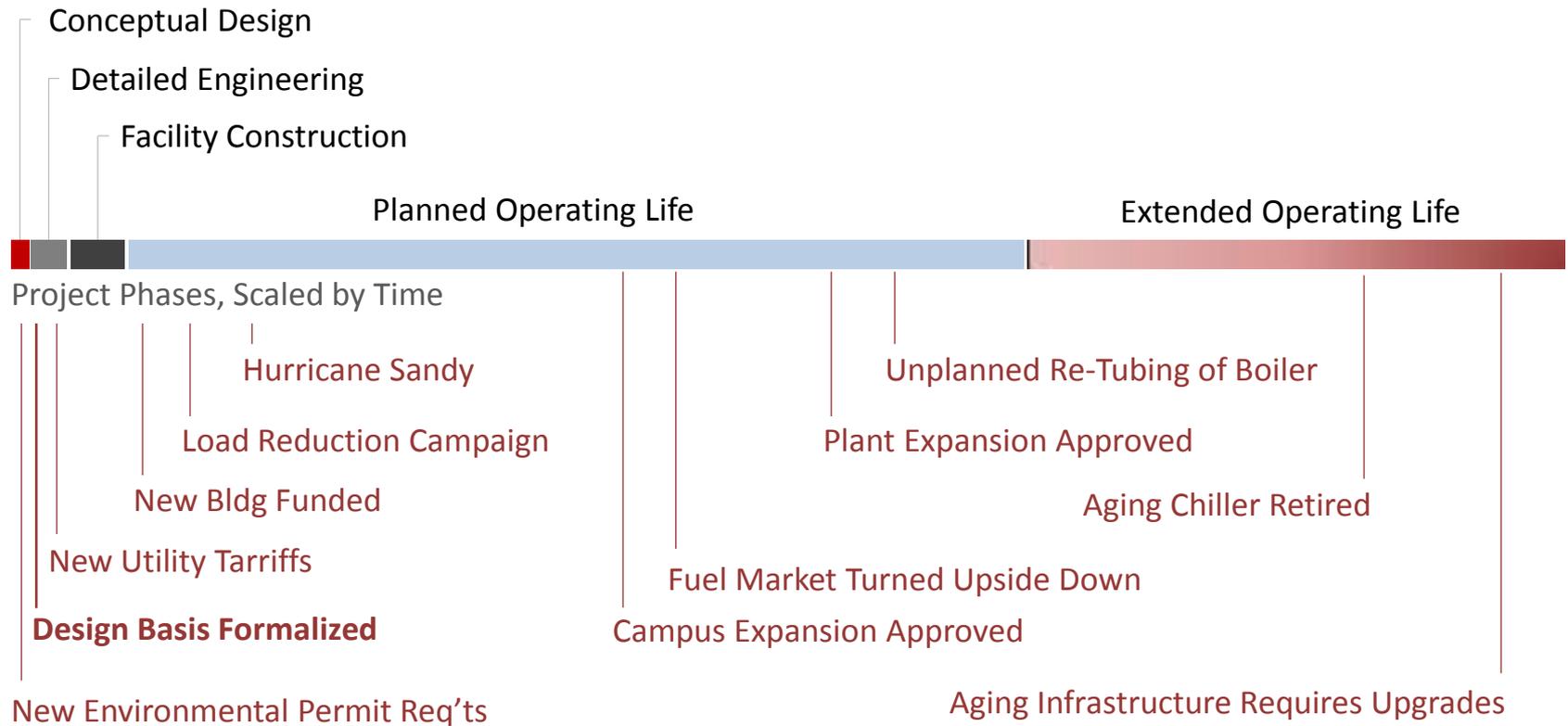
Presented by Michael Mark, PE

Getting Off to the Right Start



The First 1/4% of Project Life Cycle Costs Inform Performance of Last 99%

The Reality of Systems



System Conditions Change Often... (Continuously...)

The Importance of Initial Conditions



“Design Basis”



“Real World”
(Slugger 1 of 9)

What Does Resiliency Mean When Pitching to an Entire Line-Up of Real World Hitters?

No One Right Answer...



First
Cost



Payback
Period



Reliability



Adaptability



Operability

Sample Considerations...

- Prime Mover Size, Quantity and Selection
 - Load Profile
 - Utility Tariffs
 - Resiliency
 - Flexibility to Future Change
 - Space Constraints
 - Environmental Drivers
 - Staffing Capabilities

Prime Mover Example

How Many Reciprocating Engines to Install...?

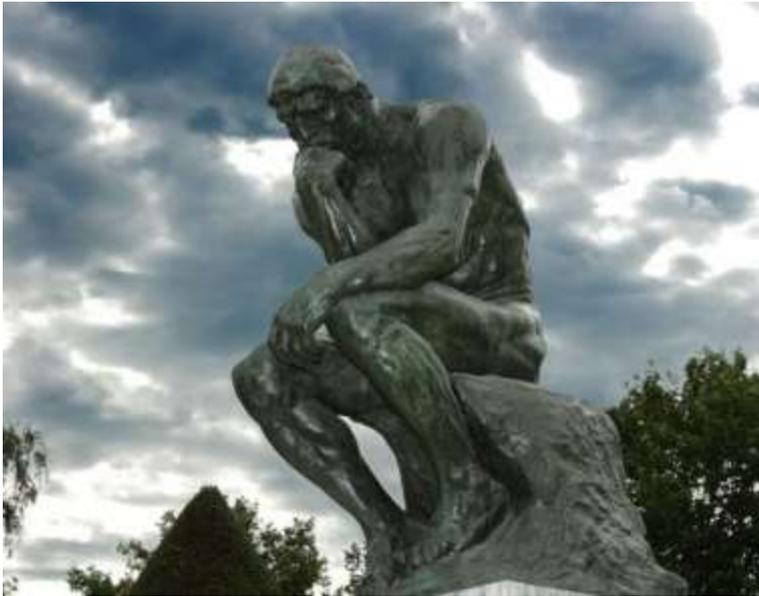
	Favors Less Engines	Favors More Engines
Utility Standby Charges	↓	↑
Load Profile Range	↓	↑
Avoided Infrastructure Cost	↓	↑
Storm Resiliency / Island Operation	↓	↑
Operational Flexibility	↓	↑
Future Load Growth	↓	↑

Which Prime Mover to Use?

Considerations When Comparing CTG's to Recip's

	Favors Recip's	Favors CTG's
Fuel Flexibility Desired	↓	↑
Diverse Chiller Plant Desired	↓	↑
Thermal Profile Requires Steam	↓	↑
Thermal Energy Weights Strongly in Project Economics	↓	↑
Relatively Flat Utility Profiles	↓	↑

Finding the Balance...



This gentleman is clearly reflecting upon the merits and operational challenges of a central utility plant...

He appears to have been doing so for quite some time...

It is important to hone in on the key drivers for a particular project and focus attention accordingly to avoid a similar fate...

Questions...

