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## ***Considerations:***

*Coal to Natural Gas Conversion  
Emissions Control Technology*

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# Considerations

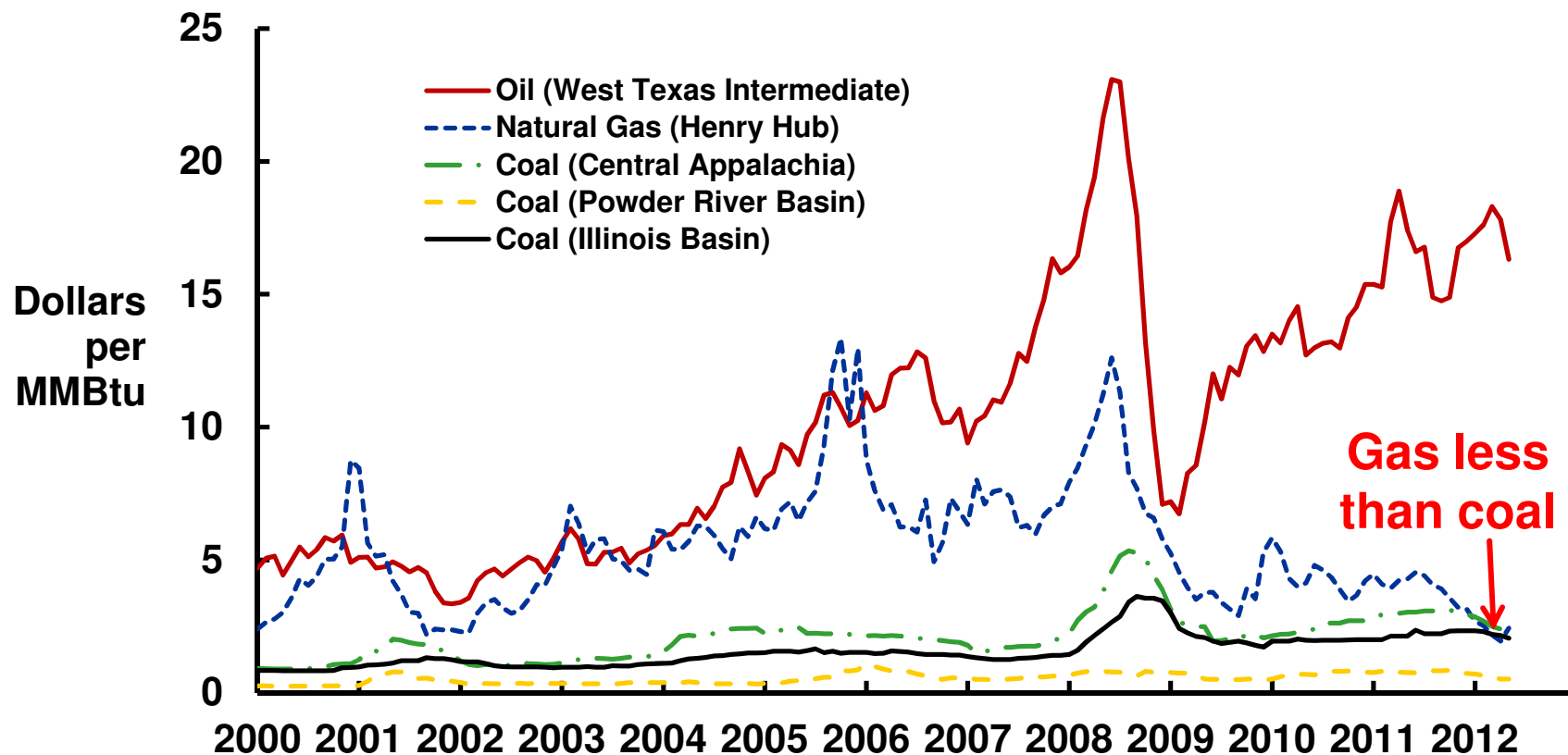
## Coal to Natural Gas Conversion

- Burner Options
- Boiler Effects

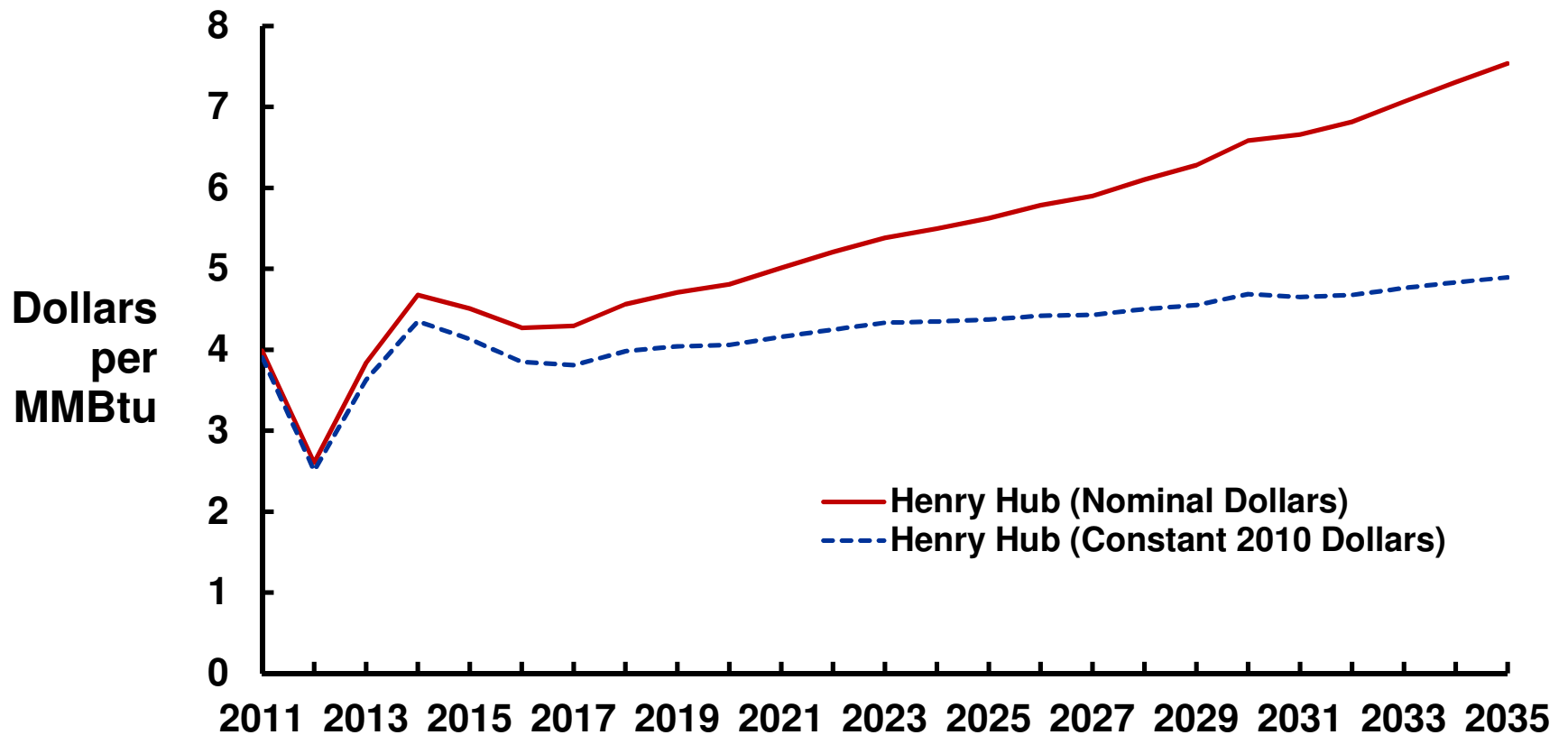
