Finding Lost Megawatts

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CURTISS WRIGHT Flow Control Company
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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.

Find Lost Megawatts

- Use Data for 100% Load
- Components in Performance Mode
- Follow 4-Step Pattern
    1. Develop Benchmark Model
    2. Insert Plant Data
    3. Correct to Standard Conditions
    4. Perform Upgrades
- Special Option 6 Recommended

I. Develop Benchmark

Benchmark Model

Design

Acceptance Test

Post-Outage Test

Other

I. Develop Benchmark

1. Turbine Thermal Kit “Design” Model
2. Previously Data-Tuned Model
   - Acceptance Test
   - Post-Outage Test
   - Other Data
3. Inherited Model

I. Develop Benchmark

Benchmark Model

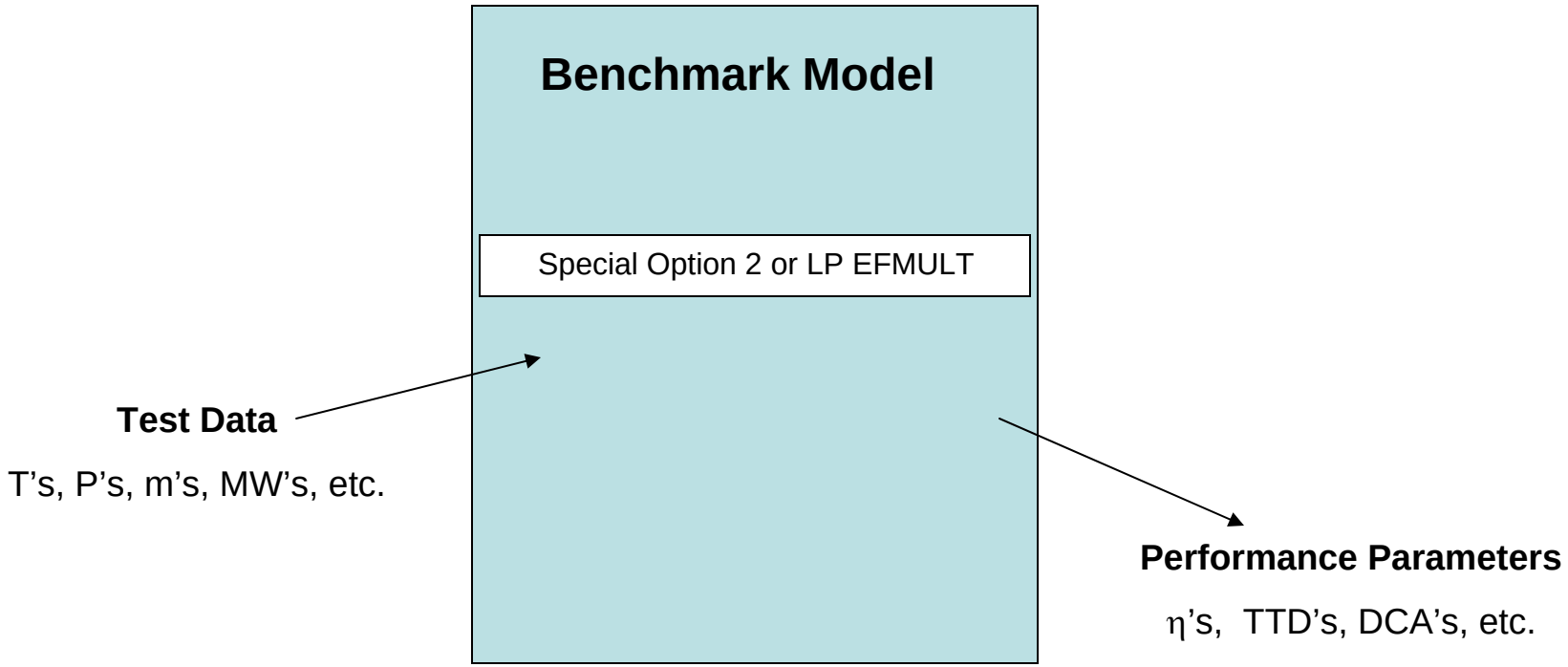
Design

Acceptance Test

Post-Outage Test

Other

II. Insert Plant Data



II. Insert Plant Data

- Data = 1 “Point”
  - Test
  - Plant PPC
  - Other
- Same Load as Benchmark
- Be Aware of Data “Units”
- Match Generation

