

An Integrated Approach to Central Energy Plant Control Systems



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Is This Your Controls Staff?



Agenda

- ▶ Typical Design Approach
- ▶ Integrated Design Approach
- ▶ Integrated Design Approach Implementation
- ▶ Case Studies
- ▶ Summary

Typical Design Approach

Typical Design Approach

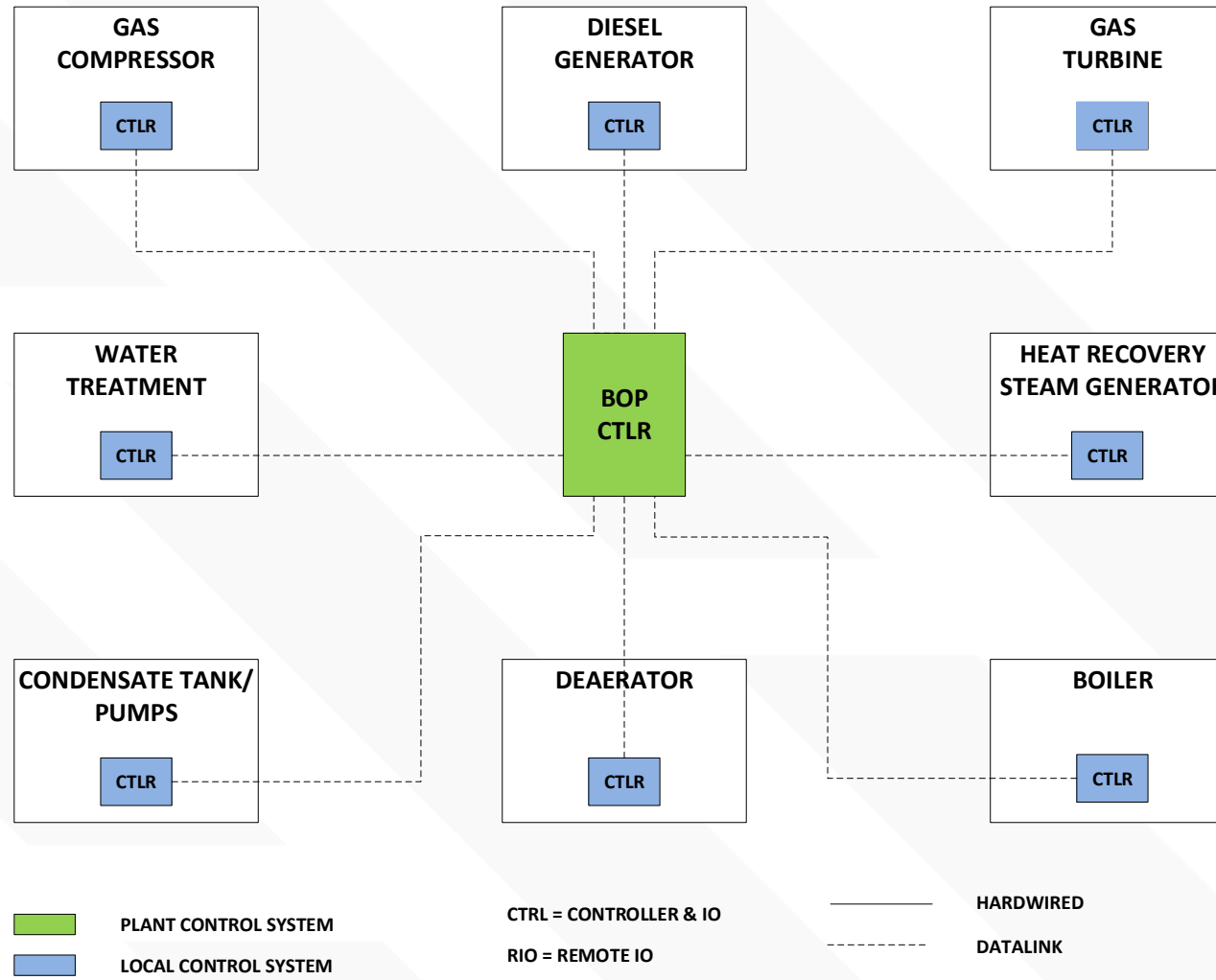
▶ Local Control Systems

- Come with packaged systems provided by OEM

▶ Plant Control System

- Interfaces with Local Control Systems for display to Operator in Control Room
- Plant Control System picks up miscellaneous BOP IO

System Architecture



So What's the Problem?

