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SYSTEMS REFERENCE DELIVERABLE

Smart cities – City service continuity –
Part 2: Implementation guideline and city service cases

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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FOREWORD

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IEC SRD 63152-2 has been prepared by IEC systems committee Smart Cities. It is a Systems Reference Deliverable.

The text of this Systems Reference Deliverable is based on the following documents:

Draft	Report on voting
SyCSmartCities/253/DTS	SyCSmartCities/263/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Systems Reference Deliverable is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63152 series, published under the general title *Smart cities – City service continuity against disasters*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

0.1 General

It is important that organizations providing services are able to develop and implement preparedness measures to maintain and restore required services in the event of a disaster.

Because many of the services depend on electricity, an electricity continuity plan (ECP) and an electricity continuity system (ECS) can help maintain and restore necessary services in power failure that is caused by a disaster. IEC 63152 describes the concept and minimum requirements of ECP and ECS based on a business continuity plan (BCP).

However, depending on the type, degree, and quality of services, there are various ways to respond to disasters, and ECP and ECS cannot be created in the same way.

This document is designed to serve as a guideline for the design of basic parts by showing the process and points to be noted in the preparation of ECP and ECS for power outages based on normal service.

It is assumed that ECP and ECS will be useful to urban developers, urban operators, public service providers, disaster managers and system integrators, and manufacturers of systems related equipment and facilities.

0.2 Why ECP and ECS are needed

Services in cities are not just public services. There are a lot of different types of services and service users such as residential services, transportation services, medical services, manufacturing services, etc. These services are also composed of various services.

Electricity is a very important resource to provide these services. Physical damage can be unavoidable due to a disaster, but even in areas not directly affected physically, the power disruption affects the surrounding areas, making it impossible to maintain normal services.

For example, what about the transportation system when there is a blackout due to a disaster?

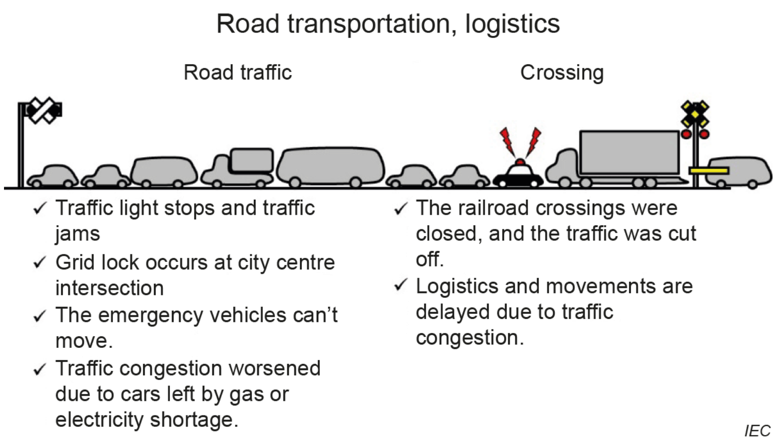

Figure 1 – Impact of power outage in traffic

During normal times, traffic signals display instructions regularly, and the traffic centre can control traffic signals based on traffic volume sensor information.

As shown in Figure 1, a power failure causes traffic jams in many places because traffic lights cannot display instructions. In that case, the traffic centre will not be able to grasp the traffic jam situation and will not be able to give appropriate instructions to emergency vehicles. Of course, the distribution will be delayed due to the traffic jam. Also, if the signal display disappears, there can be many accidents. (See Annex A for more examples.)

It would be helpful to have a system (ECS) in place to back up the power supply to important traffic signals, traffic sensors, etc., and to plan (ECP) activities to minimize the adverse effects on traffic with the minimum necessary information in the event of a power failure.

In addition, ECP and ECS cannot be used effectively if users are not familiar with them. It is important to conduct regular training to familiarize users with ECP and ECS. Furthermore, small power outages can be opportunities to check the effectiveness of ECP and ECS as well as identify points for improvements.

0.3 How to develop ECP and ECS using this document

With this in mind, this document shows as much as possible what should be considered when continuing service in the event of a power failure.

