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Intelligent transport systems — Energy-based green ITS services for smart city mobility applications via nomadic and mobile devices —

Part 3: Data exchange requirements for electric vehicle (EV)-based demand response charging services

Systèmes de transport intelligents — Services STI écologiques basés sur l'énergie pour les applications de mobilité des villes intelligentes via des dispositifs nomades et mobiles —

Partie 3: Exigences en matière d'échange de données pour les services de recharge à la demande des véhicules électriques (VE)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 17748 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Renewable energy sources in the electric power system have been increasing as part of efforts to overcome the global climate crisis (see ISO Guide 84). Unlike traditionally concentrated electric power generation sources, renewable energy sources are distributed nationwide. Cities are getting smarter thanks to information and communication technologies. They are also growing larger as the urbanization rate (the share of a population living in urban areas) rapidly increases. The number of eco-friendly electric vehicles in the transportation sector is also increasing. These changes make the efficient use of electric energy pivotal in cities, especially smart cities, which need to take climate action to reach carbon neutrality.

This document is based on the assumption that a smart city has its own energy management system to operate the electric power grid that provides electric energy for its citizens. It defines data exchange requirements to support electric vehicle (EV)-based demand response (DR) services that utilize nomadic devices in smart cities.

This document considers two types of EV-based DR service. The first type reduces electric energy consumption in response to a reduction request event issued by the energy management system of the smart city. Such an event can be issued in consideration of a shortage of reserved power, or on days when naturally occurring fine dust is so severe that, in accordance with the environmental policy of the smart city, coal-fired power plants blamed for the fine dust emissions are not operated. In this case, EV owners who receive a demand reduction request message from a DR service provider via nomadic devices can stop charging their EVs or reduce the charging load of EVs that are currently being charged.

The second type of EV-based DR service increases demand on days when a grid-side imbalance event is forecast due to over-generation of electric power from renewable energy sources. In this case, EV owners who receive a demand increase request message from a DR service provider can go to a specified charging station and charge their EVs during a specified time period.

These services, interworking the energy and transportation sectors, will contribute to making cities safer, more comfortable and more sustainable.

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Intelligent transport systems — Energy-based green ITS services for smart city mobility applications via nomadic and mobile devices —

Part 3:
Data exchange requirements for electric vehicle (EV)-based demand response charging services

1 Scope

This document specifies the data exchange requirements between related systems within the smart city for electric vehicle (EV)-based demand response (DR) services utilizing nomadic devices as follows:

— EV-based DR service for demand reduction, called “demand response” during the shortage of reserve on electric grid or in response to a fine dust warning issued according to an air quality forecast;

— EV-based DR for demand increase, called “reverse demand response”, instead of curtailment during excess electricity generation by renewable energy sources such as the sun and wind.

This document defines the requirements of main actors such as the EV, nomadic device, smart city cloud, charging station and service provider to support EV-based DR services.

This document also defines the data set and data processing procedure requirements for EV-based DR services.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15118-2, *Road vehicles — Vehicle-to-Grid Communication Interface — Part 2: Network and application protocol requirements*

ISO 15118-20, *Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation network layer and application layer requirements*

IEC 61851-1, *Electric vehicle conductive charging system — Part 1: General requirements*

IEC 62746-10-1, *Systems interface between customer energy management system and the power management system — Part 10-1: Open automated demand response*

IEC 63584, *Open Charge Point Protocol (OCPP)*

3 Terms and definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
payment meter
electricity meter with additional functionality that can be operated and controlled to allow the flow of energy according to agreed payment modes

3.1.2
customer baseline load
pattern of electric demand as usual, needed to measure performance of demand response program

3.1.3
demand response meter
meter installed by the service provider to measure load amount of the customer

3.1.4
electric vehicle supply equipment
equipment or a combination of equipment, providing dedicated functions to supply electric energy from a fixed electrical installation or supply network to an electric vehicle for power transfer

3.1.5
electric vehicle-based demand response
demand response activity by which the cost of charging electric vehicles is modified to cause consumers to shift consumption patterns

3.1.6
load increase amount
difference between the customer baseline load and the actual power consumption at each transaction time when the customer increases power load through participation in reverse demand response

3.1.7
load reduction amount
difference between the customer baseline load and the actual power consumption at each transaction time when the customer reduces power load through participation in reduction demand response

3.1.8
nomadic device
device that provides communications connectivity via equipment such as cellular telephones, mobile wireless broadband (e.g. WIMAX, HC-SDMA), WiFi, etc.

3.1.9
reverse demand response resources
demand response resources for large-scale transaction of power load increase

3.1.10
smart city cloud
advanced city platform using information and communication technology to intelligently network key functions of the city

3.1.11
standard demand response resources
demand response resources for large-scale transaction of power load reduction

3.1.12
virtual end node
client, energy management system, thermostat or other end device that accepts the OpenADR signal from a server like virtual top node

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