ASME PTC-50

PERFORMANCE TEST CODE 50

on

FUEL CELL POWER SYSTEMS PERFORMANCE

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OBJECT

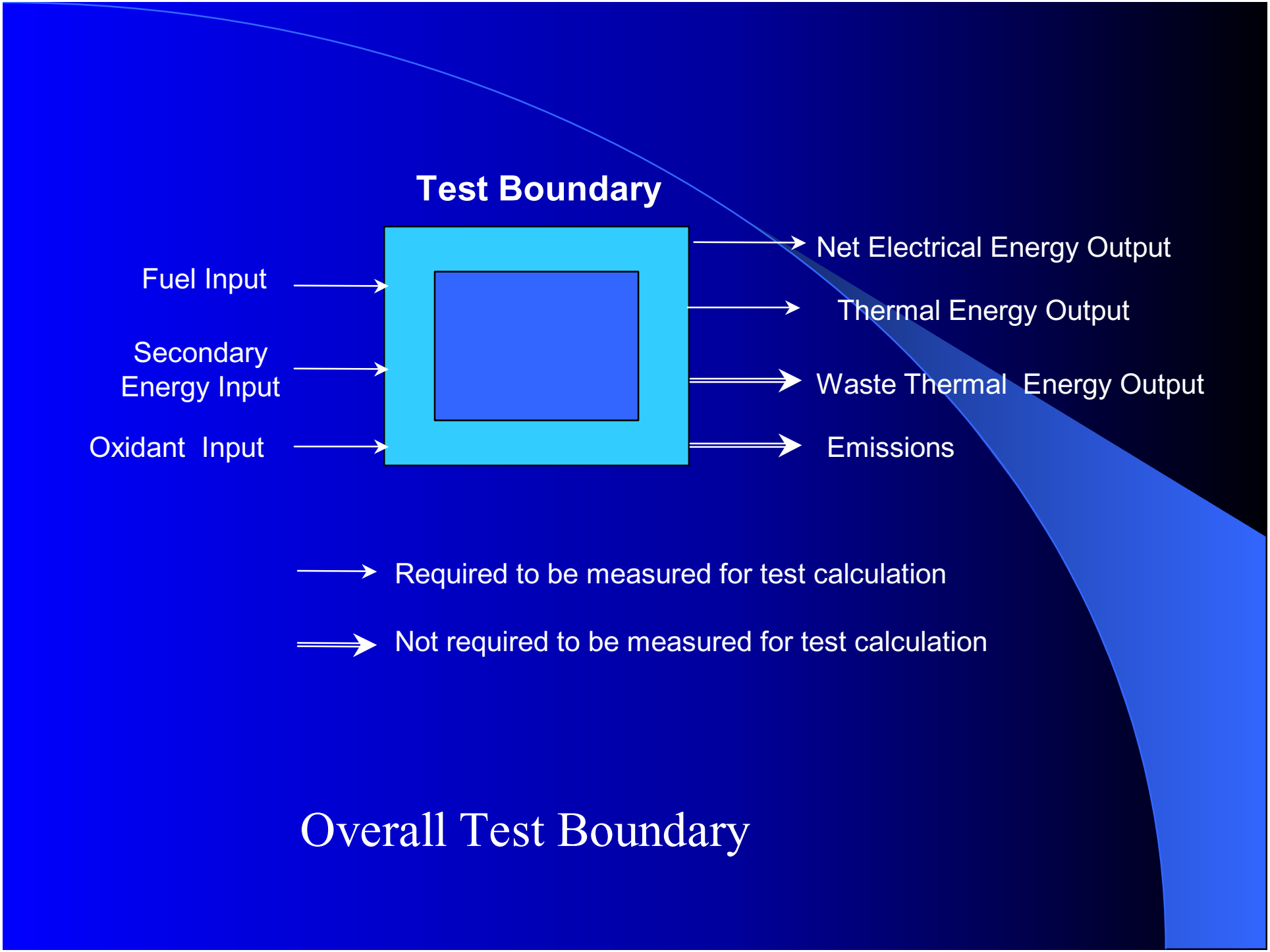
This Code provides test procedures, methods and definitions for the performance characterization of fuel cell power systems. Fuel cell power systems include all components required in the conversion of input fuel and oxidizer into output electrical and thermal energy. Performance characterization of fuel systems includes evaluating system energy inputs and electrical and thermal outputs to determine fuel-to-electrical energy conversion efficiency and where applicable the overall thermal effectiveness. These efficiencies will be determined to an absolute uncertainty of less than ? 2% at a 95% confidence level.