Here is how to develop the core ECP and ECS (See Figure 2).

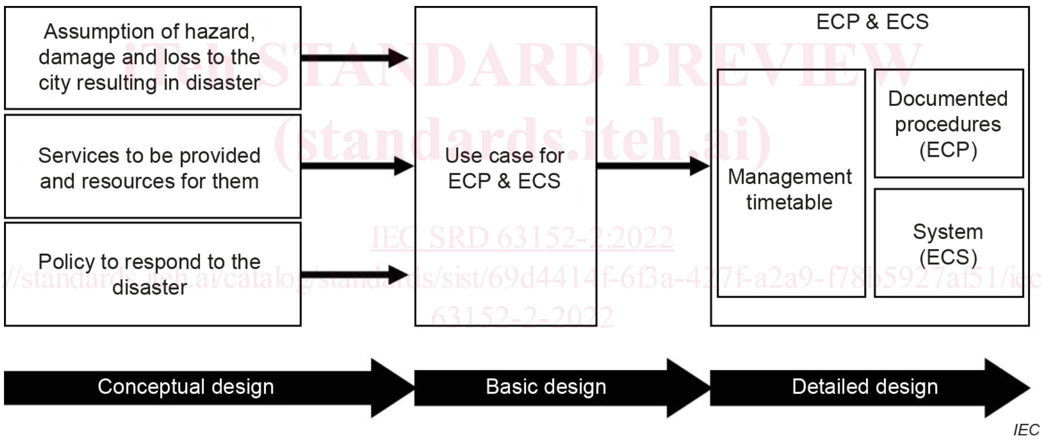

Figure 2 – Design flow image of ECP and ECS

First of all, a conceptual design is performed while clarifying the following points:

- assumption of disaster and level of damage to the city and to the organization;
- all services provided in the organization in normal time;
- policy and intention regarding what service and what level of service needs to be secured at the time of disaster.

Next, use cases for establishing ECP and ECS are described using templates to match the conceptual design, and basic requirements are summarized in the description as a basic design.

Finally, in the detailed design, the basic design is described in detail in the management timetable to clarify the overall picture of the disaster response, and then the ECP document is prepared and the ECS is designed.

0.4 What is the benefit?

There are many benefits to ECP and ECS, in addition to maintaining a certain level of service after a disaster. They include the following.

- Increase of the likelihood of early recovery.

  The implementation of ECP and ECS not only ensures that basic services are maintained for a period of time after a disaster, but also increases the likelihood of early recovery.

  If ECP and ECS maintain basic services during a power outage, they reduce the burden of responding to services that need to be restored after a power outage. In addition, they will reserve the capacity to create scenarios and preparation for the recovery during the power outage.

- ECP and ECS collaboration across multiple services.

  By considering ECP and ECS for each of the important services, and by understanding and coordinating the measures related among them, we can expand what can be covered by multiple ECP and ECS.

  As a result, we will be able to cover more facilities, more areas, and even apply them to the supply chain.

  If these efforts are accumulated, it will become possible to build cities that can respond to a variety of power outages, not just in times of disaster.

- Preparation and application for multiple disasters response (e.g. coronavirus + earthquake).

  Sometimes multiple disasters occur at the same time. For example, an earthquake can occur where an infectious disease, such as a coronavirus, is widespread.

  ECP controls human activity and ECS controls systems. When disasters are compounded in this way, staff shortages also need to be addressed. Several additional measures can be needed to identify gaps in staff and maintain ECP and ECS.

  The effectiveness of ECP and ECS can be enhanced by considering them in various disaster situations.

It is expected that the use of this document will enable many service providers to aim for more effective and advanced disaster response.

SMART CITIES – CITY SERVICE CONTINUITY –

Part 2: Implementation guideline and city service cases

1 Scope

This part of IEC 63152, which is a Systems Reference Deliverable, provides design guidelines for implementation of city service continuity (CSC) specified in IEC 63152 and includes city service cases for various target organizations (municipality, town developer, building administrator, etc.). The city service cases to be included are not only for emergency use but also for normal time use.

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.