## Emissions Control Technology

- Interaction among technologies
- It's rarely simple

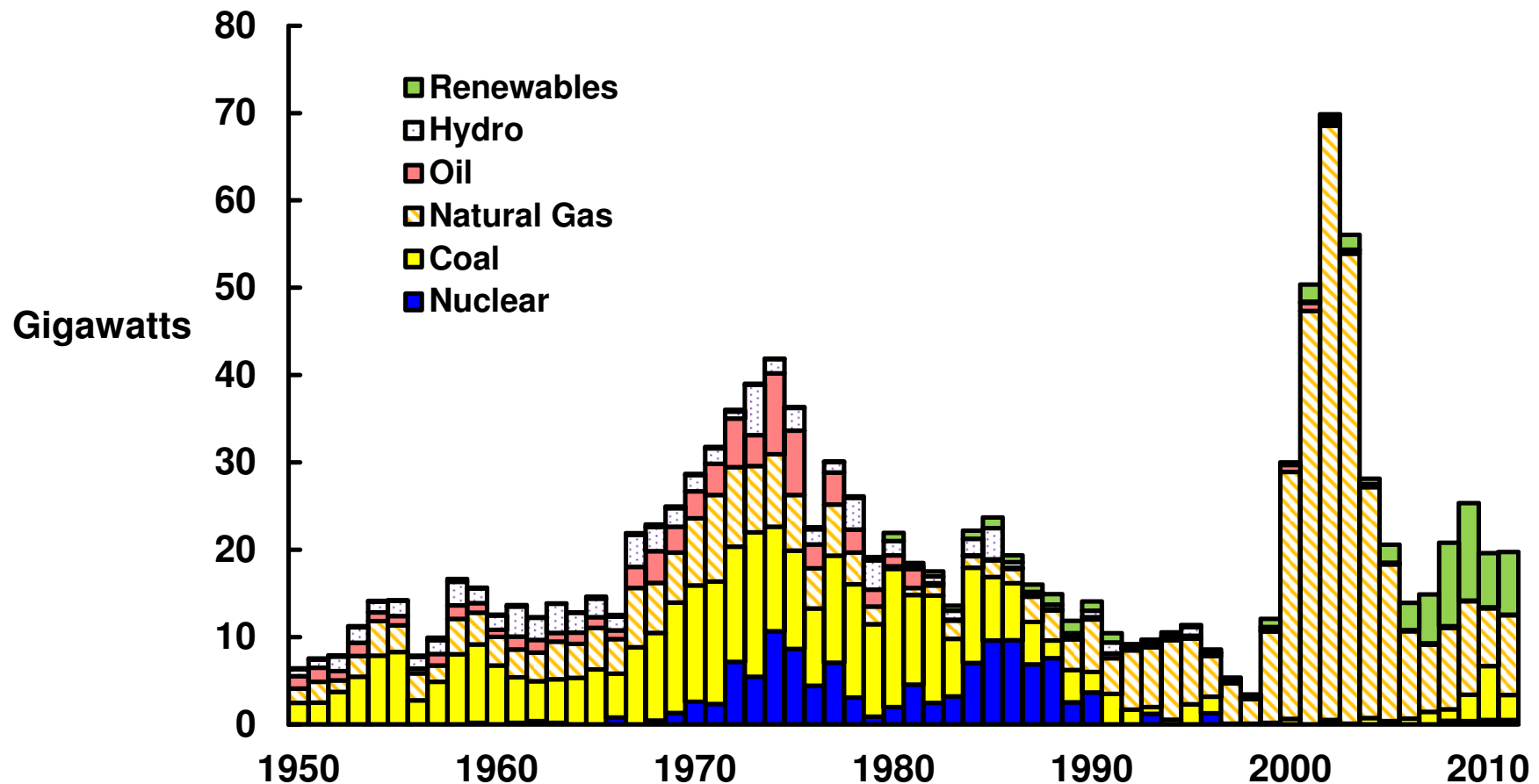
# Hmm...expensive controls or cheap gas?



