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Information technology — Sensor networks: Sensor network and its interfaces for smart grid system

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*.

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Introduction

Transitioning the existing Power Grid to Smart Grid is a challenging task over a lengthy period, and all power needs should be satisfied during the period that this transition takes place. This transition will likely affect a broad set of stakeholders, e.g., individuals and businesses, and the stakeholders should properly be informed of the changes taking place and to come. Smart Grid is a large, complex system which operates at various operation modes ranging from fully automated to handle time critical and instantaneous responses (sensing and actuation) to human-in-the-loop for response and interaction (command and control). The transition to Smart Grid will be a gradual migration with the coexistence of diverse technologies, systems, and equipment from the past, today, and the future. To ensure the interoperability of the diverse technologies, systems, and equipment without compromising the performance (e.g., reliability, safety, cyber security, etc.), Smart Grid will require effective standards. These standards should not be static, but evolve over the transitional time period. These standards should maintain their integrity to support all technologies, systems, and equipment that are and will be involved during the transition.

This International Standard does not address standards for Smart Grid (e.g., electrical power system). This International Standard addresses sensor network and its interfaces to Smart Grid, e.g., various applications of the sensor network to Smart Grid. The sensor network and its processing algorithms provide intelligent services to the user, e.g., operators in various domains of Smart Grid including power utilities and consumers.

The sensor network plays many critical roles in all areas of Smart Grid because: (1) sensors with processing capability are smart devices and sensor nodes can include actuators, (2) sensor data/information are transmitted via wired/wireless communication systems and data links, and sensor nodes typically include communication devices that formulate protocols for the data/information streams, and (3) sensors monitor and measure their designated environments, collect data from the environments, analyse the data if they have processing capability, formats the data, and stores them at their local memory devices; thus, within sensor network, some level of data management is necessary.

Sensor data from Smart Grid in many cases should be secured and cyber security should be in place to prevent from unauthorized access of sensors and related devices on the sensor network. Certain types of sensor data, e.g., customer data and information, should be protected from the information security and privacy point of view.

The sensor network can provide various applications and services during the transitional road to Smart Grid. The sensor network is expected to become one of the essential and critical players in migrating the legacy power grid system to Smart Grid. This includes adding and integrating sensor-related and network-related technologies with power systems and devices from the past, today, and the future. From the sensor network point of view, the information technology (IT) network is considered as the information highway or IT backbone providing the pathways for Smart Grid data and information. Therefore, a study of existing sensor network and power system related standards is necessary to leverage these standards for the sensor network standard development unique for Smart Grid, smart grid services and applications during the transitional period and afterward.

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Information technology — Sensor networks: Sensor network and its interfaces for smart grid system

1 Scope

This International Standard is for sensor networks in order to support smart grid technologies for power generation, distribution, networks, energy storage, load efficiency, control and communications, and associated environmental challenges. This International Standard characterizes the requirements for sensor networks to support the aforementioned applications and challenges. Data from sensors in smart grid systems is collected, transmitted, published, and acted upon to ensure efficient coordination of the various systems and subsystems. The intelligence derived through the sensor networks supports synchronization, monitoring and responding, command and control, data/information processing, security, information routing, and human-grid display/graphical interfaces.

This International standard specifies

— interfaces between the sensor networks and other networks for smart grid system applications,

— sensor network architecture to support smart grid systems,

— interface between sensor networks with smart grid systems, and

— sensor network based emerging applications and services to support smart grid systems.

2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 29182-1, *Information technology — Sensor networks: Sensor Network Reference Architecture (SNRA) — Part 1: General overview and requirements*

ISO/IEC 29182-2, *Information technology — Sensor networks: Sensor Network Reference Architecture (SNRA) — Part 2: Vocabulary and terminology*

ISO/IEC 29182-3, *Information technology — Sensor networks: Sensor Network Reference Architecture (SNRA) — Part 3: Reference architecture views*

ISO/IEC 29182-4, *Information technology — Sensor networks: Sensor Network Reference Architecture (SNRA) — Part 4: Entity models*

ISO/IEC 29182-5, *Information technology — Sensor networks: Sensor Network Reference Architecture (SNRA) — Part 5: Interface definitions*

IEEE 2030, *Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), and End-Use Applications and Loads*

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