IEC 63152, *Smart cities – City service continuity against disasters – The role of the electrical supply*

3 Terms and definitions

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

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
business continuity plan
BCP
documented information that guides an organization to respond to a disruption and resume, recover and restore the delivery of products and services consistent with its business continuity objectives

[SOURCE: ISO 22301:2019, 3.4]

3.2
electricity continuity plan
ECP
documented procedures that guide organizations to ensure continuity of electricity supply to maintain city services in a business continuity plan that addresses disruption caused by a critical event

[SOURCE: IEC 63152:2020, 3.2]

3.3
electricity continuity system
ECS
system required to ensure reliable and effective implementation of functions which are necessary for ECP

[SOURCE: IEC 63152:2020, 3.3]

3.4
city service
service that is performed for the benefit of the public

Note 1 to entry: In this document, services depend on provision of electricity supply.

[SOURCE: IEC 63152:2020, 3.4]

3.5
city service continuity
CSC
status in which, and capability with which, city services (i.e. public, medical, transportation communication services) that are provided to users in normal times, continue to be fully or partly provided, even in a state of emergency in which the normal functions of city infrastructures are interrupted

[SOURCE: IEC 63152:2020, 3.5]

3.6
disaster
rapid or slow onset event that causes significant disruption to one or more city services for an extended period of time

Note 1 to entry: This can include natural disasters, failures of key components or systems whether in hardware or software, physical damage to systems, and cyber attacks.

[SOURCE: IEC 63152:2020, 3.6]

3.7
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

[SOURCE: IEC 62559-2:2015, 3.1]

3.8
use case template
form which allows the structured description of a use case in predefined fields

[SOURCE: IEC 62559-2:2015, 3.4]

4 Overview of electricity continuity plan (ECP) and electricity continuity system (ECS) based on IEC 63152

4.1 Necessity of electricity continuity

Smart cities aim to provide more convenience and efficiency to their residents often through useful functions built on information and communication technology platforms powered by electricity. A smart city is advanced and complex due to the numerous functions it provides.

Therefore, if a smart city loses power, it will lose its ICT infrastructure and every function implemented for the smart city. This is one reason why electricity continuity is vitally important in smart cities.

There are various types of hazard that can bring damage and loss to a city resulting in disaster. Each city has its own weaknesses, and there are high-frequency disasters, depending on the nature of its location, climate and city composition. Loss of electricity due to a disaster brings big damage to the city. In situations where a hazard as shown in Figure 3 strikes the city, the first action to establish the countermeasures is to grasp what happens to electrical equipment and what problems will occur with each location, service or industry in a city, and then to assume damage when a hazard strikes a city and electricity is cut off.

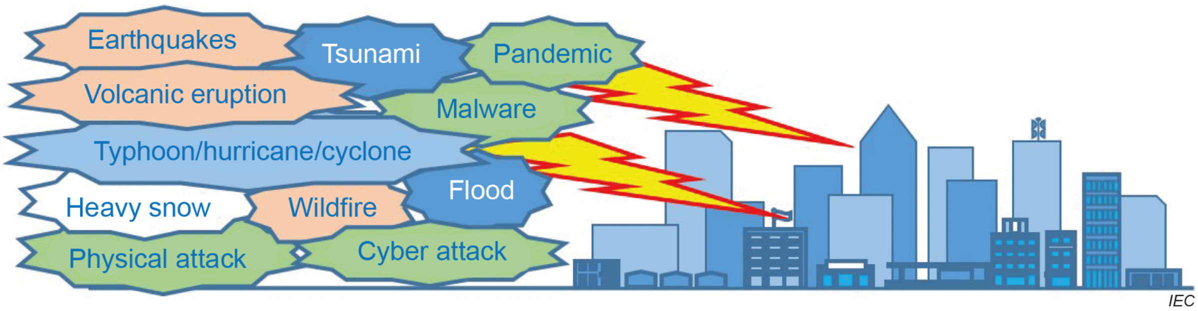

Figure 3 – Examples of hazards that can strike cities

Annex A shows a lot of issues as "impacts of power outage" caused by disasters in various fields of city services and activities as follows.

a) Life, home and buildings fields

When homes or buildings lose electricity, all electrical equipment stops, such as lighting, air conditioners, refrigerator, elevators, communication line, power supply to smartphone, computers, TV. Electronic keys of doors cannot work and mechanical parking locks up cars. Water supply also stops due to lack of power for pumps, then bath, shower and toilet cannot be used in addition to lack of drinking water. Fuel for emergency power generators will soon run out. Daily life will drastically change.

b) Mobility, transportation and logistics fields

Road and air traffic, public transportation, and logistics are affected.

