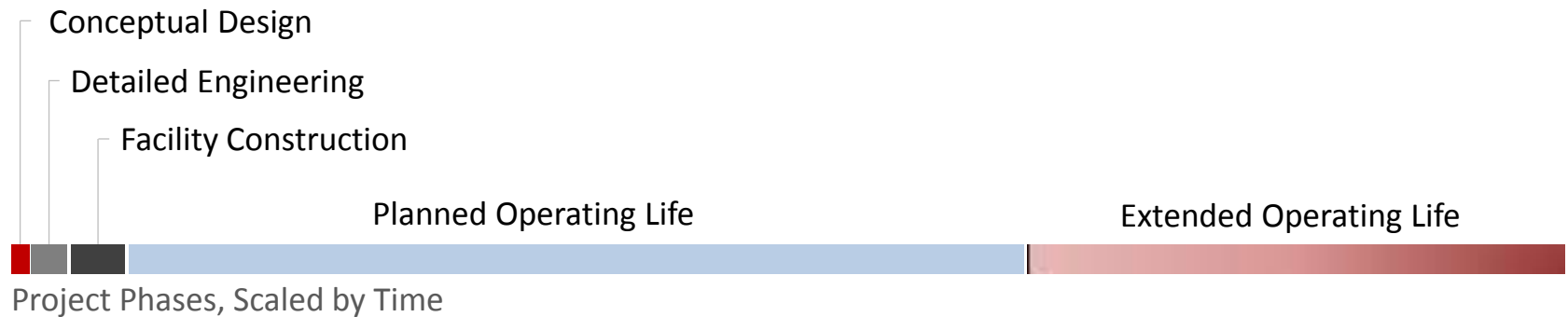


# WALDRON

## **Good Systems Start With Good Engineering Practices for Operational Maintainability**

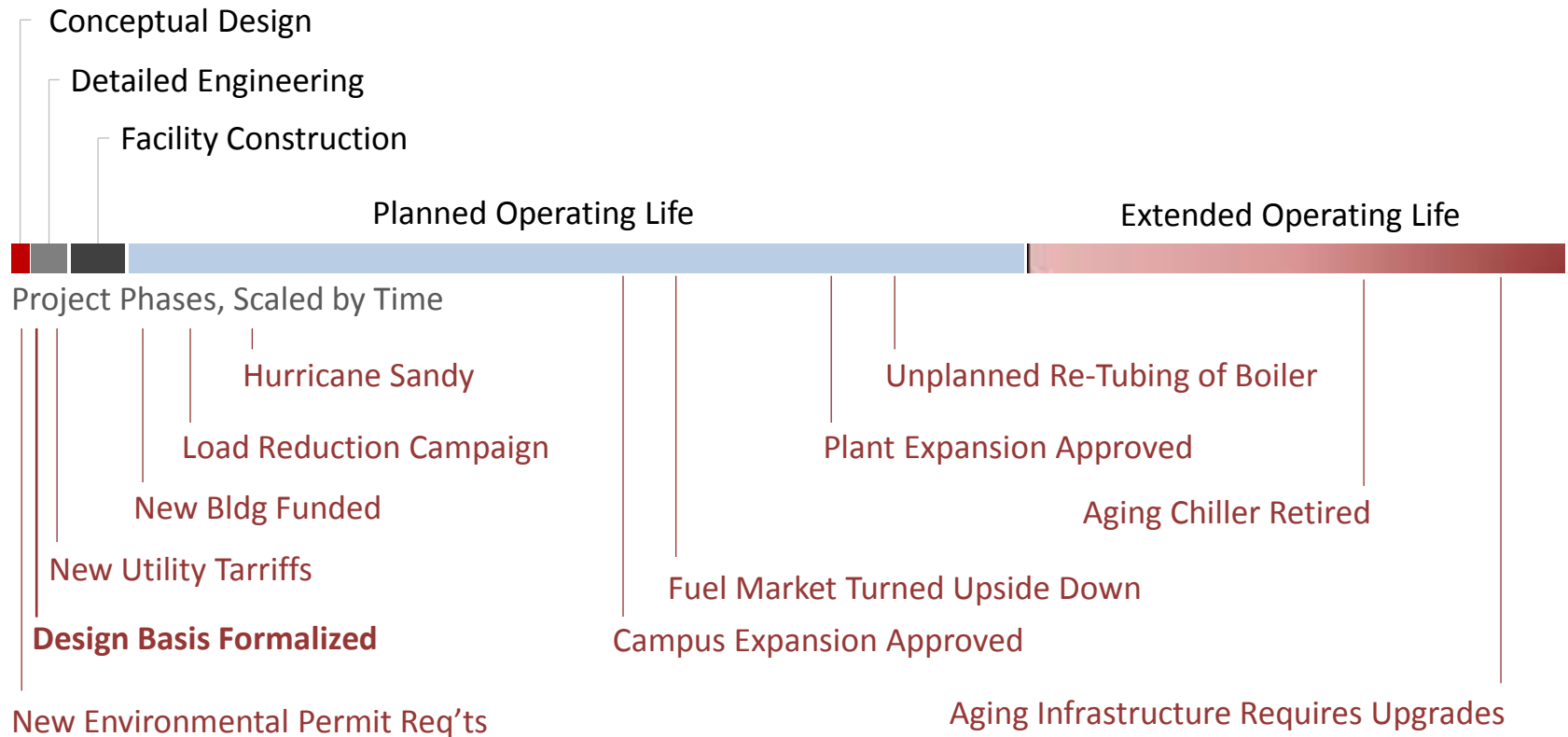
**Presented by Michael Mark, PE**

# 