

# Lessons Learned from Commissioning CHP Plants

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A grayscale photograph of an industrial facility, likely a power plant or refinery, with a city skyline in the background. The foreground shows large industrial tanks and piping. A tall, twisted metal structure stands on the left. In the background, a bridge and a city skyline are visible under a cloudy sky.

**1. Quality**

**2. Strategy**

**3. Sequence**



# Lesson 1 **Quality**

# Lesson 1 **Quality**

“

Quality is the fitness for use.

**Joseph M. Juran**

”

# Lesson 1 **Quality**

Inspections can identify good or bad

**...but inspection alone cannot fix anything.**





# Lesson 1 **Quality**

When should you verify quality?



# Lesson 1 **Quality**

**QUALITY**  
MUST BE  
**BUILT IN**  
DURING **CONSTRUCTION**

# Lesson 1 **Quality**

# QUALITY





# Lesson 1 **Quality**

Was it factory tested?

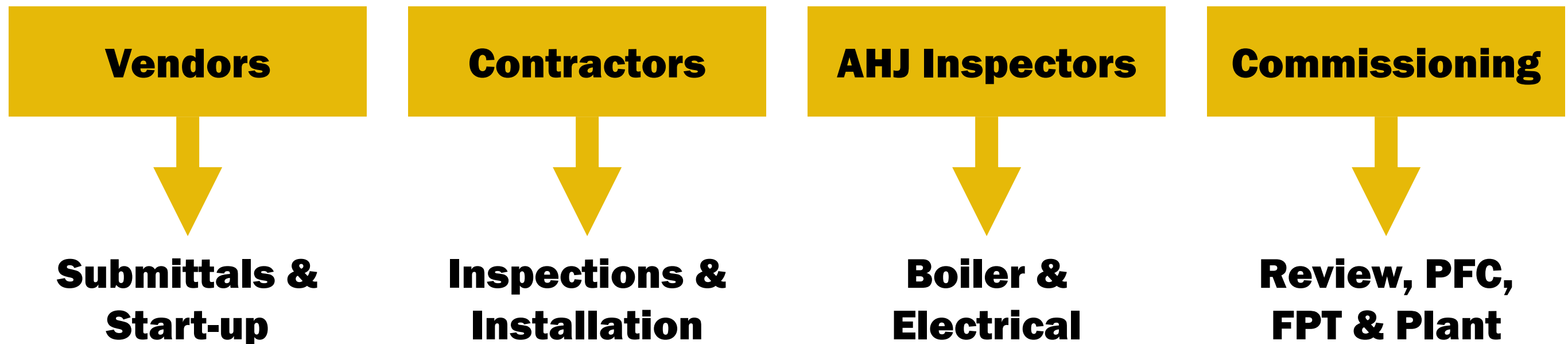
Yes!

But... Err..... *Oops.*



# Lesson 1 **Quality**

Quality has tasks for **everybody**.