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 – 1st 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 – 1st 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**

II. Insert Plant Data

Accuracy:

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

II. Insert Plant Data

PEPSE Data Mechanisms:

- Directly Into Components/Streams
- Special I/O Processor
- Special Option 6 Template

II. Insert Plant Data

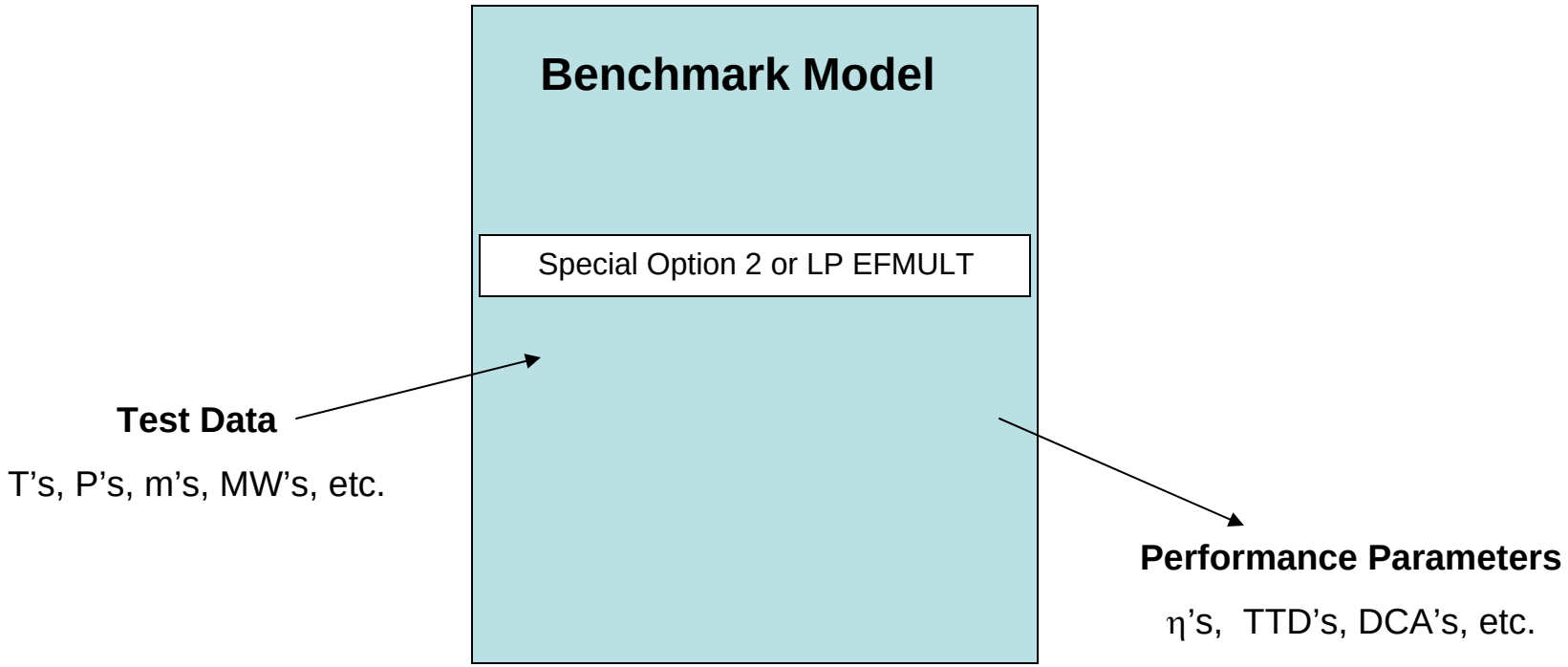
Inserting Data Into PEPSE:

- Manually
- Special Option 6 Run Menu
- Spreadsheet/VBA Program

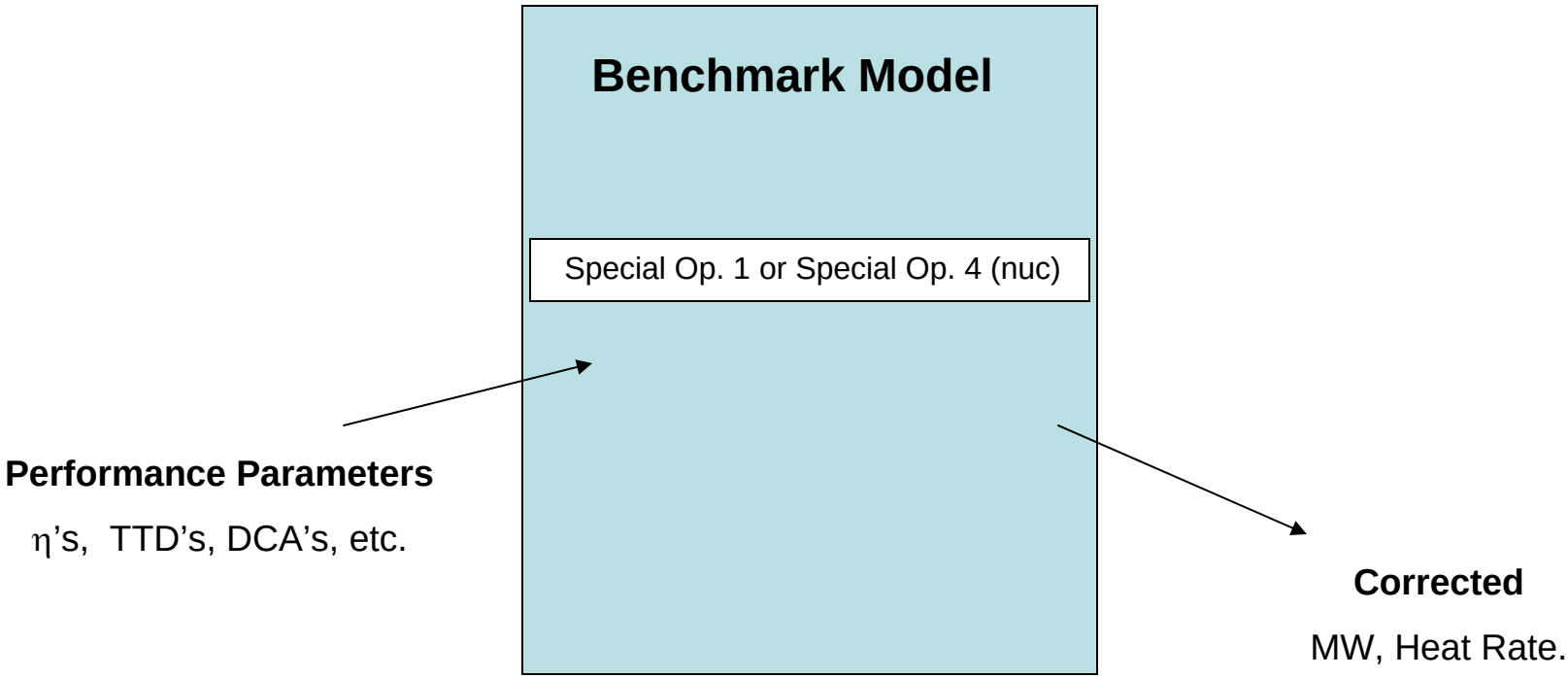
II. Insert Plant Data

Result of this step is the calculation of component and stream performance parameters that reflect current plant operation.

