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**Fossil Fuel Power Plant Unit/
Plant Demand Development**

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Fossil Fuel Power Plant Unit/Plant Demand Development

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Preface

This preface, as well as all footnotes and annexes, is included for information purposes and is not part of ANSI/ISA-77.43.01-2014.

In the 2014 edition, the title and purpose has been modified to make this standard applicable for once-through boilers. Thus, all references to “drum type” boiler have been removed. In the 2014 edition, the scope has been modified to include generation demand and turbine demand development and to change firing rate demand to boiler demand. The scope modification correctly identifies the content covered within the document and uses terms common to the industry.

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1 Purpose

The purpose of this document is to establish the minimum requirements for the functional design specifications of unit/plant demand development for control systems for fossil-fueled power plant boilers.

2 Scope

The scope of this standard is to address the unit/plant demand development subsystem for boilers with steaming capacities of 200,000 lbs/hr (25 kg/s) or greater. This subsystem includes generation demand, boiler demand development, turbine demand development, throttle/header pressure control, and unit megawatt/steam flow control as applicable.

This standard will address two types of process applications:

- a) a single boiler supplying a single turbine, typical of an electric utility power plant; and
- b) a single boiler or multiple boilers supplying a common distribution header, typical of an industrial power plant.

Specifically excluded from consideration are:

- a) dispatch control;
- b) turbine/generator control (other than turbine demand);
- c) feedwater controls
- d) steam temperature controls (covered separately by ANSI/ISA-77.44.01, Fossil Fuel Power Plant – Steam Temperature Controls);
- e) combustion controls (covered separately by ANSI/ISA-77.41.01, Fossil Fuel Power Plant Boiler Combustion Controls);
- f) steam distribution control systems;
- g) economic loading of boilers; and
- h) fluidized bed boilers.

3 Definitions

The following definitions are included to clarify their use in this standard and may not correspond to the use of the word in other texts. For other definitions, reference ISA-51.1, Process Instrumentation Terminology.

3.1 alarm:

an audible and/or visible means of indication to the plant operator of an equipment or process malfunction or abnormal condition requiring a response.

3.2 boiler:

the entire vessel in which steam or other vapor is generated for use external to the vessel. This includes the furnace, consisting of waterwall tubes; the firebox area, including burners and dampers; the convection area, consisting of any superheater, reheater, and/or economizer sections or any combined thereof, as well as drums and headers.

3.3 boiler follow mode:

a mode of boiler/turbine control where the boiler responds to an energy demand requirement and controls boiler pressure by regulating boiler inputs.

3.4 coordinated control mode:

a mode of boiler/turbine control that provides for the parallel operation of the boiler and the turbine as a unit to match generation to demand while maintaining boiler/turbine balance.

3.5 controller:

any manual or automatic device or system of devices used to regulate a process within defined parameters. If automatic, the device or system responds to variations in a process variable.

3.6 differential pressure flow element:

a measuring element that is inserted in a process flow path and used to create a pressure drop that is proportional to the square of the rate of flow.

3.7 firing rate:

the rate of fuel combustion in a boiler.

3.8 first-stage pressure:

the pressure within a steam turbine at the point where the steam exits the first row of turbine blades. The pressure at this point is closely proportional to the flow rate of steam through the turbine. First-stage pressure is also referred to as impulse pressure by some turbine manufacturers.

3.9 frequency:

an electrical measurement of the number of cycles in a given period of time that an electrical current oscillates. In the United States, the electrical system operates at a frequency of sixty Hertz (cycles/sec).

3.10 load:

the rate of energy output, usually expressed as lb/hr (kg/s) of steam or megawatts of electrical generation.

3.11 load dispatch:

a remotely developed signal transmitted to an electric generating unit's control system for the development of that unit's net generation requirement.

3.12 load index:

signal representative of desired output energy flow rate.

3.13 mass steam flow:

the mass flow rate of steam from the boiler derived either from direct process measurements and/or calculations from other parameters. If volumetric steam flow rate measuring techniques are employed, the measured (indicated) flow shall be compensated for flowing steam density to determine the true mass steam flow rate.

3.14 megawatt:

a unit of power measurement equal to one million watts. Turbine/generator capability is usually expressed in megawatts.

3.15 mode (submode):

a particular operating state of a control system such as manual, automatic, remote, coordinated, etc. A mode is usually designed to achieve a desired control strategy.