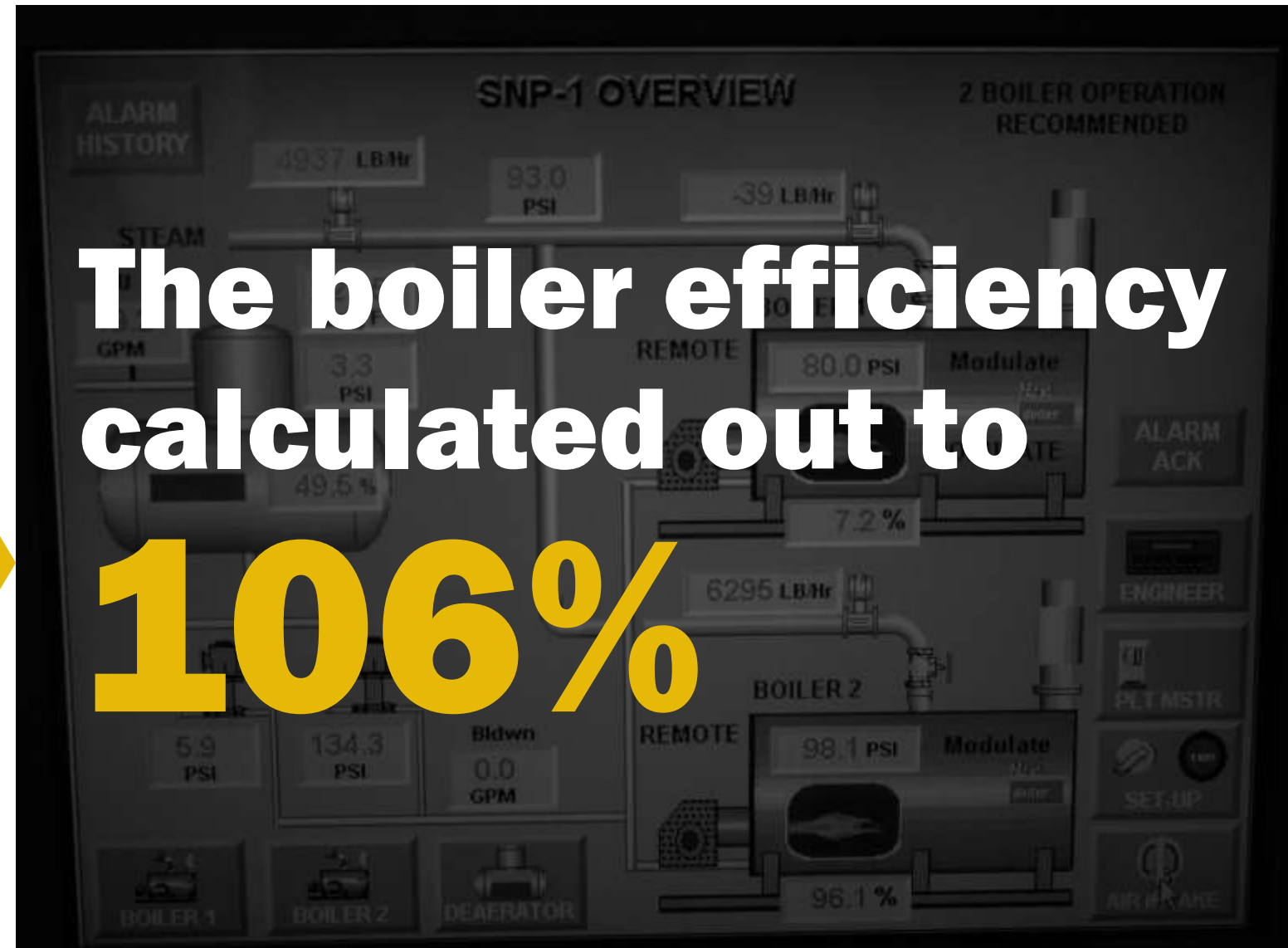




# Lesson 1 **Quality**

Trust but **verify**.

This vendor provided  
his startup sheet data.