DESIGN ATTRIBUTE	IMPACT
Multiple Platforms	Increased O&M Costs
Variations in IO/Logic/HMI	Increased Complexity of O&M
Datalinks between Local Control Systems and Plant Control System	Lower Plant Availability

Integrated Design Approach

Integrated Design Approach

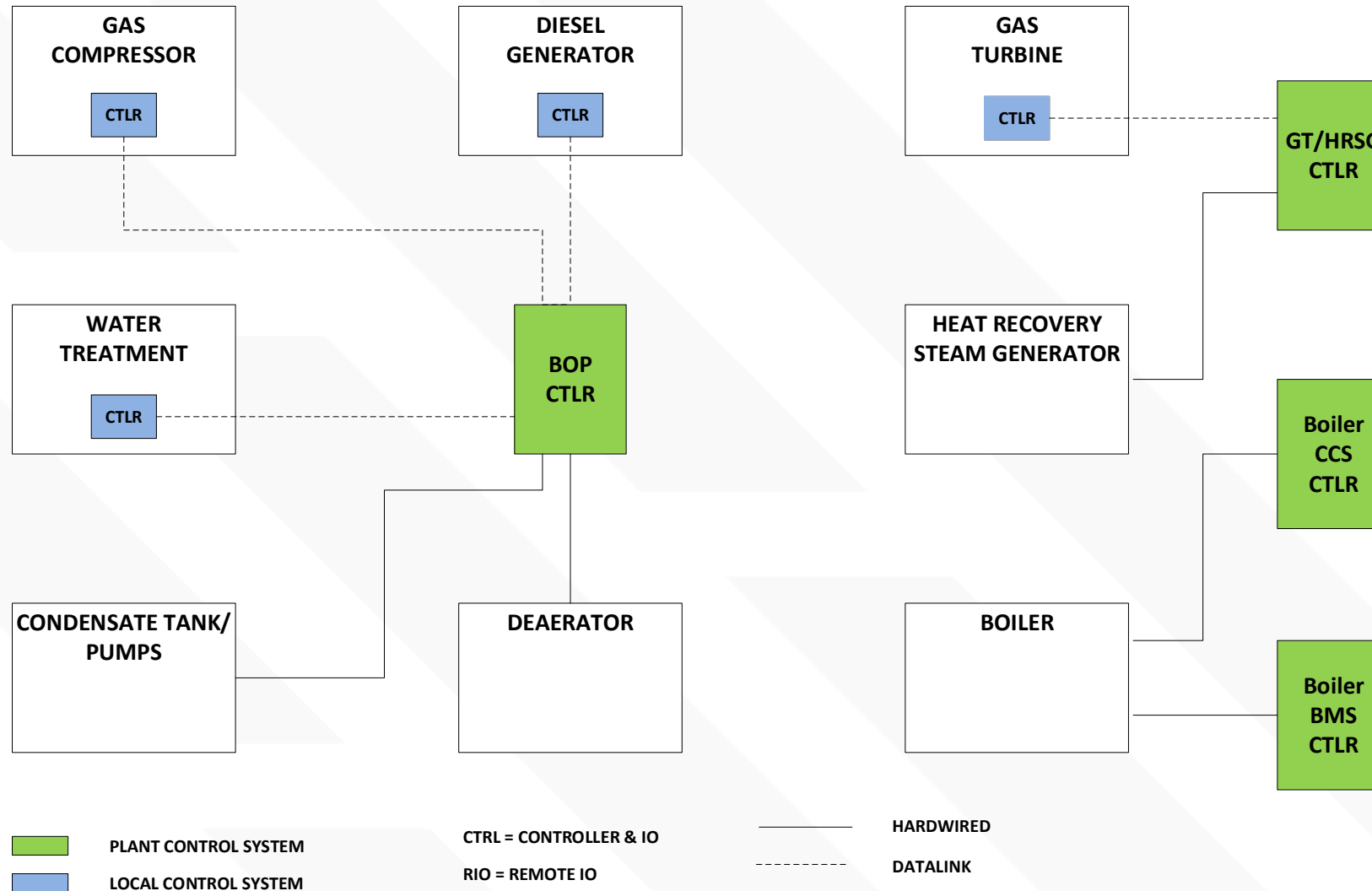
▶ Local Control Systems

- Minimize as far as practical
- Extent depends on the following:
 - New plant vs existing plant
 - Type of packaged system
 - Suitability of Plant Control System platform for control

▶ Plant Control System

- Controls as much of the plant as possible

System Architecture (one of many)