# And it will be cheap “forever”...right?



# Electric generation capacity additions since 1950

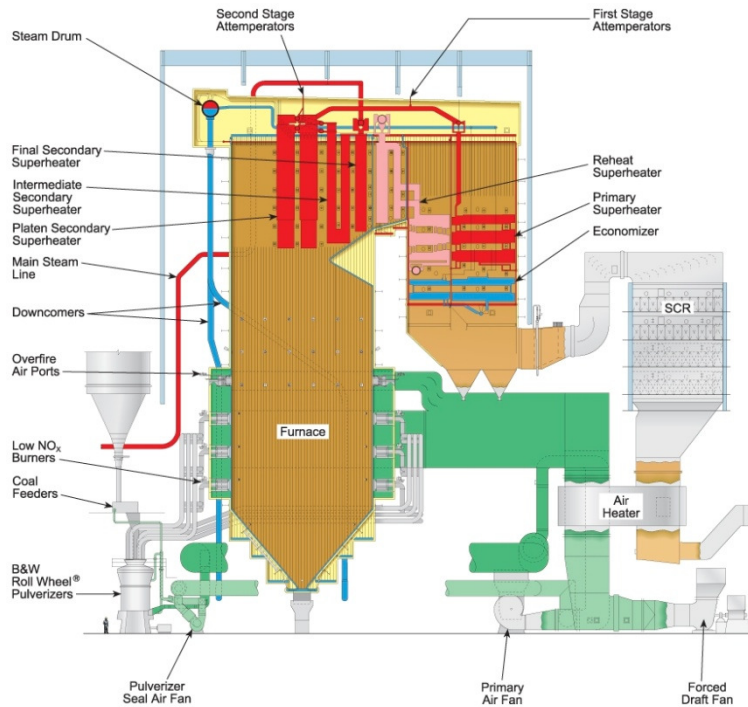


# Gas Conversion Fundamentals

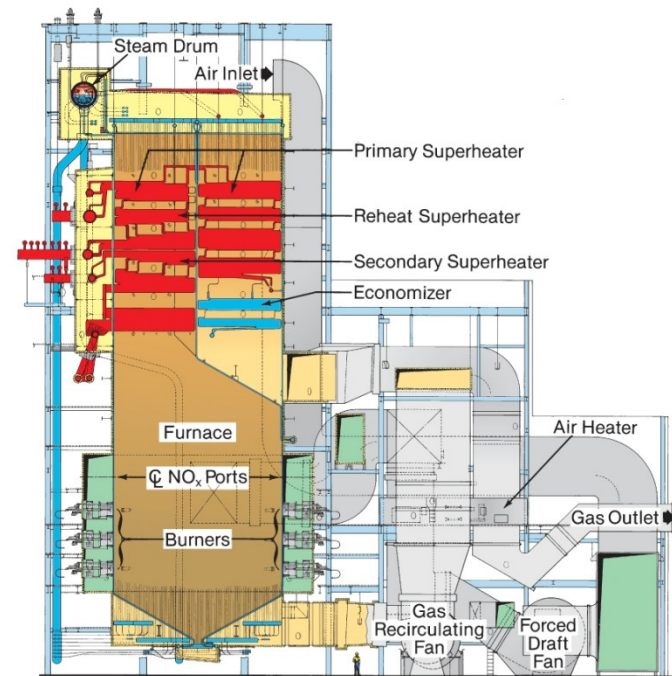
*So you want to  
Convert this...*

*Into*

*This?*



Typical PC Boiler

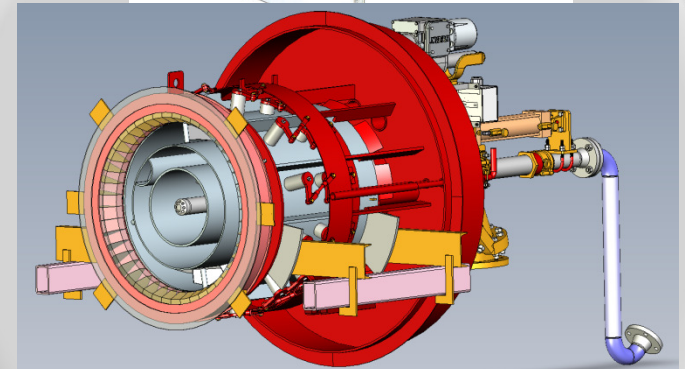
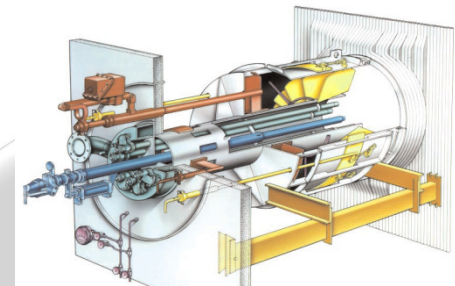


Typical Gas Boiler

# Coal to NG Conversion Burner Options

For coal fired boilers there are four approaches depending on the owner's objectives

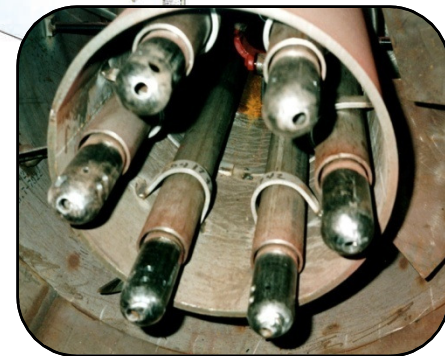