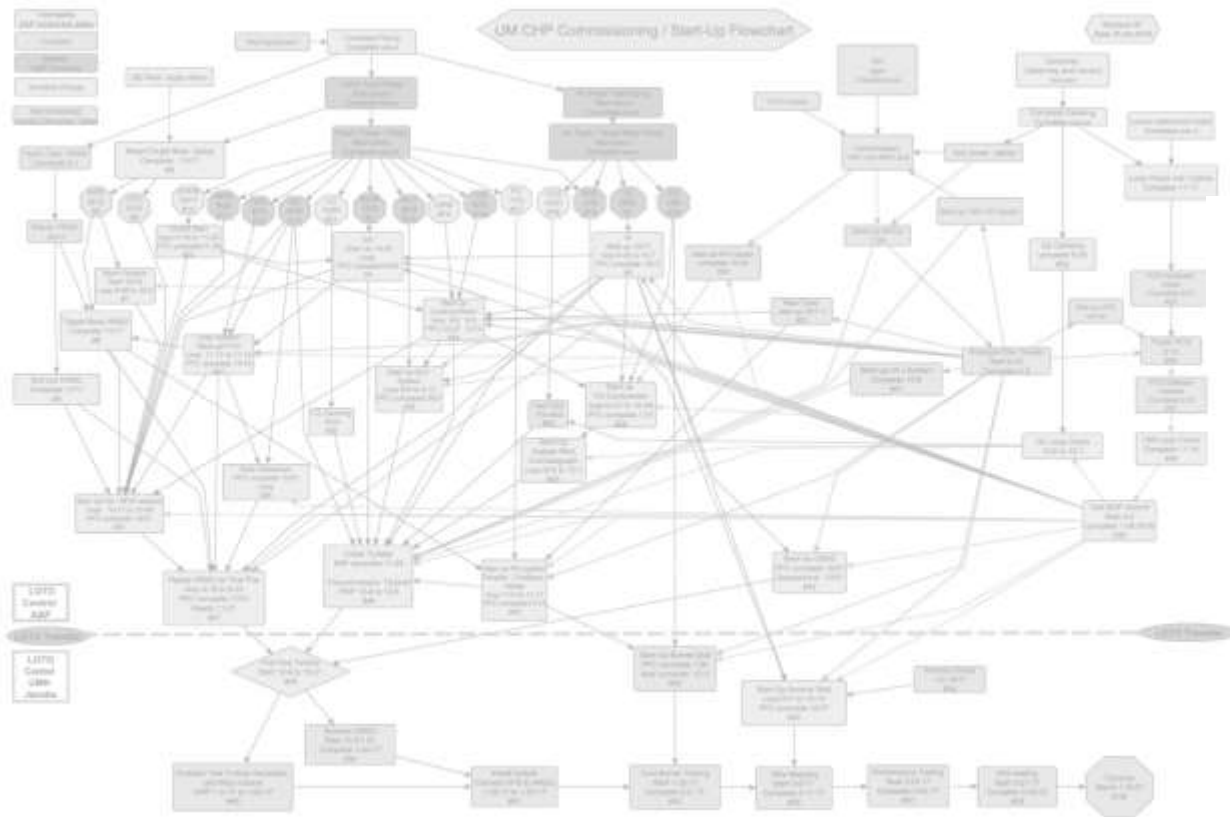
# Lesson 2 **Strategy**



# Lesson 2 **Strategy**

**Construction**

**Operation**



**MAGIC?**



# Lesson 2 **Strategy**

**Construction**

**Operation**

**STRATEGY !**

**SEQUENCE +  
COMMUNICATION =  
TEAMWORK**



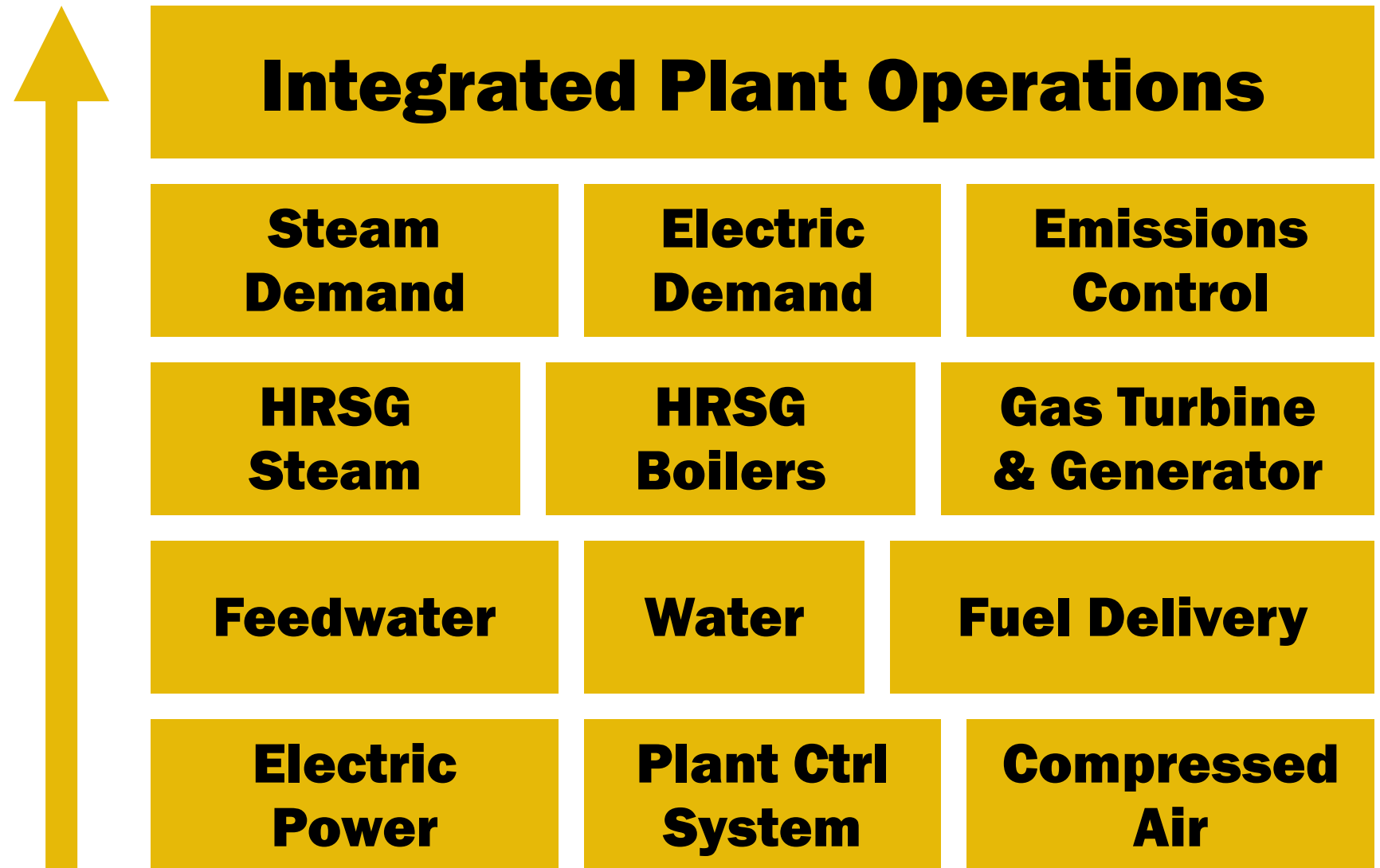




# Lesson 3 **Sequence**

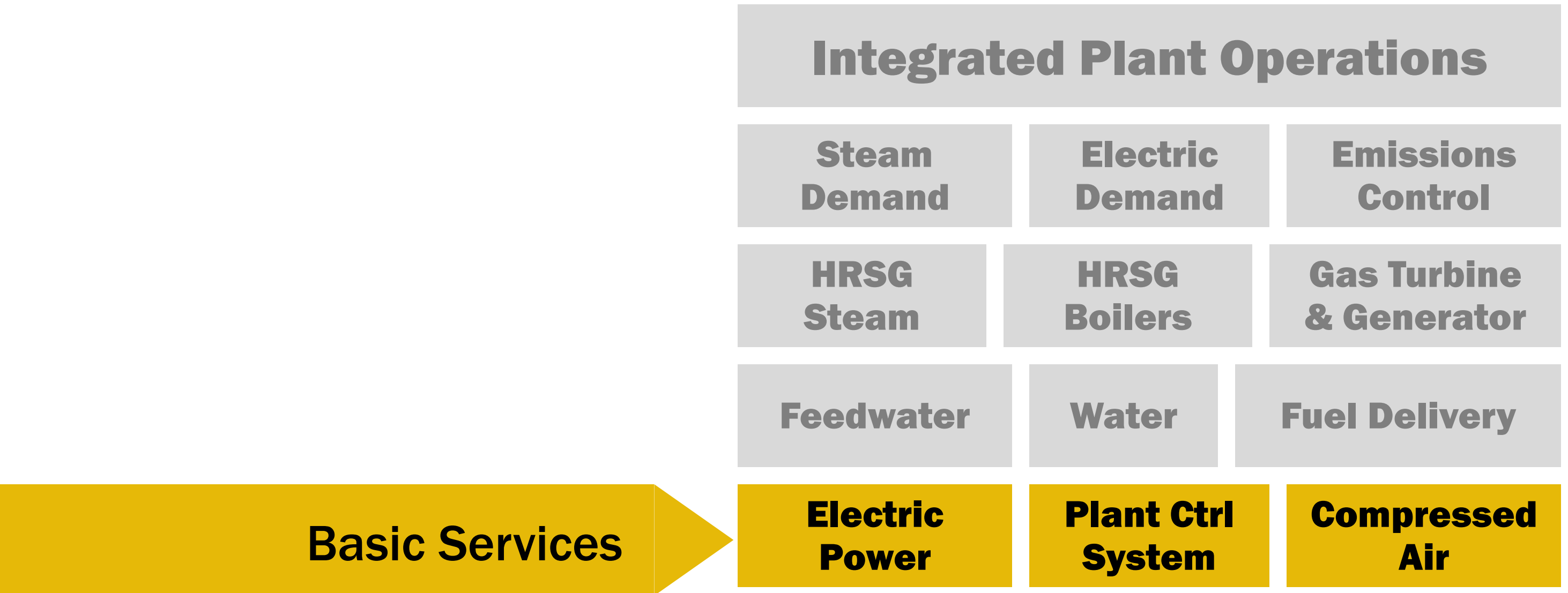
# Lesson 3 **Sequence**

Plant systems have dependencies. Build the wall from **bottom to top.**

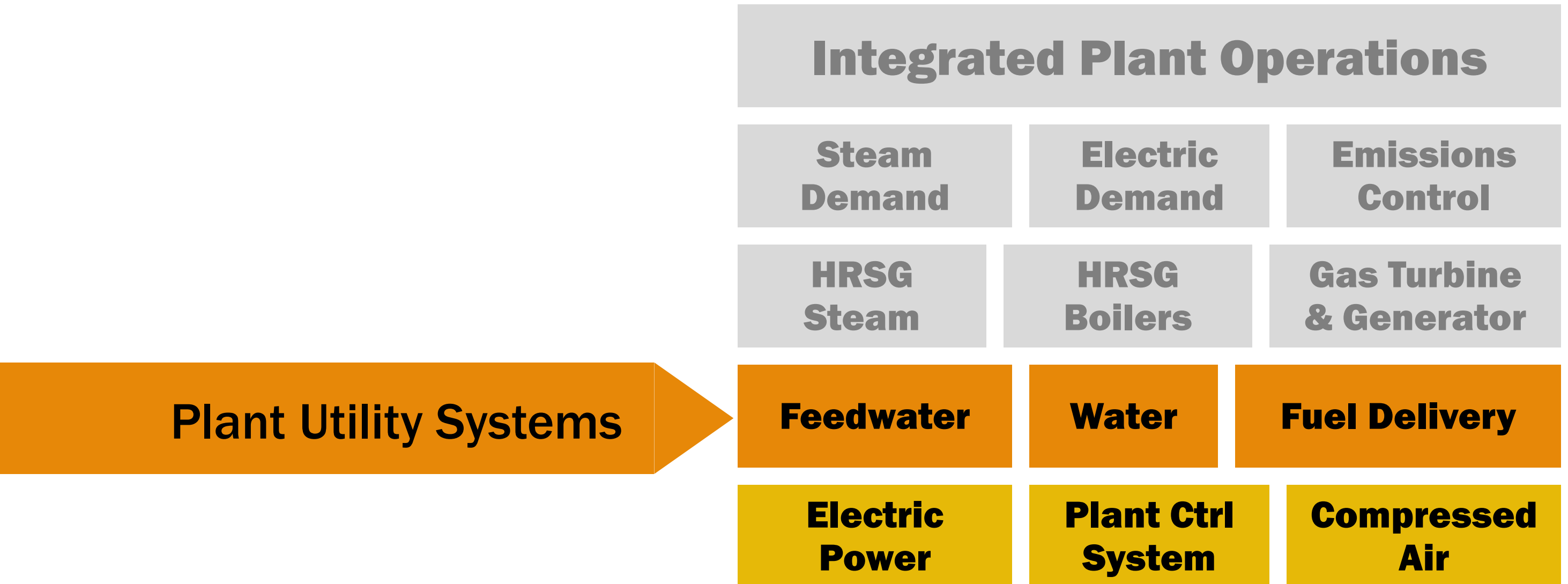




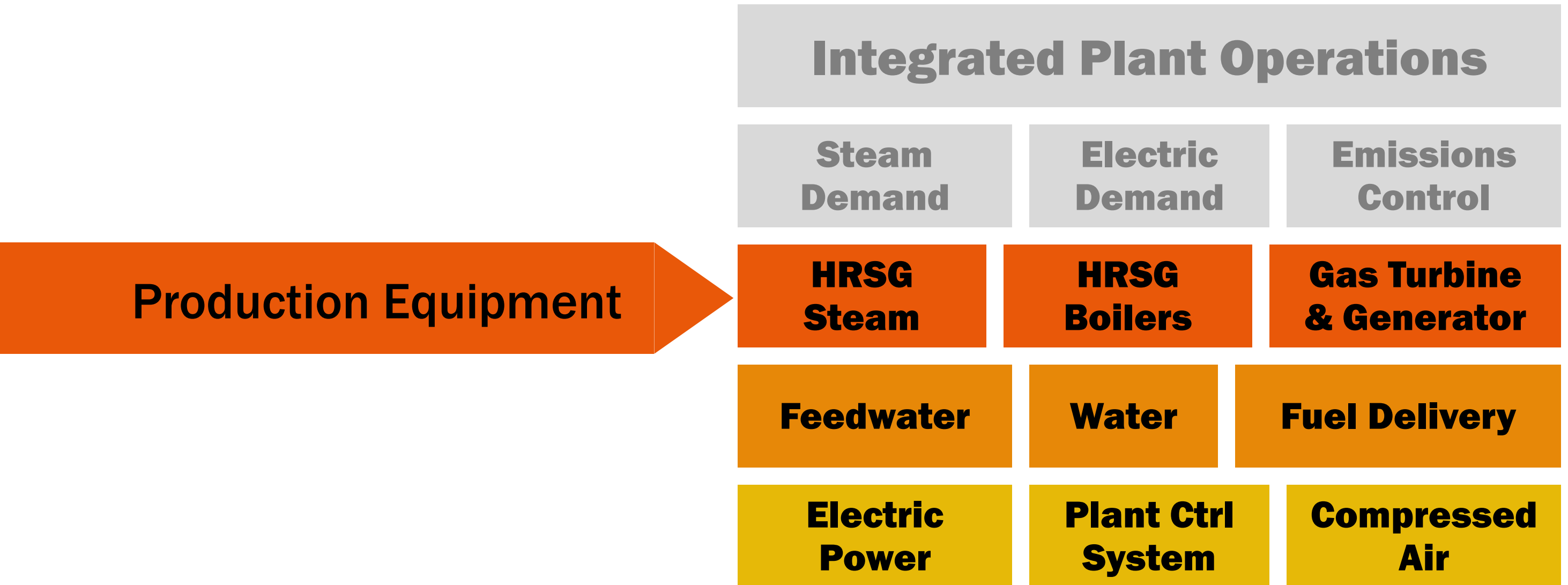
# Lesson 3 **Sequence**



# Lesson 3 **Sequence**

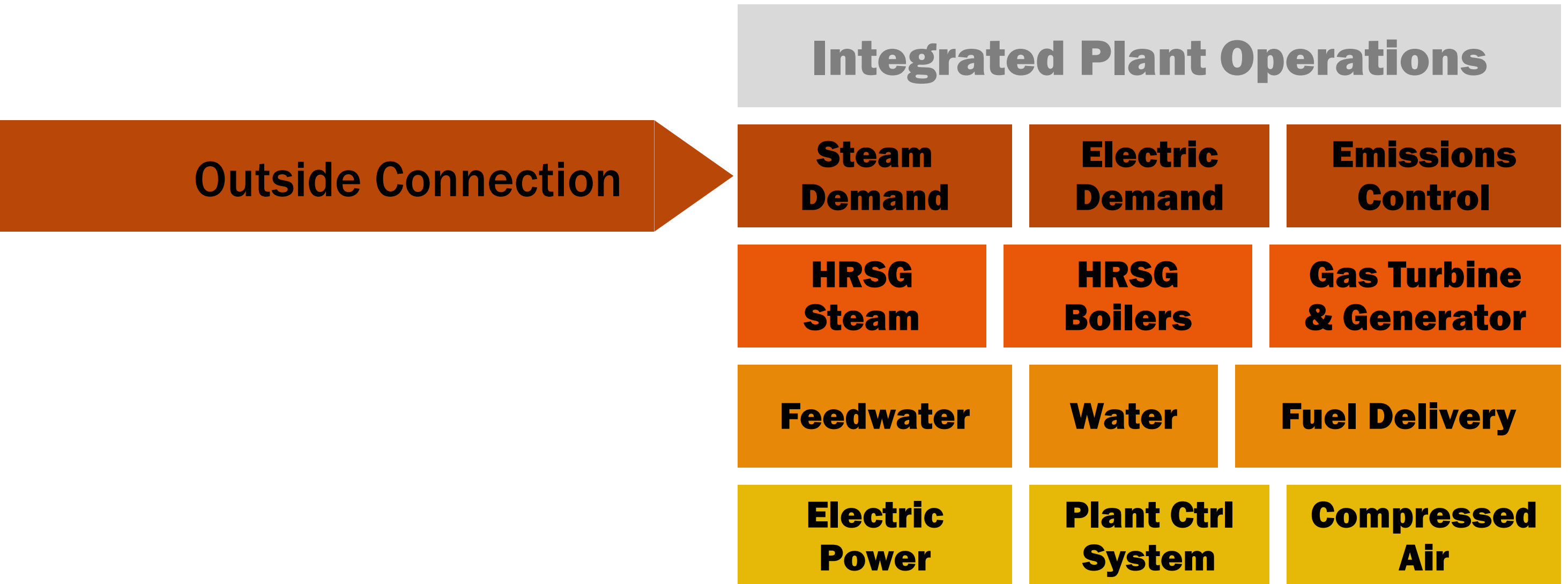


# Lesson 3 **Sequence**





# Lesson 3 **Sequence**



# Lesson 3 **Sequence**

**Total Capacity / Efficiency**

**Integrated Plant Operations**

**Steam  
Demand**