What Are the Benefits?

DESIGN ATTRIBUTE	IMPACT
Minimize number of platforms	Decreased O&M Costs
Standardized Control System Design	Decreased Complexity of O&M
Native Network Between Plant Control System and Packaged Systems	Increased Plant Availability

Integrated Design Approach Implementation

How Much to Integrate into Plant Control System?

► New Plant

- As much as possible
- Things to consider leaving out:
 - Machine control systems
 - Standard product control systems
 - Equipment Control is not suitable for Plant Control System

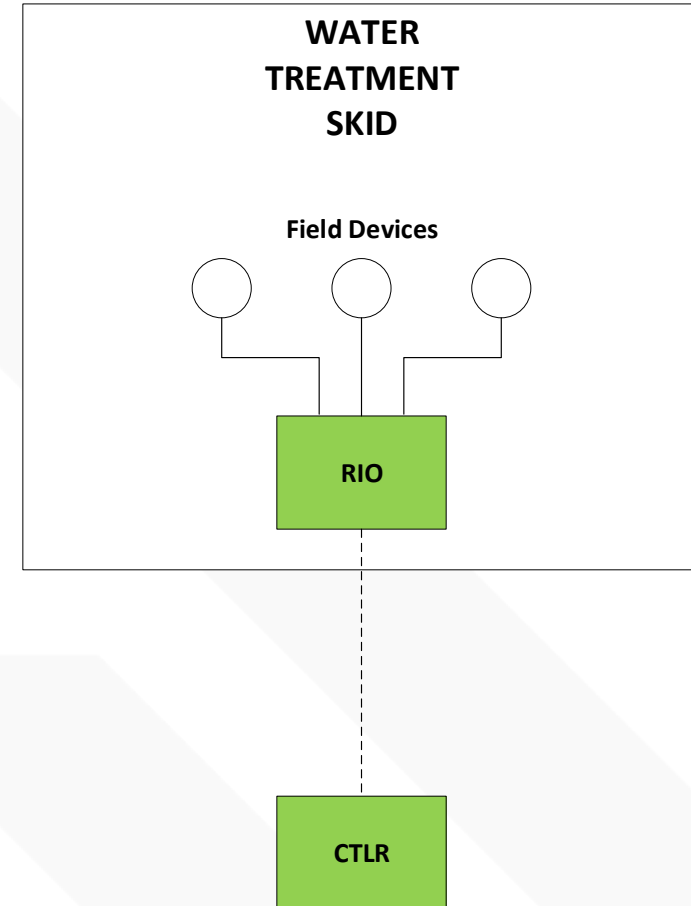
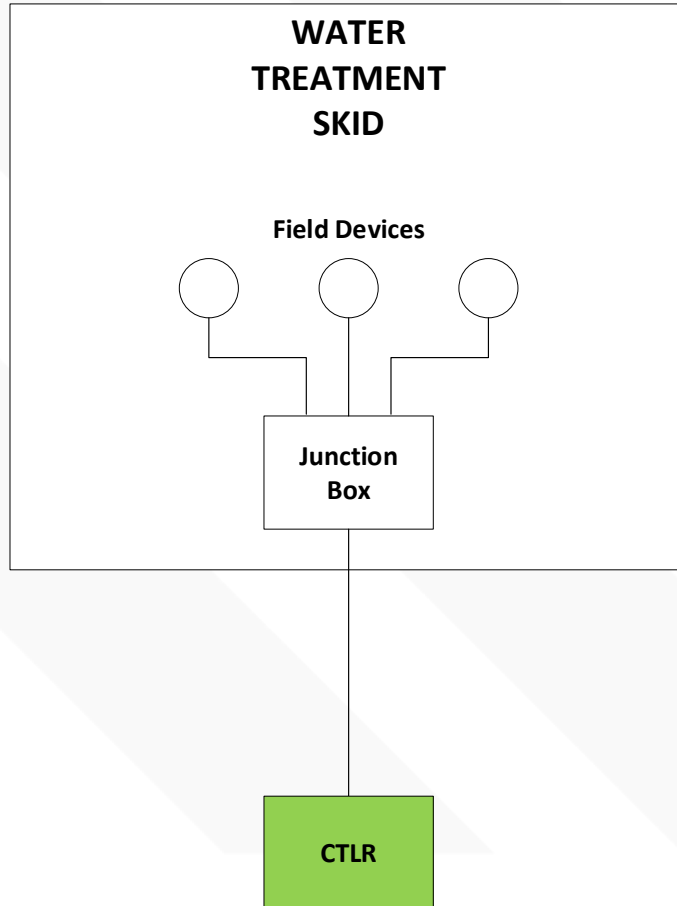
► Existing Plant