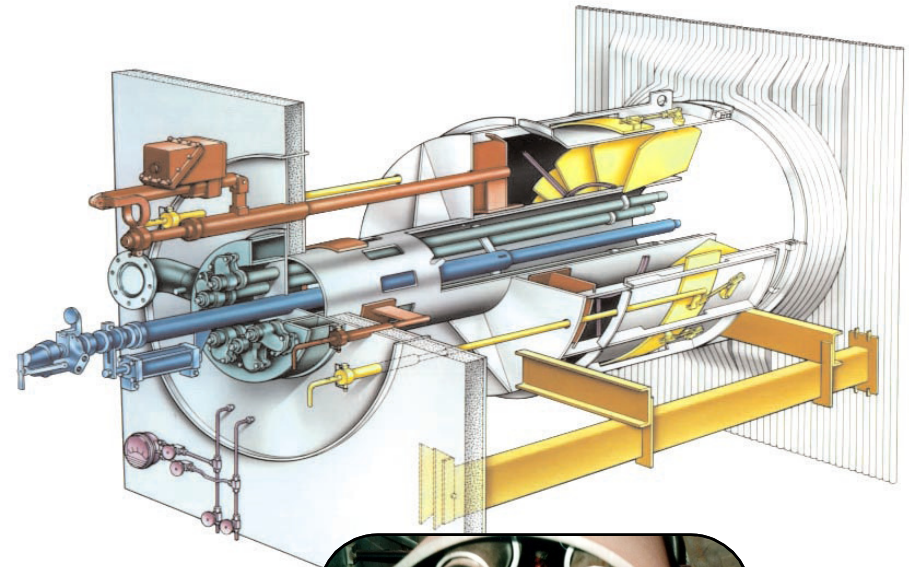
1. Completely abandon coal – Replace all burners with new gas burners
2. Retain ability to fire coal – Coal nozzle replacement only with gas elements
3. Retain ability to fire coal – PC burners with gas elements
4. Continue to fire coal – Partial burner replacement/modification



## ***Coal to NG Conversion***

### ***Approach 1 – Abandon Coal – Complete Retrofit***

- Complete Burner replacement with new gas only burners
- Adjust SH surface (if necessary) to reduce spray flows
- Possibly adjust Economizer surface.



