



# Tuning PEPSE Models to Actual Plant Data

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# Using Plant Data in PEPSE

1. Tune Model to Plant – Make your model behave like your plant.
2. Find Lost MW & Improve Heat Rate – Find lost MW and quantify reduced component and system performance.



# Tune Model to Plant

- Use Several Sets of Data
- Components in Design Mode
- Use Controls (and SO5) for Tuning
- Insert Tuned Parameters Into Model



# Questions?

- What data do I use?
- Where do I get it?
- How much data?
- Accuracy?
- What do I do with it?



# What Data Do I Use?

- 3 “Points” – Hot, Mid, Cold
- Same Load
- Be Aware of Data “Units”



# What Data Do I Use? Nuclear

## Boundary Conditions

**MWt**

**MWe**

**S/G (PWR) or Reactor (BWR) steam out moisture or quality, and pressure**

**Circulating water temperature and flow rate**

**Condenser backpressure(s)**

**Atmospheric pressure**

## Plant Data

**Turbine pressures – 1<sup>st</sup> stage, HP exhaust, LP inlet**

**Extraction pressures – at turbines or feedwater heaters**

**Pump discharge pressures and temperatures**

**MSR outlet pressures and temperatures**

**Feedwater heater outlet and drain temperatures**

**Make-up and blowdown flows**

**Others as available**



# What Data Do I Use?

## Fossil

### Boundary Conditions

**MWe**

**Main steam conditions – pressure, temperature, flow (or FW flow)**

**Reheat conditions – pressure, temperature**

**Circulating water temperature and flow rate**

**Condenser backpressure(s)**

**Atmospheric pressure**

### Plant Data

**Turbine pressures – 1<sup>st</sup> stage, HP exhaust, IP exhaust**

**Turbine temperatures – HP exhaust, IP exhaust, extractions**

**Extraction pressures – at turbines or feedwater heaters**

**Pump discharge pressures and temperatures**

**Feedwater heater outlet and drain temperatures**

**Make-up and blowdown flows**

**Others as available**



# Where Do I Get It?

- Acceptance Test
- Periodic Performance Test
- Plant Data from PPC





# How Much Data?

- One-hour Averages
- 3 Days Out of the Year
- Some Data Not Important to Heat Balance Calcs



# Accuracy?

- PTC-6 Instrumentation
- Periodic Test Instrumentation
- Plant Instrumentation
- Gauges and Clipboard



# What Do I Do with It?

Goal - Make the PEPSE model behave like the plant using the same boundary conditions. This allows the model to be used to make accurate predictions of the behavior of the actual plant under other simulated conditions.



# How Do I Do That?

1. Develop PEPSE Model
2. Components in Design Mode
3. Secure Data
4. Write Controls (and SO5) to Tune
5. Insert Tuned Parameters Back Into Model – Disable Controls/SO5



# How Do I Do That?

## 1. Develop PEPSE Model

- Turbine Thermal Kit “Design” Model
- Previously Data-Tuned Model
- Inherited Model



# How Do I Do That?

## 2. Components in Design Mode

- Feedwater Heaters
- Reheaters
- Condensers
- Other HX's as Available
- "GE" Turbines
- Steam Generator - TROUBLE



# How Do I Do That?

## 3. Secure Data

- Conduct a Test
- Take Data from the PPC
- Secure on a Spreadsheet



# How Do I Do That?

## 4. Write Controls (and SO5) to Tune

**Turbines – EFMULT's and SHAPER's for ext/exh enthalpies**

**Condensers – UALLC for backpressure**

**FWHR's – UALLC and UALLDC for out temps**

**Heat Exchangers – UHX for out temps**

**Reheaters – HTTIRH for desired out condition**

**Sources – Use pressure, temp, flow as known**

**Valves – Adjust DP's as required**

**Pumps – Use discharge pressure, temp**

**Mixer's – No data needed**

**Splitters – Flow data as available**

**Streams - Adjust DP's as required**

**Others – Data as available**





# How Do I Do That?

## 5. Insert Tuned Parameter Back into Model

- Manually
- External File
- “Save” Case
- Spreadsheet/VBA Program



**FAMOS: Fleet Asset Management and Optimization Solutions**

# Demonstration



## FAMOS: Fleet Asset Management and Optimization Solutions