- As much as possible
- Things to consider leaving out:
 - Anything O&M staff wants to continue to use OEM for services
 - Equipment Control is not suitable for Plant Control System

Plant Control System Design Criteria

- ▶ Minimum one set of redundant controllers
- ▶ Segregate multiple steam/electricity/chilled water units based on availability requirements
- ▶ For Boiler or fired HRSG, need separate Combustion Control and Burner Management controllers per NFPA 85
- ▶ Other segregation as needed based on plant design

Plant Control System Integration with Skids



Plant Control System Standardization: Hardware

- ▶ Controllers
- ▶ IO Modules
- ▶ Communication Modules
- ▶ Networking Components
- ▶ Power Supplies
- ▶ Human Machine Interface



Plant Control System Standardization: Software

▶ 10

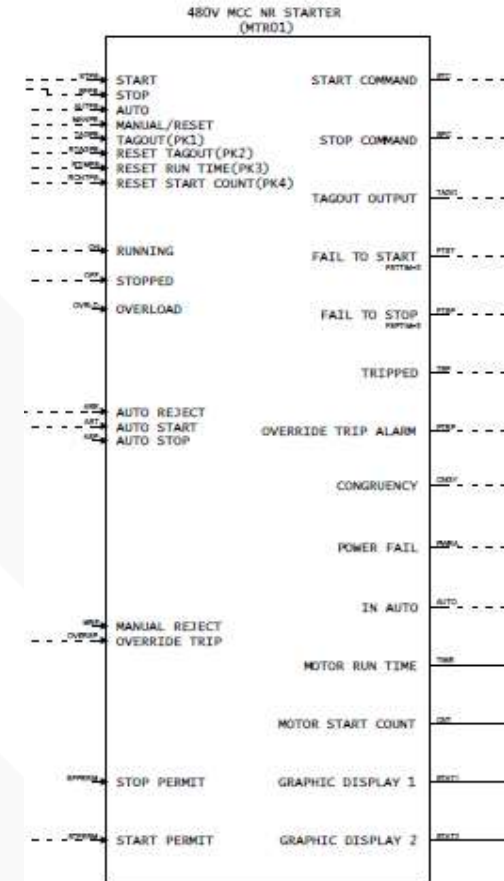
- Standardized tagging/naming convention

► Logic Design

- Develop functional structure to match plant design
- Standardized logic for plant components

▶ Graphic Design

- Standard templates and faceplates with macros
- Color standards
- Alarming standards
- High performance graphics



Project Execution

- ▶ Define design standards to be used
 - IO
 - Logic
 - Graphics
 - HW Design
- ▶ Develop spec documents:
 - Control system architecture
 - IO List
 - Specification
 - Include design standards
- ▶ Verify implementation during submittal reviews and FAT
- ▶ If Engineering firm is also system integrator can streamline process