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**Highest cost & longest  
outage time**

**Allows for best combustion  
and boiler performance**

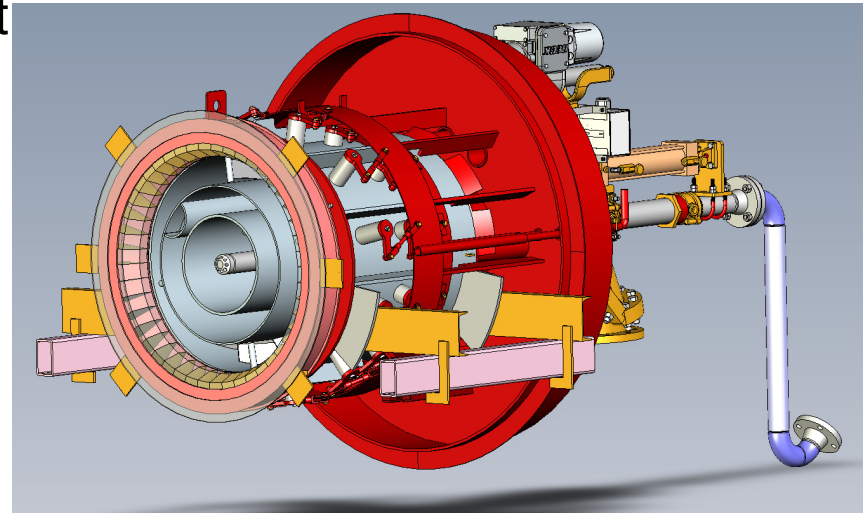


## ***Coal to NG Conversion***

### ***Approach 2 – Continue Coal – Coal Nozzle Replacement***

Replacement coal nozzle can be supplied incorporating a gas element

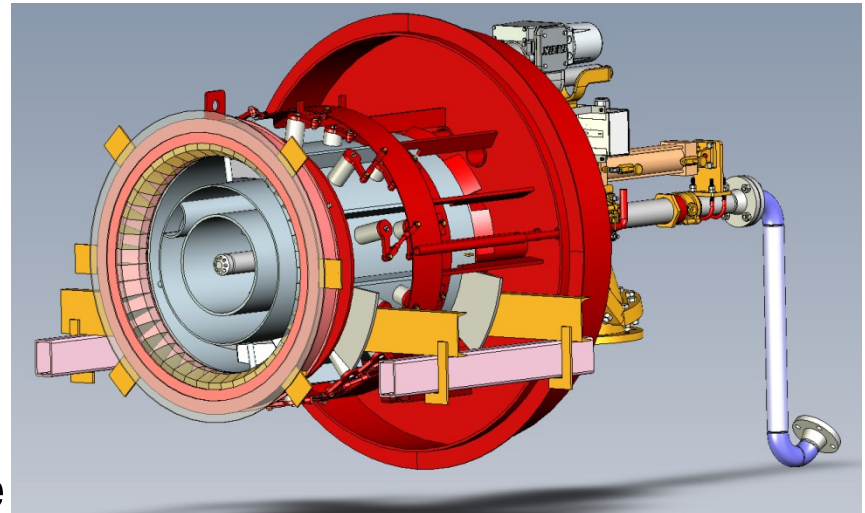
- Lower cost & shorter outage time
  - Performance compromises
  - Can modify all or some burners
  - Pressure part metallurgy must be reviewed
- 
- Provides a hedge against gas curtailments & shortages



## ***Coal to NG Conversion Approach 3 – Retain Coal – Burner Replacement***

Where existing burners are not suitable for a simple coal nozzle replacement, a complete PC burner with gas elements can replace existing burners

- Higher cost & longer outage time
- Allows for good compromise between fuel flexibility and combustion performance
- Burners can be sized for reasonable pressure drop and/or to accommodate FGR
- Pressure part metallurgy must be reviewed
- **Provides a hedge against gas curtailments & shortages**