SCOPE

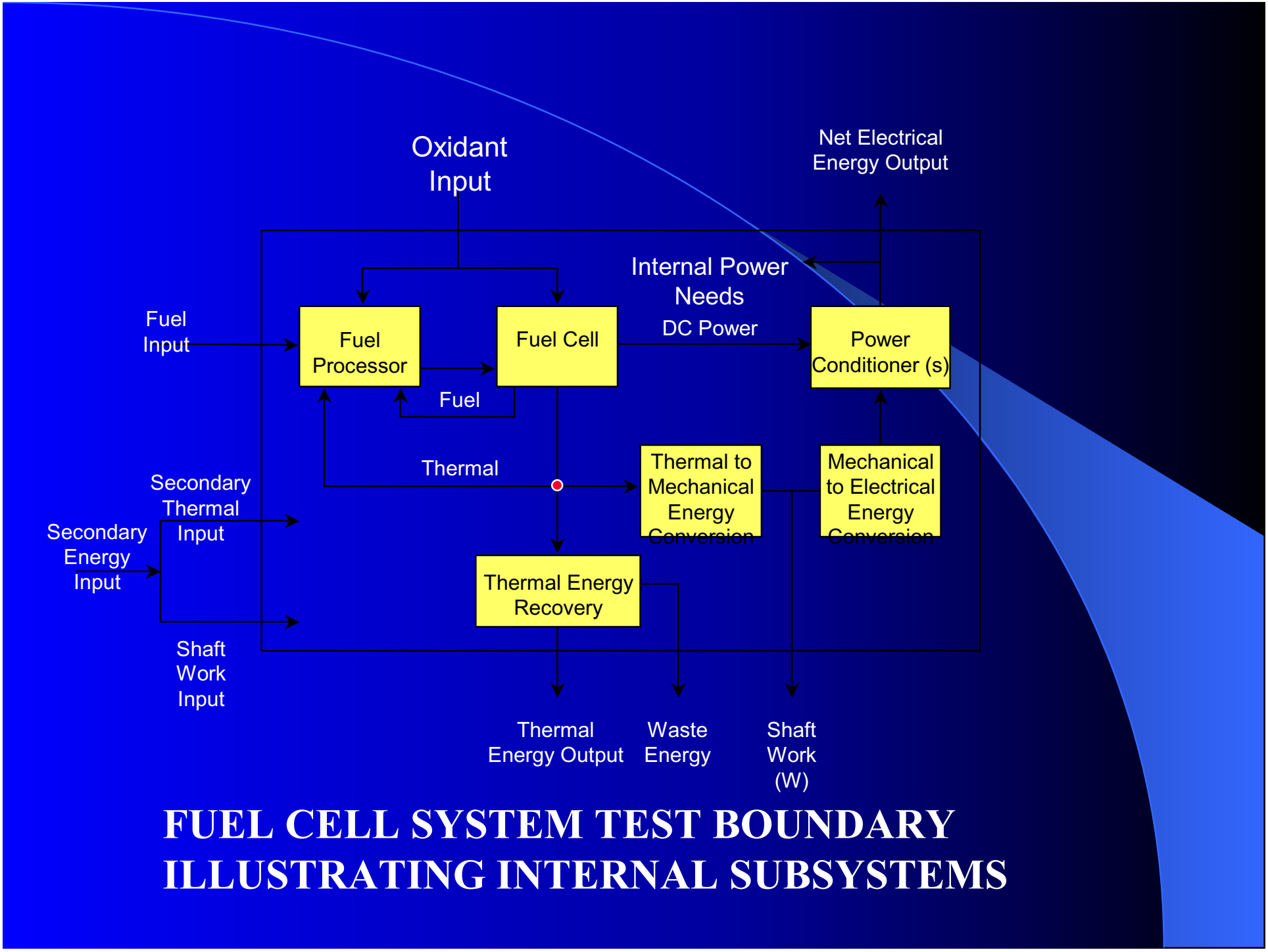
- Applies to all fuel cell power systems regardless of the electrical power output, thermal output, fuel cell type, fuel type, or system application.
- The net power output and all the fuel input to the system shall be taken into account in the performance test calculations.
- Applies to the performance of overall fuel cell power systems.
- Addresses combined heat and power systems, that is, the generation of electricity and usable heat at specific thermal conditions.
- Does not address the performance of specific subsystems nor does it apply to energy storage systems

SCOPE (cont)

- Does not address emissions, reliability, safety issues, or endurance.
- Contains methods and procedures for conducting and reporting fuel cell system testing, including instrumentation to be used, testing techniques, and methods for calculating and reporting results.
- Defines the test boundary for fuel and oxidant input, secondary energy input and net electrical and thermal energy output
- Provides procedures for determination of electrical efficiency or heat rate and overall thermal effectiveness at rated or any other steady state condition. The Code also provides the method to correct results from the test to reference conditions.



Overall Test Boundary



FUEL CELL SYSTEM TEST BOUNDARY ILLUSTRATING INTERNAL SUBSYSTEMS

0 INTRODUCTION

1 OBJECT AND SCOPE

1.1 Object

1.2 Scope

1.3 Test Uncertainty

2 DEFINITIONS AND DESCRIPTION OF TERMS

3 GUIDING PRINCIPLES

- 3.1 Introduction
- 3.2 Agreements
- 3.3 Test Boundary
- 3.4 Test Plan
- 3.5 Preparation for Test
- 3.6 Parameters to be Measured or Determined During the Test Period
- 3.7 Operation of the Test
- 3.8 Calculation and Reporting of Results
- 3.9 Records

4 INSTRUMENTS AND METHODS OF MEASUREMENT

4.1 General Requirements

4.2 Checklist of Instruments and Apparatus

4.3 Determination of Outputs

4.4 Determination of Fuel Input

4.5 Data Collection and Handling

5 COMPUTATION OF RESULTS

- 5.1 Introduction
- 5.2 Computation of Inputs
- 5.3 Computation of Electric Power Output
- 5.4 Computation of Thermal and Mechanical Output
- 5.5 Computation of Average Net Power
- 5.6 Computation of Efficiencies
- 5.7 Correction of Test Results to Specified or Standard Conditions

6 REPORT OF RESULTS

7 MANDATORY APPENDIX

7.1 Uncertainty Analysis and Sample Calculations

ASME Board on Performance Test Codes passed review in early May

Completing Public Review Process:

- Notice placed in the Mechanical Engineering magazine, May 2002 issue, page 63
- Also placed in ANSI Standards Action, Vol. 33 #7, March 28, 2002, page 6.
- Comment date ended on May 28, 2002.
- Approval request from ANSI to be processed in June

Document should be published this summer