II. Insert Plant Data



III. Correct to Standard



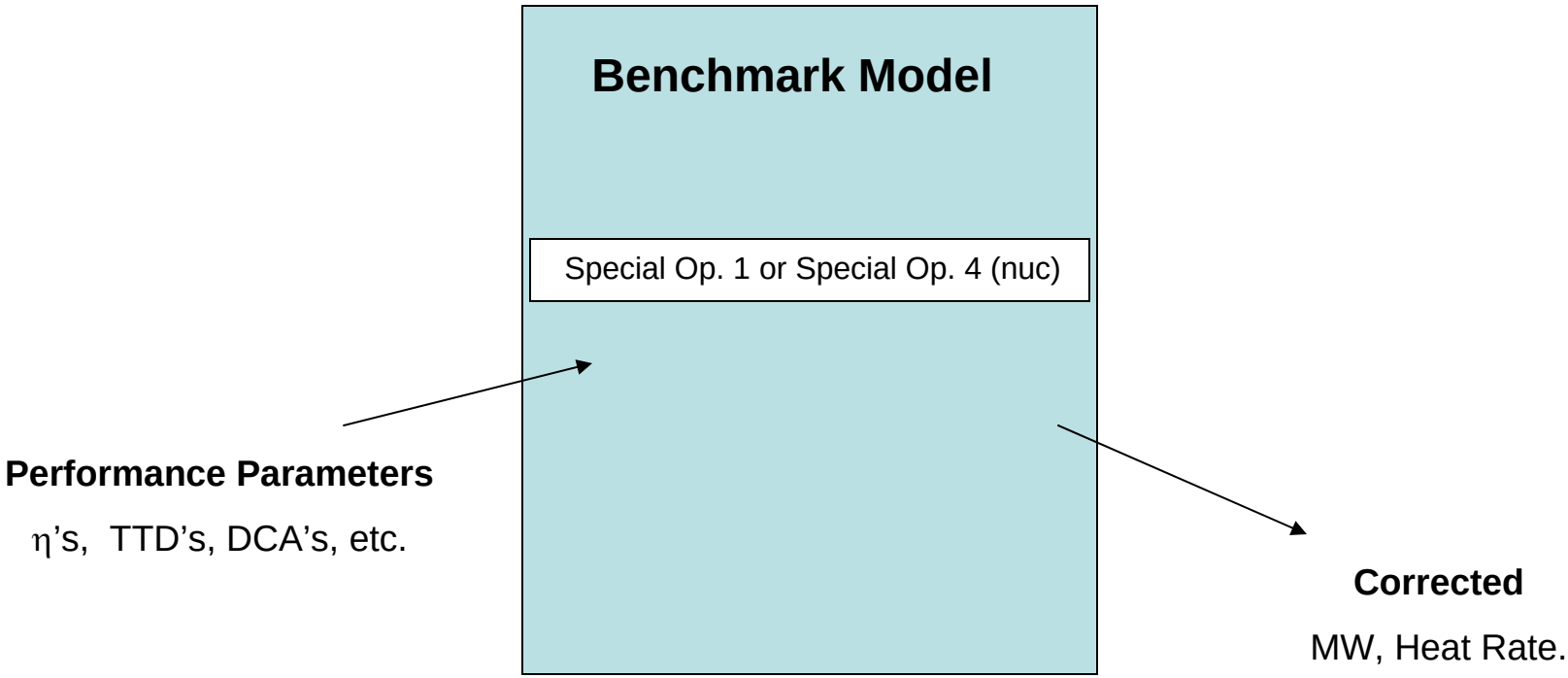
III. Correct to Standard

1. Different BC's Than Benchmark
2. Normalize to Same BC's
3. Assumption? – Performance Parameters Do Not Change

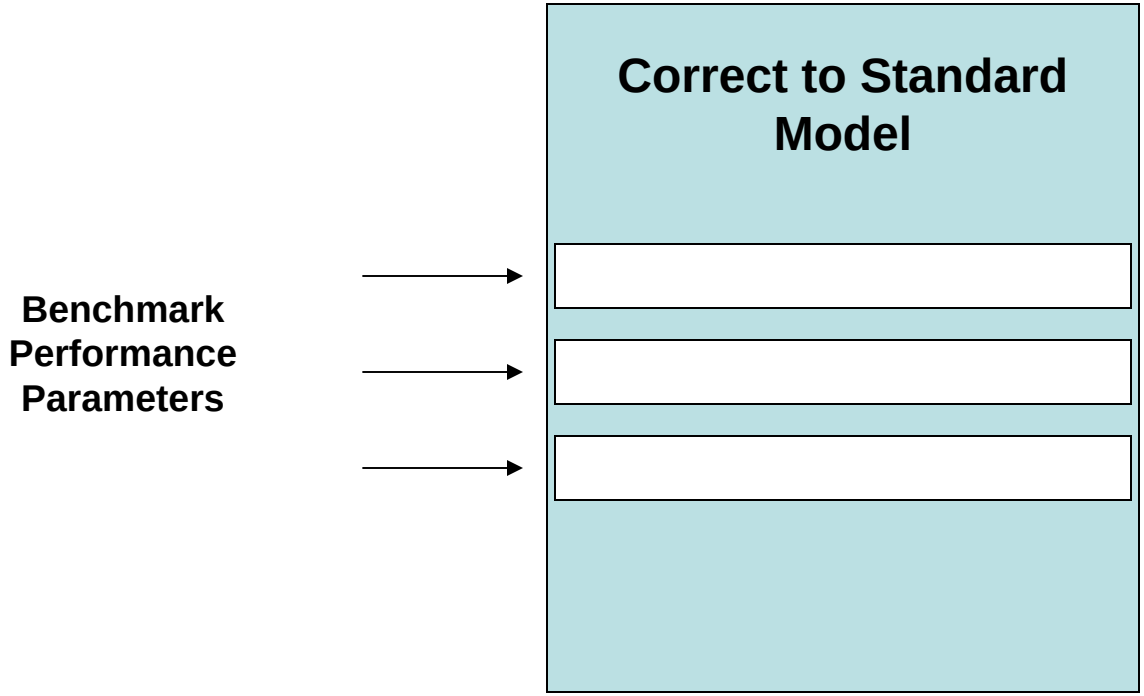
III. Correct to Standard

1. Insert Component/Stream Performance Parameters from Test
2. Normalize Inlet Conditions – Special Option 1 (fossil) or 4 (nuclear)
3. Use Benchmark Boundary Conditions (PTC 6 Group 2 Corrections)

III. Correct to Standard



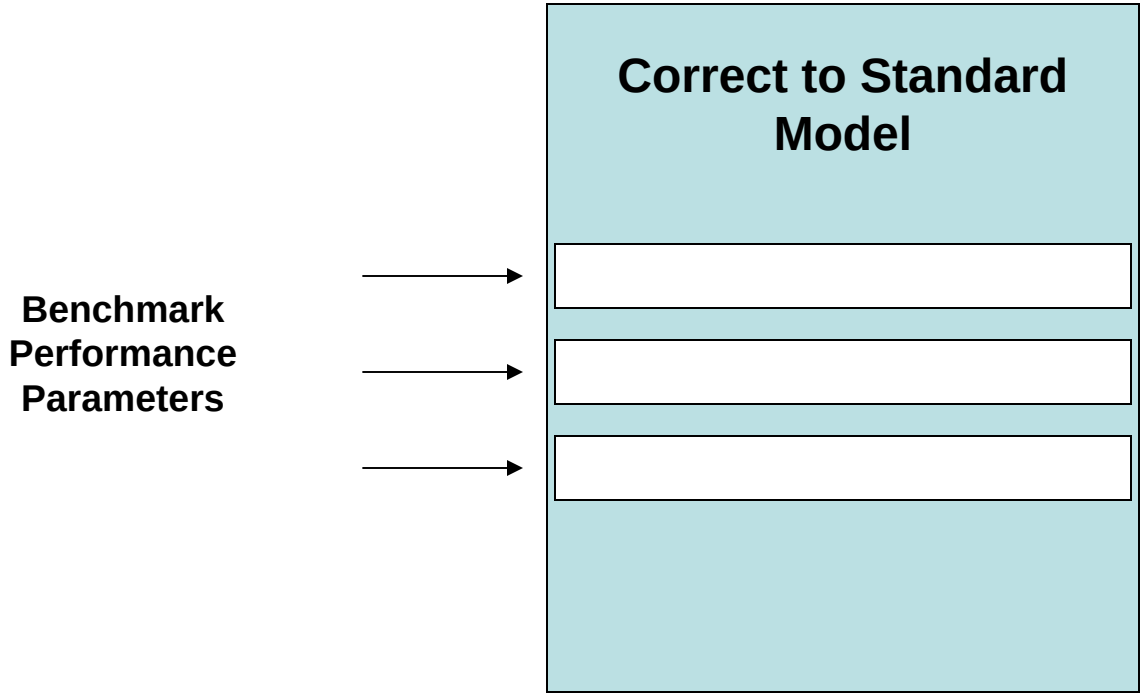
IV. Upgrades


Correct to Standard Model
Benchmark Performance Parameters

IV. Upgrades

1. “Turn Back Time”
2. Benchmark Performance Parameters Inserted Into “Corrected” Model One-At-A-Time
3. Note Individual and Cumulative Effect

IV. Upgrades


Correct to Standard Model
Benchmark Performance Parameters

Special Option 6

- Automates the Test Data Evaluation Process
- Uses Stacked Cases to Perform All Steps Consecutively – Only Changes for Each Step are Required
- Passes Required Information from One Step to the Next
- Can Stop Process at End of Any Step
- Read All Restrictions and Limitations Carefully

Demonstration

FAMOS: Fleet Asset Management and Optimization Solutions

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