Project Execution:

Integration of OEM Equipment (New Plants)

► Design Input from OEM

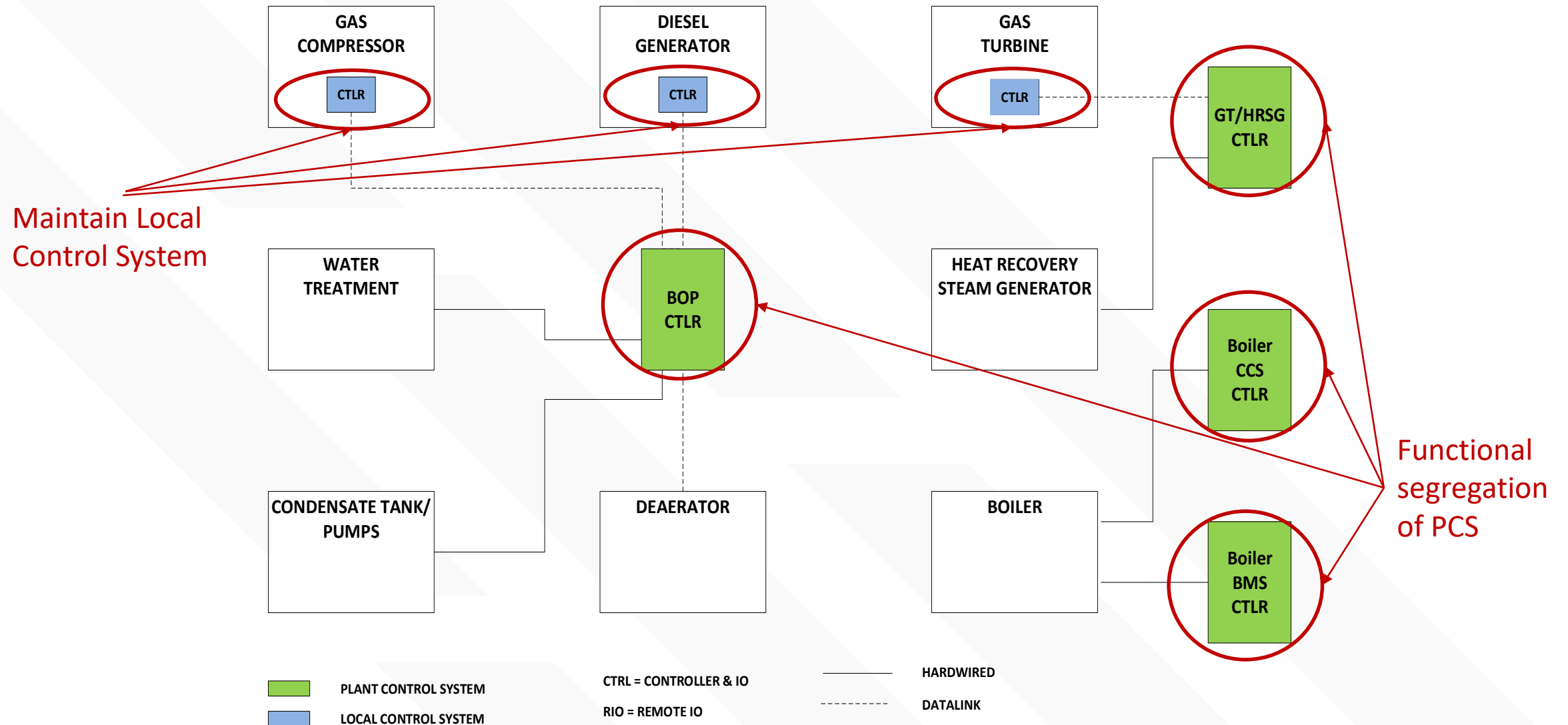
- P&IDs
- Functional Input – one or more of the following:
 - Sequence of Operation
 - Functional Description
 - Control Narrative
 - Logic Diagrams
- Cut Sheets of Field Devices
- Drawings of Skid Interface
 - Schematic for junction box
 - Remote IO panel drawing