When the road traffic control system loses electricity, traffic lights stop functioning and heavy traffic jams can occur, and many accidents can happen especially at night. Emergency vehicles cannot move, logistics and movements are delayed. The fuel shortage gets worse. Logistics is disrupted by traffic jams and fuel shortages. Stores are out of stock.

When railway networks and airports lose electricity, power and signal systems are down and trains cannot operate, the airport control system stops and aircraft are unable to take off or land.

c) Medical and commerce fields

Hospitals, medical services, retail, banking services, tourism, entertainments are affected.

Medical equipment, lighting, waterworks, pumps, air conditioners, refrigerators, elevators, etc. will stop working when a hospital runs out of fuel for its emergency generator. If there are more patients than usual due to the disaster, there will be a serious shortage of medical supplies and materials, combined with supply disruptions due to traffic congestion.

When retails lose electricity, not only do stores run out of stock on essential items including food, but electronic payment becomes unavailable and cashless payment such as credit cards or e-money is not possible. Banks are also unable to function; automated teller machines (ATMs) stop and the bank network stops.

d) Public and infrastructures fields

Public services, government services, shelters, education, communication, broadcasting, information services, gig economy, social infrastructures are affected.

When traffic jams occur due to power outage, rescue, search and fire extinguishing operations do not progress. Then the damage expands, resulting in a complex disaster.

When communication bases lose electricity and emergency power supply runs out, internet and phone services will be interrupted. Smartphones become disconnected and information cannot be accessed, which increases people's anxiety about the situation and prospects for recovery.

When social infrastructures lose electricity, such as drain pumps in lowlands, dams, floodgates and observation devices, holes occur in disaster prevention.

e) Industry and energy fields

When manufacturing or food industries lose electricity, the production stops. The impact of supply chain disruptions extends beyond disaster-affected areas to factories on the supply chain around the world. Shut down of food processing factories cuts off food supplies to consumption areas. Operations of petrol, oil and fuel refineries stop and their supply stops.

Agriculture lighting and control of greenhouse farming are halted. The refrigerator and freezer stop functioning, causing food spoilage in the dairy and fisheries industries.

Services or organizations in a city have complex interrelationships. Impacts of power outage for a service or organization propagate to adjacent or cascaded services or organizations, causing spread of damage. Understanding the interrelationships is important.

These examples, most of which have already been experienced in past disasters, seriously indicate the necessity of electricity continuity in a city, and the necessity for the countermeasures.

To solve the issue, the following points should be addressed.

- What happens to electrical equipment and what problems will occur with city services?
- How do we want to overcome the situation and what level of services do we want to secure at the time of disaster?
- What measures are necessary and effective, particularly from the perspective of electricity continuity?

Measures should include plans and systems for electricity continuity that are prepared prior to the disaster and operational during the disaster. Concept of and requirements for electricity continuity plan (ECP) and electricity continuity system (ECS), which are collectively called ECP & ECS, are introduced by IEC 63152 for this purpose. Specific procedures are given in the following clauses.

This document focuses on disaster preparedness and recovery on the demand side. Supply-side grid efforts will also enhance electricity resilience in complementary ways.

4.2 Countermeasures to disasters

As countermeasures to power outage due to disasters, ECP & ECS support city services to continue their role in the event of disaster, together with BCP. Well preparedness before a disaster and sure operation during a disaster are key points of effective ECP & ECS.

During establishment of ECP & ECS, desired levels of services to be secured during a disaster are a key point to be determined. The following items should be considered in determining the levels.

- To assume that all functions, information and things that require electricity in normal time are stopped.