**Electric  
Demand**

**Emissions  
Control**

**HRSG  
Steam**

**HRSG  
Boilers**

**Gas Turbine  
& Generator**

**Feedwater**

**Water**

**Fuel Delivery**

**Electric  
Power**

**Plant Ctrl  
System**

**Compressed  
Air**



## Lesson 4 **Communication**



# Lesson 4 Communication

Daily  
schedules  
for morning  
meetings

	Yesterday	Today	Tomorrow			
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1/15 Off  (GE on site)	1/16 Set up & test chemical injection system NALCO. Polymer & Caustic Pumps  HRSG Fill Atemperator line flush Test run Ammonia fans	1/17 CTG crank testing FGC Startup (Vendor) Fuel Gas skid start  Set up Glycol system & test run electric heater Installed steam siphons Set up CBD system Blowdown HRSG modules	1/18 First Fire Day (First Fire Postponed)  FGC Startup (Vendor)  HRSG Trip Tests  Cooling water tuning	1/19 (First Fire Postponed)  FGC Startup (Vendor)  Fuel Oil Pump Startup Fuel Oil Heater startup <i>as needed:</i> Tune HRSG drum level Tune DA pressure & level	1/20 CTG First Fire CTG Trip testing  FGC Startup (Vendor)  <i>as needed:</i> Tune BFP speed controls Tune DA pressure & level	1/21 Catch Up Day
1/22 Off	1/23 (start 12 hr days) Start CTG at 8:00am Electrical Phase Test(10a) Synchronize CTG Electrical Testing  Fuel 1 Mapping (gas)  <i>as needed:</i> Tune BOP control loops	1/24 Fuel 1 Mapping  RO/makeup FPT - remote start  Water Sampling FPT <i>as needed:</i> Tune BOP control loops	1/25 Fuel 1 Mapping  Fuel Oil Drain Tank floats & vent installed  <i>as needed:</i> Tune BOP control loops	1/26 Fuel 1 Mapping  Fuel Oil Drain Tank startup?  Cooling Water FPT-start	1/26 Fuel 1 Mapping  Feedwater FPT (?) Glycol FPT?	1/28 Catch-up day