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



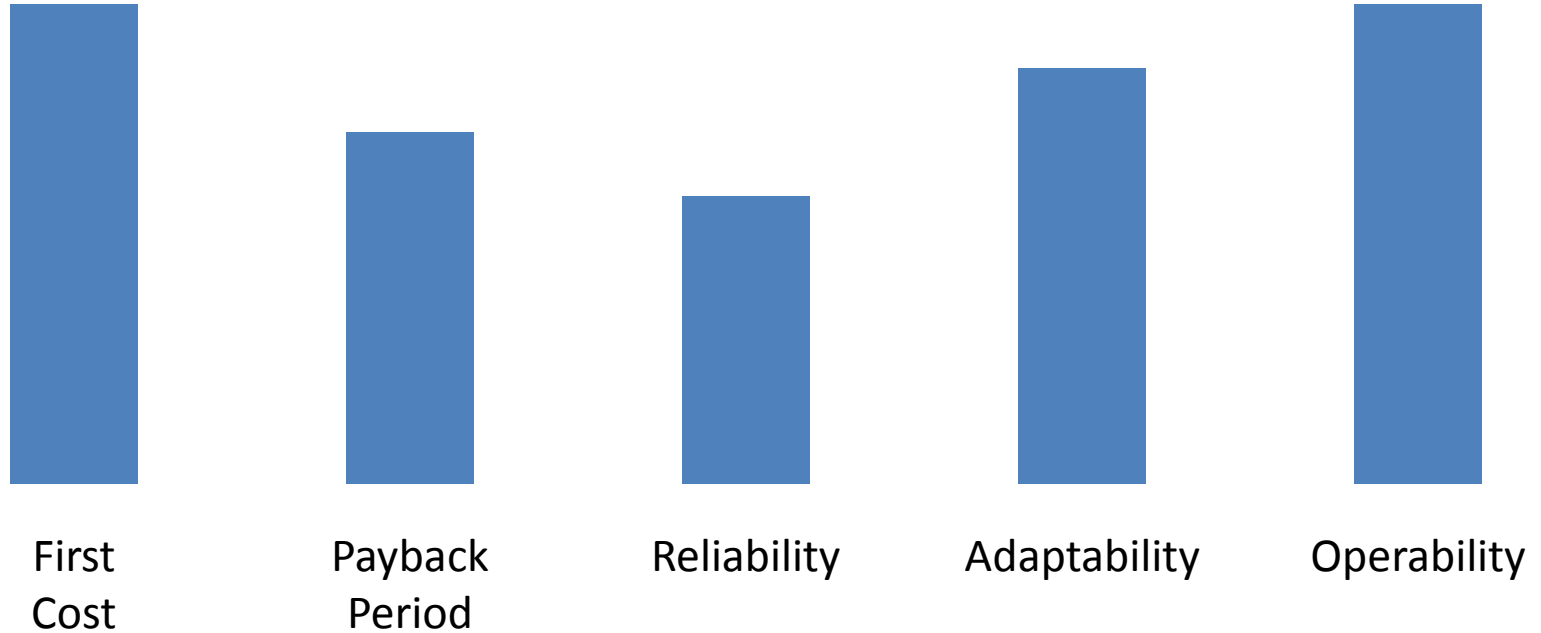
“Design Basis”



“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...



# 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...