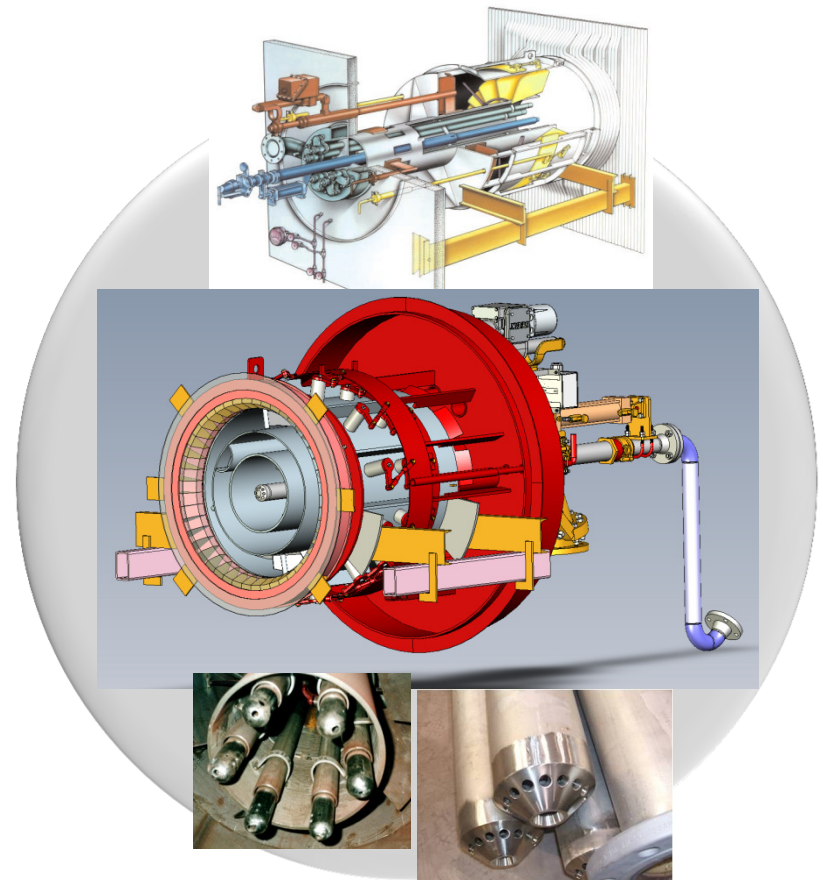


## Coal to NG Conversion

### Approach 4 – Retain Coal – Augment / Partial Replacement

In some cases where an owner plans to continue to fire coal but would like to augment with gas to lower emissions or improve turndown, some burners can be replaced or modified for gas firing

- Most applicable to larger units – with many burners
- Good tool for turndown improvement
- Can be coupled with change to gas ignitors for incremental increase in heat input on gas



# Coal to NG Conversion

## Other Burner Scope Items:

- ▶ FGR or IFGR system – depending on NOx performance level desired
- ▶ OFA system – depending on NOx performance level desired
- ▶ Burner throat openings (not common)
- ▶ New ignitors

## ***Coal to NG Conversion Equipment Boiler Considerations***

### **Pressure Parts:**

- ▶ Convective surface absorptions are higher due to gas weight, gas properties and surface effectiveness
- ▶ Spray attemperator capacities need to be checked
- ▶ SH outlet sections often require surface adjustments and/or materials upgrades
- ▶ Economizer surface may need to be modified to prevent steaming

## Coal to NG Conversion Air System Considerations

The FD Fan Capacity will need to be checked

- ▶ After a gas conversion, all combustion air must be delivered by the FD fan through the existing Airheater and Secondary Air ducts to the windbox and burners (and/or OFA system). No more primary air from pulverizers.
- ▶ FGR (if required) will exacerbate the FD fan issues
- ▶ The airheater performance should also be checked, especially if IFGR is used for NOx control

# Take Aways

- There are several options for modifying/replacing burners
- Convection Pass heating surface may need modification
- Air system modifications may be required