# Lesson 4 Communication

Each day shows the expected tasks.

Schedule vendors on site only when needed.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1/15 Off  (GE on site)	1/16 Set up & test chemical injection system NALCO Polymer & Caustic Pumps  HRSG Fill Atemperator line flush Test run Ammonia fans	1/17 CTG FGC Fuel  Set test Inst Set Ble	1/18 1/23 (start 12 hr days) Start CTG at 8:00am Electrical Phase Test(10a) Synchronize CTG Electrical Testing  Fuel 1 Mapping (gas)  as needed: Tune BOP control loops	1/19 First Fire Postponed) C Startup (Vendor) el Oil Pump Startup el Oil Heater startup as needed: ne HRSG drum level ne DA pressure & level	1/20 CTG First Fire CTG Trip testing  FGC Startup (Vendor)  as needed: Tune BFP speed controls Tune DA pressure & level	1/21 Catch Up Day
1/22 Off	1/23 (start 12 hr days) Start CTG at 8:00am Electrical Phase Test(10a) Synchronize CTG Electrical Testing  Fuel 1 Mapping (gas)  as needed: Tune BOP control loops	1/24 Fuel  RO/makeup FPT - remote start  Water Sampling FPT as needed: Tune BOP control loops	1/25 Fuel Oil Drain Tank floats & vent installed  as needed: Tune BOP control loops	1/26 Fuel 1 Mapping  Fuel Oil Drain Tank startup?  Cooling Water FPT-start	1/26 Fuel 1 Mapping  Feedwater FPT (?) Glycol FPT?	1/28 Catch-up day

# Summary

## Sweet success!

It's a cold winter morning  
your CHP plant is online,  
meeting campus power  
and steam demands.





# Questions?



*Easy as 3.14159 226535 89793 23846 . . .*

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