► Execution Support from OEM

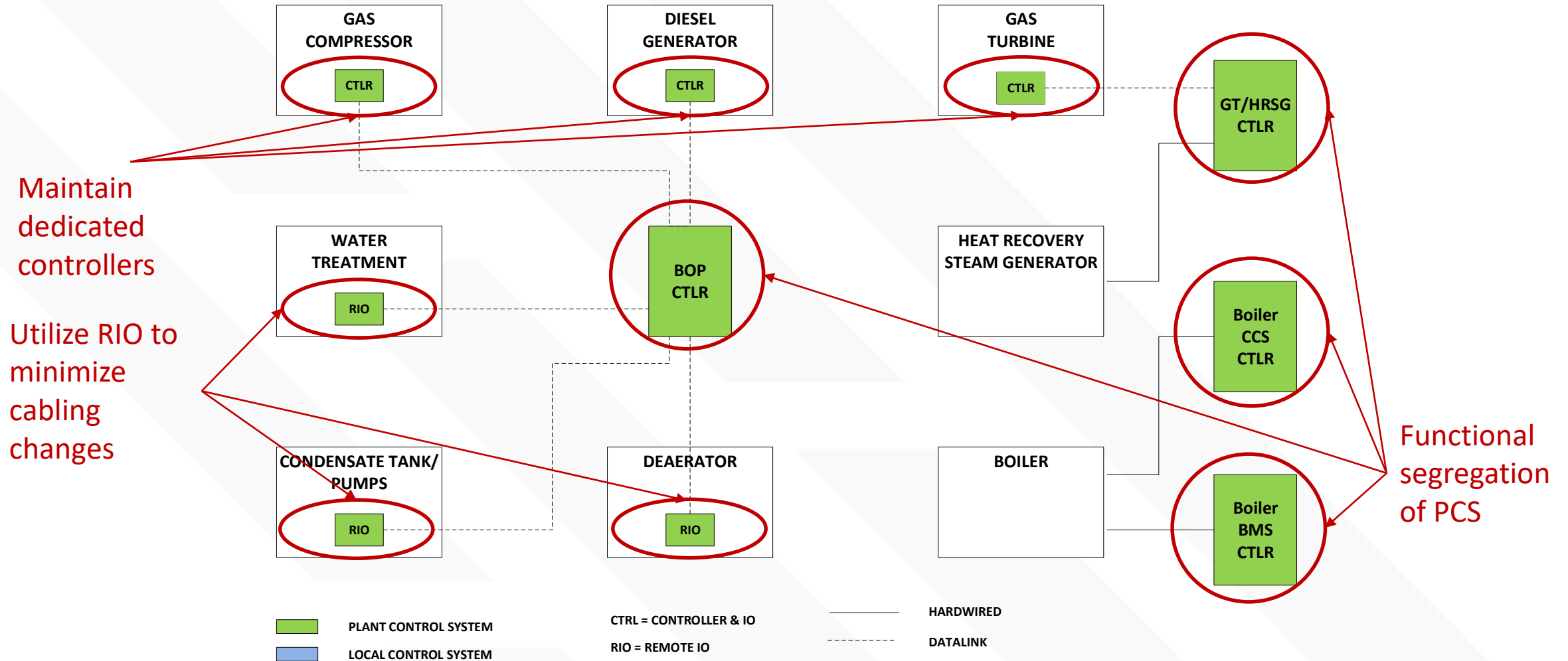
- Review implementation of design into control system
 - Logic
 - Graphics
 - IO
 - BMS drawings
- FAT support
- FAT acceptance
- Site support

Case Studies

New Plant Design



Existing Plant Upgrade



SUMMARY

Summary

- ▶ Integrated design approach offers the following benefits
 - Improved availability
 - Simplified and more effective O&M
 - Lower O&M costs
- ▶ Integrated design approach requires different approach for design and project execution
- ▶ Integrated design approach will result in different Plant Control System architectures depending on the following:
 - New vs existing plant
 - Objectives of Owner

Let's Get This Guy Some Help!



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