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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS,
NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Next Generation Networks – Frameworks and functional
architecture models

Framework for an energy-sharing and trading platform

Recommendation ITU-T Y.2072

ITU-T

ITU-T Y-SERIES RECOMMENDATIONS

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Recommendation ITU-T Y.2072

Framework for an energy-sharing and trading platform

Summary

To increase the efficiency of the electricity grid and reduce electricity grid wastage, it is important to support an open service platform with the capacity for more effective electricity markets and electricity trading. Thus, Recommendation ITU-T Y.2072 provides a framework for an energy-sharing and trading platform for integrated control and management, taking into account energy production, storage and consumption. After identifying key characteristics and core technologies of the platform, Recommendation ITU-T Y.2072 specifies requirements taking into account the energy value chain made up of various stakeholders. Then, Recommendation ITU-T Y.2072 provides an architectural overview specifying related interfaces and functional blocks. Finally, mechanisms for energy information exchange to support integrated control and management services on the energy-sharing and trading platform are described.

History

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* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation ITU-T Y.2072

Framework for an energy-sharing and trading platform

1 Scope

To increase the efficiency of the electricity grid and reduce electricity grid wastage, it is important to support an open service platform with the capacity for more effective electricity markets and electricity trading. Thus, this Recommendation provides a framework for an energy-sharing and trading platform for integrated control and management taking into account energy production, storage and consumption.

This Recommendation covers:

- key characteristics and core technologies for an energy-sharing and trading platform;
- requirements taking into account the energy value chain made up of various stakeholders;
- architectural overview specifying related interfaces and functional blocks;
- mechanisms for energy information exchange.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T X.1111] Recommendation ITU-T X.1111 (2007), *Framework of security technologies for home network*.
- [ITU-T Y.2071] Recommendation ITU-T Y.2071 (2015), *Framework of a micro energy grid*.
- [ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 aggregator: A system in smart grid for collecting the energy generated by residences and micro grids.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.2 customer: The end user of energy or services, who may also generate, store, and manage the energy.

NOTE 1 – Based on [b-ITU-T Smart-O-30].

NOTE 2 – Traditionally, three customer types are discussed, each with its own domain: residential, commercial, and industrial.

3.2.3 demand response (DR): A smart grid feature that allows consumers to reduce or change their electrical use patterns during peak demand, usually in exchange for a financial incentive. Mechanisms and incentives for utilities, business, industrial, and residential customers to cut energy use during times of peak demand or when power reliability is at risk. Demand response is necessary for optimizing the balance of power supply and demand.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.4 distributed energy resource (DER): An energy generation and energy storage facility located at the customer premises or power transmission and distribution systems.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.5 energy management system (EMS): A computer system comprising a software platform providing basic support services and a set of applications providing the functionality needed for the effective operation of electrical generation and transmission facilities so as to ensure adequate security of energy supply at minimum cost.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.6 energy storage: Energy storage provides storage functions of electricity using various types of batteries.

NOTE 1 – Based on [b-ITU-T Smart-O-30].

NOTE 2 – One example usage of energy storage is used to respond effectively to dynamic price mechanism from utility network. The electric energy is stored to the storage during lower price period relatively, while the stored electric energy may replace the higher price of electric power from utility network.

3.2.7 renewable energy certificate (REC): A tradable, non-tangible energy commodity that represents proof that energy was generated from an eligible renewable energy resource (renewable electricity) and was fed into the shared system of power lines that transport energy.

NOTE – An REC is also known as a “green tag”, “renewable energy credit”, “renewable electricity certificate”, or “tradable renewable certificate”.

3.2.8 service provider: An organization providing services related to smart grid to electrical customers and utilities.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.9 substation: A site where equipment for switching or regulating electrical voltage is located.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.10 supervisory control and data acquisition (SCADA): A computer system that monitors an industrial, infrastructure, or facility-based control process.

NOTE – Based on [b-ITU-T Smart-O-30].

3.2.11 utility provider: An organization that provides electric power, gas, and water. In the smart grid, a utility provider supplies electric power.

NOTE – Based on the definition of “utility company” in [b-ITU-T Smart-O-30].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
CBL	Customer Baseline Load
DER	Distributed Energy Resource
DNP	Distributed Network Protocol
DR	Demand Response

EI	Energy Interoperation
EIMA	Energy-Integrated Management Application Service
EIMC	Energy-Integrated Management Core Service
EIMS	Energy-Integrated Management System
EIPS	Energy Information Portal Service
EMIX	Energy Market Information Exchange
EMS	Energy Management System
ESPS	Energy Service Provider Service
ESS	Energy Storage System
ESTS	Energy information Sharing and Trading Server Service
ETC	Energy-Trading Client
ETOS	Energy-Trading Operation Service
ETS	Energy-Trading Server
M2M	Machine to Machine
OpenADR	Open Automated Demand Response
REC	Renewable Energy Certificate
SCADA	Supervisory Control And Data Acquisition
SEP	Smart Energy Profile
SOA	Service-Oriented Architecture
VEN	Virtual End Node
VTN	Virtual Top Node
XML	Extensible Markup Language

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

6 Introduction to an energy-sharing and trading platform

6.1 The concept of an energy-sharing and trading platform

As the smart grid shifts from the conceptual modelling phase to actual implementation, factors such as scalability, reliability and cyber security are becoming major issues. From the business perspective of the smart grid, it is also important to optimize energy supply and demand, as well as to stimulate the participation of energy-trading markets taking into account stakeholders such as wholesalers, retailers, third party service providers and consumers.

For energy-related services in a smart grid environment in particular, taking into account energy production, storage and consumption, it is essential to build up an intelligent energy-sharing and trading platform for energy consumption recognition and prediction through context awareness from sensing information using machine to machine (M2M) communications, as well as for more efficient

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